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Maria Dobryakova, Isak Froumin, Kirill Barannikov, Igor Remorenko

November 2018

INTRODUCTION

Yet another... however —

> *Defining "competence" is like trying to climb a greased pole. Every time you think you have it, it slips.*[1]
>
> *Gerald M. Phillips*

> *It seems as if the concept of competence reveals a negative correlation between its popularity and its precision*[2]
>
> *Franz Weinert*

> *If I have seen further it is by standing on the shoulders of Giants.*
>
> *Isaac Newton*

For decades, governments and the general public have been concerned about the adequacy and quality of education with regard to the demands of a well-functioning society, as well as the economic and social payoffs of public educational expenditures. The strategic framework for European cooperation in education and training (ET 2020)[3] pleads for four major targets of educational reform, representing an official European and supra-national perspective on educational needs (Eurydice 2012)[4]:

1 Phillips, Gerald M. 1984. "A Competent View of 'Competence'." *Communication Education* 33:1, 25–36.

2 Weinert, Franz E. 2001. "Competencies and Key Competencies: Educational Perspective." In *International Encyclopedia of the Social and Behavioral Sciences,* edited by N. J. Smelser and P. B. Baltes, 2433–2436. Amsterdam: Elsevier.

3 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3Aef0016 [Accessed October 30, 2018]

4 https://eacea.ec.europa.eu/national-policies/eurydice/content/ongoing-reforms-and-policy-developments-20_en [Accessed October 30, 2018]

- Making lifelong learning and mobility a reality
- Improving the quality and efficiency of education and training
- Promoting equity, social cohesion, and active citizenship
- Enhancing creativity and innovation

To date, there are two major educational approaches to meet these needs: *competence-based education,* with the focus on mastering tools to solve-real life problems, and *knowledge-based education,* with the focus on essential knowledge about the world around us. Both approaches have existed for ages. They have been implemented together or separately. Most of the time, knowledge-based education was dominant in school education. For centuries, scholars and teachers have polished the body of essential knowledge for every child. It led to a profound mainstream consensus around the essential knowledge that has been achieved by mid-20th century.

Tectonic changes in culture, social, and economic order in the second half of the 20th century led to heated discussions about the content of school education. Traditional understanding of 'necessary knowledge and skills' was challenged by industry, scientists, and politicians. Education was bound to change, and this pressure was growing. This pressure is well described in thousands of policy documents issued by national governments and international organizations. The following statement by the Ministry of Education of Singapore illustrates this sense of urgency:

"Globalisation, changing demographics and technological advancements are some of the key driving forces of the future. Our students will have to be prepared to face these challenges and seize the opportunities brought about by these forces. … To help our students thrive in a fast-changing world…"[5]

Parents and teachers tried to resist. They considered the sacred and eternal collection of facts and skills as the foundation for social cohesion, national unity, and intergenerational communication. This is why school practice and curriculum theory did not lead the process of changes. Teachers reacted to the external pressure and signals by fragmented and inconsistent attempts to change the curriculum and practices of learning while keeping the "essential knowledge and skills" intact. It led to a "conceptual mess" in educational policy, school practices, theory of curriculum, and schooling.

It is only relatively recently that researchers in education and human capital admitted the problem of the conceptual mess. The Organisation for Economic Co-operation and Devel-

[5] https://www.moe.gov.sg/education/education-system/21st-century-competencies.

opment (OECD) Definition and Selection of Competences (DeSeCo) project[6] was the first attempt to put the field in order. It was an important attempt but it did not succeed as many countries continued to transform their curricula at a very high speed. They did not have time to reflect and talk to researchers.

Since then, the landscape has changed. The discourse of the rapid technological developments undermining the existing social order, as multiplied by global challenges — which places us in an increasingly changing and unpredictable world — has gained pace. On the one hand, business consultants and educational researchers have been trying to clarify the conceptual picture. Quite a few seminal reports have been published. Influential publications by brilliant authors, individual and institutional, have addressed the issue of competences. As we show below (see especially Chapter 2), the findings of the reports on new competences are becoming more and more coherent.

On the other hand, many countries have implemented significant curriculum reforms aimed to the development of new competences. There has been a vast array of practical attempts at different levels and of varied scale, stemming from and initiated by both industrial HR departments and school communities, governmental policies, and parents' concerns.

This helps us respond to a reader who may wonder what the added value is of yet another report. It is threefold:

1. We attempt to take a step back — borrowing from impressionistic or aerial mapping techniques — and rather than shuffling the existing frameworks and picking the most appealing ingredients, we develop *a thinking grid* to embrace and stream the components of various frameworks into major areas of competence and literacy. To achieve this, we try to look into the nature of a specific competence and how it is related to other competences. We thus try to sort out the bundle of terms, which have become known as 'the 21st century skills' and which may seem confusing for an overwhelmed newcomer trying to make sense of this talk.

2. We make a clear distinction between the notion of key competences and the notion of new literacy.

3. We draw our findings and recommendations from a *comparative analysis* of curriculum and instruction policies from eight countries and territories (Canada-Ontario, China, Finland, Poland, Republic of Korea, Russia, United Kingdom-England, United States-North Carolina), identifying common features of successful reforms and likely traps not to trip over.

[6] http://deseco.ch; https://www.oecd.org/pisa/35070367.pdf.

This project was initiated by the Charitable Foundation "Investment to the Future" of Sberbank, the largest bank of the Russian Republic, which was not only for the Russian audience. The foundation realized that it cannot borrow from good international practices to improve the Russian school curriculum unless 'the 21st century skills' discussion acquires a greater conceptual clarity. Having discovered the conceptual mess, the foundation offered an interesting task for our international team of researchers.

This report provides a practical framework for curriculum and school practices' transformation and also could serve as a foundation for fine-tuning policy in Russia and in other countries in the area of curriculum design, teaching, and learning toward the 21st century environment.

In its analysis of current education reforms, the project does not aim for the revision of disciplinary school knowledge but instead focuses on these three meta-disciplinary questions:

- Which competences and literacies are now required universally (and how to find one's way in the variety of existing lists and frameworks)?
- How can they be developed at school?
- What needs to be transformed in schools to meet these requirements and how can this be done?

This report is intended mainly for policy makers in education who are already familiar with various attempts to balance the existing deficits and the foreseen changes of the labor market, on the one hand, and individuals' lifelong overall well-being associated with the opportunities provided by education, on the other. Metaphorically, it is a scaffolding compass in competence-based education for policy makers. At the same time, it is a road map for school leadership who feel a responsibility to make a difference and who may, thus, welcome some general guidelines. Last, but by no means the least, it is for teachers and parents who want to see the bigger picture of where today's education is heading or should be heading — for these key stakeholders to be able to set expectations and make informed decisions concerning their choice of pedagogical practices and learning environment for their children.

1. Temptations resisted

No shuffling of terms. Who would resist the temptation of laying out the elements of various frameworks into neat columns? However, we do not perform an item-by-item analysis. We have tried it and, for our purpose, it did not work. We found such an exercise visually exciting and convincing in the short run — yet futile and misleading if we try to see a longer

perspective. First, there is the problem of synonyms and overlapping terms. Second, even if we control for this, we still will not be on a solid ground to justify why we pick these very items and why we pack them this very way. And the resulting framework is neither scalable nor sustainable. Nevertheless, we admit the convincing attractiveness of such a comparative layout and, in this respect, recommend the recent European Commission document comparing national and international frameworks.[7]

No academically isolated concepts. In the discussions of competences and literacies, the latter are often ascribed to individuals as autonomous actors and are treated from mostly psychological and psychometric perspectives, that is, as isolated personal qualities not rooted in their specific social context. This trend is naturally supported by assessment approaches. We also address their social dimension, which allows us to rest on the sociological academic tradition and helps us sort out some 'conceptual mess' stemming from isolated treatment of concepts, especially in the area of literacy studies.

No noncritical reliance on employers' choice. Lists of 'future skills' often come from companies describing their current deficits. We fully acknowledge this as a reliable and extremely important voice to be taken into account when developing education policy. But we cannot rely on it blindly. One caveat needs to be considered: companies tend to convey their current deficits — whereas schools offer education, which the now first-graders will start using in real life (professional and everyday) in about 15 years and then for their life-long well-being. If the development of a professional competence framework can be "a pragmatic process engaging a broad cross-section of stakeholders who prioritise competence inclusion based upon industry knowledge and experience,"[8] an attempt to develop a competence model for education should rest on a more durable ground. It means that when considering employers' laments, we should concentrate on their vision — on the major drivers and trends that will be dominating the scenery and shaping it. These include both technological trends and 'grand challenges' we, as the planet, are now facing.

2. Structure of the report

The report opens with setting the scene (**Chapter 1**): (1) a brief overview of global trends relevant for education. In the area of foresight studies, there is a vast literature on long-term trends related to development of technologies, society, and nature. We highlight those

[7] Commission staff working document accompanying the document *Proposal for a Council Recommendation on Key Competences for Life Long Learning*. SWD(2018) 14 final. January 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018DC0024

[8] European e-Competence Framework 3.0. P. 5. http://www.ecompetences.eu/wp- content/uploads/2014/02/European-e-Competence-Framework-3.0_CEN_CWA_16234–1_2014.pdf.

with greater implications for education and then proceed to (2) describing key educational trends which develop as a reaction to them.

The next three parts (**Chapters 2–11)** make up the core of the report. First, we present our 'thinking grid' to do the puzzle of abundant and overlapping lists of 21st century skills (**Chapter 2**). We look into the nature of key competences and explore the concept of literacy trying to pin down the abundance of adjectives: information, mathematical, digital, financial, health, visual, environmental, scientific, technological, cultural, global, and so on. We also pay special attention to the high-frequency concepts — digital literacy, information literacy, data literacy, computational literacy/thinking, health literacy — describing how they fit into the framework.

Then we explore the country cases (**Chapters 3–10**), trying to answer the main question: how to make 21st century skills a sustainable school reality (while also preserving the disciplinary core of education). The selection of countries is meant to provide a diversity of approaches and experiences. Among the top-10 Programme for International Student Assessment (PISA) countries and territories, Canada (Ontario) and Finland present examples of a coherent sustainable education policy rooted in Western philosophy, while China and Korea bring vivid examples from the East. Poland, with its PISA scores going up so impressively, is an important case to analyze efficient education policy. The cases of United Kingdom (England) and the United States, with their renowned educational institutions, lets us look into more patch-type approaches, with controversial turns, yet rich in islands of educational innovation going further than is generally implied by the state policy.

Each country case follows the same overall structure, with exceptions needed to clarify country-specific matters.

- Some background to the curriculum transformation, describing the transition to a curriculum with a stronger emphasis on 21st century skills and new literacy agenda along with the role of different stakeholders.

- The conceptual framework underlying the transition and how it is/was translated into practical matters: educational standards, teaching techniques and guidelines, textbooks and teaching materials, learning experience, and learning environment.

- How is the task of developing key competences and new literacies implemented at schools? Are there any special courses or is this task seamlessly integrated into disciplinary courses? How does this task unfold/evolve from preschool to high school; how does it change with the age of pupils? Is it implemented mostly within formal education at schools or balanced between formal and informal education?

- How is the development of key competences and new literacies assessed and measured; what tests and other measures are used?

- How was teacher retraining organized, if at all, and how is teachers' ability to teach key competences assessed?

- How was the transition communicated to the stakeholders, including schoolteachers, and how did they react?

In **Chapter 11**, we offer a summary of the country cases focusing on regulatory aspects of knowledge and competences in the curriculum.

In **Chapter 12**, we present pedagogical and school practices, which have demonstrated their potential with respect to 21st century skills and which, to varying degrees, are used in the countries under discussion.

Main takeaways

Our ambition has been to produce two kinds of incremental value: (1) to develop a comprehensive framework to embrace various classifications of key competences and literacies and (2) to explore country-specific approaches to competence-based education, to generalize on the good practices and limitations and make recommendations for those pursuing the path.

(1) Framework

We have analyzed over 180 competence frameworks, including industrial and business ones, trying to align them with influential theories of cognition, development, language, personality, and learning. We argue — supporting some of the earlier attempts in this area — that all key competences (we can use the word 'skills') that are used in different frameworks fall into one of the three core mega-competences:

- Thinking competence (competence **to use thinking skills** to solve intellectual (cognitive) problems)

- Interaction with others (interpersonal competence)

- Interaction 'with self' (intrapersonal competence)

Each key competence reflects the individual's holistic ability to act in a certain way in a given situation. Each key competence is underpinned by constituent skills (combined with knowledge and attitudes), which are mobilized in an individual's behavior when the com-

petence is at work (though a mechanical addition of these constituent skills does not necessarily lead to a competence either). We identify the three core competences but deliberately do not constrain their internal structure by a finite set of skills — we do mention some to provide a context but those mentioned are not intended to be exhaustive, and this is a distinctive advantage of our framework, reflecting the nature of a competence.

It is not a hierarchical list either, with some domains having a priority over others. The implication is that a learning situation — just like a real-life problem — should be designed in a way which requires bringing together relevant skills and attitudes from all the universal mega-competences.

As far as literacy is concerned, we argue that what has become known as 'literacy' ultimately falls into one of the two major categories:

- Domain-general, tool-based literacy, which involves one's ability to use sign systems and related communication tools

- Domain-specific (content-specific and context-bound) literacy, which involves practical factual knowledge of specific areas of contemporary life.

(2) Best practices

Currently, the new model for school education has not taken shape to be recognized globally and universally. However, it has already become clear that it is not so much a revision of the disciplinary content and not even special courses to develop key competences, which make up the core of the ongoing transformations. Rather, it is a fundamental and comprehensive **change of approaches to teaching and assessment — and to overall school practices**.

Following this general vector, each country beats its own path around twists and turns of its unique circumstances — cultural, historic, demographic, and economic. Nevertheless, an analysis of national strategies and their sociopolitical context makes it possible to highlight common features and factors of success.

In educational policy

- Focusing on few ambitious goals.

- Investing in teachers and their continuous professional development.

- Evidence-based decision making, monitoring implementation of reforms.

- Transparency, communication with stakeholders, including parents, students, business representatives, and local community.

- Disciplinary outcomes are defined in terms of school leavers' capability to solve real-life problems (this capability is usually called a competency[9] in a particular area) and not in terms of the number of topics covered in class.

- Intended learning outcomes include not only disciplinary competency but also general (meta-disciplinary) competences as well as personality traits (values, attitudes).

- The role of curriculum is important but it cannot bring about sustainable change if it is not supported in school practices — it is but one lever (and a smaller lever) when compared to pedagogical practice and teacher/principal leadership.

At the same time, we should be cautioned against

- **Accountability versus capacity building**: using test results and teacher appraisal, to reward or punish teachers and schools verus capacity building;

- **Individual versus group teacher and leadership quality solutions:** promoting individual versus group solutions;

- **Technology versus instruction:** investing in and assuming that the wonders of the digital world will carry the day versus quality instructional practice; and

- **Fragmented strategies versus integrated** or systemic strategies.

In curriculum design

- Competences and literacies that a country has adopted as most important are presented as a clear, coherent, and concise list or framework.

- Development of general competences is integrated into disciplinary learning; it is not a separate task but an integral feature of teaching and learning (although additional training sessions and courses are also possible).

[9] The distinction between competency and competence is not really relevant here; it is explained in more detail in chapter 2, with 'competency' stemming from professional qualifications and 'competence' tending to describe general capabilities.

- Disciplinary knowledge is structured and presented in large conceptual units highlighting the 'big ideas' to be internalized by the students and applied in real life; interdisciplinary connections are made explicit.

- Regulatory efforts focus on intended learning outcomes defined as "what students will be able to do (demonstrate, produce) as a result of engaging in the learning process" and not on adopting lists of topics and specifying their content in great detail.

- Summative assessment includes assessment of general competences.

In school practices — educational leadership, teaching, and learning

- A key component in the school structure is the role of the school principal — while the teacher is central to student achievement, research advises that teacher effectiveness is connected to principal instructional leadership. School leadership is a key factor in teaching and learning practice.

- The emphasis is on students and their learning (and on students owning their learning) and not on teachers' instructional activity to introduce new content.

- A supportive learning environment (positive emotional background and ambitious goals for each student).

- Inquiry-based learning to activate students' curiosity and encourage them to make meaning: students (on their own and in collaboration with peers) specify the task for themselves, search relevant information and research the topic, present what they have learned, formulate criteria of success, and, together with the teacher, evaluate the result.

- Project-based learning as mainly interdisciplinary group projects (3–15 students) lasting several days, a semester or even the whole academic year, and focusing, among other things, on challenges relevant for the local community.

- Assessment for learning which serves as a feedback mechanism highlighting students' strengths and weaknesses and their short-term and longer-term personal learning objectives.

- Personalized learning optimized in terms of pace of learning and instructional approach for the needs of each individual learner.

- Learning tasks and situations are linked to students' real-life experience and are relevant for them.

Nearly all the countries center their instruction models on the learner and emphasize the students' learning experience and active inquiry. Educational systems have become responsible not only for the proper supply of disciplinary knowledge and related teaching materials but also for development of the active learner who is able to learn new things, to explore the unknown and who enjoys it. The exact shape of the framework of competences and literacies is, thus, of minor importance compared to the pedagogy and learning environment constituting the individual's learning experience.

Chapter 1

GLOBAL TRENDS: IMPLICATIONS FOR EDUCATION

In education, we can never be complacent. Good is no longer good enough. We are on our journey of change together, on a collective journey from great to excellent (Fullan, 2015).

Globalization, technology, and a deeper understanding of relationships, engagement and building community influence society's understandings of learning today. The change is so profound that it is described as disruptive innovations (Christiansen, Horn and Johnston 2008). In foresight studies, they are often clustered in six dimensions: social, technological, economic, ecological, political trends and public values (STEEPV). Technology is not the only factor of change but it is surely a significant factor accelerating the pace and adoption of change which is feeling like a new phenomena.

The literature of global trends and megatrends is vast but tends to emphasise, to a varying degree and in various aspects, the same trends. We briefly outline them here paying attention only to the aspects, which require a reaction from education systems.

1) Aging World, Growing Social and Demographic Disproportions: world population growth, but mainly in the poorer economies; population ageing and increasing life expectancy; a high level of social inequality at the global and national level.

The implications for industry are augmenting the call for lifelong learning/reskilling. Governments are needing to address social services gaps. Even in countries within the Middle East and North Africa region experiencing higher birth rates the world is expected to have a talent/human capital shortage of 85M by 2030 = $8.5 Trillion shortage.

2) Rapid Urbanization. It has the potential to improve the well-being of societies. Although only around half the world's people live in cities today, they generate more than 80 percent of GDP; it is estimated that nearly 40 percent of the world's urban expansion may be in slums, exacerbating economic disparities and unsanitary conditions. By 2050 2/3 of our global population will be in urban centres.

3) Labour Market Shifts, Skills Mismatch: Job polarization, wage polarization, growth in service sectors, decline in good production sector, etc.

Technologies bring about new formats of employment and communication, digital technologies transform labour markets: people can now easily communicate, physically being far away from each other. Labour mobility and competition are no longer constrained be national borders. The share of non-routine tasks, including those which require collaborative problem solving, is growing; demand for routine non-manual labour is decreasing (Autor & Price 2013[1]; Autor, Levy, and Murnane 2003). New professions appear.

There is a growing gap between skills available and skills required. This is accompanied by *Immigration Policy Shifts*, i.e. increased restrictions to talent mobilization/migration.

4) Economic Shifts with a Global Capacity Imbalance. Data as a New Raw Material To Be Mined. Creation of wealth is shifting; rise of collaboration commons and zero margin cost phenomena.

The abundance of information is changing the nature of consumption and production: the amount of data registered (from humans, from sensors) and used as value-added information is growing. Information has become a new type of raw material, it has brought about a new business model — "platform capitalism" (Srnicek 2016), and the ways we deal with information raise new ethical questions (e.g. see Zuckerberg's Senate hearing, April 2018).

There is a growing gap between mature/developed markets focusing in quality and new/emerging markets producing quantity.

5) Convergence of new technologies — nano-, bio-, info- and cognitive (NBIC): at the level of research (disciplines that had developed apart from each other, now work together and lead to qualitatively new results); at the level of development of new products and in the area of production; at the level of implementation of technologies into social and technological systems (e.g. logistics in healthcare, food security).

[1] Autor D., Price B. The changing task composition of the US Labor Market. An update of Autor, Levy and Murnane (2003). https://economics.mit.edu/files/11600

Autor, Levy and Murnane (2003), 'The Skill Content of Recent Technological Change'

6) Technological developments may push us to reconsider our ethical frameworks: new technologies (genetic engineering, transplantation, reproduction technologies, prolongation of life) often spill over conventional ethical norms and require that we reconsider them in terms of philosophy (and religion) and law. Artificial intelligence brings about new agents that we will have to deal with — personally and legally.

7) The model of interaction between state and its citizens is changing: individuals get new tools to interact directly with each other, without intermediaries, and become more independent from the state — politically, economically, and technologically. This changes the key functions of the state, including such functions as maintenance of territorial integrity, law enforcement, taxation, circulation of money, production of public goods, etc.

These interplay with «Grand challenges»: climate change, depletion of natural resources and biodiversity, threats to security — all these require global action and coordination.

1. CHANGING LABOUR MARKET AND WORLD OF WORK

Work is an essential element of human life, both in terms of generating income and, for many people, as an intrinsic source of meaning and satisfaction in life. In today's world, the ways in which we perceive and conceptualize what it means to work are dramatically shifting. This shift has caused widespread pressure to align 21st century competencies/skills with projections for 21st century jobs. These changes, however, can and do have highly disruptive effects for individuals, families, communities, nations, and as a result, the world-at-large. For instance, automation enabled by technologies including robotics and artificial intelligence offer opportunities and risk. McKinsey and Company (2017) caution that 30% of activities intrinsic of 60% of all occupations can be automated potentially affecting 50% of the world's economy. Technology and digital demands are part of this changing workforce and highly skilled employees will benefit. There will be substantive impacts on the number and types of jobs.

Presently, there are widely divergent analyses of what the labour market might do in the future. Uncertainty is inevitable, since many forces affect the labour market. Technology is one disrupting factor sometimes inciting extensive and rapid changes in the working world in a short period of time or revolutionary changes over a longer period, such as the decline of employment in agriculture. Additionally, environmental, social and political factors have the potential to create changes including migration of large numbers of people looking

for work[2], urbanization, an aging population, and the changing role of women and their increased participation in the labour force. These changes can happen locally, as some jobs shift to lower wage jurisdictions, or globally as economic activity becomes more integrated across borders. While it is important to use data to analyze trends in these factors, the problem is that the future is highly unpredictable.

The World Economic Forum (2016) considers that we may be entering, *'the Fourth Industrial Age'*, with workers operating in a more digital, technological, automated, and outsourced workplace. Traditional jobs in areas such as manufacturing (moving offshore), and primary industries such as farming, forestry and mining are disappearing in the interconnected 'Knowledge Economy'. There is growing polarization of low and high skilled jobs, with increasing underemployment. Globally, 75 million youth are unemployed; in the US, Canada, and fifteen European Union nations there are approximately 300 million adults not in the work force and at least 100 million would like to be working (McKinsey, 2017). Jobs and people are congregating in cities and the pull for urbanization interacts with the push from rural and remote communities.

Change can bring opportunities for consumption (mobile internet), production (automation), and for a fortunate few, flexible hours and locations for work (cloud technology), and employment. Transitions can result in challenges, including structural underemployment and unemployment (World Economic Forum, 2016). Ensuring a highly skilled and educated workforce can minimize some of these labour disruptions.

In its 2017 report, *OECD Skills Outlook*, the OECD notes the opportunities and challenges presented by increasing globalization. The interlocking global economic networks mean that workers in different countries may potentially contribute to the design, creation, marketing and sales of the same product(s). More companies are transnational and more jobs/occupations are outsourced. The report notes that workers will require strong cognitive skills including literacy, numeracy and problem solving; management/team skills (social-emotional, motivated, self-directed and resilient), and communication skills with a "readiness to learn" (2017, p. 1).

Demographics, in both society and the workplace are shifting too. The population is aging, and there will be myriad business opportunities serving an older society. Society is urbanizing. Women have made significant gains in the workforce; "[a]s a market, women will account for US $5 trillion additional consumer spending and more than 2/3 of global disposable income over the next decade" (World Economic Forum, 2016, p. 6).

[2] In 2015, 247 million people live in a country not of their birth. Cross-border migration of people seeking work and economic improvement is a significant contributing factor to this statistic.

A racially and linguistically diverse workforce requires different social skills to communicate, collaborate, collectively solve problems, and achieve goals. These cross-functional skills include collaboration, social and cultural awareness, people management, flexibility, empathy, and effective communication, including active listening. All link to Social and Emotional Learning or SEL (World Economic Forum, 2016).

The increase for job demands are in fields that McKinsey & Company (2010) refer to as "interactive work", acting as connectors to the knowledge economy. For these value-creating jobs, technology enhances and does not replace the work. However, these jobs require an educated, skilled, flexible, collaborative, and adaptable workforce. When launching the OECD Adult Skills report in Singapore (2016), Andreas Schleicher (OECD Director for Education and Skills) said that *"without the right skills, people will languish on the margins of society, technological progress will slow and countries will struggle in the global economy…governments must improve their education system and work with business and unions to develop fair and inclusive policies so that everyone can participate fully in society."* [3]

These trends for new skills and competencies emerging in a digitized, automated, linked and diverse workplace continue to influence education and learning. Tomorrow's workers will likely face temporary, project-based activities with less security and more collaboration and interaction albeit remotely via the cloud (Economist Intelligence Unit, 2015).

2. WHAT ARE THE SKILLS AND KNOWLEDGE REQUIRED BY TODAY'S LEARNERS FOR TOMORROW'S WORLD?

What are the skills and knowledge required by today's learners for tomorrow's rapidly changing, diverse, interconnected and digital world to be global citizens? What are the 21st century global competencies? What are the strategies, programs and services required that build these competencies? How can learners demonstrate learning outcomes or the mastery of these competencies in terms of what they know and are able to do as evidence?

[3] Improve skills to build fairer, more inclusive societies (OECD, 2016) http://www.oecd.org/newsroom/improve-skills-to-build-fairer-more-inclusive-societies.htm

Different groups have identified different skills/knowledge clusters for the 21st century. Keeping in mind these uncertainties, the expert consensus is that long-term changes in the nature of work have brought an increasing demand for new skills, commonly referred to as 21st century competencies/skills.

The *enGauge Report* (2003),[4] identified four clusters of skills and knowledge for the 21st century workplace:

1) Digital-age literacies including scientific, economic, technical, visual, information, cultural and global in addition to the traditional literacies;

2) Inventive thinking including adaptive and managing complexity, self-direction, curiosity and risk taking, higher order reasoning;

3) Effective communication including teaming, collaboration, personal, social and civic responsibility and interactive communication; and

4) High productivity including prioritizing, planning, managing for result, effective use of real-world tools and ability to produce relevant, high quality products.

The World Economic Forum (2016) examined technological drivers of change noting that tomorrow's workers will have to interact comfortably in the new digital, technological world of work linked by the *Internet of Things*. Educating learners for 21st century skills/competencies will help in the transition. OECD (2012) notes that the labour force participation for adults with no experience using ICT is lower than those with high proficiency (47% to 90%). Additionally, the more frequent use of digital tools at work is associated with high wages. There will be emerging consumer concerns and supply and demand chains that will structurally affect industries such as, transportation/mobility, infrastructure, financial services and investing. '*The Fourth Industrial Age'* requires a highly skilled and educated workforce that can demonstrate new abilities, and skills.

The World Forum (2016, p. 21) outlined their *Core Work Related Skills* that workers will need to succeed in the changing workplace (see the chart below).

[4] *enGauge 21st Century Skills for 21st Century Learners* report: http://www.d.umn.edu/~hrallis/professional/workshops_attended/ties05/engauageskillsbrochure.pdf

Core Work Related Skills (WEF, 2016)

Abilities	Basic Skills	Cross Functional Skills	
Cognitive: Flexibility, Creativity, Logical reasoning, Problem sensitivity, Mathematical reasoning, Visualization	**Content:** Active learning Oral expression, Reading comprehension, Written expression, ICT literacy	**Social:** Coordination Emotional Intelligence, Negotiation, Persuasion, Service orientation, Training and teaching others	**Resource Management:** Financial resources, Material resources, People management
Physical: Strength, Manual dexterity, Precision	**Process:** Active listening, Critical thinking, Monitoring self and others	**System:** Judgment, Decision making, System analysis **Complex Problem Solving:** Ability to solve complex problems	**Technical:** Equipment maintenance and repair, Equipment operation and control, Programming, Quality Control, Technology and User Experience Design, Troubleshooting

OECD's analysis of the *Survey for Adult Skills*[5] indicate that highly skilled adults across the OECD are twice as likely to be to be employed, and three times as likely to earn above the median income as low-skilled adults. Highly skilled adults are more likely to be healthier, vote, volunteer and be productive citizens.[6] OECD, examining data from global benchmark assessments such as PISA has identified economies/countries with school systems that are effective inclusive, and grounded in equity.[7] Public education is now recognized "as one of the critical drivers for social and economic change", because most students (more than 80% of those participating in PISA) attend publicly funded schools (Grose & Freedman, 2014, p. 34).

There is a consensus that education systems should change to nurture skills/competencies that include curiosity, innovation, and critical thinking. How does one revise or construct a new type of balance between teaching existing knowledge, while facilitating learners to be adaptively creative about possible, probable and preferable solutions for tomorrow's problems?

Today's dynamics require the transformation of education systems so that they are more responsive to new realities and more agile to prepare all students for future success (Grose, 2016).

5 Programme for International Assessment of Adult Competencies (PIAAC)

6 Causality is still being determined.

7 OECD (2016), PISA 2015 Results (Volume II): Policies and Practices for Successful Schools, PISA, OECD Publishing, Paris.

3. INDUSTRIAL AGE SCHOOLS ARE NOT SUITED FOR THE KNOWLEDGE SOCIETY. A SHIFT TOWARDS FOSTERING COMPETENCES FOR LIFE LONG LEARNING

We are living in a period of profound change. The world has evolved from a traditional industrial base to an interconnected and globalized knowledge economy. Education is one of the critical drivers of social and economic change. By the 1950s, developed countries (irrespective of their political and economic order) had established a model of school an overall goal of which was to support industrial production: mass education, compulsory 8 to11 years of studies, and uniform disciplinary contents for all students. However, mass participation of population in this model changed the quality of human capital and posed new challenges to education.

First, national states and international organizations' concern was to provide a minimal set of disciplinary contents, because, by default, mass education cannot be selective. Rather, it should entitle every student to a minimal kit of knowledge and skills. Instead of preparing the lucky few for their next levels of highly selective education, it is to guarantee foundational skills for everyone's well-being and success in the unstable, changing world.

This is why, in the 1960s, education specialists began to draw attention to the essential insufficiency of disciplinary knowledge and to the need to interpret the goals of mass education in a broader way. The international approach to this issue is well formulated in the influential Faure report by UNESCO (1972).

As a result, by the 1980s, most developed countries had extended their traditional curricula to include tasks to foster higher order thinking and critical thinking, in particular.

NB: This trend has never required a radical change of the structure of disciplinary learning and even of educational technologies. Rather it implies a change in the nature of learning tasks and assessment of learning outcomes.

Second, the industrial community set forth new requirements to mass education. Mainly these were caused by changes in the labour market and types of labour: the share of routine labour was decreasing and the share of non-routine labour was growing. A widespread demand for expert thinking/analysis and complex communication was registered. Industrial associations insisted that mass education should develop soft skills and key competences (21st century skills), including self-organisation, communication, cooperation and collaborative problem-solving skills.

In the last decades, leading global corporations — primary in the hi-tech sector — continue their labour market research and argue: employers welcome people who are able to think critically, to solve problems creatively, who are open to new knowledge and innovative approaches, who are efficient communicators and team-workers.

NB: Prior to mid-1990s, in most countries, demands from the industrial sector were not reflected in school education. However, according to CEDEFOP, more than 50% of countries have included in 2014 key competences in the level descriptors of their National Qualification Frameworks[8]

Third, the increasing uncertainty of the future called for different outcomes of school education — it is becoming but a stage, one among many others during the life course, and it requires the skill of learning to learn and adapt to new circumstances. The industrial model welcomes accurate, obedient workers performing predictable tasks. While the current VUCA world poses complex problems. Living in a world of uncertainty means solving an infinite number of unknown problems and shifting between multiple, fuzzy and dynamically changing goals and conditions [Poddiakov 2014].

"Complex problem solving expects the efficient interaction between the problem-solving person and situational conditions that depend on the task. It demands the use of cognitive, emotional, and social resources as well as knowledge" [Funke 2013[9]]

In such a world, we can't learn everything by heart in advance and thus get ready for the unknown — we have to update our skills, grasp new opportunities and avert new risks.

NB: Prior to mid-1990s, fostering learning to learn skills was not among objectives of school education.

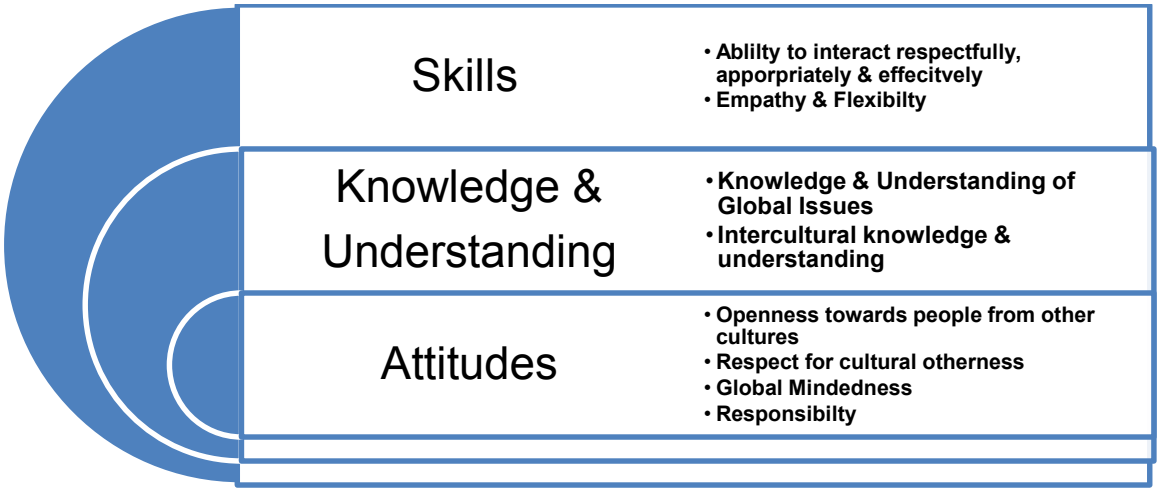
And **fourth**, by the beginning of the 21st century it became evident that school disciplinary knowledge, which had mostly been packed half a century ago, was outdated. Professional and public associations insisted: school mandatory knowledge should be extended, and this is the new literacy. By the 2010s, the list of new literacies had inflated up to more than 50 items and included financial, health, digital, legal, environmental and other 'literacies'. Even the global context we live in is becoming an aspect of new literacy.

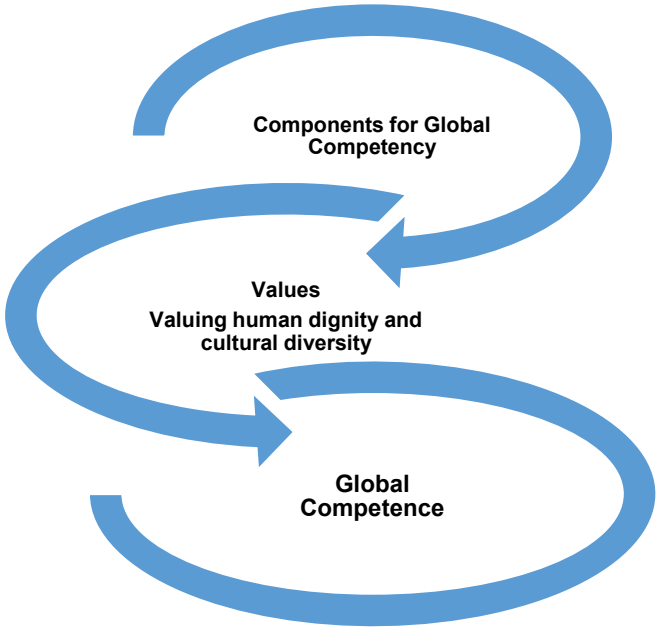
[8] P. 8. https://ec.europa.eu/education/sites/education/files/swd-recommendation-key-competences-lifelong-learning.pdf

[9] Funke J. Complex Problem Solving, in: Seel N.W. (ed.) *Encyclopedia of the Sciences of Learning* (P. 682–685). Heidelberg: Springer.

Global Competency for an Inclusive World (2016) is a report for the proposed 2018 Global Competencies assessment that will form part of PISA, 2018. It will assess "the extent students have developed and can apply intercultural and global issues to the following set of knowledge and skills: knowledge and understanding of global issues, intercultural knowledge and understanding, and analytical and critical thinking" (OECD, 2016, p. 5).

Proposed Dimensions for Global Competency for PISA 2018





At the same time, conception of traditional literacy has been extended to include one's ability to comprehend and communicate information in various formats (textual and visual, in natural and formal languages, etc.). Fluency with processing information has become a

prerequisite for life-long learning and a ticket to opportunities of participation in social and economic life.

NB: National systems of education integrated new topics and even courses into their curricula, but did not launch systemic transformations.

However, the rate of global change is much greater than the rate of school curriculum and teachers' training programmes upgrade. A step-by-step revision of disciplinary content, in the effort to catch up with technological and socioeconomic change, is no longer efficient: there is a great chance that such knowledge will become outdated when a school graduate enters the labour market.

At the turn of the 21st century, international organizations (UNESCO, OECD, World Bank) and leading national education systems were clear: the four trends call for a profound curriculum transformation. They will not allow a replication of best practices and models of the past — rather they demand an orientation to the future.

4. NATIONAL INITIATIVES TO REVISE THE CURRICULUM

Countries with a fast growing innovative economy (Finland and Australia, some of the US states and Canadian provinces, South Korea, Singapore, Scotland and Ireland) were the first to start their transition towards competence-based curriculum at the late 1990s — early 2000s. They were developing:

— their own frameworks of key competences and lists of "new literacies";

— indications of their level of development and assessment tools;

— methods to foster competences.

Somewhat later other countries also joined this movement: China, Japan, Germany, the Netherlands, post-socialist European countries, Latin American countries[10].

[10] For more detail on European countries, see e.g. *Report on a literature review of reforms related to the 2006 European Framework of Key Competences for lifelong learning and the role of the Framework in these reforms* / EC. https://ec.europa.eu/education/sites/education/files/review-reforms-2006-eu-framework-kc-nc0717185enn_en.pdf

There is no universally acknowledged model so far, but it is clear: the transformation focuses on a systemic transformation of pedagogical practices and assessment of learning outcomes — and not on a revision of outdated knowledge or development of specialized courses to foster 21st century skills.

Each country tries to find its own path depending on its unique cultural, historical, social, demographic and economic context. Nevertheless, common features can be identified which allow a country to travel successfully the road taken.

In educational policy

- Focusing on few ambitious goals.
- Investing into teachers and their continuous professional development.
- Evidence-based decision-making, monitoring implementation of reforms.
- Transparency, communication with stakeholders, including parents, students, business representatives, and local community.
- Disciplinary outcomes are defined in terms of school leavers' capability to solve real life problems (this capability is usually called a competency[11] in a particular area), and not it terms of the number of topics covered in class.
- Intended learning outcomes include not only disciplinary competency, but also general (meta-disciplinary) competences as well as personality traits (values, attitudes).
- The role of curriculum is important but it cannot bring about a sustainable change if it is not supported in school practices — it is but one lever (and a smaller lever) when compared to pedagogical practice and teacher/principal leadership.

At the same time, we should be cautioned against:

√ **Accountability versus capacity building**: using test results, and teacher appraisal, to reward or punish teachers and schools versus capacity building.

√ **Individual versus group teacher and leadership quality solutions:** promoting individual versus group solutions.

[11] The distinction between competency and competence is not really relevant here; it is explained in more detail in chapter 2, with "competency" stemming from professional qualifications and "competence" tending to describe general capabilities.

√ **Technology versus instruction:** investing in and assuming that the wonders of the digital world will carry the day versus quality instructional practice.

√ **Fragmented strategies versus integrated** or systemic strategies.

In curriculum design

- Competences and literacies that a country has adopted as most important are presented as a clear, coherent and concise list or framework.

- Development of general competences is integrated into disciplinary learning; it is not a separate task but an integral feature of teaching and learning (although additional training sessions and courses are also possible).

- Disciplinary knowledge is structured and presented in large conceptual units highlighting the "big ideas" to be internalized by the students and applied in real life; interdisciplinary connections are made explicit.

- Regulatory efforts focus on intended learning outcomes defined as "what students will be able to do (demonstrate, produce) as a result of engaging in the learning process", and not on adopting lists of topics and specifying their content in great detail.

- Summative assessment includes assessment of general competences.

In school practices — educational leadership, teaching and learning

- A key component in the school structure is the role of the school principal — while the teacher is central to student achievement, research advises that teacher effectiveness is connected to principal instructional leadership. School leadership is a key factor in teaching and learning practice.

- The emphasis is on students and their learning (and on students owning their learning), and not on teachers' instructional activity to introduce new content.

- A supportive learning environment (positive emotional background and ambitious goals for each student).

- Inquiry-based learning to activate students' curiosity and encourage them to make meaning: students (on their own and in collaboration with peers) specify the task for themselves, search relevant information and research the topic, present what they

have learned, formulate criteria of success and, together with the teacher, evaluate the result.

- Project-based learning as mainly interdisciplinary group projects (3–15 students) lasting several days, a semester or even the whole academic year, and focusing, among other things, on challenges relevant for the local community.

- Assessment *for* learning which serves as a feedback mechanism highlighting students' strengths and weaknesses and their short-term and longer-term personal learning objectives.

- Personalized learning optimized in terms of pace of learning and instructional approach for the needs of each individual learner.

- Learning tasks and situations are linked to students' real-life experience and are relevant for them.

Nearly all the countries centre their instruction models on the learner, emphasize the students' learning experience and active inquiry. Educational systems have become responsible not only for the proper supply of disciplinary knowledge and related teaching materials, but also for development of the active learner who is able to learn new things, to explore the unknown and who enjoys it. The exact shape of the framework of competences and literacies is, thus, of minor importance as compared to pedagogy and learning environment constituting individual's learning experience.

Supporting deeper learning includes leveraging digital and social media to connect to the world and to access online and self-directed learning opportunities (Fullan & Langworthy, 2014; Pellegrino & Hilton, 2012; Dede, 2014; Griffin, McGraw & Care, 2012). While sound pedagogical practices that support deeper learning must come first, ubiquitous technology influences the possibilities, mediums and modalities, creating the environment for deep, engaging and complex learning. Technology provides opportunities for local and global collaboration, communication, knowledge building, visualization, creation, simulation, and gaming. It offers tools to support assessment for, as, and of learning, with timely, descriptive feedback. It affords multiple opportunities to shift the concept of traditional schooling structures to include informal physical and virtual learning environments unbound by time, place and space.

Education is shifting from institutions of teaching to ones for learning and the next transformation will be to institutions of thinking and 21st century global skills/competencies. This will require a balance of effective evidence-based practices reliant on student data, and emerging learner-centric pedagogies, structures and practices (Grose, 2016). Digital literacy and networked digital technologies build on traditional literacy and mathemati-

cal skills. An increasingly diverse population and workplace require renewed emphasis on social emotional skills, teambuilding, conflict resolution and shared leadership. Labour market changes described in Section 7 add to the pressure for transformative change. Intentionally closing achievement and academic gaps for underserved and underachieving cohorts are critical for equity and excellence to become transformative.

Schools and school systems become the agents for this change. Learning is complex, and transitioning to a more agile, adaptive and dynamic environment requires school leaders who value learning by intentionally and explicitly supporting exploration, growth and risk-taking in the learning process, who provide opportunities for teachers to personalize their own professional learning designs, and who encourage creative thinking by providing time for ideas to evolve (Grose & Freedman, 2014). Transformation of education requires collaborative partnerships between government, teachers, and administrators sharing both leadership and accountability.

Some of the areas for future consideration for 21st century learning include:

- Intentional programming to prepare students for work/education/life after high school with career skills and certification opportunities.
- Intentionally evolving educational initiatives to align with the changed world of work, including more opportunities for apprenticeship, authentic project-based learning and experiential opportunities within the community.
- Increasing expertise to navigate digital employment platforms and digital-enabled independent work.
- Expansion of public private partnerships.
- Provision of entrepreneurial opportunities within the formal and informal curriculum.
- Increasing digital literacy through creation of networked classrooms and schools.
- More flipped schools/classrooms and consideration of robotic influences within the classrooms.
- Greater emphasis within the curriculum on developing and sustaining 21st century global interpersonal and intrapersonal competencies (including cooperation, empathy, respect, resilience, self-reliance, and teamwork).
- Increasing opportunities for reskilling of adult learners.

- Developing shared and intelligent accountability.
- Drilling deeper into student achievement data to include demographic profiles and data to inform policy development and to target interventions for underserved cohorts.
- More intensive, evidence-informed practices to build the skills and knowledge of students in terms of complex problem-solving in mathematics.
- Aligning teacher pre-service and ongoing professional learning with 21st century skills/competences.
- Fostering global interactions including exchanges.
- Learning from and with others through new types of learning/training opportunities.
- Exploring technical innovations (including 3D, AI/student interface).

As school teams, schools and school system leaders take personal ownership and professional responsibility for their learning, improving student outcomes and understanding the evidence of their impact, powerful shift and change occurs. We are transitioning towards the integration of 21st century skills and competencies.

So the mainstream seems clear, i.e. shifting the emphasis from disciplinary knowledge to key competences and learning outcomes, while not losing the disciplinary foundation and keeping it as the core, lots of issues remain unresolved — from how to define and select the key disciplinary knowledge to how to assess competences.

Chapter 2

A GRID SYSTEM OF KEY COMPETENCES AND LITERACIES

"Competence" is not a "thing." It is an evaluation. [1]

Gerald M. Phillips

What is a grid system? … a structure comprising a series of horizontal and vertical lines, used to arrange content. … …They allow you to design in proportions… …will eventually be invisible to your final user. …A grid system should always be very flexible, so that you can almost twist it to your needs.

A web-design guide[2]

1. COMPETENCE FRAMEWORKS: AN OVERVIEW OF APPROACHES

We have analyzed over 180 national and international frameworks of competences and "21st century skills", including professional ones (European Commission, OECD, UNESCO, World Economic Forum, ATC21S, P21, EnGauge et al.), as well as comparative reviews (Tan et al. 2017; Voogt, Roblin 2012; Kereluik et al. 2013; Pellegrino, Hilton 2012). We were trying to align them with influential theories of cognition, development, language, personality and learning

1 Gerald M. Phillips (1984) A competent view of "competence", Communication Education, 33:1, 25–36. P. 25.

2 https://webdesign.tutsplus.com/articles/all-about-grid-systems--webdesign-14471

(Chomsky, Bernstein, Dewey, H. Gardner[3], Habermas, Kahneman[4] & Tverski, Leontiev, Maturana & Varela, Piaget, Skinner, Vygotsky et al.).

The exact words used in the frameworks often overlap but seldom coincide; the many synonyms cause a conceptual mess. The most recurring examples, as summarized in a recent UNESCO publication[5], include:

- Creativity, communication, critical thinking, problem solving, curiosity, metacognition;
- Digital, technology, and ICTs skills;
- Basic, media, information, financial, scientific literacies and numeracy,
- Cross-cultural skills, leadership, global awareness;
- Initiative, self-direction, perseverance, responsibility, accountability, adaptability;
- Knowledge of disciplines, STEM mindset.

To try and make sense of this overwhelming richness, we made three steps. *First*, we tried to see if any significant differences are implied when different words are picked to denote "21st century skills": key / core competencies and competences, transversal skills, transferal skills, soft skills (to make things still worse, it is not unusual that the word 'literacy' is also used interchangeably with these). Our answer is no: the plurality of the terms refers to the general universality of a capacity, which is not limited by a specific type of task or situation. The subtle nuances are discussed in academic papers, but get blurred in professional and policy frameworks which need to be crisp and clear. We affirm that these differences in wording are not really relevant for our practical purposes, as all the plurality of terms tends to describe the same thing: qualities which (a) everyone needs and which (b) can be applied in different contexts. Therefore, we shall not be discussing it in more detail here; we have chosen the term "key competences" as it is used more or less consistently in major European policy papers, and will be sticking to it for the sake of clarity.

[3] Gardner H. The Mind's New Science: The History of Cognitive Revolution. Harper Collins Basic Books, 1987.

[4] e.g. Thinking, Fast and Slow. Penguin Books Ltd., 2011.

[5] Future Competences and the Future of Curriculum. A Global Reference for Curricula Transformation / By Mmantsetsa Marope, Patrick Griffin, Carmel Gallagher / IBE UNESCO.
http://www.ibe.unesco.org/sites/default/files/resources/02_future_competences_and_the_future_of_curriculum_30oct.v2.pdf

Key competences are those which all individuals need for personal fulfilment and development, employability, social inclusion and active citizenship. They are developed in a lifelong learning perspective, from early childhood throughout adult life, and through formal, non-formal and informal learning.

The key competences are all considered equally important; each of them contributes to a successful life in society. Competences can be applied in many different contexts and in a variety of combinations. They overlap and interlock; aspects essential to one domain will support competence in another. Skills such as critical thinking, problem solving, team work, communication and negotiation skills, analytical skills, creativity, and intercultural skills are embedded throughout the key competences.[6]

Second, we looked into the variety of adjectives accompanying these "universal capacities" (key competences and literacies): financial, civic, mathematical, computational, legal, environmental, cultural, informational, digital, entrepreneurial, physical, emotional, etc. *Third*, we tried to get to grips with the important concepts that did not really fit after we had completed the first two steps: problem-solving, decision-making, learning to learn.

To proceed with the steps 2 and 3, we need to define competence irrespective of its "21st century" prefix and to disentangle it from literacy. Often a distinction is made between job-related professional *competencies*[7] and *competences* in a broader sense in everyday life (e.g., Aragon & Johnson, 2002; Boon & van der Klink, 2002; Winterton, Delamare Le Deist & Stringfellow, 2006). In our operational framework, we do not adopt the distinction between competency (= qualification) and competence but rather consider both terms as equivalent. From a psychological point of view, such a distinction doesn't matter because there is a general consensus that competenc(i)es cover knowledge, skills, and attitudes.

Again, there are multiple conceptualisations of competence, and scholars usually single out three major approaches: the behaviourist (the emphasis is on performance), the generic (focuses on common abilities to explain the variance in performance), and the cognitive (highlights mental — intellectual — resources to achieve a mastery level of performance)[8]. All agree, however, that it is a capacity to act in a certain way, and this capacity is underpinned by related knowledge, skills, and attitudes.

6 Annex to the Proposal for a Council Recommendation on Key Competences for Life Long Learning. COM(2018) 24 final. https://ec.europa.eu/education/sites/education/files/annex-recommendation-key-competences-lifelong-learning.pdf

7 They correspond with *qualifications*, as discussed in the 1990s.

8 E.g. Navaitienė J., Rimkevičienė V., Račelytė D. (2015) Methodology of Development of Intercultural Competence. http://incom-vet.eu/wp-content/uploads/2015/09/1_METHODOLOGY-FOR-DEVELOPMENT-OF-INTERCULTURAL-COMPETENCE.pdf

Competence **is a set of an individual's integrated capabilities composed of clusters of knowledge, skills, attitudes, and values that are mobilized in a particular context to meet the requirements of a given task or problem (cf. Mulder, 2011), where**

«a) knowledge is composed of the facts and figures, concepts, ideas and theories which are already established and support the understanding of a certain area or subject;

b) skills are defined as the ability and capacity to carry out processes and use the existing knowledge to achieve results;

c) attitudes describe the disposition and mind-sets to act or react to ideas, persons or situations»[9].

Literacy also implies action, but of a specific scope: it is mediated by language presented in oral or written form.

Literacy **in its narrow sense refers to the acquisition and usage of the abilities of *R*eading, w*R*iting, and a*R*ithmetic, the so-called 3Rs. In its broader sense, literacy denotes the capacity of individuals to analyze, reason and communicate effectively as they pose, solve and interpret problems in everyday life and a variety of subject matter areas (OECD, 2005). All frameworks of 21st century skills include various combinations of key competences, their essential skills, attitudes and values, accompanied also by literacies — and all imply or clearly aim at holistic education. However, we can highlight two distinctive approaches to making such a framework: a list and a grid.**

In *a list*, as the name suggests, all the components are listed one by one and are presented in a non-hierarchical order. There are plenty of examples to illustrate this approach: European Key Competences for Lifelong Learning (2018)[10]; The Economist framework commissioned by Google (2015)[11]; Pan-Canadian and Ontario Frameworks of 21st Century Competences (2016)[12] and most of the other national frameworks.

A grid is essentially different: it offers sockets for broad categories of competences, together with their core skills, and focuses on the distinctive nature of the categories, not

9 Annex to the Proposal for a Council Recommendation on Key Competences for Life Long Learning. COM(2018) 24 final. https://ec.europa.eu/education/sites/education/files/annex-recommendation-key-competences-lifelong-learning.pdf

10 European Key Competences for Lifelong Learning (2018)

11 The Economist (2015). *Driving the skills agenda: Preparing students for the future. An Economic Intelligence Unit Report sponsored by Google for Education.*

https://www.eiuperspectives.economist.com/sites/default/files/Drivingtheskillsagenda.pdf

12 http://www.edugains.ca/resources21CL/About21stCentury/21CL_21stCenturyCompetencies.pdf

on the exact list of their nested components. The few existing examples of grid frameworks have been very influential: The DeSeCo Project's conceptual framework for key competencies (OECD 2005); ATC21S (2012)[13]; the Faure report and the Delors report by UNESCO[14] and the recent framework by IBE UNESCO[15]; the National Research Council framework (Pellegrino & Hilton 2012)[16] which is used in RAND[17], the Asia Society[18] publications, in the Harvard *Global Education Innovation Initiative*[19] and its comparative volume from six nations[20], and others. The recent framework presented by the World Bank (2018)[21] also follows this approach. Among national curriculum frameworks, the recent Norwegian approach could be mentioned[22].

Delors UNESCO:

- **learning to know,**
- **learning to do,**
- **learning to be,**
- **learning to live together.**

13 Griffin P., Care E. (eds) Assessment and Teaching of 21st Century Skills. Springer, 2015. https://www.cisco.com/c/dam/en_us/about/citizenship/socio-economic/docs/ATC21S_Exec_Summary.pdf

14 Faure E. et. al. Learning to be / UNESCO, 1972. http://www.unesco.org/education/pdf/15_60.pdf; Delors J. et al. Learning: The Treasure Within / UNESCO, 1996. http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/rethinking-education/resources/;

15 Future Competences and the Future of Curriculum. A Global Reference for Curricula Transformation / By Mmantsetsa Marope, Patrick Griffin, Carmel Gallagher / IBE UNESCO. http://www.ibe.unesco.org/sites/default/files/resources/02_future_competences_and_the_future_of_curriculum_30oct.v2.pdf

16 National Research Council. (2012). *Education for life and work: Developing transferable knowledge and skills in the 21st century.* Committee on Defining Deeper Learning and 21st Century Skills, James W. Pellegrino and Margaret L. Hilton, Editors. Board on Testing and Assessment and Board on Science Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academies Press.

17 Yuan, Kun, Brian M. Stecher, and Laura S. Hamilton, *The Feasibility of Developing a Repository of Assessments of Hard-to-Measure Competencies*, Santa Monica, Calif.: RAND Corporation, RR-1204-WFHF, 2015. P. 7. As of May 25, 2018: https://www.rand.org/pubs/research_reports/RR1204.html

18 Russell C. et al. (2016) System Supports for 21st Century Competencies/ Center for Global Education, Asia Society. https://asiasociety.org/sites/default/files/system-supports-for-21st-century-competencies-2016_0.pdf

19 https://globaled.gse.harvard.edu/21st-century-education

20 Reimers F., Chung C. (eds.) (2016) Teaching and Learning for the Twenty-First Century: Educational Goals, Policies, And Curricula From Six Nations. Harvard Education Press.

21 World Bank. 2018. World Development Report 2018: Learning to Realize Education's Promise. Washington, DC: World Bank. doi:10.1596/978–1-4648–1096–1. P. 103.

22 Official Norwegian Reports NOU 2015: 8. *The School of the Future. Renewal of subjects and competences*. https://www.regjeringen.no/contentassets/da148fec8c4a4ab88daa8b677a700292/en-gb/pdfs/nou201520150008000engpdfs.pdf

IBE UNESCO:

- lifelong learning (curiosity, creativity, critical thinking…);
- self-agency (initiative/drive/motivation, endurance/grit/resilience, responsibility…);
- interactively using diverse tools and resources (impactful use of resources, efficient use of resources, responsible consumption…);
- interacting with others (teamwork, collaboration, negotiation…);
- interacting in and with the world (being local and global, balancing rights with privileges, balancing freedoms with respect…);
- trans-disciplinarity (STEM, humanities, social sciences…);
- multi-literateness (reading & writing, numeracy, digital…)

DeSeCo:

- interact in heterogeneous groups,
- use tools interactively (e.g. language, technology),
- act autonomously.

ATC21S:

- Ways of Thinking (creativity and innovation; critical thinking, problem solving, and decision making; learning to learn and metacognition),
- Ways of Working (communication; collaboration and teamwork),
- Tools for Working (information literacy; information technology and communication literacy),
- Living in the World (life and career; personal and social responsibility).

World Bank:

- **(A) Cognitive skills**

  Foundational skills

  — **general academic (literacy, numeracy)**

  — **general cognitive**

  Higher-order

- **(B) Socioemotional skills (Self-awareness; Self-management; Social awareness; Relationship skills)**

- **(C) Technical skills (Entrepreneurial; Digital)**

With problem-solving and organizational skills emerging at the intersection of the three broad categories A+B+C.

RAND, Asia Society (based on the National Research Council):

- **cognitive (including critical thinking, information literacy, reasoning and argumentation, and innovation),**
- **interpersonal (including communication, collaboration, responsibility, and conflict resolution),**
- **intrapersonal (including flexibility, initiative, appreciation for diversity, and the ability to reflect on one's own learning).**

There are also seminal frameworks which we would classify as *mixed*, as they involve some formal features of a grid but essentially rely to a considerable extent on the list approach.

— World Economic Forum[23] lists 16 skills essential to the 21st-century workforce grouped into three categories:

  - foundational literacies ("how students apply core skills to everyday tasks") — literacy, numeracy, scientific literacy, ICT literacy, financial literacy, cultural and civic literacy;

[23] *New Vision for Education: Unlocking the Potential of Technology* (WEF, 2015). http://www3.weforum.org/docs/WEFUSA_NewVisionforEducation_Report2015.pdf;

New vision for education: Fostering social and emotional learning through technology (WEF 2016). http://www3.weforum.org/docs/WEF_New_Vision_for_Education.pdf

- competences ("how student approach complex challenges") — critical thinking / problem solving, creativity, communication, collaboration;

- character qualities ("how students approach their changing environment") — curiosity, initiative, persistence / grit, adaptability, leadership, social and cultural awareness.

This framework apparently covers all the dimensions of 21st century skills; however, to bring this framework to education, one would need to answer tricky questions like: how is 'cultural literacy' different from 'cultural awareness' or how is 'leadership' related to 'collaboration'.

— Partnership for 21st Century Learning (P21)[24]

- Key subjects — 3Rs and 21st century themes (Global Awareness; Financial, Economic, Business and Entrepreneurial Literacy; Civic Literacy; Health Literacy; Environmental Literacy);

- learning and innovation skills (critical thinking, communication, collaboration, creativity);

- information, media and technology skills (Information literacy; Media literacy; ICT literacy).

- life and career skills (Flexibility and Adaptability; Initiative and Self-Direction; Social and Cross-Cultural Skills; Productivity and Accountability; Leadership and Responsibility).

This framework designed for education is widely used (see the chapter on the US in this report). We refer to it as a mixed type because some of the skills although mentioned under their umbrella category seem to overlap and make recurrent lists: collaboration, communication are not to be easily separated from social and cross-cultural skills; the 3Rs are also inherent in information, media and technology skills.

In the "grid versus list" race, we are not backing either of the approaches in favour of the other. We believe that lists, with their finite number of clearly named components, are easier to communicate to the end user, and this is a truly convincing advantage. However, grids are scaleable, more adaptable and sustainable, which makes them more suited for longer-term policies in our fast-changing world.

[24] http://www.p21.org/our-work/p21-framework

2. COMPETENCE AS A COMBINATION OF KNOWLEDGE, SKILLS AND ATTITUDES. HOW A COMPETENCE IS DEVELOPED

Each key competence reflects an individual's holistic ability to act in a certain way in a given situation. Each key competence is underpinned by constituent essential skills (combined with knowledge and attitudes), which are mobilized in an individual's behaviour when the competence is at work (though a mechanical addition of these constituent skills does not necessarily lead to a competence either). Thus, *competence implies a sense of agency, action and value*. One can't communicate competencies. They have to be developed.

Competence = knowledge + skills + attitudes → action (cf. Leisen 2009; Rost 2010).

Knowledge

It is clear that domain-specific **knowledge** is a major source of "power" in complex tasks (e.g. Hambric, Meinz 2011, among many others). However, in cognitive psychology a distinction is usually made between declarative knowledge and procedural knowledge. *Declarative knowledge* is the knowledge of facts, which a person has memorized and can retrieve from semantic long-term memory. The concept of declarative knowledge became closely related to *knowing that something is the case*. In contrast, *procedural knowledge* corresponds to *knowing how to do something*, and consists of operations available in the operator (or procedural) memory that make a person capable of carrying out complex cognitive processes without having to control consciously the individual components of these processes (Johnson, 2003). In cognitive psychology, *procedural learning* (i.e. the acquisition of procedural knowledge) often is the same as *skill acquisition*, for which three stages can be distinguished (cf. Ackerman, 1989).

Stages of procedural learning

1. **The *cognitive stage* focuses on interpreting a problem — i.e. on seeing a situation as a problem to be solved, which involves choosing a suitable strategy and resources. It involves an interpretation of the information available in the declarative form — e.g. as written or spoken instructions, or as a sample problem. At this stage, one creates a mental representation of that what is known / available and what must be done to solve the problem.**

2. **At the *stage of knowledge compilation* numerous repetitions of part-skills eventually lead to a proceduralization of one's declarative knowledge of actions. This may be described**

as a process of skill-specific fine-tuning, during which information about the problem (which is often insufficient) is systematically corrected and errors are weeded out. Through practice, the learner connects individual part-skills into a holistic procedure, which can be used as an algorithm to solve the problem.

3. The *autonomous stage* implies routine execution of the algorithm acquired in the previous stage. The learner accomplishes this by automating the skills he or she has acquired. This makes their execution faster and more exact, reduces the number of errors and, as a result, the amount of necessary attention and control.

The stages presented are not rigid, of course. Numerous variations are possible depending on particular learning situations.

Thus, procedural knowledge results from the proceduralization of declarative knowledge but the relationship between declarative and procedural knowledge is reciprocal: declarative knowledge about how (and under which circumstances) an action should be carried out becomes procedural knowledge, which in turn, includes declarative knowledge about the procedures to be performed.

Some competences emphasize declarative knowledge, others rely mostly on procedural knowledge (cf. Oosterhof, 2012), and there are competences that combine both (cf. Miller & Hudson, 2007). Both declarative and procedural knowledge can be taught. At the same time, neither declarative, nor procedural knowledge mean competence by default — one has to be able to apply this knowledge to practical situations.

For our purpose of bringing the competence framework into school reality, it is important to mention that there is also *tacit knowledge*, which results from one's ability to learn and then apply what has never been taught explicitly. This knowledge is a key element of practical intelligence in occupational settings (cf. Wagner & Sternberg, 1986). There is no doubt that competences comprise more than just taught knowledge, which makes the issue of learning environment very important.

Skills

Skills are the second major constituent of any competence. The Concise Oxford English Dictionary defines *skill as the ability to do something well*. This ability comes from one's knowledge, practice, aptitude, etc. Put briefly, *skills are the "know hows"* required in a person's life. Lots of skills are mentioned in everyday communication and academic literature (manual skills, mechanical skills, professional skills, occupational skills, social skills, emotional skills, mathematical skills, reasoning skills, problem-solving skills, etc.)

It is widely recognized that:

— skills are malleable; "they can be developed through practice and reinforced through daily experiences" (OECD, 2015, p. 18);

— skills imply an ability and capacity to perform a task easily, smoothly and adaptively.

Thus, the term "skill" refers to a level of *performance*, in the sense of accuracy and speed in performing a particular task.

Attitudes

Various influential papers (e.g. OECD 2005, 2014, 2015) emphasize the importance of **attitudes** as a third major constituent of competences. From a psychological perspective, *attitudes are a manner thinking, feeling, or behaving* that reflects a disposition or a state of mind (cf. Seel, 2003); "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon an individual's response to all objects and situations with which it is related" (Allport 1935: 810; see also Breckler, Wiggins 1992: 409). For example, attitudes towards literacy influence how often and how well children read and write. Children form positive or negative attitudes about reading and writing — whether they are enjoyable and useful. Actually, everything with which an individual has a personal relation can be the object of an attitude. Accordingly, OECD papers emphasize attitudes towards self, learning, and working as well as attitudes towards mathematics or problem solving.

In psychological literature three components of attitudes are usually distinguished: (a) the *Cognitive* component embracing beliefs and opinions, (b) the *Affective* component focusing on feelings toward something, and (c) the *Conative* component with behavioural intentions. All the three form the so called *CAC-model of attitudes* (cf. Eagly & Chaiken, 1993; Jain, 2014).

Our framework operates with a *three-component model of competence* including knowledge, skills, and attitudes but mainly it centres on *skills* as a major component of competences. We argue that it is efficient to systematically train skills by means of extensive deliberate practice (Baartman & de Bruijn, 2011; Evers et al. 1998). Therefore, in our operational framework the systematic training of skills constitutes the fundamental basis for the development of competences.

However, the development of competences additionally depends on enduring ***personal characteristics,*** which are the constant aspects of a person's individuality and relatively stable over time. We consider aptitudes, personality and motivational traits as personal characteristics that correlate with a person's competences (cf. Ericsson, Roring & Nandagopal, 2007). ***Aptitudes*** (or talents) are defined as an innate or acquired capacity for doing something; occasionally the term "aptitude" is a synonym for *intelligence* as readiness or

quickness in learning and problem solving. Gardner (1983) has identified seven intelligences that have a profound impact on the development of competences. Another constant aspect of person's individuality consists of ***traits*** defined as habitual patterns of behaviour, thought, and emotion. Personality traits are distinguishable features of a person's nature that demonstrates consistency across situations and over time. Currently, the *Five Factor Model of Personality* traits is without doubt the most popular approach in research on personality (cf. McCrae & Costa, 2008). Because a person's behaviour is strongly influences by motivation that channels, energizes, and sustains behaviour over time (Corr, DeYoung & McNaughton, 2016), ***motivational*** traits have been added to personality traits. Some researchers (e.g., Deci & Ryan, 2000) argue that motivational traits affect performance through task-specific self-regulatory processes, such as motivation control, emotion management, staying focused on the task, and metacognition. Thus, motivational traits are expected to affect competences through task-specific motivation and self-regulation variables.

Skilled performance and mastery learning

A skill is acquired or developed through training or experience. However, simple practice is not enough to gain a skill. The practice must be intentional and repetitious, aimed at improving performance, designed for current skill levels, and combined with immediate feedback. This implies **deliberate practice** as a highly structured activity aimed at improving performance. Four essential components of deliberate practice have been identified (Ericsson 1996): (1) the learner must be motivated to attend to the task and exert effort to improve performance; (2) the design of the task should take into account the learner's pre-existing knowledge so that the task can be correctly understood after a brief period of instruction; (3) the learner should receive immediate informative feedback and knowledge of results of the performance, and (4) the learner should repeatedly perform the same or similar tasks.

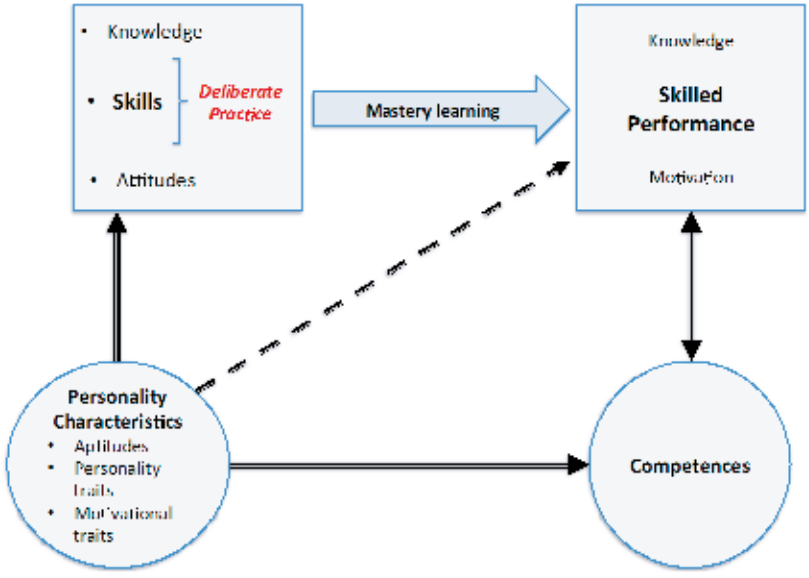
Successful deliberate practice results in **skilled performance** (which can be defined as procedural knowledge acquired through deliberate practice (cf. Harvey, 1997)). The quality of performance is determined by knowledge, skills and attitudes. Observation of somebody's skilled performance fosters motivation and nurtures a positive attitude towards the competence. This brings us to the distinction between competence and performance.

Competence is, by nature, a theoretical construct, that cannot be observed but serves as a "useful notion" to explain directly observable behaviours. For example, it is relatively easy to observe the overt behaviour in solving a puzzle but it is a much more difficult task to understand what accounts for this behaviour. Thus, psychologists (e.g., Schott & Ghanbari, 2012) argue that it is the performance of an individual to solve consistently and successfully particular tasks and problems that makes an underlying competence visible. For example, if a student consistently and effectively solves quadratic equations in a vari-

ety of tests we attribute this overt behaviour (= performance) to a presumed mathematical competence. Accordingly, we define *competence as mastery in performing particular skills*. Improvements in performance result from deliberate practice, which continues until performance reaches a level that can be considered as expertise (Ericsson, Krampe, & Tesch-Römer, 1993). This corresponds with Bloom's (1981) approach of **mastery learning** which involves a set of teaching and learning strategies based on the premise that students will achieve a high level of competence in a given domain if they are given enough time for deliberate practice.

The interplay of components leading to the development of a competence is depicted as a path model in Fig. 1.

Fig. 2.1. De*velopment of competences.*



Such a path model is useful, because, first, it illustrates the (causal) relations between variables of interest. In general, path models are read from left to right, with the independent variables on the left predicting the outcomes (dependent variables) on the right. Second, it distinguishes between *endogenous factors*, such as traits, competences and literacies, and *exogenous factors*, such as instructional interventions (e.g., deliberate practice), skilled performance and the use of tools in order to solve problems in everyday life. Finally, the path model can be applied as a template for regression analyses.

Skilled performance and competence can be general (applied in a variety of contexts) and context-dependent (cf. Winterton et al. 2006; Garavan & McGuire, 2001; Van de Ven, 2004).

We focus on general competences that are apply to multiple areas of life and, thus, should bring benefits in a wide spectrum of contexts. Individuals need a wide range of competences to face the complex challenges of today's world, but it would be of limited practical value to produce very long lists of everything that they may need to be able to do in various contexts at some point in their lives (OECD, 2005). Therefore, *key competences* take centre stage in our framework.

3. OUR FRAMEWORK: THE COMPONENTS

3.1. Key competences

We support the grid approach towards a framework and argue that all the child processes under the generic competence parent umbrella consistently fall into one of three core domains:

— thinking and reasoning competence;

— interpersonal competence;

— intrapersonal competence.

We identify the three core domains of competence but deliberately do not constrain their internal structure by a finite set of essential skills[25] — we do mention some, to provide a context, but those mentioned are not intended to be exhaustive, and this is a distinctive advantage of our framework reflecting the nature of a competence.

This grouping into three domains does not imply a hierarchy, with some domains having a priority over others. The implication is that a learning situation — just like a real life problem — should be designed in a way which requires the bringing together of knowledge, skills and attitudes from all the core domains.

[25] To be specific, it is all the three components: knowledge + skills + attitudes. However, we deliberately highlight skills here, as it is the major component of a competence. Systematic training of skills constitutes the fundamental basis for the development of competences. See section 2 for more detail.

Competences: the framework

(1) Competence of thinking and reasoning:

- to understand, analyse and interpret a problem or task, search and identify patterns and trends in an array of facts; to identify implicit properties of objects and processes, to identify hidden resources needed to solve a problem or perform a task; relate causes to the effects they produce, also in complex branching and forking; apply formal logic in situations of insufficient information; identify, differentiate and classify primary and secondary factors, contradictions and similarities…;

- creative thinking, inventive thinking, innovative thinking (including subjective and objective creativity); generating and exploring ideas; efficient decision-making in new and uncertain situations, in situations of insufficient information…;

- systemic thinking, integrative thinking, recognition and interpretation of patterns, their limitations and universality; simulation and modeling of complex processes and phenomena (registration of relevant factors, decision-making in unstable environments, including network-based; risk-management, compensation for system's failures and maintaining system's sustainability; balancing between familiar solution algorithms and adaptability to changing conditions)…;

- to choose ways to solve complex problems, including open-ended tasks with more than one solution, to generate multiple solutions…

In Annex 1 we bring examples from national curricula to demonstrate how the thinking competence can be broken into essential skills and what its indicators may be.

(2) Interaction with other people (intrapersonal competence):

- **to cooperate and collaborate, to establish, develop and maintain social relationships, to net**work, both as a leader and as part of a team, to take and distribute responsibility, to coordinate teamwork…;

- to negotiate (being able to convince other people, to justify one's position, to acknowledge other peopl**es' interests, taking into account social and cultural diversity), to resolve conflicts, to acknowledge the possibility of objective conflicts of interest between different social groups…**

- **to support strong and weak ties**[26] **with people.**

(3) Interaction "with self" (intrapersonal competence):

- **self-regulation, self-control, including emotional recognition and regulation;**

- **self-organisation (being able to act reflexively and intentionally, to mobilise oneself to perform a task, to choose insistence or flexibility…)**

[26] Granovetter M. (1973) *The American Journal of Sociology*, Vol. 78, No. 6. (May, 1973), pp. 1360–1380.

Key competences determine how efficient an individual is in decision-making, how he behaves in different situations, and how open he is to personal growth, learning and self-development opportunities (the "learning-to-learn" disposition in the narrow academic sense, and the inclination to master any new skills required in professional or everyday life, in the broad sense).

Development of these three key competences is an important task of mass education today.

3.2. Literacy

We now turn to the concept of literacy trying to pin down the branching generosity of adjectives: information, mathematical, digital[27], financial, health, visual, environmental, scientific, technological, cultural, global, etc.

We argue that what has become known as "literacy" ultimately falls into one of the two major categories:

— domain-general, tool-based literacy based on the use of signs and symbols;

— domain-specific (or content and context-specific) literacy as practical factual knowledge of specific areas of contemporary life.

To explain this distinction, we first discuss the evolution of the traditional 3Rs literacy and its new dimensions in today's world, and then, by the example of health literacy, demonstrate the knowledge-specific focus of other "literacies".

Literacy as a cognitive skill and social practice. A new understanding of literacy

The term literacy has been commonly used to refer to the acquisition and usage of the basic competences of ***r***eading, (w)***r***iting, and (a)***r***ithmetic, the so-called 3Rs, which are dichotomized into literacy and numeracy. More recently, 'literacy' has been defined as the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts (UNESCO, 2004; OECD, 2000), with numeracy defined as the ability to reason and to apply mathematical concepts in everyday life (e.g. Litster, 2013). Both literacy and numeracy are considered as catalysts for successful participation in social, cultural, political and economic activities, and for learning throughout life.

As new technologies spread, the term literacy obtained a broader meaning, and a large number of "new literacies" were introduced. The shift from a literacy limited to reading and

[27] van Laar, Ester, et al. The relation between 21st-century skills and digital skills: A systematic literature review, in: *Computers in Human Behavior* 72 (2017) 577–588. http://dx.doi.org/10.1016/j.chb.2017.03.010

writing to a plurality of literacies (UNESCO 2004) reflects *a move away from thinking about literacy as a purely cognitive phenomenon*, made up of a technical set of processing skills that the individual either has or doesn't have, *to understanding literacy as a social practice shaped by the context in which it occurs*. The former is described as an autonomous model of literacy, in which the benefits of literacy are imagined to automatically follow from the acquisition of the skill (Street, 1984). It is contrasted with an ideological model of literacy, which recognises that reading and writing are social acts shaped by the cultural and social contexts in which they happen. An ideological model entails " the recognition of multiple literacies, varying according to time and space, but also contested in relations of power" (Street, 2003). Pedagogies, which are informed by this perspective, emphasize an awareness of larger sociocultural patterns and tend to be more inclusive of practices that are considered part of the wider social and cultural literacy environment but which may not necessarily be recognised in formal education.

Ultimately, in its very essence, *literacy is the foundation of communication*: a person is able to understand what someone (be that a person or an agency) tries to communicate to him or her, and also communicate something that others can understand. This communication takes place in various forms, spheres, domains. As these spheres change their language and tools (due to whatever reasons) the person needs to update his or her ability to communicate in them.

In a diverse and changing world, it's not enough to treat literacy as a purely cognitive skill one masters and applies narrowly to specific tools — rather, we have to embed it into its social and cultural context. 'As society and technology change, so does literacy' [NCTE 2013]. The plurality of literacies stems from the plurality of their social and communicative contexts.

Introducing digital dimension: does it bring about a new nature of literacy?

The digital age poses new communication challenges. As the means of communicating written information become more diversified and include print, nonprint, multimedia, hypertext, internet web pages, RSS feeds, and social networking, some researchers suggest that making meaning from multiple information sources denotes a new form of literacy, which involves locating, evaluating, and using diverse sources of information, digital as well as printed, for the purpose of constructing an integrated, meaningful mental representation of a particular issue, topic, or situation [e.g. Rouet & Britt 2017]. Other literacy researchers remain sceptical, however, and argue that not enough is understood about whether traditional reading and writing practices, on the one hand, and their digital form, on the other, make cognitively different demands on the learner [see also in Rouet & Britt 2017]. We believe *that the new "digital literacy" is cognitively similar to traditional forms and is most accessible to individuals who have mastered traditional literacy skills*.

The difference between traditional written (printed) literacy and its newer digital self lies rather with the growing abundance of sources, on the one hand, and their greater accessibility, on the other. This combination of abundance and accessibility, enhanced by IT technologies, blurs the boundaries between the author (producer) and the reader (consumer) of information[28]. The increased accessibility of authorship and production results in a less evident authority of information. However, this is not something entirely new for democratic cultures based on plurality of voices.

Clearly, there is a difference in the dynamics of face-to-face and online communication and there is also a difference in the dynamics of using traditional printed texts and digital texts: unlike traditional printed texts, digital text is not linear, it is rich in hyperlinks that bring the reader from one part to another, and allow us to easily leave the original text and go explore further and further. This is perhaps the fundamental difference between print and digital reading: the latter rests more heavily on readers' ability to mentally represent the information "space" — and this has been found to explain the imperfect correlation between one's performance in print and digital tasks[29] (Naumann 2015; Rouet, Vörös, & Pléh 2012). This shift from print to digital may also be interpreted as a shift from text-type to image-type representations (cf. Kress 2009), which means that digital reading would normally imply a greater emphasis on one's fluency with visual formats.

The implicit question posed by representation in speech and writing: What happened and in what order? *(the logic of time)*

The implicit question posed by representation in image: What are the salient features of the world and in what relation do they stand to each other? *(the logic of space)*

(Kress 2009, p. 25–29)

To navigate amongst hyperlinks, one has to sieve piles of excessive information — which requires critical thinking. What, in these respect, would be efficient search strategies? They would involve the ability to formulate the gist: being able to put it in such a way that it is differentiated from alternative meanings. To use digital texts productively, one should reduce their complexity on the one hand, and to keep room for creative solutions, on the other. Cognitively, however, this is also not a new task, as the best short cut to the answer has always cut you off from browsing of alternative sources, and this is the paradoxical marriage of having to be efficient and creative at once (it's difficult to be creative if 'full of care, we have no time to stand and stare', but standing and staring is not an efficient short cut).

[28] This point is also addressed in Rouet & Britt 2017, p. 33.

[29] We thank J.-F. Rouet for this comment.

"Old" literacy (the 3 Rs) in digital environments faces a diversity of tools, purposes and contexts. It becomes multi-tool, multi-purpose, and multi-context but fundamentally it remains unchanged. Traditional written literacy is acquiring a new dimension in digital environments, but this does not automatically imply a cognitive shift to a new type of literacy of a different nature. Differences apply mostly at the behavioural level. At the same time, it raises new dilemmas of safety issues: a greater exposure makes a person susceptible to more risks.

Moreover, though digitalization may not bring about a fundamental cognitive change in itself, it does influence pedagogical and school practices: "Combining inquiry and technology opens the door to powerful new teaching and assessment practices that result in documented benefits for learners" (Jakobsen 2015).[30] Leveraging digital, as stated in Michael Fullan's global research project, *New Pedagogies for Deeper Learning* (NPDL)[31], 'accelerates access to knowledge beyond the classroom and cultivates student driven deep learning'. For some instances of practical implementation see chapters on Ontario (Canada) and South Carolina (US), in this report.

Information literacy and data literacy as an extension of literacy and numeracy

When we make rational decisions, we rely on information. In many cases, this information contains some data to illustrate or to justify the argument. "We use data every day — to choose medications or health practices, to decide on a place to live, or to make judgments about education policy and practice. The newspapers and TV news are full of data about nutrition, side effects of popular drugs, and polls for current elections. Undoubtedly there is valuable information here, but how do you judge the reliability of what you read, see, or hear? This is no trivial skill — and we are not preparing students to make these critical and subtle distinctions" (Rubin, 2005, p. 22).

The digital world provides not only the possibility of accessing and manipulating massive amounts of data (including the so called 'big data' feeding artificial intelligence, governmental and commercial decision-making and practices) but it also changes the information behaviour of users in their daily life, and in particular in information-sharing and collaboration made possible by network technologies (cf. Esposito, 2017; Ferneley, Heinze & Child, 2009; Koltay, Špiranec & Karvalics, 2016). When people use the word data, they are often referring to information that is stored as text, statistics, tables or charts. However, there is a subtle difference between data and information.

[30] Jakobsen M. Teaching in a Participatory Digital World, in: *Education Canada Magazine*, Fall 2015, vol. 55, no. 3.

[31] http://npdl.global/making-it-happen/new-pedagogies/

Data are processed into an answer to an enquiry (Ackoff 1989). When this happens, data become "information". Data itself is of no value until it is transformed into a relevant form. In this sense, information represents data.

The difference between data and information is functional: *data are simply facts or figures — bits* of information, but not information itself. When data are processed, interpreted, organized, structured or presented so as to make them meaningful or useful, they are called information. Information provides context and wiggle room for data. For example, a list of dates (182, 179, 149, 165) is meaningless without the information that the numbers correspond with the tape-measured body length of people. — "*The numbers have no way of speaking for themselves. We speak for them. We imbue them with meaning*"(Silver, 2012, p. 13).

Data literacy is the ability to read, work with, analyze and argue with data. It is "understanding what data mean, including how to read charts appropriately, draw correct conclusions from data and recognize when data are being used in misleading or inappropriate ways" (Carlson et al., 2011, p. 634). Put briefly, *data literacy is the ability to derive meaningful information from data*, just as literacy is the ability to derive information (make meaning) from written words. Data literacy focuses on both the technical and social aspects of data. It encompasses practically all activities related to data management, including data curation, data citation and fostering of data quality (cf. Koltay, 2015; Martin, 2014.)

"Data literacy must [...] include the ability to do something with raw information — to process it in some way. [...] we must have basic statistical literacy and fluency in the tools that allow us to make sense out of numerical data, not just words and ideas [...] Data literacy also means the ability to communicate and exchange information with others" (Johnson, 2012, p. 83; emphasis added)"

In addition to data literacy, the digital world, with its informational abundance and accessibility, strongly requires *information literacy* which "empowers people …to seek, evaluate, use and create information effectively to achieve their personal, social, occupational and educational goals" (Garner, 2006, p. 3). Information literacy is usually defined as "*the ability to search for, select, critically evaluate and use information for solving problems in various contexts*" (Limberg, Sundin & Talja, 2012, p. 96). It enables people to interpret and make informed judgments as users of information sources, as well as to become producers of information in their own right.

According to the *Alexandria Proclamation of 2005,* the empowerment of people through information literacy is an important prerequisite for fostering equitable access to information provided by media and information systems. *Information literacy* and lifelong learning are seen as the "beacons of the information society" that comprise "the competencies to

recognise information needs and to locate, evaluate, apply and create information within cultural and social contexts […], extends beyond current technologies to encompass learning, critical thinking and interpretative skills across professional boundaries and empowers individuals and communities“ (Garner, 2006, p. 3).

The current discussion about 21st century teaching emphasizes the importance of data and information literacy for students' future life, and thus, postulates that school education should equip students with the necessary data and information literacy skills to succeed in the information-driven economy and society (cf. Jerde & Taper, 2004; Scaramozzino, 2010). Students who are able to collect, analyze, and draw conclusions from data are also well-prepared to further their academic achievement. This argument, however, contradicts the observation that only few students graduate with the ability to understand and analyze data effectively (cf. Hunt, 2004; Shorish, 2015), and likewise, many students lack a sound understanding of information literacy although they use the Internet extensively (cf. Firooznia & Andreadis, 2006; Thompson & Blankinship, 2015). Why is this so? Scholars trace the roots back to the lack of statistical literacy — which is yet another layer of data literacy.

Basically, *statistical literacy is the ability to understand and reason with statistics and data* "that permeate our daily lives — coupled with the ability to appreciate the contribution that statistical thinking can make in public and private, professional and personal decisions" (Wallman, 1993, p. 1). Most people are not skilled in *statistical literacy* (Gal, 2004; Ridgway, Nicholson & McCusker, 2007) although in most industrial countries the teaching of statistics is an inherent part of the mathematics curriculum (e.g., Bunimovich, 2011; Holmes, 2000; Lajoie, 1998; Ottaviani, 2005). Statistical literacy is needed by everyone in order to make sense of the statistical information which pervades everyday life — in newspapers, television, and the Internet. Whenever people are confronted with risky decisions (e.g., in healthcare) statistical literacy can be crucial for "reading between the numbers" (Tal, 2001).

However, "why is it so difficult for us to think statistically? We easily think associatively, we think metaphorically, we think causally, but statistics requires thinking about many things at once, which is something that [intuition] is not designed to do" (Kahneman, 2013, p. 13). This ability to think "about many things at once" is not naturally associated with "time-based" modes of representations (such as texts), which unfold successively (Kress 2009, p. 25–29). Statistics in this sense is similar to visual, space-based modes of representation, which 'spring' on you as one piece.

The incompetence of most people to think statistically inflates into a *collective statistical illiteracy,* i.e., "the widespread inability to understand the meaning of numbers" (Gigerenzer et al., 2007, p. 53). Statistical illiteracy is a widespread phenomenon among most citizens, as well as in the media (Gigerenzer et al. 2007; Ridgway & Ridgway, 2011). Because current statistics curricula appear to be fairly ineffective in equipping students as prospective citizens to understand and accept statistical reasoning, some authors advocate a curriculum

reform designed to require students to reason from complex data (e.g., Ridgway et al., 2007; Tishkovskaya & Lancaster, 2012).

Data literacy (with its cousin layers of information and statistical literacy) is related to critical thinking with its major sub-elements of analysis and evaluation (see esp. Schield 2004). Information literacy is also intrinsically associated with practices and critical thinking in technology-enhanced environments (cf. Bruce, 2004; Eisenberg et al., 2004, 2010).

Thus, data literacy, information literacy and statistical literacy are intimately connected with each other and aim for conjunction in critical thinking (Schield, 2004). Furthermore, these literacies are connected with other human capacities, such as scientific literacy, health literacy etc.

Variety of literacies: the two types

It's easy to collect twenty and more literacies from literature — from "civic literacy" to "visual literacy". This variety of literacies encompasses a broad range of knowledge, skills and attitudes that are in some cases domain-specific and in other cases make a tool-based and sign/symbol-based foundation for any other knowledge or its application in everyday life. This is similar to the distinction between conceptual ('know-that') and contextual ('know-how') knowledge (e.g. Muller & Young 2017, p. 8–9), or, as in cognitive psychology, between declarative knowledge (for 'know that') and procedural knowledge (for 'know-how').

We argue that traditional literacy (reading, writing) and numeracy, also as extended in the data literacy dimension and diversified in the contemporary digital environment, form the *know-how* (tools) type of literacy. We contend that such variations of literacy as visual, data, media, information, ICT are but particular cases of the general-domain tool/sign-based literacies applied to diversely organized texts and images.

The Harvard Project Zero showed that following a period of mundane symbol mastery in infancy, young children rapidly attain initial competence in dealing with a broad range of sign systems in their culture (e.g., language, gestures, pictures, numbers, and music) mediated by everyday life experiences. By school age, the major task is the mastery of notations (for instance, in mathematics) that entail learning features of reduction, systematisation, and legibility. In consequence, there are authors who aim to create multiple semiotic worlds in the classroom (Hicks 1995) by focusing on the use of different signs and symbols for representation and communication purposes.

In contrast, the bundle (or rather an unruly array) of various domain-specific literacies such as financial, entrepreneurial, health, cultural, ecological, or civic literacy all belong to the 'know-that' type and are standing on the shoulders of key competences and domain-general tool/sign-based literacies. Let us illustrate it through the example of health literacy.

As a longitudinal study demonstrates (Bostock & Steptoe, 2012), mortality in older adults is positively correlated with low health literacy. Lower health literacy is associated with less *knowledge* of chronic disease processes, poorer mental and physical health, limited use of preventive services, and higher rates of hospital admissions (see also Kopera-Frye, 2017). What is health literacy?

Based on its basic understanding of health ("a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"[32]), the World Health Organization defines health literacy as the ability of individuals to gain access to, understand and use information in ways which promote and maintain good health. In more practical terms, health literacy is the capacity to make sound health decisions in the context of everyday life (Kickbusch, Maag 2008). Health literacy can be defined as a wide range of skills that people develop to seek out, comprehend, evaluate and use health *information and concepts* to make informed choices, reduce health risks and increase their quality of life (Sørensen et al. 2012, p. 12; see also Zarcadoolas et al., 2005).

Similar examples can be given to illustrate the nature of financial, environmental, or any other kind of context-specific "literacy".

It should be specified that the mechanism of the development of context-specific "literacies" is mainly the same, as with key competences: deliberate practice of health-related — to continue with the health literacy example — knowledge and attitudes, as well as of cognitive and noncognitive skills results in *skilled performance*, which in turn constitutes the fundamental basis of a substantial transfer of health-related knowledge, attitudes and skills to various situations of everyday life. Moreover, despite their context specificity, such "literacies" rely heavily on key competences and domain-general literacy (cf. McKenna, Sixsmith & Barry, 2017; Sqiers et al., 2012; Zarcadoolas et al., 2005).

Literacy: the framework

(1) Domain-general tool-based literacy

It is based on one's ability to use sign / symbol systems and related communication tools. It involves the transformation of the 3Rs (*R*eading, w*R*iting, a*R*ithmetic) in modern technological contexts, taking into account the existing formats of "human to human" and "human to machine" communication and information exchange.

- **reading linguistic literacy (reading, writing, speaking) is the ability to make meaning and create information in natural languages in various textual and visual formats, including in digital environments** *(literacy + digital literacy)*;

[32] 1946 WHO constitution.

- **numeracy (including data literacy) is the ability use mathematical tools, reasoning and modeling in everyday life, including in digital environments** *(numeracy + data literacy + digital literacy)*;

- **computational literacy is the ability to comprehend, reformulate and generate information in formal languages, to create algorithms and to code information.**

(2) Domain-specific "literacy" as practical factual knowledge of specific areas of contemporary life

We keep the word "literacy" because such combinations of words have become well established and it is important that they remain recognizable; however, we add quotation marks, because it is in fact about elementary knowledge of specific areas of life and skills of applying it. Such "literacy" is derivative from key competences and tool-based literacy, and the latter are a prerequisite for it. The list of "literacies" provided below is not exhaustive. Several dozen such "literacies" are to be found in academic literature and policy papers. The following "literacies" are most frequent:

- **civic "li**teracy"
- financial "literacy"
- legal "literacy"
- environmental "literacy"
- science and technological "literacy"
- health "literacy".

The "Big Picture" of our framework

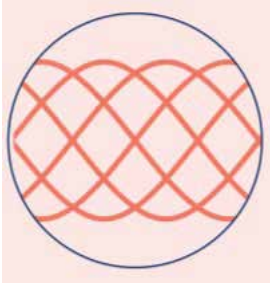
These three key competences (thinking; interpersonal; intrapersonal) and two kinds of literacy (general tool-based; content-specific) combine into the framework we present. Five of the components are domain-general and ultimately aimed at problem solving (cf. Greiff et al. 2014).

"Domain-general problem solving …touches on several cognitive and noncognitive skills such as information processing, representation and evaluation of knowledge, reasoning, self-regulation, metastrategic thinking, proactive planning, and decision-making".[33]

[33] Greiff S. et al. Domain-general problem solving skills and education in the 21st century, in: *Educational Research Review* 13 (2014) 74–83. http://dx.doi.org/10.1016/j.edurev.2014.10.002

domain-general problem-solving	thinking competence
	interpersonal competence
	intrapersonal competence
	domain-general tool-based literacy
	content-specific literacy

As we have mentioned, the components of the framework interplay and intertwine, and this supports the "braid" conceptualizations of competences adopted by OECD and UNESCO.



UNESCO: "The Constituent Elements interact and intertwine to produce 7 macro competences that are considered relevant across contexts".

OECD: "The concept of competency implies more than just the acquisition of knowledge and skills; it involves the mobilisation of knowledge, skills, attitudes and values to meet complex demands".[4]

We argue that such a framework is advantageous in the transformation of learning content and teaching practice because it can help:

- √ evaluate the progress of key competences' development;
- √ clarify the priority areas in which learning content needs to be revised;
- √ develop basic skills of processing information in multiple formats;
- √ integrate students' learning experience, otherwise fragmented between separate subjects, into a coherent learning activity — which fosters systemic understanding of

[34] Future Competences and the Future of Curriculum. A Global Reference for Curricula Transformation / By Mmantsetsa Marope, Patrick Griffin, Carmel Gallagher / IBE UNESCO, 2018. http://www.ibe.unesco.org/sites/default/files/resources/02_future_competences_and_the_future_of_curriculum_30oct.v2.pdf

[35] The Future of Education and Skills. Education 2030 / OECD, 2018. http://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf

practical situations and, therefore, stimulates one's ability to make decisions taking into account the complex interplay of relevant factors;

- √ involve cross-disciplinary approaches to design learning situations — which balances the status of different subjects (e.g. the status of mathematics vs music or physical education) and motivates students to engage fully with the intended curriculum, not pragmatically reducing it to the subjects which "I need or like most";

- √ design *learning situations* in which all the main components of real life problem-solving are mobilized;

- √ develop and offer *assessment tasks*, which assess not only separate skills but the complex ability to act in certain situations and solve certain problems.

Thus, the framework places disciplinary knowledge into practical situations of everyday and professional tasks and, with appropriate teaching methods, stimulates students' motivation for learning, including lifelong learning. **Such a school would bring forth students who can make decisions, act and solve everyday problems and who can learn independently, adapting to new challenging situations.**

ANNEX 1

The Competence of Thinking and Reasoning: examples from national curricula

Developed on the basis of curricula from Australia, Canada (British Columbia, Ontario), Singapore

Essential skills	Indicators	Examples of mastery levels (from lowest to highest)
(1) Comprehension of knowledge	demonstrate relevant factual knowledge and understanding of concepts	
(2) Question and investigate	explore possibilities (ranging from one part of the process to a complex inquiry into a local or global issue)	pose factual and exploratory questions based on personal interests and experiences
	identify and explore questions or challenges related to key issues or problematic situations in their studies, their lives, their communities, and the media	pose questions to identify and clarify issues, and compare information in their world

Extension of Annex 1

Essential skills	Indicators	Examples of mastery levels (from lowest to highest)
	develop and refine questions	pose questions to expand their knowledge about the world
		pose questions to clarify and interpret information and probe for causes and consequences
		pose questions to probe assumptions and investigate complex issues
		pose questions to critically analyse complex issues and abstract ideas
(3) Analysis	process information / data in appropriate ways based on reliability and relevance	
	see patterns and relationships in both content and ideas	
	analyze using specific criteria	
	make inferences and/or find information to support ideas	
	construct explanations with relevant and sound information	
(4) Evaluation & critique	consider option, consider a variety of perspectives	
	compare between ideas or make choices based on reasoned argument	
	consider purpose, focus on evidence, and use criteria (explicit or implicit) to draw conclusions and make defensible judgments or assessments	
	analyze and make judgments about a work, a position, a process, a performance, or another product or act	
	reflect and make informed decisions based on information	
(5) Developing ideas; imagining possibilities and connecting ideas	refining ideas	use imagination to view or create things in new ways and connect two things that seem different
	making connections within and between various contexts	build on what they know to create ideas and possibilities in ways that are new to them

Essential skills	Indicators	Examples of mastery levels (from lowest to highest)
	working on realizing ideas	expand on known ideas to create new and imaginative combinations
	transforming products, methods, performances, and representations in response to problems, events, issues, and needs	combine ideas in a variety of ways and from a range of sources to create new possibilities
	generating additional creative ideas to come up with solutions to problems along the way	draw parallels between known and new ideas to create new ways of achieving goals
		create and connect complex ideas using imagery, analogies and symbolism
(6) Generating ideas	evaluating of ideas and choosing the ideas to develop	give their unconscious minds lots of ideas and information to combine and recombine at random (e.g., by learning a lot about something of interest)
	creating products, methods, performances, and representations in response to problems, events, issues, and needs	provide the incubation time for the unconscious to work
		quieten the filters and censors in the conscious and subconscious minds that tend to prevent novel ideas and inspirations from rising to the conscious mind (e.g., by doing relaxing or automatic activities)
(7) Application: Anticipation — Action — Reflection	*Anticipation*	
	Seeking solutions and putting ideas into action	predict what might happen in a given situation and when putting ideas into action
	combining ideas into a plan, proposal or product	investigate options and predict possible outcomes when putting ideas into action
	working with clear purpose and considering the potential users or audience of their work	experiment with a range of options when seeking solutions and putting ideas into action
	monitoring their progress, and adjusting their procedures in the light of criteria and feedback	assess and test options to identify the most effective solution and to put ideas into action
		predict possibilities, and identify and test consequences when seeking solutions and putting ideas into action

End of Annex 1

Essential skills	Indicators	Examples of mastery levels (from lowest to highest)
		assess risks and explain contingencies, taking account of a range of perspectives, when seeking solutions and putting complex ideas into action
	Reflection	
	Evaluate procedures and outcomes	check whether they are satisfied with the outcome of tasks or actions
	determine the extent to which they have met their goals	evaluate whether they have accomplished what they set out to achieve
		explain and justify ideas and outcomes
		evaluate the effectiveness of ideas, products, performances, methods and courses of action against given criteria
		explain intentions and justify ideas, methods and courses of action, and account for expected and unexpected outcomes against criteria they have identified
		evaluate the effectiveness of ideas, products and performances and implement courses of action to achieve desired outcomes against criteria they have identified

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Chapter 3

CANADA (ONTARIO): A UNIFYING THEME FOR CANADIAN EDUCATION IS EQUITY

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Highlights

- Canadians honor a sense of fairness and equal access for all students.
- Canada is a land of immigrants. All immigrants add to the rich diversity of Canada and Ontario. Creating culturally responsive and supportive structures to increase educational outcomes is a focus of Canada's educational systems.
- The Ontario effort is serious and multifaceted, involving many aspects of the system: curriculum, pedagogy, leadership, technology, assessment, and community engagement.
- Ontario: teachers and education leaders continually learn from each other.
- Ontario: stakeholder engagement has been a source of strength and support. Parents are essential partners.
- Tests and data are to be used to support improvement, not to make judgments.
- Effective change requires three to seven years of intentional implementation, targeted and intentional support, and monitoring.

INTRODUCTION

Canada has one of the most successful education systems in the world, as evidenced by continuous high performance on the recent Programme for International Student Assessment (PISA) and other international assessments. Within Canada, Ontario has produced major improvements in the last 10–15 years in elementary school literacy and secondary school graduation rates. These improvements extend across a large, diverse, and complex education system.

The 10 sections of this chapter provide a brief description of the Canadian and Ontario school systems, outlining some of the main strategies used. It describes the approach Ontario is taking toward defining, developing, implementing, monitoring, assessing, and extending 21st century competences and skills. The Ontario effort is serious and multifaceted, involving many aspects of the system: curriculum, pedagogy, leadership, technology, assessment, and community engagement.

Moving to 21st century skills and competences is a complicated, contextual, and contingent transition. For effective and lasting change to occur, many instances must happen in a mutually reinforcing manner, which can be challenging to implement in a large system. Though we are optimistic about what will happen, we recognize that the best intentions, at times, do not guarantee desired results. We continue to benefit from and contribute to the steady development of international knowledge about effective schools and changes in schools. Accordingly, this report is presented with a mixture of pride, optimism, curiosity, caution, and realism.

1. STATE OF EDUCATION IN CANADA

Canada has been identified as one of seven nations/economies where 90 percent of 15-year-olds master the baseline proficiency in science, reading, and mathematics as measured by PISA.[1] Based on PISA analysis, Canadian students are considered "high performers in science" (OECD 2016c, 34). On PISA 2015, "only three countries achieved higher results than Canada in science, one in reading, and six in mathematics" (CMEC 2016b, 13). Students' financial literacy knowledge and skills formed the basis of PISA's 2015 assessment of the financial literacy component.[2] Eighty-seven percent of Canadian students met the baseline for financial literacy, as compared to 78 percent for the Organisation for Economic

[1] According to PISA 2015, 510,000 students completed the assessment representing 29 million 15-year-olds in 72 participating countries/economies.

[2] In 2015, 15 countries and economies involving 137,000 students participated representing 11 million students. Ontario was one of the seven participating provinces.

Co-operation and Development (OECD) average. Twenty-two percent of students scored at level 5 or high achievement, as compared to 12 percent for the OECD. Canada remained a top performer among the participating jurisdictions. Within Canada, Ontario remains a high-performing jurisdiction balancing excellence and equity (CMEC 2016a). Canada is one of a very few countries where students born outside the country do as well, on average, as students born in the country.

Intentional policies, programs, and interventions support positive academic outcomes for underserved and traditionally underperforming learners, based on the economic, social, and cultural status (ESCS)[3] index. Ontario promotes "inclusive and equitable quality education" as described in Sustainable Development Goal (SDG) 4. To prepare students for increasing complex challenges, school systems are being asked to implement 21st century skills and competences within their formal and informal curricula.

The terms '21st century skills' and 'global competences' are often used interchangeably in the literature. Competencies are more than a skill. A skill is the ability to perform a task and solve a problem. Competencies include the ability to apply the skill effectively and appropriately in a defined context (Ontario Ministry of Education 2016).

There is no national structure for education across Canada. Education falls within the jurisdictional responsibilities of the individual departments/ministries of education for each of the provinces and territories. The exceptions are for First Nations Peoples living on reserves and the children of employees of the Armed Forces, which remain under federal jurisdiction. Additionally, the federal government provides funding for minority languages[4] and some aspects of research, training, and higher education. The OECD has described the role of the federal government in education as "limited and sometimes non-existent;" however, its academic outcomes, as measured by international assessments, remain stellar (Coughlan 2017).

1.1. How Does Canadian Education Work?

Canada comprises ten provinces and three territories in a federated structure and is a member of the British Commonwealth of Nations. Canada is the second-largest country by area in the world (9,984,670 km^2) with a population of approximately 37 million. The country's population density is less than four people per square kilometer. The small population given the large land mass affects education in rural and remote areas.

[3] Students in the bottom quarter of the index are classified as disadvantaged in terms of learners and schools.

[4] English in Quebec and French in the other jurisdictions.

Most Canadians live in urban areas and 45 percent of the population lives in six metropolitan areas. Ontario is Canada's most populous province at 13.9 million, with 38.5 percent of the country's total population (Statistics Canada 2016).

Canada is the only nation in the developed world without a national education policy or ministry/department of education. Canada's 1867 Constitution Act[5] mandated that "for each province the legislature may exclusively make Laws in relation to Education."[6] The federal government plays a minor role in education, acting through voluntary collaboration. When describing educational transitions, for Canada the process is collaborative, because each jurisdiction sets its own parameters. Ontario's context is presented in Section 2.

The various departments/ministers of education across Canada cooperate with the Council of Ministers of Education, Canada (CMEC), which is the intergovernmental organization for education, founded in 1967. The CMEC[7]

- Provides leadership on education at national and international levels;
- Serves as a national forum for policy and education-related issues;
- Offers a mechanism to direct research;
- Supports recognition and portability of educational and occupational qualifications; and
- Administers the official language programs for French and English.

In 2017, CMEC launched a multiyear strategic plan promoting pan-Canadian excellence and equity in education to maintain its 'world-class' results. The plan for change was negotiated within the national frame for education based on research and provincial/territorial student achievement data. Key components of the plan for more effective K-12 education include

- Promoting more effective transitions from secondary school through post- secondary;
- Supporting approaches in indigenizing education, ensuring cultural responsive opportunities for First Nation, Metis, and Inuit (FNMI) learners;
- Ensuring students are equipped for the digital world by integrating technology and developing 21st century skills;

[5] Originally the British North America Act — http://laws-lois.justice.gc.ca/eng/Const/

[6] Constitutional Act, 1867, http://laws-lois.justice.gc.ca/eng/Const/page-1.html

[7] CMEC website: www.cmec.ca

- Improving mathematical skills, knowledge, practices, and opportunities so that Canadian learners acquire CMEC's six global competences: critical thinking and problem solving; innovation; creativity and entrepreneurship; learning to learn; collaboration, communication, and global citizenship; and sustainability; and

- Supporting student well-being.

The provinces/territories act as agents for transitioning educational change, in terms of policies, processes, focus, and resources, including implementing CMEC's six global competences.

An elected member of the provincial/territorial legislature, who is appointed to the education portfolio, acts as the Minister for Education. This person heads the department/ministry, which may represent elementary/secondary and/or post-secondary education. Despite provincial/territorial jurisdictions, there is equity in education across Canada.[8]

Local governance is in the purview of school boards, divisions, districts, or district education councils. Locally elected (three- to four-year terms) in most provinces, they provide local governance, hire teachers and administrators, allocate programs to schools, budget for individual schools, and own and operate school buildings. Almost all provinces/territories fund schools/systems; local contributions through local property taxes are now minor or nonexistent. This provides more centralized control. Administrative structures vary across the country with an appointed superintendent and/or director of education leading K-12 school systems.[9] They select a variety of system- and school-based staff, depending on the size of the school system.[10] A principal leads a school, and in the case of larger schools, vice/assistant principals are appointed to meet specific qualifications and requirements. The trustees or members of the board that govern local education are elected by public ballot.

Canada spends 8 percent of the gross domestic product on education. Education funding with centralized control is more equitable. Curriculum is established by the individual province/territory. Teachers and administrators are required to meet specific qualifications, and all provinces administer some degree of accountability through assessments. Teachers and most support staff members are unionized and bargaining may be at the district and/or provincial/territorial level. Most schools have a form of mandated parent/community council that provides local advice to the school/district.

[8] Quebec has only 11 years of school instead of 12 in the other provinces and a 2-year college system that provides academic programs for university and/or technical training.

[9] These individuals are required to have teaching qualifications.

[10] Range from 3,000,000 pupils in Toronto to less than 1,000 in rural/remote parts of the country.

Canada focuses on maintaining the excellence and equity inherent in the system. Provinces and territories offer different curricula, prerequisites, and qualifications.[11]

- All jurisdictions offer a form of noncompulsory, **pre-Grade 1 schooling**, such as kindergarten and/or preschool education. The impact of effective early years' education is increasingly refocusing governmental agendas on improving the quality of the programming. On a pan-Canadian level, 95 percent of five-year-olds and over 40 percent of four-year-olds attend school. Programs vary from half days to all day, every day (Ontario).

- There are approximately 5 million students enrolled in over 15,000 public **elementary and secondary schools** across Canada. Public education is provided free of charge to all Canadians who meet various age and residency requirements.

- The age of compulsory Grade 1 education varies across jurisdictions. Most students begin at age six, and some at age five. Elementary education covers Grade 1 to Grade 8. Over 98 percent of students go on to attend secondary school (Grades 9 through 12). Compulsory schooling lasts through secondary school between 16 and 18 years of age.

- Students enroll in public education or private/independent/faith-based schools, which are regulated by the relevant jurisdiction. According to the Fraser Institute, 6.8 percent of Canadian students attend private schools. Some provinces and territories provide partial private school tuition, but Ontario, New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland/Labrador do not. In Ontario, due to historic constitutional factors, Catholic education is fully subsidized from kindergarten through Grade 12.

- Most students attend their local school; however, there is some choice built into the system for Francophone (French as a first language) schools, magnet programs,[12] and providing specialized services and programs to students with special needs. Integration of students with special needs is the placement of choice.

- Canada is officially bilingual (French and English). Eighty-five percent of French first-language Canadians reside in Quebec, which has language laws in education to promote and protect French as the first official language of the province. French first-language students living outside of Quebec have their language rights and access to French first-language education, as protected by the Canadian Charter of Rights and Freedoms.[13]

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11 Further information regarding each province/territory's education system can be found at https://www.cicic.ca/1301/Ministries-Departments-responsible-for-education-in-Canada/index.canada.

12 Arts, sports, and gifted programming.

13 Canadian Charter of Rights and Freedoms: http://laws-lois.justice.gc.ca/eng/Const/page-15.html

- 400,000 are enrolled in French immersion programs, which is the fastest growing education program across Canada.

- Canada has the highest percentage of adults holding tertiary qualifications among OECD countries. Twenty-five percent of Canadians ages 25–64 have a college diploma[14] as their highest level of education, a proportion higher than any OECD country.

1.2. Diversity

Canada, except for the FNMI peoples, is a land of immigrants. All immigrants add to the rich diversity of Canada and Ontario.

Canada and Ontario welcome newcomers; according to Statistics Canada (2017), 22 percent of the total population are immigrants. Close to 30 percent of Ontario's population is foreign born and more than 30 percent of young adults are from families where both parents immigrated to Canada from other countries. PISA 2015 provides evidence of Canada's consistent performance on equity in terms of narrowing educational outcomes due to the impact of social background, between advantaged and disadvantaged students. Canadian and Ontario students demonstrate more resilience overall.[15] In Canada, the SECS gap was 9 percent compared with over 20 percent for the OECD. Canada's immigrant students perform better than most OECD economies/nations, even when social factors are excluded. Closing this academic gap has shown improvement since 2006. A unifying theme for Canadian education, according to the OECD, is equity (OECD, Canada Country Overview, 2015). Canadians honor a sense of fairness and equal access for all students.

Creating culturally responsive and supportive structures to increase educational outcomes is a focus of Canada's educational systems. Diversity has been reported to add to economic prosperity: "viewed across all sectors, one percent increase in ethno-cultural diversity was associated with an average 2.4 percent increase in revenue and a 0.5 percent increase in workplace productivity" (Momani and Stirk 2017, 1). Diverse peoples wish to live in diverse cities that reflect their backgrounds and shared experiences. This cultural responsiveness extends to schools and the workplace, where 'cultural fluency' is being nurtured (Momani and Stirk 2017, 15).

A recent British Broadcasting Corporation (BBC) article applauded Canada's ability to lower the achievement gap between immigrant and advantaged students, ensuring more equitable outcomes (Coughlan 2017). Although Canada currently performs well on the OECD's index of well-being, the country is committed to providing targeted opportunities for growth

[14] College refers to both colleges and polytechnics.

[15] Students who perform well on PISA despite disadvantaged backgrounds.

and inclusivity, through education and retraining to prepare for the 21st century workplace (OECD 2017).

2. STATE OF EDUCATION IN ONTARIO

Ontario's education system is internationally recognized as a high-achieving, equitable, and continuously improving education system (Brochu, Gluszynski, and Cartwright2011; Mourshed, Chijioke, and Barber 2010). Education in Ontario is continuing its improvement journey, focused on deeper learning, additional 21st century skill development, and wellness. Ontario is preparing its students to be personally successful, economically productive, engaged citizens of the world, which, it believes, will in turn provide for the province's success in the decades to come.

It is one of the most diverse provinces, with 2.1 million students in four different publicly funded school systems (English Public, English Catholic, French Public, and French Catholic). Currently, 20.7 percent of Ontario students have a first language other than English or French. There are approximately 73,700 elementary school teachers and 41,300 secondary school teachers, represented by four different teacher unions. Education is delivered in almost 4,000 elementary schools and 900 secondary schools, each under the jurisdiction of a district school board. There are 60 English language and 12 French language school districts that range in size, from a few hundred students in rural areas to 250,000 students in the Toronto District School Board (one of the largest urban districts in North America). Approximately 95 percent of all students in the province attend publicly funded schools. The remaining students are homeschooled or attend private schools or federally funded First Nations schools. While indigenous pupils living on reserves generally attend federally operated schools, over 70 percent of First Nations students attend provincially operated schools in Ontario.

Formal education in Ontario begins at age four with all-day, everyday junior and senior kindergarten (two years). While attendance in kindergarten is optional, over 90 percent of Ontario's four- and five-year-olds are enrolled. Compulsory enrolment begins in Grade 1 at age six and students are legally required to remain in school until age 18 or graduation from secondary school. Kindergarten to Grade 8 classes are traditionally offered in elementary schools, while Grades 9 to 12 are found in secondary schools.

2.1. Educational Improvement Processes

In 2003, concern was raised over student performance results based on annual province-wide curriculum-based assessments of literacy and numeracy in Grades 3 and

6.[16] The newly elected provincial government announced that educational improvement is its top priority.

The government established three goals:

(a) To raise the bar for student achievement, specifically to increase the percentage of children in Grades 3 and 6 who met or exceeded the province's literacy and numeracy standards from 54 percent in 2003 to 75 percent, and to increase the rate of secondary school graduation from 68 percent to 85 percent[17]

(b) To narrow the gap for students who have historically faced challenges to their success in school

(c) To build public confidence in publicly funded education

By the 2015–2016 school year, these critical foundational measurements of students' readiness to succeed had improved to 72 percent and 86.5 percent, respectively. Ontario also significantly narrowed the achievement gap for students experiencing challenges to their learning. For example, the performance gap on the Grade 6 writing test for students learning English as a second language narrowed from 30 percent in 2003 to 3 percent in 2015. The performance on the same test by students with special needs rose from 12 percent to 46 percent (integration of students with special needs into regular classes is the preferred approach across the province). The province also saw dramatic reductions in the numbers of low-performing elementary schools (usually schools in areas of poverty and/or high immigration), from over 700 in 2003 to less than 70 in 2015–2016.[18]

This transformation was achieved through a partnership between the government and the school districts' leaders and teachers. Progress was made through eight overall strategies and conditions identified to support system-wide change:

(a) A small number of ambitious goals

(b) A guiding coalition of leadership

(c) High standards and expectations

[16] The Education Quality and Accountability Office (EQAO) designs, administers, and reports on the provincial assessments for Grades 3, 6, 9 and 10 http://www.eqao.com/en

[17] The rate is established for all students entering Grade 9 who complete their secondary school studies within 5 years.

[18] These results were tracked and supported by the Ministry's Literacy and Numeracy Secretariat.

(d) Investment in leadership and capacity building related to pedagogy (professional learning)

(e) Mobilizing data and effective practices as a strategy for improvement

(f) Intervention in a nonpunitive manner

(g) Being vigilant about distractors

(h) Being transparent, relentless, and increasingly challenging

2.2. Provincial Standards for Improving Student Skills

Provincial standards set very high expectations for students. Higher-order thinking skills, critical thinking, problem solving and analysis, and collaboration and communications skills are all part of Ontario's curriculum. Students must demonstrate these skills to meet the provincial standards. To assist teachers in improving instruction to meet these ambitious standards, the ministry produced two reports that describe high-quality literacy instruction: The Early Reading Strategy in 2003 and the Expert Panel on Literacy in Grades 4 to 6 in Ontario in 2004. The government established curricular expectations for the content that students were to learn and shared research-informed teaching strategies that had proven to be successful. Teachers selected their pedagogical approaches after learning together about the range of teaching approaches that can be most effective for different contexts.

The 2004 literacy report defined literacy as:

> *"…the ability to use language and images in rich and varied forms to read, write, listen, speak, view, represent, and think critically about ideas. It enables us to share information, to interact with others, and to make meaning. Literacy is a complex process that involves building on prior knowledge, culture, and experiences in order to develop new knowledge and deeper understanding. It connects individuals and communities, and is an essential tool for personal growth and active participation in a democratic society"* (Ontario Ministry of Education 2004, 5).

This report, and other documents by the ministry, established effective instruction as

- The use of assessment to guide instruction;
- Differentiating instruction to address student needs;

- A gradual release of responsibility for learning from teacher to student; and
- Integrating literacy instruction across various curriculum areas.

Support in literacy, mathematics, and secondary school improvement was also provided through a new division of the ministry: the Student Achievement Division.[19] It was staffed by a combination of ministry staff members and educators seconded from the school system to lead the initiative to improve student learning. Districts and schools were expected to produce improved student learning outcomes and were provided increasing support to realize success. They submitted improvement plans[20] with measurable targets and strategies/actions on how to meet their targets. This holds school boards/districts accountable for their student achievement results.

Having seen the efficacy of these approaches in improving learning in measurable ways, the same philosophy and approaches are informing Ontario's commitment to additional 21st century skills. In 2014, over 50 percent of school boards had independently identified 21st century competences as a focus for their systems; currently all 72 have incorporated some form of 21st century skills/competences (Ontario Ministry of Education 2016).

Successful change occurs through knowledgeable leadership and relationship development, knowledge building and innovation, and transparent accountability throughout the system. Educators in Ontario understand their power to improve learning for all students. They are now involved in collaborative inquiry and action research in their classrooms, as well as working together to increase learning outcomes for students and staff.

3. TWENTY-FIRST CENTURY COMPETENCES

3.1. Pan-Canadian Competency Frame

In 2016, the CMEC adapted a pan-Canadian frame for global competences, including definitions and detailed descriptors of what students are to know, understand, and demonstrate to prepare them for the rapid socially, technologically, economically, and culturally changing world. Previous research and discussion resources from the Conference Board of Canada, C21, and OECD informed the CMEC's six global competences:

[19] Ministry of Education staff: http://edu.gov.on.ca/eng/about/whoweare.html

[20] Board Improvement Plans for Student Achievement (BIPSA) and schools submitted to the school system School Improvement Plans (SIPs).

- Critical thinking and problem solving
- Innovation, creativity, and entrepreneurship
- Learning to learn/self-awareness and self-direction
- Collaboration
- Communication
- Global citizenship and sustainability

These six components were developed to meet the 2030 SDG4 on education of the United Nations Educational, Scientific, and Cultural Organization (UNESCO), promoting global citizenship and sustainable development. They were refined with input from business and the corporate sectors to ensure that they align with changing workforce demands. A brief synopsis is depicted in Table 3.1.

Table 3.1. *Pan-Canadian frame of competencies*

Component	Definition	Descriptors
Critical thinking and problem solving	Acquiring, processing analyzing and interpreting information to make informed judgements and decisions.	Solve meaningful, real-life, complex problems, engage in inquiry, see patterns.
Innovation, creativity, and entrepreneurship	Ability to move from idea to action to meet community needs, enhance, improve concepts, ideas, products.	Formulate and express insightful questions & opinions, contribute solutions to complex, economic, social and environmental problems.
Learning to learn/ self-awareness and self-direction	Becoming aware, demonstrating agency, development of motivation, perseverance, resilience and self-regulation, growth mindset.	Use metacognition, goal-setting, independence, self-regulate to be life-long learners.
Collaboration	Interplay of cognitive, interpersonal and intrapersonal competencies.	Develop positive and respectful relationships, learn from and contribute to others.
Communication	Receiving and expressing meaning, understanding local and global perspectives, positive digital literacy.	Communicate effectively in oral and written form using appropriate tools.
Global citizenship and sustainability	Acquisition of skills for engaged citizenship local and global, appreciation for diversity.	Understand diverse and interconnected forces, discrimination, engage and contribute positively.

Awareness of financial literacy is another component for informed citizens operating in the 21st century and is implied, although not directly addressed, within the CMEC model. **Financial literacy**, according to Canada's Task Force on Financial Literacy (2010), is having the knowledge, skills, and confidence to make responsible decisions.

Within this framework, each province and territory will decide how best to embed the six CMEC competences in their curricula and resources to teach and measure students' ability to master the competences required to become informed and productive citizens.

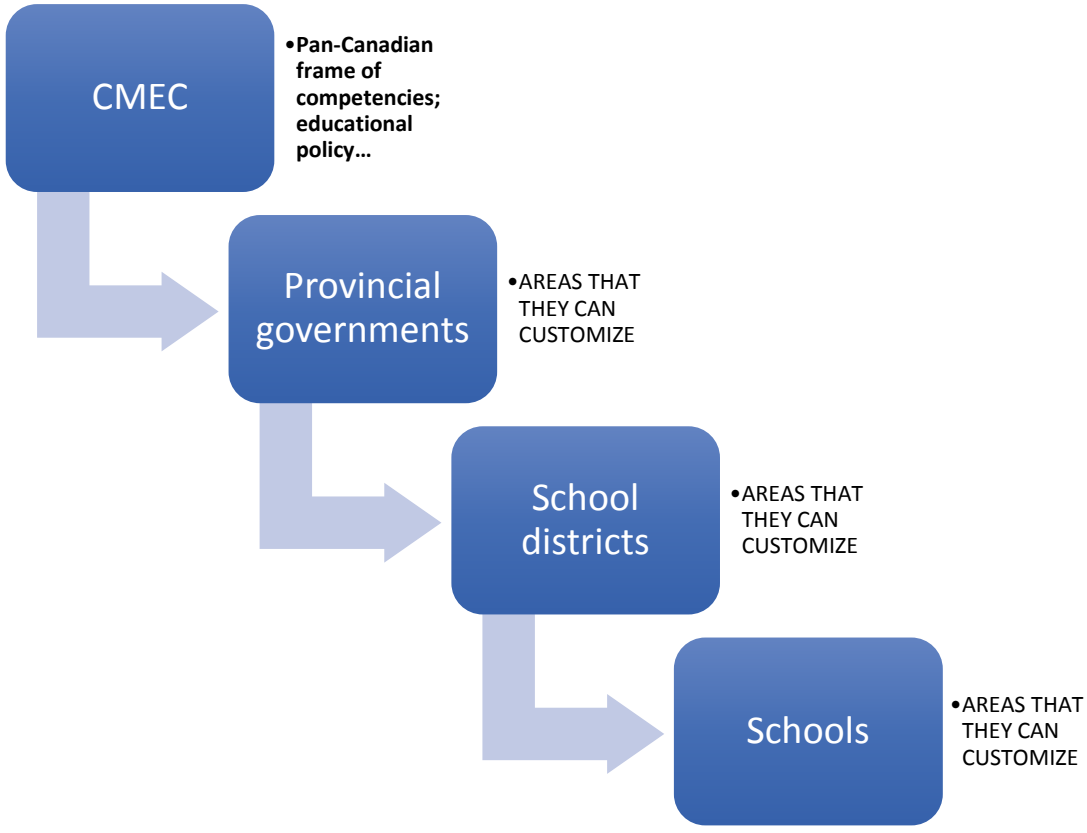
The right to customize the policy is stressed throughout the education system, from the CMEC all the way down to individual schools. A lesson learned: systems that try to be too directive create greater alienation and resistance at the local level.

The CMEC recognizes that educational policy direction regarding 21st century skills/competences comes from provincial/territorial governments and may include any or all of the following:

- Changes in official curricula
- Guidance to school districts on how to conduct various activities
- Changes in time allocations for the school day or year
- Professional development for school leaders and teachers
- Pilot projects or resources of various kinds for use by schools and teachers
- Public education intended to inform parents and others about changing ideas about schooling

Once such guidance is given, school districts normally have a reasonable degree of flexibility in how they adopt such measures, depending on local priorities. Even when provinces provide clear policy direction, they are generally reluctant to supervise too closely or intervene too forcefully, preferring to allow local districts to guide changes. Similarly, districts may give individual schools a fair amount of autonomy in deciding how to follow or interpret various policy guidance. While this decentralized system may seem 'soft' in terms of implementing new approaches, experience in Canada and elsewhere has clearly shown that systems that try to be too directive create greater alienation and resistance at the local level, and in the end, achieve less effective implementation. A combination of intelligent pressure and ongoing job-embedded professional support is applied.

Figure 3.1.



3.2. Ontario 6C Model

Ontario similar to other provinces is attempting to prepare students, "for success in a dynamic, technologically intensive and increasingly connected 21st century world" (Ontario Ministry of Education 2016) with the goal of becoming "world leaders in higher-order skills such as critical thinking and problem solving, which will allow Ontario to thrive in the increasingly competitive marketplace" by 2025 (Ontario Ministry of Finance, 2014, p. 9).

The 6Cs or six competences are described in Table 3.2. These became the agenda for Ontario's focus on transitioning to 21st century learning and deepening students' learning. The aim was to operationalize the competences and assess for them.

Table 3.2. *Ontario 6C model*

Character	Citizenship	Collaboration	Communication	Creativity and Imagination	Critical Thinking
Honesty, self-regulation, empathy, perseverance	Global knowledge, sensitivity and respect for others, active involvement	Working in teams, social networking, learn from and contribute to others	Communicate effectively—oral, writing, in a variety of forms—use digital tools, active listening	Economic and social entrepreneurship, leadership for action pursue novel ideas	Thinking critically, solve problems, effective decision making

In the fall of 2013, individuals and organizations across the province consulted on a renewed vision for education. Embedded into the four goals of 'Achieving Excellence: A Renewed Vision for Education in Ontario'[21] were recommendations for 21st century/global competences, and previous models informed their design. Ontario's frame for 21st century/global competences aligns with the pan-Canadian vision, reflects Ontario's unique context, and is evidence informed.

The province explored the implications for policy and practice. The six competences allow Ontario's students to go deeper, involve cognitive, interpersonal, and intrapersonal learning domains, and transfer/apply these to new and challenging experiences. The 21st century competences support learning in and across the discipline areas in Ontario's K-12 education system.

Table 3.3. *Ontario's 21st century global competences/skills*

Component	Descriptors
Critical thinking and problem-solving	Solves meaningful, real-life complex problems; takes concrete steps to address issues; designs and manages projects; acquires, processes, interprets, and analyzes information to make informed decisions; engages in inquiry; makes connections; transfers learning
Innovation, creativity, and entrepreneurship	Contributes to complex problems; enhances a concept, idea, or product; takes risks in thinking and creating; makes discoveries through inquiry research; pursues new ideas; leads and motivates with an ethical entrepreneurial spirit
Learning to learn/ self-aware and self-directed learning	Learns the process of learning, believes in a grow mind-set, perseveres and overcomes challenges to reach a goal, self-regulates, reflects on learning, cultivates emotional intelligence, adapts to change, manages various aspects of life

[21] Achieving Excellence, Ensuring Equity, Promoting Well-Being, Enhancing Public Confidence

End of table 3.3.

Component	Descriptors
Collaboration	Participates in teams; establishes positive relationships; learns from and contributes to others' learning; co-constructs knowledge, meaning, and content; assumes a variety of roles within a team; manages conflict; networks; respects a diversity of perspectives
Communication	Communicates effectively in different contexts in oral and written form in English and/or French, asks effective questions, communicates using a variety of media, selects appropriate digital tools, listens to understand, gains knowledge about a variety of languages, voices opinions, and advocates for ideas
Global citizenship	Contributes to society and the culture of the local, global, and digital community in a responsible, accountable, and ethical manner, engages in local and global initiatives, learns from and with a diverse people, interacts safely and responsibly within a variety of communities, creates a positive digital footprint, relates to the environment, and is mindful of the importance of all living things

These components reflect Ontario's emphasis on equity and diversity, as well as the focus on achieving excellence for all. The 21st century/global competences are woven within teaching and learning, indigenous education, education for sustainable development, early education and development, wellness and mental health, experiential learning, and assessment. The aim is to create global citizens prepared to live and thrive in the 21st century.[22]

3.2.1. Competences Applied

The global competencies are seamlessly integrated into the K-12 curriculum.

There is a '21st Century Learning Unit' in the Ontario Ministry of Education's Curriculum and Assessment Policy Branch. The competences/skills spiral through the K-12 curriculum. As curriculum documents and policies are revised, these 21st century skills are included in the updates and revisions.[23]

For instance, the 2016 Kindergarten Program begins with a preface entitled 'Elementary Schools for the Twenty-First Century', "today and in the future, children need to be critically literate in order to synthesize information, make informed decisions, communicate effectively and thrive in an ever-changing global community" (Ontario Ministry of Education 2016e, 4).

[22] About 21st Century Learning in Ontario: http://www.edugains.ca/newsite/21stCenturyLearning/about_learning_in_ontario.html

[23] The Ontario Early Years program is operating a 6-week school readiness preparation program for students entering kindergarten. The program 'School's Cool' is targeted at children from low income or vulnerable communities. In Ontario, kindergarten is voluntary; however, students may begin the September they will turn 4 if before January 1 or if eligible will begin at 3 years and 9 months.

This message repeats in the revisions to all curriculum policy documents from kindergarten through Grade 12. The Ministry of Education's student achievement officers and school board educators participated in 45 experimental learning projects to apply experiential learning and create video pedagogical documentation of innovative practices (Ontario Ministry of Education 2016, 27).

3.2.2. Competences in Kindergarten and Elementary Schools

The kindergarten curriculum is included as part of the elementary listings. The optional kindergarten, two-year, play-based learning program uses targeted strategies and inquiry to begin to close academic gaps for traditionally underachieving students, including those from backgrounds of generational poverty, new immigrants, and refugees.

The elementary curriculum policy documents are listed both by grade and by subject area. The most recent curriculum revisions are in Health and Physical Education (2015), Social Sciences (2013) and French as a Second Language (2013). The older documents such as Language (2006) and Mathematics (2005) contain fewer references to global competences and critical and creative thinking. The new Health and Physical Education Curriculum document[24] includes references to the challenges for positive, lifelong physical and mental health, as well as personal and collective wellness.[25]

Pedagogy in the elementary grades focuses on inquiry and creating opportunities for students to collaboratively and creatively solve problems.

Pedagogy in the elementary grades focuses on inquiry and creating opportunities for students to collaboratively and creatively solve problems. A K-12 career-planning resource document, 'Creating Pathways to Success', was developed in 2013 to "ensure that students develop the knowledge and skills they need to make informed education and career/life choices through the effective application of a four-step inquiry process" (p. 3).

In 2016, the ministry released a resource document on financial literacy for Grades 4–8: "the goal is to help students acquire the knowledge and skills that will enable them to understand and respond to complex issues regarding their personal finances, as well as to develop an understanding of local and global effects of world economic forces and the social, environmental, and ethical implications of their own choices as consumers" (2016, p. 3).

[24] Health and Physical Education Curriculum Document: http://edu.gov.on.ca/eng/curriculum/elementary/health1to8.pdf

[25] "A variety of factors, known as the 'determinants of health' have been shown to affect a person's overall state of well-being. Some of these are income, education and literacy, gender and culture, physical and social environment, personal health practices and coping skills, and availability of health services" (Health and Physical Education Document 2015, 4).

In 2017, a resource document on environmental education[26] was developed. The directions and messages from these more recent revisions to curriculum resource documents and policy align with the global competences and enable implementation within the learning process. It is a model of how global competences can be infused across the curriculum as educators identify subject-specific expectations that can be paired with global competences in engaging ways. This is an example of how emerging trends and needs are identified and then aligned to competency development.

3.2.3. Competences in Secondary Schools

As is the case with elementary education, the curriculum policy documents for secondary education are accessible by subject and grade. The pattern of curricular revisions mirrors the elementary revisions. The achievement charts used for gathering evidence of learning assess evidence of knowledge and understanding, thinking, communication, and application in each of the subject-specific areas.[27]

Relevance and deeper understanding to build global competences are integrated aims. The following is an example from the 'Canada and World Studies' curriculum document (2013): "examining current events helps students analyze controversial issues, understand diverse perspectives, develop informed opinions, and build a deeper understanding of the world in which they live" (p. 40). As mathematics and science curricula are updated through revisions, these skills will be included throughout the grades and subjects.

The Grade 9 and 10 Canadian and World Studies curriculum, particularly in the compulsory 'Civics and Citizenship' course in Grade 10, provides students with opportunities to learn about what it means to be a responsible, active citizen in the community of the classroom and the diverse communities to which they belong within and outside of school. It is important for students to understand that they belong to many communities and that, ultimately, they are all citizens of the global community. The "Framework for Citizenship Education" (p. 10) is published in the Grade 9 and 10 Canadian and World Studies curriculum (2013) and demonstrates how the global competences are seamlessly integrated into the curriculum.

Additionally, the revisions updating the various curriculum policy documents added a section on 21st century skills/competences for program considerations. This section contains common and key messaging in terms of education for

[26] Environmental Education: Scope and Sequence of Expectations. The Ontario Curriculum, Grades 1–8, and the Kindergarten Program. 2017 Edition. http://www.edu.gov.on.ca/eng/curriculum/elementary/environmental_ed_kto8_eng.pdf

[27] An example of a secondary school achievement chart is found on pages 36–37 of the Canadian World Studies Curriculum (2013): http://edu.gov.on.ca/eng/curriculum/secondary/canworld910curr2013.pdf

- Instructional programming;
- Students with special needs;
- Students whose maternal languages are other than English/French and are English language learners (ELLs);
- Equity;
- Financial literacy;
- Mathematical and language literacy;
- Inquiry skills within mathematics and language literacy;
- Critical thinking and critical literacy; and
- Information and communications technology.

Box 3.1

Two examples from common messages demonstrate how these are fundamental to building and applying global competences within the curriculum:

(a) "The Ontario equity and inclusive education strategy focuses on respecting diversity, promoting inclusive education, and identifying and eliminating discriminatory biases, systemic barriers, and power dynamics that limit the ability of students to learn, grow, and contribute to society …. Diversity is valued, and all members of the school community feel safe, comfortable, and accepted." (2013, 49).

(b) Information Literacy and Research Skills, students will:

- **"access, select, gather, process, critically evaluate, create, and communicate information;**
- **use the information obtained to explore and investigate issues, solve problems, make decisions, build knowledge, create personal meaning, and enrich their lives;**
- **communicate their findings to different audiences, using a variety of formats and technologies; and**
- **use information and research with understanding, responsibility, and imagination." (2013, 54).**

Global skills/competences are also embedded explicitly in all careers and guidance courses in Grades 9–12, where students focus on the development of the nine essential skills that have been identified by the Government of Canada and other national and international agencies as necessary for success in any occupation. The nine essential skills for career and guidance courses are as follows:

- Reading text
- Document use
- Writing
- Numeracy
- Oral communication
- Thinking skills
- Working with others
- Computer use
- Continuous learning

Students learn about the importance and transferability of the essential skills and become actively involved in developing and applying them in preparation for future work.

3.2.4. Specialist High Skills Major (Grades 11 and 12)

Ontario emphasized increased graduation rates as one of its priorities. One of the strategies that allows application of global competences and alternative pathways is the Specialist High Skills Major (SHSM) program,[28] which allows senior students to focus on a career path while fulfilling the requirements for their high school diploma. The pathways encompass the workplace, apprenticeship, college, and university, and the SHSM program allows students to explore career options and gain important workplace skills, sector certification, and global competences.

The SHSM programs preparing students for the 21st century workplace is available in a variety of sectors, from agriculture and manufacturing to nonprofit and environment.

[28] Specialist High Skills Major Program: http://www.edu.gov.on.ca/morestudentsuccess/SHSM.html

Innovation is embedded in the Grade 9–12 courses, including technological education, science, and computer studies and linked to every SHSM program. A clear example found in the Ontario curriculum is the '13 Fundamental Technological Education' concepts aligned throughout the Grade 9–12 curriculum for technological education (2009), including transportation technology, construction, manufacturing, design technology, health care, green industries, and communications technology. 'Innovation' is listed as its own stand-alone fundamental concept.

Similar to the elementary curriculum, there is a range of policy and other resource documents that support and enhance students' learning[29] including 'First Nations, Metis and Inuit Connections Perspectives' (2016), 'Financial Literacy' (2016), and 'Growing Success' (2010). These reflect Ontario's continued commitment to excellence and equity. To support the implementation of 21st century competences/skills, the ministry established an Innovation Learning Fund, managed through the Council of Ontario Directors of Education.[30]

3.2.5. Informal Education

Schools and school systems are encouraged to develop student leadership and voice.

In terms of informal education, schools and school systems are encouraged to develop student leadership and voice as outlined in the 'School Effectiveness Framework' (2013). The Student Achievement Division[31] addresses issues ranging from student success, leadership, program implementation, and professional development among others. Schools and school districts organize a variety of cocurricular opportunities including teams, clubs, and events (arts, athletics, and IT) for students where they can collaborate and practice the global competences. In terms of leadership roles, students are elected by other students to school councils. At a system level, they provide input as student trustees on the Board of Education.

3.2.6. Special Education

An inclusionary placement in a regular classroom is the placement of first choice. The global competencies are easily adapted to support individualized learning plans and differentiated instruction.

Special education is included within the ministry's Equity and Inclusion Strategy. Students who require supports beyond those ordinarily received due to behavioral, communicational, intellectual, and

[29] Ontario Secondary Policy and Resource Documents: http://edu.gov.on.ca/eng/curriculum/secondary/commontwo.html

[30] Invitation for the 21st Century Teaching and Learning Roundtable Event: http://www.edu.gov.on.ca/eng/policyfunding/memos/jan2016/2016round_table.pdf

[31] Ministry of Education Organizational Chart: http://edu.gov.on.ca/eng/general/edu_chart.html

physical or multiple exceptionalities may be identified as students with special needs through an Individual Education Plan (IEP).

An inclusionary placement in a regular classroom is the placement of first choice. Depending on the severity of the exceptionality and impact on learning needs, students may be placed in a small class setting with dedicated programming and services as outlined by an Identification, Placement, and Review Committee (IPRC). Approximately 12–15 percent of all Ontario students are identified with special needs. The most frequent exceptionality designated are learning disabilities. The Education Act mandates programs and services for identified students, including the use of assistive technology.[32] More detailed information is contained in the ministry's Special Education Update.[33]

For students with special needs, the global competences are critical in ensuring that students develop the necessary skills and abilities to navigate life successfully. The global competences are easily adapted to support individualized learning plans and differentiated instruction to support the unique learning needs of every student and provide an inclusive framework that can be used to assist students in the acquisition of skills on a developmental continuum.

3.2.7. Postsecondary Partnerships

Twenty-first century skills/competences support Ontario as a world-class education system. Partnerships with universities encourage research and evidence-informed practices. The Institute for Knowledge, Innovation, and Technology at OISE, University of Toronto, uses knowledge-building competences, enables "the exchange of ideas and opinions within a community of learners" (Ontario Ministry of Education 2016, 28), and shares its findings at national and international research conferences.

4. MEASURING AND ASSESSING TWENTY-FIRST CENTURY COMPETENCES

Ontario's framework for 21st century/global competences provides six specific, evidence-based competences that have the capacity to transform both teaching and learning in schools. The competences, when embedded into the K-12 curriculum, provide a coherent framework and context to develop and prepare students to thrive as global citizens.

[32] Assistive Technology Tools: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/WW_TechnologyTools.pdf

[33] Ministry of Education Special Education Update: http://www.edu.gov.on.ca/eng/general/elemsec/speced/special_ed_update.html

"The research shows that whatever is measured matters" (Binkley et al. 2012, 20). For the 21st century skills to be embedded and assessed in Ontario schools, Ontario educators require a formal structure for measuring and assessing the impact on student learning. This strategic planning process needs clear, focused, and purposeful direction on the use of the framework by both system and school leaders (Marzano and Heflebower 2012). To establish a structure for success, a strategic execution process that outlines the implementation and monitoring process must be developed, including metrics that assess evidence of impact.

The tools to secure accountability are provided by the Education Quality and Accountability Office (EQAO) provincial assessments, the School Effectiveness Framework K-12 (2013), District Reviews, School Self-Assessment (SSA), and ongoing system/school leadership.

4.1.1. Education Quality and Accountability Office

In Ontario, the provincial agency tasked with assessment is the EQAO. The EQAO was established to design and deliver large-scale assessments and to measure Ontario's students' performance in reading, writing, and mathematics in Grades 3, 6, 9, and 10.[34] The provincial assessments are developed by Ontario educators and aligned to the provincial curriculum.

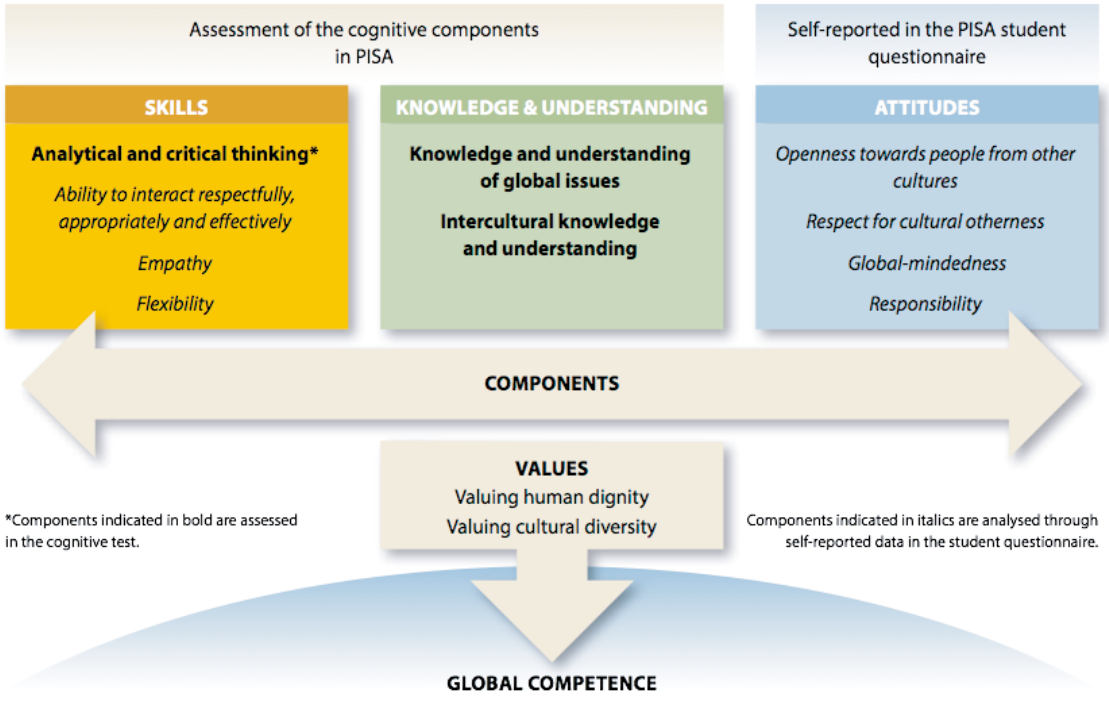
The EQAO provides schools and school districts with detailed information about students' achievement on the provincial assessments as well as contextual, attitudinal, and behavioral information from questionnaires. The data are used to inform school planning and interventions. The school and district results are publicly available, which encourages education members and systems to be accountable and enhances public confidence as part of the Achieving Excellence mandate (discussed in Section 3).

The EQAO conducts research into educational practices and administers and reports on the pan-Canadian and international assessments[35] including PISA. Participation in the national and international assessments is another form of measuring; a framework is being developed for PISA 2018 to measure students' knowledge and understanding of global skills/competences (Figure 3.2).

[34] Grade 10 Assessment: Ontario Secondary School Literacy Test (OSSLT).

[35] Pan-Canadian Assessment Program (PCAP), PISA, Trends in International Mathematics and Science Study (TIMSS), Progress in International Reading Literacy Study (PIRLS). The results are on the EQAO's web site www.eqao.com

Figure 3.2. *The dimensions for the proposed assessment of global competence, PISA 2018*



Communication, numeracy, critical thinking and problem-solving, and the 'learning to learn' are measured through assessment tasks, item analysis, and questionnaires in provincial assessments.

As the EQAO assesses the provincial curriculum, it also assesses 21st century skills as a component of its mandate. In 2014, the EQAO identified four skill categories that align to the provincial assessments: communication, numeracy, critical thinking and problem-solving, and the 'learning to learn' as outlined in Ontario's global competences. These are measured through assessment tasks, item analysis, and questionnaires. The results have been referenced in the international assessment results of Canadian students, such as the financial literacy component of PISA. The EQAO has plans to convert the assessments into an electronic format mirroring the PISA initiatives.

Table 3.4 outlines two of the 21st century skills assessed by the EQAO.

Table 3.4. *Examples of 21st century skills assessed by the EQAO*

21st Century Skills	EQAO
Communication • Communicate clearly and correctly in written form. • Respond to written text in a manner that will ensure effective communication. • Read and understand information presented in a variety of forms.	• In the writing components for Grades 3, and 6, and OSSLT, students respond to multiple- choice questions and, prompts, write responses expressing opinions, finding evidence from the text, communicate ideas and information clearly and coherently, interact with narrative, informational, and graphic selections to construct an understanding, and make connections between the text and their personal knowledge and expertise.
Critical Thinking and Problem Solving • Apply a systematic approach to solve problems. • Use a variety of thinking skills to solve problems. • Analyze ideas and information to draw conclusions and make judgements.	• Students are expected to solve problems by selecting and applying a variety of problem-solving strategies. They have to make a plan and carry it out. Students identify the most important elements of the problem, understand relationships between elements, and draw appropriate conclusions. Students provide relevant supporting evidence from the text. • Students analyze ideas and information presented in reading selections and respond to questions that require justification of interpretations from the text.

A detailed discussion of how Ontario students perform on components of 21st century skills across the EQAO and the pan-Canadian and international assessments can be found in the background papers on 21st Century Skills for Elementary and for Secondary Students referenced at the end of this chapter.

For example, Ontario students show a progression toward acquiring important skills such as applying a variety of thinking skills, demonstrating a systematic approach to solving problems, and analyzing information to make judgments and draw conclusions. While the EQAO confirms that Ontario's students are progressing in their acquisition of 21st century skills, there are areas requiring consolidation and mastery for all students. These include

- Using critical-thinking skills to solve problems;
- Communicating ideas clearly, coherently, and effectively; and
- Making real-world connections to literacy and numeracy skills.

4.1.2. Implementation of Provincial Directives in Schools and School Systems

In terms of monitoring school systems and schools' implementation of provincial directives such as Ontario's framework for 21st century/global competences, the provincial govern-

ment mandated that every school board should create and submit the BIPSA to the ministry. These plans contain measurable goals, increasingly including 21st century global skills, and evidence/data of the intended changes as a measure of accountability. Additionally, each school in the district must create and submit their SIP. There is a mandated provincial process for school and school system reviews to measure and assess defined metrics in terms of learning, including 21st century/global competences.

In other Canadian provinces, school reviews are used to assess and monitor change and can be a tool for transformative change (Freedman and Di Cecco 2013). These reviews include the improvement plans and student achievement data described within the 'School Effectiveness Framework K-12' (2013).[36]

The 'School Effectiveness Framework K-12' (2013) is a self-assessment tool for schools. "It serves to:

- Help educators identify areas of strength, areas requiring improvement and next steps;
- Act as a catalyst for shared instructional leadership through collaborative conversations focused on high levels of student learning and achievement;
- Promote inquiry focused on student learning, achievement and well-being that informs goals and effective teaching and learning practices/strategies;
- Support educators in determining explicit, intentional and precise improvement planning decisions which inform monitoring and feedback for continuous improvement and future planning in relation to enhanced student learning, achievement and well-being;
- Maintain communication with stakeholders to foster increased public confidence about school effectiveness; and
- Build coherence in and across schools and districts" (SEF 2013, 3).

As Ontario's system/school leaders and teachers build their capacity at full and sustainable integration of the global competences, the future of educational innovation becomes more engaging and fluid. Creating dynamic teaching and learning environments that embrace the global competences and are integrated into a culturally responsive, inclusive curriculum provides a formula for innovative 21st century education.

[36] School Effectiveness Framework K-12 (2013): http://www.edu.gov.on.ca/eng/literacynumeracy/SEF2013.pdf

The best outcome of the development of 21st century skills/competences is that it provides clearly defined expectations to ensure equitable and inclusive learning spaces for all students. It transcends all grades and creates a responsive education approach for focusing Canadian students, teachers, and leaders. The EQAO and the 'School Effectiveness Framework K-12' (2013) provide mechanisms to assess how effectively Ontario's students will respond to the changing world and workplace.

However, successful adoption and implementation of a change initiative also requires a formal structure, a strategic planning process, and the implementation of action plans at a system level and in all of Ontario's schools. This requires clear, focused, and purposeful direction on the use of the framework by both system and school leaders (Trilling and Fadel 2009). At the heart of leading a successful change is the ability to monitor the implementation process and its effectiveness on a shift in instructional practice and an improvement in the academic success of students. This strategy focuses on intentionally building professional capacity, establishing plans, operationalizing implementation, and monitoring.

The 'School Effectiveness Framework K-12' (2013) provides a focused structure for monitoring school improvement, staff instructional strategies, and student achievement success by implementing the SSA monitoring process three times a year. The SSA process brings school leaders together with their school staff and board staff to formally review the SIP and to assess data and evidence of impact. Three times a year, school teams meet to review data and conduct school learning walks to observe visible learning and engage student voices. Input from parent surveys and the School Community Council is often included to incorporate attitudinal/perceptual data into the assessment and analysis. This process will be discussed further in Section 6.

In Ontario, supervision of school leaders and schools is the responsibility of superintendents and directors[37] of the 72 Boards of Education. Superintendents of schools play an integral role in developing and supporting principals as instructional leaders and learners within the change process. The emphasis is on improvement and excellence for senior leaders.

The school teams, with superintendent support, complete an analysis report of the SSA and adjust goals and outcomes in the school plan. As school teams are becoming more proficient in using the SSA process, it is proving to be an effective assessment tool for monitoring; it shifts accountability and ownership to school staff in assessing their impact on school improvement and student achievement and success. The superintendent's leadership in monitoring is an essential component of ensuring monitoring at all levels; this process has purpose and structure to support overall system accountability. Superintendents visit their

[37] Council of Ontario Directors of Education (CODE): http://www.ontariodirectors.ca/

'Family of Schools' at least three times a year to meet with the school administrators and school staff. Together, data are analyzed and learning walks are completed to demonstrate the implementation of key strategies and instructional practices, as outlined in the School Plan. Superintendents provide formal, written, and descriptive feedback and set targets with school teams.

A clearly defined strategic execution process, with formal and informal monitoring, is necessary to achieve sustained change in practice and adoption. The following guidelines build on research adapted from Norton and Kaplan (2008):

- Establishing a sense of urgency with shared leadership and accountability
- Creating a team of key individuals to lead, guide the work, and collaborate
- Developing a vision, which includes success criteria, indicators, and measurable goals
- Creating an implementation plan with incremental steps and defined timelines
- Communicating the vision and change process
- Empowering leaders and teachers to implement change (resource allocation and ongoing, relevant professional development) that reflects 21st century classrooms
- Developing an accountability framework that outlines each individual's responsibility in monitoring, including intentional visibility
- Establishing the metrics based on success criteria and report on the results
- Gathering and analyzing data from a variety of sources to inform next steps
- Monitoring the results regularly for impact and adjustment
- Achieving sustainability

School monitoring is a critical process for ensuring high expectations and ongoing school, staff, and student improvement. The most effective monitoring systems include formal processes for both internal and external accountability. The EQAO provides an external monitoring process that includes a critical lens on data. Internal monitoring by school administrators, school leadership teams, and superintendents creates a process for internal accountability and responsibility, which has the power to yield incredible results as our schools take ownership for improvement (Fullan 2013).

5. TEACHER DEVELOPMENT AND THE ROLE OF LEADERS: TEACHERS AND LEADERS CONTINUALLY LEARN FROM EACH OTHER

As Ontario strives to prepare students for success in a changing, technology-reliant world, collective efforts continue to address the inevitable implications for the ways in which students learn, teachers teach, and leaders lead. The focus on creating system coherence indicates the success of Ontario, as it has, in a relatively short time frame, learned the required conditions to improve outcomes for students (Fullan and Quinn 2016).

'Achieving Excellence: A Renewed Vision for Education in Ontario' (2014) articulates a commitment to define and measure 21st century competences. The commitment is highlighted in the budget statement that "by 2025… Ontario will be a world leader in higher-order skills, such as critical thinking and problem solving, which will allow Ontario to thrive in the increasingly competitive global marketplace" (Sousa 2014, 9).

'Achieving Excellence' also acknowledges a renewed focus on leadership, indicating that "Ontario will cultivate and continuously develop a high-quality teaching profession and strong leadership at all levels of the system" (Ontario Ministry of Education 2014, 1).

5.1.1. Professional Learning for Teachers: The Idea Is for Schools to Recognize That "Learning Is Voluntary but Inevitable"

Teacher professional learning and leadership capacity building have long been a focus in Ontario. The success of Ontario's improvement strategy has hinged on supporting the growth of an innovative culture of learning, encouraging risk taking, and promoting continuous learning, collaboration, and capacity building. The Ministry of Education's Phase 1 document '21st Century Competences' (2016) notes that these approaches "are key to transformations in pedagogical practice, new learning partnerships, enhanced use of digital tools and resources and strategic design of learning spaces required for the development of 21st century competencies" (Ontario Ministry of Education 2016a, 48).

Both pre- and in-service teacher development programming have been continuously evolving to keep up with Ontario's direction and the changing global context. There is renewed focus on revising approaches to teacher training, including a newly mandated two-year preservice teaching program.[38] The expanded program was designed to ensure that teacher candidates are able to develop pedagogical strategies that offer opportunities to promote deep learning and 21st century skills/competences. As noted by Pellegrino and Hilton

[38] Teacher candidates have an undergraduate degree and then a two-year teaching program at a Faculty of Education: http://edu.gov.on.ca/eng/general/list/faculty.html

(2012) "novice and experienced teachers need time to develop new understandings of the subjects they teach as well as the understanding of how to assess 21st century competences in these subjects, making ongoing professional learning opportunities a central facet of every teacher's job."

Providing opportunities for teachers to learn from each other has been key to the transformation of school cultures.

"Engaging in problem solving and critical and creative thinking has been central to learning and innovation" (Pellegrino and Hilton 2012, 50). Providing opportunities for teachers to learn from each other through the implementation process has been key to the transformation of school cultures. Our changing times require heightened attention to the process of teaching and learning to ensure that these competences are explicit and intentional, not only within the curriculum, but also in the necessary shift in classroom and leadership practice (Leithwood 2012). As Fullan notes, the idea is for schools to recognize that "learning is voluntary but inevitable" (2010, 42). To this end, the Ontario Ministry of Education has collaborated with teacher federations in developing professional learning opportunities and resources.[39]

5.1.2. Evidence-Based Developments in Teaching and Learning Approaches

Ever since 2011, school districts in Ontario have been learning more about the manner in which technology-enabled teaching and learning has affected the demonstration of these competences (Ontario Ministry of Education 2016). The ministry offers a variety of grants to assist teachers and leaders in working together on projects, such as the Teacher Learning and Leadership Program (TLLP).[40] These projects are also included in the body of evidence of effective practices and approaches. This selection of research provides important, Ontario-based evidence to inform future work in defining and measuring 21st century competences. Evidence demonstrates that teaching strategies and the provision of 'rich learning tasks' (Fullan and Scott 2014) have continued to broaden as teachers build on their repertoire of pedagogical approaches to support this deep-learning emphasis.

Hattie's comprehensive meta-analysis of the research outlines that teaching approaches are shown to have positive impacts in schools (Hattie 2009). Fullan and Langworthy (2014, 20) note that these may range from "project-based learning through direct instruction to an inquiry-based model where the teacher uses strategies based on student needs". Arising from these deepening approaches to teaching and learning has been a renewed consideration of assessment: "If there is value in promoting new pedagogical models that make it possible for students to apply their learning to real-world problems with authentic audi-

[39] One example is the Elementary Teachers Federation of Ontario (ETFO): http://www.etfo.ca/Pages/Home.aspx

[40] 2017–2018 TLLP: http://edu.gov.on.ca/eng/teacher/tllp.html

ences, then assessments need to be adapted to widen the range of skills and knowledge being observed" (Binkley et al. 2012, 20). This requires ongoing professional development to ensure that assessment skills align with the broader goals for student learning.

5.1.3. The Role of Leaders: Leadership Has Made an "Undeniable" Difference in Ontario

Effective leadership is a key supporting condition for achieving the province's core education priorities (Leithwood et al. 2004). The Ontario Leadership Framework, which defines effective leadership practice, was last revised in 2013. Fullan (2012) has noted that leadership has made an 'undeniable' difference in Ontario.

Since 2013, the Ontario Ministry of Education has introduced its 'Well-Being Strategy for Education' (2016) and a heightened focus on its 'Equity and Inclusive Education Strategy' (2009). The challenge falls upon leaders to ensure that these strategies, together with Ontario's 21st century global competences, are firmly grounded in the work of schools as they focus on improving student achievement and well-being. The proposed global competences together with the well-being and equity strategies point to deepening the knowledge and skills necessary to support the work of teachers, schools, and leaders. Many district school boards have now moved to include these in their strategic plans (Fullan and Langworthy 2014).

Teacher and leader communication and collaboration processes have long been of interest to those engaged in professional learning. Dede (2010) acknowledges that collaborative inquiry is "tough to do well" in practice. At the school and district levels, collaborative inquiry involves teams of educators working together as co-learners to study student learning. Dweck (2010) explains that as a professional learning strategy, collaborative inquiry encourages all educators to "fulfill their potential" to help students "fulfill their potential."

Leithwood (2012) has described leadership as "the exercise of influence." Much of the focus on capacity building in the current context addresses how leaders work with their teams to improve student achievement and well-being. Leaders across Ontario have also appreciated the capacity building and resource supports provided by the Ontario ministry. One example is the professional learning series titled 'Capacity Building Series' (Ontario Ministry of Education),[41] which supports leadership and instructional effectiveness in Ontario's schools.

In recent years, interest has been generated in the power of professional networked approaches to teaching and learning. The process provides opportunities for education leaders and practitioners to develop a shared understanding of high-quality instruction and

[41] Capacity Building Series: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/capacityBuilding.html

how schools and districts can collectively support this effort (City et al. 2010). The process of teaching and learning is observed in practice and a collaborative learning culture is nurtured.

5.1.4. Collaborative Efforts between Teachers and Leaders

In 2016, aligned with its efforts in reaching the goals outlined in 'Achieving Excellence' (2014), the province introduced Policy/Program Memorandum (PPM 159) on Collaborative Professionalism (Ontario Ministry of Education 2016). This policy builds on Ontario's solid foundation of achievement promoting "the establishment of trusting relationships that value the voices of all encourage reflection and support professional growth" (Ontario Ministry of Education 2016). Specifically, the core priority of the PPM 159 addresses the building of a shared commitment to working together to improve student achievement and the well-being of both staff and students. It also addresses the need to "transform culture and optimize conditions for learning, working and leading at all levels of the education sector" (Ontario Ministry of Education 2016).

Leaders across Ontario are exploring a variety of successful processes. One that shows promise is The Learning Conversations Protocol (2016).[42] Katz and Dack (2013) designed the protocol to enable focused learning discussions among educators. The seven steps of the protocol must be followed carefully enabling collaborative groups to structure their learning conversations as a central part of their professional learning efforts.

6. COMMUNITY AND STAKEHOLDER ENGAGEMENT: STAKEHOLDER ENGAGEMENT HAS BEEN A SOURCE OF STRENGTH AND SUPPORT

For over two decades, Ontario has been experiencing a transition to an education system based on clearly articulated 21st century competences. Community and stakeholder engagement has been an important factor in shaping this change. Engagement has included public consultations leading to policy development or program change; encouragement for active involvement by parents and citizens in projects, committees, and councils; emphasis on communication and welcoming environments for parents; and initiatives of citizen organizations to supplement and support the directions of public education.

Throughout this transition, parents, teachers, education organizations, teacher unions, the business community, and other education-focused citizen groups have been engaged to

[42] The Learning Conversations Protocol (2016): http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/learning_conversations.pdf

contribute ideas and express concerns. As the system has moved toward its goals of excellence, stakeholder engagement has been a source of strength and support.

6.1.1. Public Engagement Efforts

A seminal event involving extensive engagement occurred in the mid-1990s. During this event, a ministry-appointed Royal Commission, a high-level panel of five education experts and academics, conducted broad consultation among citizens and educators.[43] The commissioners began by acknowledging widespread concern over a publicly funded education system that seemed insufficiently responsible to the public and set out to hear from as many people as possible. They listened to presentations from 1,396 groups and individuals in 27 cities and received written, voicemail, or email messages and submissions from 3,350 other individuals.[44]

Because of the interest generated by its comprehensive process, the commission's report was widely read and deeply influential. It provided "a blueprint for changing Ontario's schools to equip all students for the challenges of the 21st century" (Ontario Ministry of Education 1995). The cochair of the commission stated its goal that all students would become "literate, knowledgeable, creative and committed young men and women… able to solve problems, and think logically and critically" (Ontario Ministry of Education 1995). She added that "they will be able to communicate articulately, work cooperatively, and most importantly, will have learned how to learn" (Ontario Ministry of Education 1995).[45]

The report also emphasized technological literacy and school-community councils to foster connections with parents and community members. The commission's engagement of stakeholders was more far-reaching than any consultation previously undertaken, and the goals that resulted were the precursors of Ontario's 21st century competences and skills.[46]

Despite the success of this major exercise in public engagement, no one claimed that all views could be harmonized and included. The report acknowledges a fundamental truth that "it was not easy to find common themes or concerns among all these interested citizens, and certainly there was consensus about precious little."[47] The lesson communicated was that public engagement yields a range of material. There are immediately useful ideas,

43 Royal Commission on Learning Report: http://www.edu.gov.on.ca/eng/general/abcs/rcom/short/short.html

44 For the Love Of Learning: Report of the Royal Commission on Learning (1994): http://www.edu.gov.on.ca/eng/general/abcs/rcom/full/volume1/volume1.html

45 Royal Commission on Learning Press Release (1995): http://www.edu.gov.on.ca/eng/general/abcs/rcom/news.html

46 21st Century Competencies: Foundation Document for Ontario (2016): http://www.edugains.ca/resources-21CL/About21stCentury/21CL_21stCenturyCompetencies.pdf

47 Royal Commission on Learning: http://www.edu.gov.on.ca/eng/general/abcs/rcom/short/short.html

interesting but currently impractical thoughts, and complaints that are often passionate and highly personal. The Royal Commission's report could not include everything that everyone expressed, but its consultation had a key merit: it was an open-minded search for ideas and opinions. It was definitely not a case of education authorities looking for evidence of public support for what they had already decided to implement.

6.1.2. Establishing the EQAO: Tests Would Be fair and Data Would Be Used to Support Improvement, Not Make Judgments

Between 1997 and 2001, Ontario acted on a number of recommendations by the commission, including creation of an agency to assess the learning of every student and provide publicly accessible data from these assessments.[48] The implementation of this province-wide testing was controversial. Parents were generally in favor of the initiative, but most teachers saw tests as an unfair attempt to judge their pedagogical performance.

The new agency, the EQAO, embarked on several forms of engagement to convince its constituencies that tests would be fair and data would be used to support improvement, not make judgments:

- An advisory committee was established with members from all levels of education, from the business community to unions. The committee made key recommendations about the need for tests firmly based on the newly developed provincial curriculum.

- EQAO leaders, including members of a citizen board, travelled the province speaking to district officials and teachers about the tests. They spent long hours with teachers and representatives of the various unions, discussing improvement as the goal of the assessment. Initial engagement with these core groups lessened opposition, although it did not create enthusiastic support.

- EQAO engagement also included meetings with leaders of groups with specific interests such as learning disabilities or parent participation and with representatives of educational associations. These organizations provided ideas to improve assessment tools as well as offer support based on a clearer understanding of assessment goals.

In 2016, after 15 years of implementing tests for Grades 3, 6, 9, and 10, many educators agreed that intensive stakeholder engagement to support and improve provincial assessments was an important factor in the program's success. Furthermore, they agreed that

[48] For the Love Of Learning: Report of the Royal Commission (1994), Chapter 11: Evaluating Achievement: http://www.edu.gov.on.ca/eng/general/abcs/rcom/recommen.html

improvements in Ontario education (as reflected in PISA results) were linked to effective curriculum-based assessment that incorporated 21st century competences.

6.1.3. Engaging with Parents: Parents Are Essential Partners

In 2010, the Ministry of Education released 'Parents in Partnership: A Parent Engagement Policy' (2010).[49] This document formalized expectations that had been developing over the past decade, as the benefits of parent involvement in education became very clear. The four foundations of engagement identified in the policy were

(a) A welcoming environment;

(b) Clear communication of opportunities to participate;

(c) Ongoing dialogue; and

(d) A flow of information relevant to parent support of children.

The policy emphasized new ways to engage parents, such as using 21st century technology to allow them to view, hear, or read materials related to their children's schools. The policy also acknowledged the need for global awareness in 21st century Canada, where an appreciation for diversity is essential. Districts were encouraged to provide key messages and information in several languages to avoid excluding parents whose language or cultural background left them feeling remote from schools. Schools and districts were also reminded that including parents of diverse backgrounds on councils and committees would enrich the learning environment and that providing community outreach workers would help hesitant parents to become involved. By planning for complementary approaches by schools, districts, and the province, the education system can send a powerful message that parents are essential partners.

Parent Reaching Out Grants[50] are another example of ministry engagement. This grant program invites participation by school-based parent councils, district parent involvement committees, and not-for-profit organizations. Groups are asked to define projects that address important issues in their school communities and then apply for funding to implement their plans. Grants are awarded for a wide variety of activities, for example, learning events for families where parents attend and participate alongside their children in activities that emphasize 21st century competences such as problem-solving and critical thinking. Over 19,500 projects have been funded by these grants since 2005, and the program has contributed to lasting engagement in thousands of communities.

[49] Parents in Partnership (2010): www.edu.gov.on.ca/eng/parents/involvement/pe_policy2010.pdf

[50] Ontario Ministry of Education Parent Reaching Out Grants: www.edu.gov.on.ca/eng/parents/reaching.html

6.1.4. Achieving Excellence Report

In 2014, 'Achieving Excellence: A Renewed Vision for Education in Ontario'[51] was released by the ministry after a comprehensive engagement of stakeholders. Its premise was that Ontario had taken great strides in the previous decade but needed to move from great to excellent. The emphasis on 'renewed' in the title of this document reminds that periodic consultation should be an important part of an evolutionary process.

Consultation for 'Achieving Excellence' (2014) included input sessions for provincial organizations, regional meetings for local groups, and digital-only opportunities for individuals and groups not otherwise included. Participants in the consultation were asked to respond to seven questions developed by a committee of stakeholders. These questions invited input on graduation outcomes, student well-being, achieving equity, lifelong learning, use of technology, and partnerships. The report reflects input that supported 21st century competences as it envisages students who will "become personally successful, economically productive and actively engaged citizens" and also "motivated innovators, community builders, creative talent, skilled workers, [and] entrepreneurs" (Ontario Ministry of Education 2014, 1).

To some extent, the outcomes of this and other consultations are dependent on who is likely to have participated most effectively. Often groups that are well organized and well funded have the best chance of expressing their views in a forceful manner. They are more likely to have research data and speak in professional terms familiar to policy makers. It is always useful to ask whether the 'average person' is adequately represented when the majority of input is from professional groups. A report such as 'Achieving Excellence' (2014) must find a fair balance among the voices heard.

5.1.5. Citizen Groups

The examples presented earlier are associated with the ministry's initiatives. However, citizen groups committed to public education initiate some stakeholder engagement independently. One such group is **The Learning Partnership (TLP)**, founded by Ontario business leaders to build bridges between the education and business communities.[52]

Among other activities, TLP develops programs for students. Included in its student programs are 'Entrepreneurial Adventure' that emphasizes 21st century skills such as marketing, planning, team building, and social responsibility and 'Investigate! Invent! Innovate!' that integrates science, technology, engineering, and math (STEM) skills and

[51] Achieving Excellence: A Renewed Vision for Education in Ontario (2014): www.edu.gov,on.ca/eng/about/renewedVision.pdf

[52] The Learning Partnership: http://www.thelearningpartnership.ca/

21st century competences such as critical thinking, creativity, collaboration, and communication.

Another citizen organization with different purposes is **People for Education**.[53] This organization is devoted to research, policy recommendations, and public dialogue. It produces an annual report on publicly funded schools designed to engage the community in thoughtful conversation about system improvement. Although its 2017 report[54] is not specifically focused on 21st century competences, one section does comment on Ontario's "strategy to help the province's current and future workforce adapt to the demands of a technology-driven knowledge economy" (People for Education 2017, 30).

TLP and People for Education are examples of the citizen groups that engage productively with Ontario's evolving education programs.

7. TWENTY-FIRST CENTURY SKILLS AND INDUSTRY NEEDS

In Canada over the last 10 years, 40 percent of labor growth has been due to migration. The Canadian and Ontario economies have continued to improve since the 2008/09 global downturn and the economic projections are hopeful due to impacts from NAFTA, European Union, and pan-Asian trade opportunities. To meet the challenges, Ontario and Canada require a highly skilled (including skilled trades) and educated workforce.

7.1.1. Twenty-First Century Skills for the Changing Workplace

The Conference Board of Canada identifies employability skills for 2000 and beyond including fundamental skills, personal management skills, and teamwork skills requiring the ability to

- Communicate;
- Manage information;
- Use numbers;
- Think and solve problems;

[53] People for Education: http://www.peopleforeducation.ca/

[54] People for Education 2017 Annual Report: http://www.peopleforeducation.ca/research/annual-report/

- Demonstrate positive attitudes and behaviors;
- Be responsible;
- Be adaptable;
- Learn continuously;
- Work safely;
- Work with others; and
- Participate in projects and tasks.

In Ontario, the Premier's Highly Skilled Workforce Expert Panel's task was to develop an integrated strategy to inform policy and direction regarding the development of a highly skilled workforce to meet Ontario's demands of technology, knowledge economy, and the shifting labor market realities. The panel's aim was to develop approaches, responses, and resources to, "bridge the worlds of skills development, education and training" (OECD 2016, 2). The panel and government understand the need for a highly skilled workforce and view the training as a shared responsibility to plan, train, and reskill. Ontario's workforce is diverse and "recognized as well credentialed."

Overall, the Canadian labor force is considered well educated. The percentage of Ontario students graduating from high school after five years is above 85 percent. In 2014, the OECD (2016, 5) reported that 66 percent of Ontario adults had a post-secondary degree or diploma — more than any OECD member nation. Supporting a highly educated workforce, Canada at 55 percent has the highest proportion of working-age adults with degrees/diplomas/accreditation from post-secondary institutions, as compared to the OECD average of 35 percent (Coughlan 2017).

7.1.2. Implications for Education

According to Statistics Canada, 70 percent of new jobs will require a high school diploma and some degree of post-secondary education. Immigration will be increasingly important as birth rates decline. More than 50 percent of immigrants have a university degree, twice that of the Canadian-born population. The government wants to develop an integrated learner-focused adult education system focused on reskilling and retraining through incentivizing lifelong learning.

Grose (2016) challenges the existing expectations noting that, "as students grow to become digitally literate citizens and leaders in our connected world, multi-faceted thinking skills

are needed to navigate digital, multimodal text and media laden environments to interpret large volumes of new information; to use oral, listening and written language to communicate persuasively and to promote and advance ideas; and to think critically and ethically in contexts to collaborate, communicate, create and succeed in learning and life." Jenkins (2009, 4) explains that a changing workplace, "participatory culture shifts the focus of literacy from one of individual expression to community involvement." The 21st century skills/competences are transitioning from workplace demands into the written and taught K-12 curriculum in response to this changing reality.

8. TWENTY-FIRST CENTURY COMPETENCES IMPLEMENTATION BEST PRACTICES

This section considers best practices in pedagogical implementation, describing the influence of these factors in our shift from teaching organizations to learning organizations and in the adoption of learner-centric pedagogies aided by technology to support deeper learning (Dede 2014; Fullan and Langworthy 2013, 2014; Grose 2016; Pellegrino and Hilton 2012; TVO 2015).

Responding to a changing world and workplace, the emerging learning-focused paradigm requires an explicit and intentional transition from what is known as objectivist[55] to that of interdisciplinary, inquiry-based learner-centric approaches. These types of pedagogical practices provide students with opportunities to lead their own learning, collaborate with each other as well as experts to solve authentic and complex problems, explore their own questions, and address real-world challenges (Ontario Ministry of Education 2016). Learner-centric practices foster student agency by embedding student choice and voice in the learning process itself. This includes, but is not limited to, choice regarding the ways in which they demonstrate their learning and the type of technology they use to support their learning.

The process by which students learn rich core content in innovative ways and are able to transfer and apply that learning to new situations requires new pedagogies accelerated by technology (Fullan and Langworthy 2013). The following support the development of 21st century skills/competences:

- **Implementing pedagogical practices** that include inquiry-learning, project-based learning, experiential learning, internships, and physical and virtual connections with the wider community. As the World Economic Forum's 'The Future of Jobs Report' (2016) indicates, the global economy is expected to gain 2 million jobs in STEM-re-

[55] More traditional, teacher-focused methodologies.

lated fields in less than five years. These pedagogies should include formal and informal STEM-related experiences in computer, environmental, health and data science, engineering, gaming and digital media production through technology- supported and hands-on experience in coding, hackathon challenges, computer programming and robotics to spark interest in STEM-related careers. These are of particular importance to female students.

- **Creating knowledge-building communities** (Scardamalia and Bereiter 1994) that collaboratively explore and share new knowledge, expose students to a diversity of thought, and broaden perspectives, thereby enhancing critical and ethical thinking and deepening understandings

- **Encouraging students to creatively use** different types of tools, styles, formats, and digital media to participate in global conversations and to collaborate with multiple audiences to analyze data and solve real-world problems

- **Providing** broader participatory face-to-face, blended, and online **environments** where students engage in dialogue, collaboration, and inquiry and where they feel their voice matters, thereby empowering ownership in the learning process

- **Ensuring** there is **shared ownership** for learning by providing authentic opportunities for students to learn from and with each other, and for educators to learn from and with students

- **Focusing** explicit and intentional **learning opportunities** regarding digital leadership and the rights and responsibilities of respectful participation

Educators are striving to implement deeper learning and ensure learning is personalized, flexible, and supported by a culturally relevant and globally contextualized curriculum. Students, then, have opportunities to develop the cognitive, interpersonal, and intrapersonal competences needed to lead, learn, and work more collaboratively with all cultures in both physical and online environments.

Opportunities are provided for students to direct and construct their own learning; their own professional learning models must also evolve to support teacher agency. This requires a shift from a traditional top-down professional learning model to more authentic learning ecosystems that support collaborative professionalism, de-privatization of practice, knowledge construction, and ongoing growth. Opportunities for professional learning and growth are collaboratively constructed and reflect the '4Rs' of authentic learning summarized in the Ontario Ministry of Education's 2017 'Mentoring for All eBook' (see Table 3.5).

Table 3.5. *4Rs of authentic professional learning*

Relational

- Relational trust creates an inclusive learning space with all partners in the learning process listening to each other (students, educators, parents, and school community).
- All learners collaboratively construct communities of practice that build upon their strengths, attributes, and experiences.

Recursive

- Rich learning tasks reflect embedded beliefs that learning itself is a messy, iterative, recursive process.
- Protocols for application of learning, follow-up, and evaluation of impact are embedded into the learning process.

Responsive

- Learners are listened to and their individual and collective voices directly inform learning designs.
- The 'how' and 'what' of the learning designs employed are based on authentic learning goals identified by the participants.
- Learning 'makes sense' to the learners and involves authentic collaboration, choice, voice, and agency.

Real World

- Learners construct learning together that is relevant and has authentic real-world connections and applications.
- Learning designs that leverage peer-to-peer networks for deep learning and foster the intentional sharing of knowledge and practice are utilized.
- A direct connection to student learning and well-being is evident (that is, students are at the center of the learning).

8.1.1. New Roles in Learning

Co-constructing empowers student ownership, collaboration, creativity, and innovation, resulting in teaching and learning that is more inclusive, instructionally precise, attributes based, and culturally responsive. As teachers shift their traditional roles, emerging as facilitators of learning-centered environments, students become authentic sources of learning for both the teacher and their peers. Teachers utilize a combination of modeling, coaching, and scaffolding to direct and guide instruction facilitating deep-learning tasks. The teacher is also a learner alongside their students.

In the context of these types of learner-centric environments in classrooms that are flexible and connected locally and globally 24/7, a more fluid and adaptive participatory learning culture emerges for all learners (Grose 2014) where:

- Critical thinkers and problem solvers use "evidence and data, analyze, think critically and manage projects, solve problems and make informed decisions using digital tools and resources"
- Collaborators work together both face-to-face and virtually, to support personalized learning and contribute to the learning of others;

- Communicators make and share meaning and their point of view using a variety of digital tools with real and online audiences; and

- Creators and innovators "demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology" (Dede 2009, 7).

8.1.2. The Role of Technology

There are two innovative and collaborative digital spaces to assist all educators in Ontario with knowledge building, accessing research and evidence, and sharing of best practices in action. The first is TVO's award-winning TeachOntario.[56] TeachOntario was created by TVO, in partnership with the Ontario Teachers' Federation (OTF) and its affiliates, the Ministry of Education and in consultation with elementary and secondary teachers from a variety of districts across the province. TeachOntario offers tremendous opportunity to support professional learning, to foster educator leadership, and to facilitate the sharing of exemplary practices with others, both locally and globally. TeachOntario is a unique destination created "for Ontario's educators, by Ontario's educators."

The second digital space is the Ontario Ministry of Education's Learning Exchange, created by the Ministry of Education's Student Achievement Division.[57] The Learning Exchange supports the goal of achieving excellence in education for early learning, K-12, and adult education.

9. TWENTY-FIRST CENTURY COMPETENCES IMPLEMENTATION CHALLENGES

Inherent challenges for effective implementation involve 'will and skill' (Fullan and Quinn 2016). Learning to collaborate, communicate effectively, and use creativity, critical thinking, and problem-solving skills is challenging to implement coherently and deeply across Ontario's classrooms and 5,000 schools. Section 9 of this chapter examines (a) how 21st century competences are applied in Ontario, (b) what challenges schools and school systems face in this type of large-scale implementation, and how educators and policy makers know if the intended change is occurring and if it is affecting student learning.

We know that it is difficult to effectively implement complex policies in education and to sustain the implementation. Policy makers and educators struggle with challenges of mov-

[56] TeachOntario: www.tvo.org/teachontario

[57] Ministry of Education's Learning Exchange: http://thelearningexchange.ca/

ing to scale and having a new practice actually taking place, roughly as intended, in all or almost all schools and classrooms. Freedman and Di Cecco (2013, 3) examine "how to decrease variability among and between schools and classrooms." Coburn (2003) argued that moving to scale involved issues of sustainability, spread of norms and beliefs involved with the change, and a shift in ownership to a shared model, so the reform becomes self-generative. This means to scale up and embed an initiative such as implementing 21st century competences, the design and planning needs to account for depth and breadth across the system, province, and nation.

For education, depth means substantive change in teaching and learning. Fullan and Quinn (2016, 3) argue that implementing change coherently involves "a set of right drivers that are effective: capacity building, collaboration, pedagogy, and systemness (coordinated policies)." These drivers also comprise the challenges to implementation. Educators tend to be risk-adverse. The change, therefore, must be clearly articulated and implemented gradually. Intentional and thoughtful action planning, including time lines, resources, professional learning, designated champions, and measures/indicators of success, provides road maps for the desired change. There are implications for policy and practice.

9.1.1. Policies and Funding

The Ministry of Education released its foundational document '21st Century Competences (2016)', referenced in Section 3 of this chapter. The document had a focus on "developing these competences in explicit and intentional ways through deliberate changes in curriculum design and pedagogical practice" (Beckett et al. 2017, 6). The challenge is "to prepare students to solve messy, complex problems — including problems we don't yet know about — associated in living in a competitive globally connected, technologically intensive world" (Ontario Ministry of Education 2016, 3). This is part of the shift from schools of teaching to schools of learning and thinking.

The initiatives are going to be effective in raising academic bars and closing gaps. The initiatives are aligned to avoid fragmentation and educators feeling overwhelmed with the scope of the change. Increasingly, educators want policies and strategies that are evidence informed (Hattie, 2009; 2014). Effective change does not happen within a single school term or even year. It requires three to seven years of intentional implementation, targeted and intentional support, and monitoring.

9.1.2. Range of Learners

In addition to embedding 21st century competences/skills in the curriculum, instructional time and pedagogical practices must be adapted to develop these skills in Ontario's students. Another issue in implementation is a recognition of support required to increase student engagement and achievement. These accommodations are required by

a range of learners. While Ontario supports both excellence and equity and has made significant gains in closing achievement gaps, complex issues remain. There are still gaps in learning experienced by indigenous students, youth in care and custody, learners with mental health issues, and students identified with special education needs. The curriculum policy documents and resources include these students as learners within the system. There are specialized supports and services provided, and the Ministry of Education works with its partners to deliver inclusive, culturally relevant education for all learners.

9.1.3. Human Resources

Effective implementation of 21st century competences/skills can occur with trained and confident staff members who understand professional pedagogy and the use of digital technology. Fullan and Langworthy (2014) caution about the challenges to implementing new pedagogies accelerated by technology. Teachers need to acquire the growth mind-set that 21st century skills can and will affect student outcomes (Beckett et al. 2017). Dede (2014, 9) notes that "teachers will find it hard to provide deep learning opportunities without employing learning opportunities;" however, many teachers lack the skill and confidence to make this happen.

On the Grade 9 EQAO mathematics assessment, only 40 percent of math teachers reported solving open-ended problems, less than 30 percent conducted math investigations, and 35 percent asked students to use computer software in mathematics classrooms. In the 2017 mathematics assessments, Ontario students in Grades 3 and 6 experienced challenges in responding to thinking problems and multistep, open-ended mathematical problems.[58]

Increasing professional learning and expertise of teachers and leaders remains an ongoing challenge for implementation:

- Designing and delivering preservice training that incorporates knowledge and evidence-informed pedagogies on implementing 21st century competences/skills
- Building the skills and knowledge of school leaders to lead collaborative deep change
- Providing funding and release time for ongoing professional learning
- Sustaining productive and impactful collaborative professional learning inquiries and sharing leadership and accountability for collectively implementing 21st century skills/competences

[58] Retrieved from: https://ca.yahoo.com/news/math-scores-flat-falling-among-143409293.html

- Developing incentives for teachers to voluntarily enroll in Additional Qualifications (AQs), where teachers take ministry-approved courses such as 'Integration of Information and Computer Technology in Instruction and Assistive Technology'

- Developing outreach partnerships with community agencies and business to offer students authentic learning experiences

- Providing frameworks and tools for knowledge sharing and mobilization

- Working with the teacher federations/unions as partners in the change process. The unions represent Catholic teachers, elementary teachers (public), secondary teachers (public), and French first-language teachers.

An equity issue involving implementation is that teachers and administrators do not reflect the student diversity that exists in Ontario's classrooms. There are challenges in developing responsive methodologies and pedagogies that allow Ontario's diverse student body to see themselves reflected in the curriculum:

- Multilingual resources and/or translated resources including braille and other accessible formats and modalities

- Using examples and ensuring that names that are reflective of the students as 21st century skills are integrated

- Changing assessment practices to provide evidence of 21st century skills/competences

- Learner-centric materials and active student involvement in terms of voice and choice

- Providing intentional interventions to close existing academic gaps

9.1.4. Learning Environment

In times of fiscal restraint, change implementation needs to be cost-effective and efficient. There are inequities existing within the system, as wealthier communities can supplement ministry/board funding and provide extra technology and opportunities to local schools.[59] Schools in urban areas have access to reliable high-speed Internet. This may not be the case in Ontario's rural/remote communities. The cost of updating equipment is very challenging. Additionally, there are challenges in terms of

[59] The top 5 percent of fundraising schools in affluent areas can raise as much funds as the bottom 83 percent combined: http://www.peopleforeducation.ca/wp-content/uploads/2017/06/P4E-annual-report-2017.pdf

- Access to current, well-maintained technology;
- Awareness of digital tools and their effective use;
- Teachers' competency with digital tools and integrating them into their practice;
- Integration of technology into the learning environment;
- Providing flexible seating for collaboration and constructivist learning; and
- Transforming school libraries into learning centers or hubs of learning.

10. ONTARIO EDUCATION: WHERE TO NEXT?

The Ontario Ministry of Education (2016, 45) states that "transformations in pedagogical practice, new learning partnerships, enhanced use of digital tools and resources, physical and virtual spaces designed to support learning are required to ensure students' development of 21st century competencies."

In that spirit, on September 6, 2017, Premier Wynne and the Minister of Education announced a plan to modernize the curriculum and improve assessment and reporting to parents and the public. To keep Ontario schools competitive and world-class, "Ontario's updated school curriculum will be developed through the public consultations with the goal of improving student achievement in core skills such as math and increasing emphasis on transferable life skills that can help students of all ages meet the changing demands of today and tomorrow. Communication, problem-solving, critical thinking, creativity and global citizenship are skills that will help Ontario students thrive as they grow up in a changing, interconnected world. Beginning next school year, new report cards will better track a young person's development of these essential and transferable life skills" (Ontario Ministry of Education 2017).

Where to next is becoming now.

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Chapter 4

CHINA: CULTIVATING A FULLY DEVELOPED PERSON — 'MORAL, INTELLECTUAL, AND PHYSICALLY HEALTHY'

Xiaoyu Chen, Lin, Xiaoying, Xia Huanhuan

Highlights

- The education system is focused on the "comprehensively developed person" cultivation, moving from common education to appreciation of individuality
- The focus of the key competency model is on enhancing students' sense of social responsibility, innovation and practical ability
- The model is based on quality-oriented education concept (1980-s) and Core Values, which are consistent with the theoretical base of Marxism, and with the policy of Chinese Communist Party of China
- The model also reflects the history and culture of the Chinese nation, integrating their elements into the curriculum in all academic disciplines
- Students are assessed not only in academic results, but also in moral character, physical and mental health, social practice, etc.

1. CHINA' S EDUCATION SYSTEM AND BASIC SITUATION

By the end of 2015, there were a total of 512,000 schools at all levels and of all types in China, including 223,700 kindergartens, 242,900 compulsory schools, 24,900 senior high schools, 2,053 special education schools, and 2,852 colleges and universities.

The total number of full-time teacher at all levels and types of schools is 15,429,000. Specifically, there were 2,303,100 kindergarten teachers, and 9,160,800 full-time teachers in compulsory education, with 1,699,000 full-time teachers in senior high school, 50,000 full-time teachers in special education schools, and 1,573,000 full-time teachers in colleges and universities.

The total number of students of all levels and types of schools is 260 million, an increase of more than 3 million over the previous year. Specifically, this includes 63.65 million preschool children, 140 million students in compulsory schools, 40.3769 million students in senior high schools, approximately half a million students in special education schools, and 36.47 million students in colleges and universities. The overall enrollment rate in higher education is 40 percent.

The total area of school buildings throughout the country is 3.11 billion square meters, and compared with last year, this is a 4 percent rise. The total value of all of teaching and scientific research instruments is 727.92 billion yuan,

In summary, since the beginning of the 21st century, China's education sector has developed rapidly and achieved remarkable achievements. Free compulsory education has been fully implemented, preschool education resources have been expanded, and high school education was universalized. China is now entering a new stage of consolidating these achievements, improving quality, and promoting balanced development. In this context, education needs to constantly return to the original point of reflection and questioning: What kind of people do we need to develop? How do we best develop our children? What are we educating our students for? The idea of key competences is included in this context, to solve the problems of educational practice for a new stage of education in China.

2. THE BACKGROUND OF KEY COMPETENCY IN CHINA

With a focus on the concept of sustainable development and a more humanistic educational idea emerging, more and more people are beginning to rethink the concept of education-

al value and attach more importance to the core values of education. At the 18th National Congress of the Communist Party of China, 'Strengthening moral values and cultivating people' was put forward as the basic task of the education system. If the curriculum for the elementary stage of education is regarded as an important part of realizing this aim, then, both now and moving into the future, the practice and theory of the core meaning, constitution, relationship, and development level of the students in general education is how we can make this task the specific and systematic goal of the educational process.

In addition, putting forward 'key competences' is a kind of inheritance and development of the achievements of recent reforms and experiences in basic education that have occurred since the introduction of the Reform and Opening-up Policy in China. In terms of its values the idea of 'key competences' is consistent with the concept of 'quality-oriented education' which was put forward in the 1980s. Since 2001, there have been several educational curriculum reforms, all of which have been aimed at improving students' all-round development

2.1. The Experimental Period of Curriculum Reforms: The Curriculum Concept of Three-dimensional Objectives

In 2001, the Ministry of Education launched a new curriculum reform, taking the aim of 'quality-oriented education' as the guiding idea, further analyzing and studying the core problem in educational practice and aimed at establishing an educational curriculum system that was quality oriented. This document firstly proposes a 'three-dimensional objectives' curriculum, pointing out that the National Curriculum is the basis of textbook compilation, teaching evaluation and examination tasks, and the basis of National Curriculum management and evaluation. In the National Curriculum, the basic requirements of students at different stages should be reflected, including the requirements in knowledge and technical ability, in process and method, in attitude and emotion, in values, and so on. There should be regulation of course content, course objectives, and other factors, as well as teaching and evaluation guidelines. In December 2002, according to the agreement of the State Council, the Ministry of Education published a paper on the reform of the evaluation and examination system of primary and secondary schools. This document is the first to mention the concept of a 'fundamental development target' which is described through six aspects, covering moral traits, civic literacy, learning ability, communication and cooperation ability, exercise and health, and appreciation and performance.

In 2004, in 'The national basic educational curriculum reform experimental area 2004: guidance for the reform of the general high school enrollment system and the graduation examination in junior school, the concept of Comprehensive Quality Evaluation was first put forward. The idea of Comprehensive Quality Evaluation uses the six aspects of the fundamental development target. Although the new concepts and policies in the aforementioned documents are not exactly the same as key competences, they can be the first stage for exploring key competences.

2.2. The Deepening Period of Curriculum Reform: Improvement of Subject Core Competence

There was a transitory stage between the testing phase period of curriculum reform and its wider rollout. This period was marked by two publications. One is the curriculum standards for all subjects in compulsory education (2011 edition), another is the new curriculum standards for all subjects in general high school (2016 edition). In these two documents, key competences are the cornerstones, directly linked with the revising of the curriculum standards for all subjects in general high schools.

From the ten-year period between 2001 and 2011, this curriculum reform achieved remarkable effects, establishing a basic education curriculum system with Chinese characteristics and reflecting the spirit of the times and the concept of quality education. In practice, there were still some elements which needed to be adjusted and improved. Therefore, as a response to the demand for, and background to, operating quality education on a wider scale, deepening the basic education curriculum reform, and improving educational quality, the new curriculum standards for all subjects in compulsory education (2011 revised edition) was born. The revised edition combines the guidelines about school subjects and the age characteristics of students, with an increased emphasis on moral education. First, all subjects should take a scientific outlook on development and the socialist core value system as its guiding ideology, merging them into the content of subjects. Second is the further highlighting of the excellent Chinese national culture and tradition. For instance, compulsory calligraphy classes as part of the Chinese language course; the addition of the contents of 'The Nine Chapters on Mathematical Procedures' to math courses; and contents which reflect the ethnic culture of China, such as traditional drama being included into history courses. Third is enhancing the relevance and contemporaneity of national unity education. As a result of the multi-ethnic society of the country and based on the general need for a harmonious socialist society, there should be an emphasis on 'ethnic contact, ethnic communication, ethnic blending, and mutual development" in national unity education. Fourth, is the intensifying of the content of legal education. In addition, the new curriculum standard of 2011 emphasizes the importance of cultivating a sense of social responsibility, encouraging students to question, especially for encouraging students' innovation ability, learning ability, and practical ability.

To implement the objects and requirements of educational reform which were put forward in the third plenary session of the 18th central committee of the Communist Party of China, ways of 'strengthening moral values and cultivating people' in theory and practice, are required. In 2014, the Ministry of Education issued 'The Ministry of Education on comprehensively widening curriculum reform and implementing the basic tasks of strengthening moral values and cultivating people'. The central committee comprehensively planned to improve education quality and promote development of this, taking curriculum reform as the entry point, and after full preparation and investigation, issuing new revised general

high school curriculum standards in 2016. This curriculum reform aimed to find the key competences for all subjects. For instance, in Chinese classes, language and characters can develop students' logical thinking, critical thinking, and analytical capacity as well as improve students' ideological level and enhance aesthetic appreciation and creativity. In history class, after learning about the last 5,000 years of Chinese history, students are able to identify with the country and cultivate their own national feelings, thus enhancing their historical sense of responsibility.

3. DEVELOPMENT OF KEY COMPETENCES IN CHINA

Each key competency is an essential and key ability that students gradually adapt to their needs for lifelong development and social development while receiving the corresponding education. A key competency has the following basic characteristics: a key competency is the most critical and necessary basic skill for all students; a key competency is a comprehensive expression of knowledge, ability, and attitude; key competences can be formed and developed through education; key competences have development continuity and stages; key competences have both personal value and social value.

In 1957, the Supreme State Council proposed that "educators should be morally, intellectually developed with a healthy body and become cultural workers." The 1995 Education Law proposed 'training' students with all-round development in moral, intellectual, and physical aspects." The 2001 Basic Education Curriculum Reform Outline emphasizes "the formation of a proactive learning attitude, so that the process of acquiring basic knowledge and basic skills becomes the process of learning to learn and form correct values..." The Compulsory Education Law of 2006 proposes "to make school-age children and adolescents develop in terms of morality, intelligence, and physical fitness, and to cultivate ideals, ethics, culture, and discipline." The Law on the Protection of Minors in 2007 states "Focus on cultivating undergraduate students' independent thinking, innovation, and practical ability to promote the comprehensive development of students." The 2010 National Medium- and Long-Term Education Reform and Development Plan outlines "to adhere to moral education first; to persist in ability; adhere to all-round development."

The main line of the concept of cultivating a fully developed person is "moral, intelligence, and physical." Its specific content changes with the development of society. The key competences of Chinese students put moral education first, valuing the potential and sense of social responsibility, innovative spirit, and practical ability. The evolution of the basic positioning of Chinese students' key competences has developed from 2001 to 2013. The Basic Education Curriculum Reform Outline in 2001 put forward the development of a positive learning attitude, making the process of acquiring basic knowledge and basic skills

to be equally the process of learning how to learn and develop the right values. In 2006, the Compulsory Education Law put forward the idea of cultivating the children and the youth in school age with all-round development in moral, intelligence, physical, and other aspects and lay the foundation for socialist builders and successors with ideals, morals, culture, and discipline. In 2007, the Law on the Protection of Minors was issued, placing stress on cultivating the independent thinking, innovation, and practical ability of minors and promoting the all-round development of students. In 2010, the National Medium- and Long-term Education Reform and Development Plan claimed keeping moral education as a priority and focusing on ability and insisting on all-round development. In 2012, the Report of the 18th National Congress of the Communist Party of China proposed that “strengthening moral quality and cultivating a person” was the basic task of education and cultivating socialist builders and successors with all-round development of morality, intelligence, physique, and aesthetic growth, advocating the socialist core values of "prosperity, democracy, civilization, harmony, freedom, equality, justice, rule of law, patriotism, dedication, integrity, and friendliness". In 2013, the third plenary session of the 18th central committee of the Communist Party of China put forward the insistence on “strengthening moral quality and cultivating a person”, developing socialist core values education and Chinese traditional culture education, and enhancing students' social responsibility, innovative spirit, and practical ability.

China's key competences lie in the following three aspects: first, paying attention to ideological and moral education and cultivating people with all-round development; second, focusing on the main line of ‘moral, intellectual, and physical’ development, although the specific content changes with social development; and reflecting moral education as the primary ability is most important, which emphasizes social responsibility, innovative spirit, practical ability, and so on.

4. FRAMEWORK FOR THE DEVELOPMENT OF KEY COMPETENCES IN CHINA

4.1. Theoretical Framework and Selection Criteria

On the one hand, the key competences of student development in China are to fully implement the educational policy and implement the fundamental tasks of student development. Focusing on comprehensive student development, the aim is on enhancing students' sense of social responsibility, innovation, and practical ability. On the other hand, it is also to fully implement the core values of socialism, in terms of social values and personal values; reflect the beliefs and values of the national, social, and individual levels that students should have; and continuously accumulate cultural achievement and the ability to develop independently. Continuous improvement as a supporting condition is ultimately reflected in the social participation and interaction process of students.

For students to develop, it first requires respect for the existence of individuals as independent beings. Therefore, it is necessary to help students develop their physical, psychological, and learning qualities. Second, human sociality requires individuals to handle challenges for both individuals and groups. The relationship between society, the state, and even the international community is based on social participation. To achieve individual development and social participation, certain tools are needed, such as language and mathematics. Cultural accomplishment is a necessary foundation for individual self-development and participation in society. Independent development and social participation are important prerequisites and fundamental guarantees for individuals being able to adapt to society and realize personal values. The fields are closely linked, mutually reinforcing, mutually based, and complementary, and play a role in different situations. The specific indicators in the field are closely related and vary over a spectrum, thus forming a rigorous and forward-looking structural system.

Therefore, the comprehensive development of Marxism is the theoretical basis for the key competences of Chinese students. The key competences of Chinese students' development are mainly reflected in the three spheres of self-development, social participation, and cultural accomplishment.

Self-development mainly reflects subjectivity and cultivates and develops physical, psychological, and learning qualities; social participation mainly reflects sociality and deals with the relationship between individuals and groups, society, countries, and the like; and cultural cultivation mainly reflects culture, and students master and apply the various achievements of human wisdom and civilization. These three fields are described using verbs, reflecting their dynamic changes and developmental concepts that keep pace with the times. Cultural accomplishment is the necessary foundation for individual self-development and participation in society. Self-development and social participation are important prerequisites and fundamental guarantees for individuals to adapt to society and realize their own personal values.

4.2. Construction of the Framework of the Key Competences System

The construction of the overall framework of the key competences system for Chinese students in the three areas of the three indicators is based on education policy research, international comparative studies, traditional cultural analysis, curriculum analysis, and empirical research.

Research into education policy on students' key competences is mainly based on text analysis and looking at the relevant education policies and policies at different stages of development since the founding of the country. The study found that although China has not

explicitly proposed the concept of 'core literacy' throughout its history, the party and the state have always attached great importance to the cultivation of students' qualities in all aspects. Regarding education, "what kind of people should be cultivated" is explained in the education policy and government work reports at different stages of development in China. From the specific content, the key competences of students reflected in China's education policies and regulations mainly includes the following aspects: moral quality, practical ability, innovative literacy, learning ability, social responsibility, aesthetic and humanistic quality, and physical and mental health.

The international comparative study of students' key competences first uses a literature analysis of international organizations such as the Organisation for Economic Co-operation and Development (OECD), United Nations Educational, Scientific, and Cultural Organization (UNESCO), and the European Union, and countries like the United States, Canada, the United Kingdom, France, Finland, Hungary, Australia, New Zealand, Japan, and Singapore. The process and results of defining, selecting, and implementing the key competences of students in 10 countries, as well as in Taiwan and Hong Kong Special Administrative Region, were organized and analyzed. This focuses on the analysis of the key competences' research methods and methods, indicator systems and connotations, and the approaches and strategies for implementing and developing core literacy. On this basis, the focus group interview method was used to organize eight experts in the field to review and verify the above research results. Through the above research, the following key competences of student development mainly includes the following aspects: communication, teamwork, information literacy, innovation literacy, social participation and contribution, self-planning and management, international vision, language literacy, mathematical literacy, learning to learn, and problem solving.

The traditional cultural analysis of students' key competences mainly adopts the literature analysis method, studies Chinese traditional cultural beliefs and traditional education, systematically organizes the thoughts of individual self-development and self-improvement in Chinese traditional culture, and clarifies the importance attached to traditional education. This content lays the foundation for constructing the general framework of the key competency system for students with ethnic characteristics. As part of the analysis of traditional cultural thoughts, more than 30 representative works by important thinkers and important schools from the pre-Qin Dynasty to Qing Dynasty are analyzed, along with, an analysis of ancient classics and traditional Chinese culture by modern and contemporary scholars. As part of the analysis of traditional education, the study collects and reviews the works of Chinese educational history and nearly one hundred academic papers on traditional Chinese education, with particular attention to the traditional Chinese education system, talent selection methods, school education content at all levels, and important educator's theoretical perspectives and educational practices and other aspects of the literature. The study concludes that the key competences of students' development mainly includes the following aspects: benevolent love, compassion, dedication, patriotism, national

sentiment, local emotion, honesty and self-discipline, stamina, etiquette education, human historical knowledge, text expression, study, and study methods.

Developing a curriculum of students' key competences, using a content analysis method, encodes, classifies, and quantifies the texts of 19 curriculum standards in the compulsory education stage and 16 curriculum standards in the high-school education stage, giving a total of 35 current curriculum standards. Key competences are included in the four parts of the course objectives, course content, and implementation recommendations. The study concludes that students' key competences includes the following aspects: learning literacy, language literacy, scientific literacy, art and aesthetic literacy, practical literacy, communication, active inquiry, information literacy, humanistic literacy, and problem solving.

The empirical study on the development of key competences of Chinese students mainly used focus group interviews, individual interviews, and questionnaire surveys to survey 608 experts and well-known members of the community in four fields and representing ten social groups. The interviews mainly focused on "in response to the development and changes of the future society, according to the actual national conditions of China, what key competences should students have after passing through different stages of school education?" After the interview, the interviewee was asked to complete a questionnaire, and the respondents were asked to evaluate the 32 core literacy indicators proposed by the current international organizations, countries, and regions compiled by the research team, and select which ones they think are suitable for China. The study concludes that students' key competences include the following aspects: moral quality, communication and cooperation, legal rules, social responsibility, physical and mental health, self-management, learning, problem solving and practice, critical thinking, and innovation.

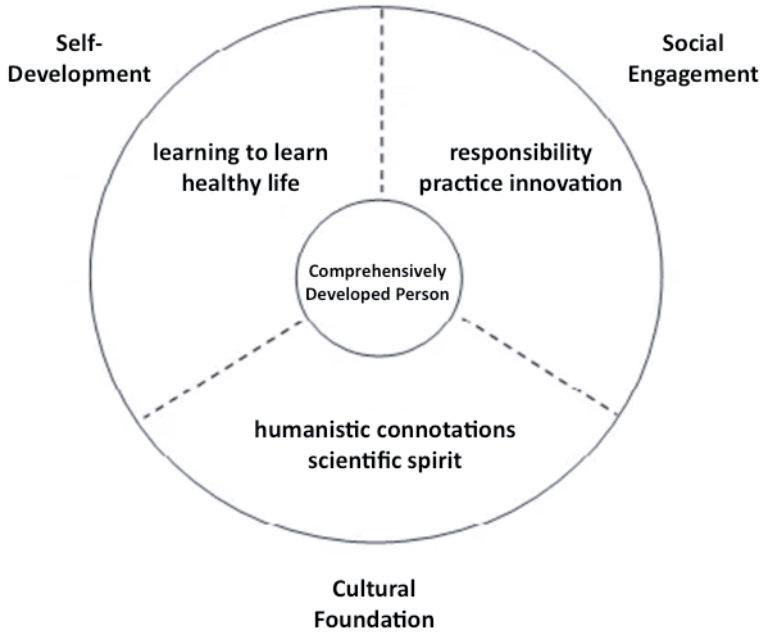
The selection of key competences indicators adhere to the relevant requirements of the party's education policy and educational goals, reflect a combination of internationalization and localization, and support the integration of tradition and modernity. Based on the integration of supportive research conclusions such as educational policy research, international comparative studies, traditional cultural analysis, curriculum analysis, and empirical research on students' core literacy, the final definition of the key competences framework for student development is as follows: Chinese students develop key competences. The core of 'comprehensive development' includes the three areas of independent development, social participation, and cultural foundation, as well as six core literacy indicators: learning, healthy living, responsibility, practice innovation, humanistic heritage, and scientific spirit.

5. KEY COMPETENCES FOR CHINESE STUDENTS

Taking "cultivating the all-round development of a person" as the core, the key competences are divided into three aspects, namely cultural foundation, independent development,

and social engagement. These are then broken down into six qualities; humanistic connotations, scientific spirit, learning to learn, healthy life, responsibility and practice innovation, as in chart 1.

Figure 4.1. *Developing key competences of Chinese students*



5.1. Cultural Basis

Culture is the root and soul of human beings. The cultural basis focuses on acquiring knowledge and skills in various fields such as humanity and science, mastering and applying the best of human wisdom and the inner spirit, pursuing the unity of the true, the good, and the beautiful, and becoming a person with profound cultural cultivation and higher spiritual pursuit.

(a) The humanistic concept refers to students' basic ability, emotional attitude, and value orientation in learning, and understanding and applying the knowledge and skills in the field of humanity, including humanistic accumulation, humanistic feelings, and aesthetic taste.

(b) Scientific spirit refers to students' value standard, mode of thinking, and behavior in learning, and understanding and applying the knowledge and skills, including rational thinking, critical questioning, and having the courage to explore.

5.2. Self-Development

Autonomy is the fundamental nature of a human being. The key points of self-development are effectively managing one's own study and life, recognizing and discovering self-worth, exploring one's own potential, dealing with a complex and changing environment effectively, making life colorful, and ultimately, becoming a person who has clear direction and enjoys their quality of life.

(a) Learning to learn means students' overall performance in learning consciousness formation, learning method selection, learning process evaluation and control, and so on. It specifically includes loving to learn and being good at learning, frequent reflection, and information consciousness.

(b) Healthy life means students' comprehensive performance in self-cognition, physical and mental development and life planning, including cherishing life, developing a healthy personality, and self-management.

5.3. Social Engagement

Sociality is the nature of man. Social engagement emphasizes the management of the relationship between self and society, complying with a code of morals and conduct which modern citizens must observe and perform, enhancing the sense of social responsibility, promoting an innovative spirit and practical ability, promoting personal value and social development to be realized, and becoming a person with ideal beliefs and with the confidence to take on responsibility.

(a) **Responsibility.** Responsibility refers to students' emotional attitude, value orientation, and behavior mode in dealing with social relations, national relations, and international relations, including social responsibility, national identity, and international understanding.

(b) **Practice innovation.** Practice innovation refers to practical ability, innovative consciousness and behavior in daily activities, and problem solving and adaptation challenges, including labor awareness, problem solving, and technical application.

Table 4.1. *Basic points and main features of key competences*

Key competencies		Basic points	Main Features
Cultural Foundation	Humanistic	Humanistic accumulation	The accumulation of basic knowledge and achievements in the field of humanity in all periods of history and all over the world; understanding and mastering the ways of recognition and practice in humanistic thought.
		Humanistic feelings	People-oriented consciousness and respecting human dignity and value; being concerned about human survival, development and happiness.
		Aesthetic taste	The accumulation of art knowledge and skills and being able to understand and respect the diversity of culture and art; having an awareness and basic ability to discover, feel, appreciate, and evaluate beauty; having a healthy aesthetic value orientation; having an interest and awareness of artistic expression and creative expression, being able to expand and sublimate beauty in life.
	Scientific spirit	Rational thinking	Pursuing genuine knowledge, being able to understand and master basic scientific principles and methods; respecting facts and evidence; having empirical consciousness and a rigorous attitude towards learning; demonstrating clear logical thinking; being able to know things, solve problems, and guide behaviors in the scientific way of thinking.
		Criticize and challenge	Having problem consciousness; being able to think and judge independently; thinking considerately; being able to analyze the problem from various angles and dialectically; making right decisions.
		Dare to explore	Having curiosity and imagination; being fearless of difficulties with an inquisitive exploratory nature; being able to try new things courageously and seek effective methods to solve problems actively.
Self Development	Learning to learn	Happy to learn and good at learning	Being able to understand the value of learning correctly; having positive learning attitude and keen learning interest; developing good learning habits; mastering the learning method which is suitable for oneself; being able to study independently; having consciousness and a belief in lifelong learning.
		Frequently reflection	Having awareness and habit of reviewing the state of study; being good at summarizing experience; being able to choose or adjust learning strategies and methods according to different situations and realities.

End of table 4.1.

Key competencies		Basic points	Main Features
		Information awareness	Being able to acquire, evaluate, identify, and use information consciously and effectively; having the ability of digital survival and adapting to the trends of social informatization such as 'Internet plus'; having awareness of internet morals and information.
	Healthy life	Cherishing life	Understanding the meaning of life and the value of life; having safety awareness and self-protection ability; mastering suitable exercise methods and skills; developing a healthy and civilized behavior and lifestyle.
		Healthy personality	Having positive psychological quality; being confident and self-appreciative, resilient, and optimistic; demonstrating self-control, being able to adjust and manage one's own emotions, controlling frustration.
		Self-management	Being able to recognize and evaluate oneself correctly; choosing the appropriate development direction according to the personality and potential of the individual; managing time and energy reasonably; continuously working to achieve goals.
Social Engagement	Responsibility	Social responsibility	Having self-respect and self-discipline; being polite, open to criticism, honest and friendly, and generous with others; respecting elders; being enthusiastic toward public service and volunteering, with a professional dedication spirit; being responsible to oneself and others; having a clear distinction between right and wrong, with an understanding of rules and laws, actively fulfilling civic obligations, and rationally exercising civil rights; pursuing freedom and equality; being able to uphold social fairness and justice; loving nature and respecting nature; having a green lifestyle and understanding sustainability
		National identity	Having national consciousness, understanding national conditions and history, identifying with the national identity, defending national sovereignty, dignity, and interests consciously; having cultural confidence and respecting the achievements of the Chinese nation and promoting the traditional culture of China and the socialist culture; understanding the history and glorious traditions of the Communist Party of China, actively loving the party, and supporting the party; understanding, accepting, and consciously practicing socialist core values, having the common ideal of socialism with Chinese characteristics, having the faith and action to realize the Chinese dream of the great rejuvenation of the Chinese nation.

Key competencies		Basic points	Main Features
		International understanding	With a global awareness and an open mind, understanding the progress of human civilization and the development of the world; being able to respect the diversity and differences of various cultures in the world; actively participating in cross-cultural communication; focusing on global challenges and understanding the connotation and value of the community of human destiny.
	Practice innovation	Labour consciousness	Respect for labor, having a positive labor attitude and good working habits; having a hands-on ability and mastering some labor skills; having the awareness to improve and innovate the way of labor and improve labor efficiency in domestic labor, production labor, public welfare activities, and social practice; having the awareness and action to create a successful life through honest and legal labor.
		Problem solution	Being good at identifying problems, having an interest and enthusiasm in solving problems; being able to find a reasonable solution according to specific conditions; having the ability to act in complex environments.
		Technology application	Understanding the organic connection between technology and human civilization; having the interest and willingness to learn and master technology; demonstrating practical, applied thinking; being able to transform ideas and programs into tangible goods, or improving and optimizing existing objects.

6. FROM THE KEY COMPETENCES OF STUDENT DEVELOPMENT TO PRACTICE

To implement the requirement of strengthening quality and cultivating a person, in the 18th National Congress of the Communist Party of China and the third plenary session of the 18th congress, in 2014, the Ministry of Education issued the opinions on comprehensively widening curriculum reform to implement the basic tasks of strengthening quality and cultivating person, putting forward that the Ministry of Education will organize and research the system of students' key competences, clarifying the essential characteristics and important abilities that students should be equipped with to fulfill the requirements for lifelong development and social development. The results of the core competences of students' development were published in 2016, with the core of cultivating 'all-round people', divided into 3 parts, which include cultural foundation, independent development, and social participation. They are then categorized as 6 qualities, including humanistic conno-

tations, scientific spirit, learning to learn, healthy life, responsibility, and practice innovation, specifically divided into 18 basic points.

The key competences of student development answer the question of what kind of people we are cultivating. Establishing the key competences of students aims to drive forward the teaching reform of education. There needs to be an active discussion on how to implement specific teaching activities and social activities from a set of theoretical frameworks so that the educational goals can be realized.

6.1. Improve Textbook Compilation and Offer a Variety of Courses

When putting this into practice, it is vital to consider these core competences when compiling textbooks. On the one hand, the traditional thinking of "knowledge as the center" should be changed in textbooks, since cultivating students' creative and practical abilities and guiding their emotions, attitudes, and values should be highlighted. On the other hand, the idea of "taking the discipline as the center" should also be disrupted. Especially when writing 'science, society, art' and other interdisciplinary teaching materials, it is necessary to break the discipline boundary and cultivate overall qualities over the specific discipline. When writing textbooks for a single subject, it is important to focus on the subject and provide academic support for building ability, instead of just focusing on knowledge of the subject, ignoring the human factor.

The curriculum is an important foundation for students' lifelong development and key competences. Following the introduction of core competences and the effort of the localization of key competences, in recent years, many schools have optimized and integrated school resources, social resources, teacher resources, and student resources, setting up scientific interest classes, art and sports skills classes, language classes, technical classes, subject development classes, experiential learning classes, and cultural communication classes on the basis of the existing curriculum. For instance, in the 'model culture' course in Qingdao second middle school, after taking part in activities such as the model United Nations conference, model economic association, moot court, model journalism competition, and so on, students can use their knowledge and intelligence to think and solve pressing international issues like a real diplomat.

6.2. Platform to Incubate and Strengthen Teacher Development

To provide high-end intellectual support and an excellent incubation platform for the growth of innovative talents, many schools are connecting with universities and establishing modern laboratory networks in areas such as mechanical engineering, robot-

ics, engineering workshops, human health, new energy vehicles, and modern biological groups. At the same time, using the full range of university and social resources, university teachers are encouraged to teach at primary and secondary schools. Scientific innovation, robots and models, engineering, environmental protection and new energy technology innovation, creative invention, and cultural innovation teams are established and they provide more professional guidance for students. In cooperation with social enterprises, the schools set up an experimental base for student innovation, so that students can carry their investigation to visit and research on the base and get effective guidance from the experts. For example, Hangzhou second middle school has a number of collaborative projects with various agencies, such as Iflytek Co. Ltd, Zhejiang Police College, and Hangzhou Normal University.

6.3. The Cumulative Generative Property of Key Competences

Using key competences has a certain cumulative generative property. It indicates that the key competence is formed in stages rather than overnight. It needs continuous development and improvement. It is also reflected in different students' development levels. The key competence framework includes a set of specific integrated indicators, specific to different years and situations. In terms of 'morality', this is about developing gratitude and honesty in primary schools, while there is more focus on responsibility in secondary schools. In terms of 'independence', primary schools prefer to cultivate children's self-confidence more, while middle schools pay more attention to the ability to be patient and value persistence. Therefore, in the process of developing these key competences, attention must be paid to the students' age characteristics and development guidelines.

Taking Chinese language teaching as an example, Chinese teaching should carry out the whole life education ideology and put students' ongoing development as a priority. Language is the foundation of a person's survival and development. It is through listening, speaking, reading, and writing that people communicate with the outside world (nature, others, and society), constantly enriching and developing their inner world, opening up the free space of the spirit, and developing the imagination and creativity of oneself. In the information society of the future, owing to the increased pace of knowledge changing and social development, people's career, status, and role are characterized by variability and diversity. Therefore, Chinese language teaching should move from merely the accumulation of knowledge to promoting the development of students' abilities, to promote students' sustainable development. In the teaching process, teachers should pay more attention to cultivating students' self-studying ability, developing confidence in the subject and good study habits, mastering the basic learning methods, making students enjoy Chinese and learn how to learn Chinese, and laying the foundation for their lifelong learning. This is closely integrated with the 'learning' and 'information' categories of the 'eight qualities'.

6.4. Enhance the Cultivation of Key Competences in Informal Learning

The establishment of core competences is based on the needs of students for lifelong development and social development. The concept of 'key competences' breaks the existing pattern of education. It advocates that education is not only the acquisition of teaching and learning methods in classroom teaching, but also the cultivation of core competences such as humanistic culture and social participation. For example, encouraging children to do what they can do in meaningful social practice such as community service and volunteering, thereby improving their social responsibilities. For example, tomb sweeping in Qingming cemetery is a type of traditional patriotic education. Taking care of the elderly can develop students' love and kindness. Participating in various kinds of agricultural work can help students to acquire a good work ethic and sense of responsibility. Developing core competences is not limited only to the school classroom. The school should establish an effective network of social activities according to local conditions, to encourage students to go out of the classroom as much as possible, so that students can learn and grow in activities and practice in reality.

7. THE ROLE OF THE SCHOOL IN THE IMPLEMENTATION OF KEY COMPETENCES OF STUDENTS' DEVELOPMENT

7.1. The Actor from Intention to Plan

The school plays a pivotal role in the development of students' key competences, and thus the role of the school is undergoing a great transformation as a result of recent changes in these competences. The first transformation is from the concept of running school to the school curriculum plan, from education concept, intention of cultivation of person to a systematic and organized school curriculum system. After the transformation, the curriculum structure of school planning is to be obtained, which is also the map of the school curriculum. From students' development quality, the school curriculum structure is planned by surrounding with the structure of students' key competences. It is a logical idea that dividing concrete realization ways, and to reflect the school intention by education means.

When establishing the curriculum system, the school needs to consider the requirements of the university entrance exams (both in China and abroad), and these needs should be integrated into the curriculum structure of the school. Schools should build the curriculum based on the demand for educational value and the fundamental mission of education. It

has been more than ten years since the reform of the high school curriculum. Many high schools have made efforts to offer many school-based courses, as well as complete school curriculum plans.

7.2. The Transformer from Common to Individuality

Students' core competences, therefore, are what the school wants each student to develop and achieve. However, these shared qualities don't mean that every student attains an equal level of quality. For the same quality, different students may have different ways of realizing it. The value of the school curriculum is to translate the common qualities into an individual quality system which adapts to the characteristics and needs of students. In this transformational process, it is important to implement the curriculum selectivity and provide hierarchical teaching.

As part of the new curriculum reform, the high school curriculum increases the number of elective classes, thereby adapting to the varying needs of different students on the course. Following the reform of the college entrance examination system, the division of arts and science no longer exists in high school. For high school students, in principle, they can combine subjects independently, which means an increased focus on students' key competences. For example, many colleges and universities in China now offer school courses and various elective courses, so that students can focus on developing their own interests and develop their own potential beyond merely completing the tasks. For these students, providing each of them with different courses is a way to emphasize their key competences. Even with the same quality, different students may improve it through different courses. At the same time, many schools also carry out hierarchical teaching according to the level of learning, and students are divided into different classes or groups to learn different subjects.

8. THE EVALUATION AND STANDARD OF KEY COMPETENCES OF STUDENTS' DEVELOPMENT

8.1. Test Evaluation According to the Academic Quality Standard

One of the most important measures to promote the evaluation reform based on the key competency criteria is to evaluate students according to their academic quality standards. Academic quality standard is the organic combination of key competences and curriculum content. According to the academic quality standard developed by the key competency system, the main result is that students should achieve certain standards after completing the

learning content at different leaning stages, grades, and subjects. Evaluation based on the academic quality standard has a great advantage over traditional examinations. On the one hand, the academic quality standard is a part of the curriculum standard and it is closely integrated with the course content. It can reflect students' standard of performance and evaluate them according to the academic quality standard, which can effectively solve this problem. On the other hand, the academic quality standard based on key competences can be used to direct education evaluation, which can then be promoted to break the restrictions of subject learning and make the comprehensive evaluation of interdisciplinary ability possible. As the ability to solve problems is one of the important qualities of students in science, math, and social disciplines, combining with each subject, the academic quality standard can develop the grading ability performance of this quality to evaluate both quality and ability.

8.2. The Reform of Exam Content from the Knowledge Center to the Quality Center

The reform of exam content needs to reflect the transformation from knowledge-oriented measurement to ability- and quality-oriented measurement. It includes a two-way checklist which can examine knowledge and ability, giving a functional orientation for each test question. When setting questions, we need to ensure the authenticity of the item materials, which should closely resemble the actual situation in society, economics, and science, to help students solve problems in real life. We also need to be realistic on the subject difficulty and length of the exams, as well as reducing the number of questions that rely on complex calculations or memory, giving students more space to think and encouraging open and creative answers. Following the exams, we need to carefully explore the students' cognitive structures and problem-solving strategies hidden under the scores.

8.3. Innovate Evaluation Methods to Ensure the Key Competences are Oriented to Test Evaluation

At present, there are two main ways of evaluating students' academic competence and quality. First, the method based on large-scale testing, including students' academic achievement tests and any related questionnaire surveys. The former is mainly based on using academic quality standards to test students' academic achievements. The latter is mainly based on testing students' interest in learning and their physical and mental states, emotional attitude, and values. The second is the evaluation method based on daily data accumulation, which mainly involves observing students, performance evaluation, and other methods. When integrating students' homework, it is not only about the interest, knowledge, effective training, and skills of student work, but also more about the student's understanding of education, understanding of life, and understanding of their emotional and moral life. Therefore, there should be an awareness of this in the task design, content, and

form. In terms of evaluation of homework, which looks at children's attitude to do homework, there should be more humanistic consciousness for children.

9. TEACHER TRAINING AND KEY COMPETENCES OF STUDENTS' DEVELOPMENT

Teaching is a combination of teaching and learning. It is a learning community consisting of teachers and students. The key competences of students' development are developing alongside new social development. Teachers' professional skills are also changing, so it is imperative to strengthen teacher training.

9.1. 'National Teacher Training Plan' Is Developing Comprehensively

The 'National Teacher Training Plan' is a major national project for implementing educational development with the aim of comprehensively improving the quality of teaching.

The 'National Teacher Training Plan' includes 'the demonstration training program for primary and secondary school teachers' and 'the training program for excellent rural teachers in the Midwest." The former so-called 'demonstration', refers to the training that is directly organized by the national Ministry of Education and the national Ministry of Finance to the primary and secondary school teachers from all provinces, autonomous regions, and directly controlled municipalities, to make the direction of the financial investment and training demonstration to the national governments at all levels, to train the excellent teachers for the primary and secondary school teachers all over the country, and to provide a batch of teaching resources with high-quality training courses. The latter refers to targeted training for rural compulsory education teachers in the central and western regions of the country. This aims to strengthen rural teacher training, to improve rural teachers' teaching ability and their professional level. The project mainly includes the short-term intensive training of rural primary and secondary school teachers, and the remote training of rural primary and secondary school teachers.

9.2. Launch 'The Project of Enhancing Quality of Teachers'

At the new stage of "further developing the reform of the training model for primary and secondary school teachers and enhancing the quality of training comprehensively," all regions of the country have actively adapted to the developing of basic education curriculum reform and the realistic demand of implementing quality education comprehensively. According to the demand in different developing stages, such as pre-job training for new teachers, improving training for on-the-job teachers, and advanced studies for key teach-

ers, targeted training is being carried out, to satisfy the needs of teachers' professional development and to guide teachers' professional growth.

9.3. Establish Provincial Training Institution of "Tripartite Synergy"

Promoting training platforms for teachers in universities, municipal and county training institutions and provincial-level teachers' workshops aim to achieve the integration of research, training, and application and promote teacher training at all levels. Combined with the local reality, relying on existing universities and teachers' professional academic power in comprehensive universities, participating in the basic education teacher training, enhancing the quality of the trainer team, improving training ability, and building a support system, guarantees the implementation of a long-term plan for teacher development. At the same time the teachers' training system and institutions can be established and improved, making full use of all the aspects such as institutional organization, academic leaders from institutions in universities, and first-rate teachers in primary and secondary schools.

10. TYPICAL CASES

10.1. Zhong Guancun No. 3 Primary School: Ture Learning

A student's time in school is relatively fixed, but the contents of the curriculum are increasing. The goal is to develop a ‘complete person’, while the distinct boundaries of the subject system divide things. How can we get teachers out of these fixed classes and out of these similar teaching spaces? How can the learning mode reform of the national curriculum be a ‘dinner’ for children?

(1) The dimensions of students′ development

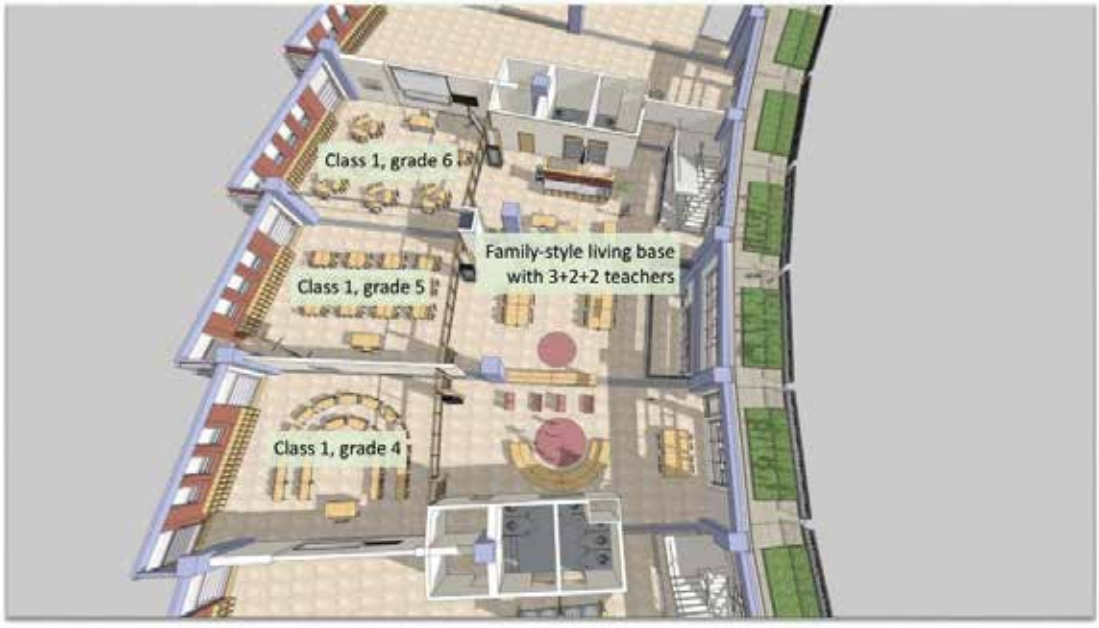
Zhongguancun No. 3 primary school has proposed three dimensions of students’ development: (a) basic knowledge ability: the ability to learn and apply this knowledge; (b) interdisciplinary ability: comprehensive knowledge ability, exploration ability, discrimination ability, and cooperative communication ability; （c） the spirit of transcending the academic subject: outlook on life; world outlook and values; the ability of emerging in new fields; and establishment of positive behavior and good character.

(2) Reset learning relationship and course system

To achieve the goal of helping students develop, Zhongguancun No. 3 primary school has reconstructed the learning relationship, making multiple environments with stable rela-

tionships for teachers and students. The students are put in mixed age 'class + group' and 'head teacher + tutor' teams, so that a teacher can monitor more students and a student is directed by more teachers.

Figure 4.2. *Resetting the learning relationship*



In addition, in terms of courses, beyond the limitations of the class teaching system Zhongguancun No. 3 primary school established, a 'class-unit–semester-year" learning chain, advocating that learning means life and life means learning. Therefore, Zhongguancun No. 3 primary school integrated the original subject courses and formed six groups of courses, including (1) mathematics, engineering, science and technology, (2) performing arts, (3) visual arts, (4) language, (5) history and social sciences, and (6) physical education classes. To effectively manage the study of six courses, it was necessary to integrate the basic course, expand certain courses and open others, and realize the subject integration, interdisciplinary connection, and multidisciplinary study of a real learning situation. To achieve this goal, Zhongguancun No. 3 primary school adjusted the course template, changing the timetable.

Figure 4.3. *The template of course arrangement*

		Monday		Tuesday		Wednesday		Thursdays		Friday	
Part 1	8: 00-9: 30	Language	Chinese English	mathematics engineering science and technology	Math Science	mathematics engineering science and technology	Math Science	Language	Chinese	interdisciplinary	Chinese Music
	9: 30-10: 10	fitness exercises									
Part 2	10: 10-11: 40	interdisciplinary	Math P. E.	interdisciplinary	Chinese	Language	Chinese English	interdisciplinary	Math P. E.	interdisciplinary	English P. E.
	11: 40-13: 00	group activities + lunch									
	13: 00-13: 15	eye exercise+ broadcasting+ rest									
Part 3	13: 20-14: 50	interdisciplinary	Arts	Project learning		Language	Calligraphy	interdisciplinary	Moral Education	Optional course	

In addition to the above changes, Zhongguancun No. 3 primary school also allocated Tuesday afternoon to project learning, including research on school furniture, garbage collection and disposal, car design, and so on. This idea of project learning broke down the walls of the classroom. Different project researches have created more possibilities for more students to develop new learning partnerships. During the process of researching, students learn to solve practical problems, acquire fundamental knowledge and skills, and develop their ability to communicate with others, along with other positive learning behaviors.

(3) Graduation project

The graduation project of Zhongguancun No. 3 primary school is known as a '1+1+1'project. Students are required to choose one subject each from categories A, B, and C to complete the graduation project, as shown in Table 4.2. It is important to note that every student has to participate in the community project in category C. The graduation project can be completed individually or as part of a team. The tutor team is composed of university professors, graduate students, and teachers.

Table 4.2. *Graduation project*

Category	Curriculum domain
A	Language arts (Chinese, English and other languages)
	Mathematics, Science, Technology, Engineering, Information
	History and social sciences (including finance and law)
B	The visual arts
	The performing arts
	Active physical activity and healthy lifestyle
	Other growth experiences
C	Community welfare activities

10.2. Tsinghua University Primary School: Student Stands in the Center of School

Since September 2016, with the publication of the research results of key competences, schools have also begun to make the process of developing the key competences school-based. There is no doubt that Tsinghua University primary school is one of the leaders in this field. Tsinghua University primary school has always focused on human development, insisting on the education philosophy of "the student is the center of the school." In terms

of the key competences which influence future survival and life, based on the characteristics of students, the school's culture for a century, and ideas for running the school, Tsinghua University primary school drew up five key competences for development: physical and mental health, ambition in learning, national passion, aesthetic taste, and learning to change.

The five key competences have defined the question of "what kind of person should we cultivate" and are also guiding the directions for school education.

(4) Physical and mental health

'Physical and mental health' originated from a school board member of Tsinghua University primary school, Mr. John Ma. The ex-principal of Tsinghua University, Jiang Nanxiang proposed "Doing exercise one hour a day, and working healthily for the motherland for 50 years." Here he means both students' physical and mental health.

Students at Tsinghua University primary school are encouraged to develop healthy habits and to maintain a good physical condition. Every student should have at least one favorite sport. Students are required to have the ability of physical coordination, the ability to resist disease, and the ability to preserve oneself in the face of danger.

(5) Ambition in learning

'Ambition in learning' originated from the original school name of 'Chengzhi', which was selected from the school motto of Tsinghua University primary school "Li Ren Wei Ben, Cheng Zhi Yu Xue." Here, this means that students remain positive about learning and grow up in a stimulating environment, as a result, achieving a successful career in the future.

Students at Tsinghua University primary school should have an insatiable desire to learn, a solid foundation, and a wide range of interests. Students should strengthen their desire to learn, be diligent, be able to study independently and cooperate with others, have good study habits and scientific learning methods, learn to think, and dare to challenge and explore, ultimately applying their knowledge to society.

(6) National passion

National passion originated from the ideas of 'social commitment' promoted by Tsinghua University, with and the spirit of Tsinghua University primary school, 'combining Chinese and western elements', which has been present for a hundred years. Here it means that our education should help students to identify as Chinese and develop forward-looking students who are modern citizens of China with an international vision and national passion.

Students at Tsinghua University primary school should respect themselves and be confident and independent, love their family, love their hometown, love the collective, love people, and love our country. Students should believe in serving and dedicating themselves to society, with a sense of social responsibility and the desire to revitalize China; a wide international vision to understand, respect, and embrace multicultural values, be able to communicate with people from different cultural backgrounds on an equal footing, and be friendly and sociable.

(7) Aesthetic taste

Aesthetic taste originated from the aesthetic ideal 'the sincere, true, and beautiful' from four Chinese classic tutors in Tsinghua University. Here it means that students should have an aesthetic consciousness conforming to the values of socialism and the ability to create beauty.

Students at Tsinghua University primary school should search for good images and beautiful things, learn to find beauty, feel beauty, and understand beauty, and be influenced by beauty in the appreciation of life, nature, science, and art. On this basis, students should promote, develop, and create beauty, improving the mental state and the aesthetic quality, and then achieve linguistic beauty, beautiful behavior, and beauty within the soul.

(8) Learning to change

Learning to change originated from the concept of 'reviving humanism' and 'the spirit of independence and freedom of thought'. Here it means that students are encouraged to actively adapt to the new environment, go beyond themselves, and innovate.

Students at Tsinghua University primary school should have a keen environmental awareness and the ability to process information to keep pace with a constantly developing society and life, being able to accept change and continually adapting to exceed expectations. They should have the ability to face problems in life without fear f and to develop a positive attitude toward life. They should dare to practice, dare to try, be fearless when facing difficulties, and attempt to overcome these with both the mind and hands. They should influence people and things around them, giving positive energy through their efforts. Students also should have the spirit of daring to be the first and have critical and creative thinking and the ability to innovate. The key competences of students at Tsinghua University primary school development are being healthy, outgoing, and happy to learn.

Chapter 5

ENGLAND: KNOWLEDGE, COMPETENCES AND CURRICULUM REFORM: WHY THE ENGLISH CASE STANDS OUT

Gemma Moss, Ann Hodgson, Susan Cousin

Highlights

- In the UK, governance of the education system is devolved to the four nations of England, Scotland, Wales and Northern Ireland
- England stands out, both from the other parts of the UK and internationally, because of the extensive use the government makes of pupil test and examination data to manage and monitor system performance
- School level data and inspection reports are placed in the public domain and penalties for not doing well include placing the school under new management and ultimately removing it from local authority control.
- The emphasis placed on pupil test and examination outcomes has led to concerns that the system encourages too much "teaching to the test" and that the curriculum has narrowed, privileging academic skills over a broader range of competences that might better equip young people for the many challenges a rapidly changing economy poses.

1. BACKGROUND: SETTING CURRICULUM REFORM IN ENGLAND IN THE U.K. NATIONAL CONTEXT

1.1. School Structures and Governance: England in the U.K. Context

Since the late 1990s, governance of the education system in the United Kingdom has been devolved to the four nations of the United Kingdom: England (population just over 55 million and site of the U.K. Parliament); Scotland (population 5.4 million); Wales (population 3.1 million); and Northern Ireland (population 1.9 million). England is unique among this group in pursuing what has been described as "an extreme example of high-autonomy–high-accountability quasi-market school reforms" (Greany and Waterhouse 2016). Each nation takes its own decisions on school structures, curriculum organization, and assessment. Current arrangements reflect different histories and political settlements.

The main differences are:

- **Qualifications**

In England, Wales, and Northern Ireland, children take the General Certificate of Secondary Education (GCSE) examinations at age 16, though the grading is somewhat different in England. Those not leaving for employment or for vocational study then specialize and study three A-level subjects which are examined at age 18.

In Scotland, students study more subjects to the end-of-stage examinations, called Highers and Advanced Highers. If successful at age 17, they can transfer from school to a four-year university degree.

- **School structures**

In England, Wales, and Scotland, comprehensive secondary schools predominate.

In Northern Ireland, selection at age 11 is common, with pupils required to take a 11 plus exam to gain entry into selective academic track grammar schools (in England a few local authorities still select pupils for grammar schools at age 11). The Northern Irish system is also largely segregated on religious lines.

In England, government policy has increasingly encouraged the entry of new not-for-profit school suppliers (for example, academy chains; sponsored academies; converter academies; free schools; and university technical colleges [UTCs]). In parallel, the role of local authorities in running and supporting schools in their locality has reduced: current legislation prohibits them from opening new schools.

- **Early years provision**

In England, formal education and direct teaching is encouraged from entry to school at age 4–5. The other three nations encourage play-based learning in the early years.

1.2. The Organization of Education in England

Education in England is divided into five main stages as set out in Table 5.1.

Table 5.1. *Structure of education in England*

Stage	Year/grade	Typical age	Type of institution	Assessment	Accountability measure
early Years Foundation Stage	Pre-school and nursery education	0–5	Preschool settings	Early years foundation stage profile	
Reception	R	4–5	Infant/ primary school		Baseline profile (TBC)
Key Stage 1	Year 1	5–6		Phonics Check	% pass/fail
	Year 2	6–7		KS1 Sats	% pupils at floor standard
Key Stage 2	Year 3	7–8	Junior/ primary school		
	Year 4	8–9			
	Year 5	9–10			
	Year 6	10–11		KS2 Sats	% pupils at floor standard
Key Stage 3	Year 7	11–12	Secondary school		
	Year 8	12–13			
	Year 9	13–14			
Key Stage 4	Year 10	14–15			
	Year 11	15–16		GCSE[a] / Ebacc[b]	% pupils at floor standard
Key Stage 5	Years 12–13	16–18	6th form, secondary school	A levels[c]; vocational qualifications:	
Post – 16			6th form college; further education college	BTEC/ CGLI; International Baccalaureate	

Note: a. Level 2: GCSE grades 5–9; Level 1: GCSE grades 1–4.
b. A school accountability measure recording how many students achieved five grade 5–9 passes in English, math, science, a language, history or geography.
c. Level 3: Advanced Level examinations (A levels).

Using this framework, the government regulates provision by:

- **Specifying the Early Years Foundation Stage** which all registered providers are expected to follow. The framework is non-statutory (that is, not a legal requirement) but is used by the Office for Standards in Education (Ofsted) in its inspections of registered providers.

- **Setting out National Curriculum programs of study for Key Stages 1–4.** These are statutory requirements that state-funded schools under local authority control are required to follow between ages 5 and 16. In practice most academies and free schools also follow the same programs of study.

- **Mandating tests in key stages 1 and 2** at age 6 (phonics screening check, with resits at age 7 for those who fail it); age 7, end of key stage 1 tests in English, math, and science; and age 11, end of key stage 2 tests in English, math, and science. School results in English and math are placed in the public domain and used to compare schools against the national average. (There are plans to further develop the testing and accountability regime.)

- **Holding schools to account for the numbers of pupils passing GCSE at key stage 4** with good grades (5–9) in particular subjects (the EBacc) and for the progress they have made between key stage 2 and key stage 4.

- **Creating high penalties for failure to meet target.** Schools judged not to meet floor standards after inspection can be placed in special measures, leading to a new governing body and head teacher and change of staff and ultimately enforced academization.

In the English system, this combination of curriculum specification, performance data, floor standards, targets, and the inspection regime means schools are held accountable for pupil performance across the key stages 1–4. Despite widespread concern that this has led to too much "teaching to the test" (Mansell 2007), the high accountability measures remain in place.

Students in England may leave school for work with a substantial training element at age 16, but otherwise they are now required to stay in education or work-based training until age 18. All pupils take end of stage examinations at 16 (GCSEs or their equivalents) which act as qualifications for further study or eventual employment. Pupils staying on in education post 16 can follow an academic track to age 18 at 11–18 schools or 16–18 sixth form colleges, taking A-level exams as their end-of-stage qualification; they can pursue vocational qualifications at further education colleges; or opt for apprenticeships with work-based training providers or employers.

There are a small number of recently introduced UTCs and studio schools catering for 14–19-year-olds wanting to take a more vocational and technical study program earlier than post 16. However, changing institutions at age 14 is unusual in England and the curriculum and assessment frameworks in place are not fully tailored to these alternative patterns of provision (Kettlewell et al. 2017; Thorley 2017).

1.3. Curriculum and Assessment in the English School System: Where the Emphasis Rests

The National Curriculum, introduced in 1988, was designed to ensure that all students studied both arts and sciences until age 16 (Previously students had chosen between arts or science tracks at age 14). It also replaced a two-tier system of examination at age 16, (consisting of O Levels, intended as preparation for A levels, and CSEs, intended to accredit students who might well leave school for work or vocational study at age 16) with a single examination called the GCSE. See Table 5.2 for an outline of the subjects studied up to 16.

Table 5.2. *Structure of the National Curriculum and exam entry in English schools, ages 5–16*

		Key stage 1	Key stage 2	Key stage 3	Key stage 4
	Age	5–7	7–11	11–14	14–16
	Year groups	1–2	3–6	7–9	10–11
Core subjects	English	✓ *x*	✓ *x*	✓	✓ *x*
	Mathematics	✓ *x*	✓ *x*	✓	✓ *x*
	Science	✓	✓	✓	✓ *x*
Foundation subjects	Art and design	✓	✓	✓	
	Citizenship			✓	✓
	Computing	✓	✓	✓	✓
	Design and technology	✓	✓	✓	
	Languages		✓	✓	*X*
	Geography	✓	✓	✓	Either *x*
	History	✓	✓	✓	or *x*
	Music	✓	✓	✓	
Additional areas of study	Religious education	✓	✓	✓	✓
	Sex and relationship education			✓	✓

Note: ✓ = Compulsory subjects at each key stage; x = High stakes assessment.

Although only three foundation subjects are compulsory in key stage 4, the EBacc — a measure of entry and attainment at key stage 4 used in performance tables — requires schools to teach students to exam level in a language and history or geography, alongside the core subjects of English, math, and science. Students are also entitled to study at least one subject from each of the following areas, leading to an approved qualification:

- The arts (comprising art and design, music, dance, drama, and media arts)
- Design and technology
- The humanities (comprising geography and history)
- Modern foreign language

Those passing the requisite examinations at age 16 can continue to in-depth study of a small number of subjects at A level. Most students on an academic track study just three advanced level subjects post 16, generally either arts or sciences, largely as preparation for single subject disciplinary study at university. This remains as the unchanging 'gold standard' for education in England, driving much of the rest of the system.

Even though around 60 percent of English students do not pursue A levels post 16, high-quality vocational education has never been successfully planned into the English system to provide an equally high status alternative route through education post 16.[1] The most recent policy has focused on preparing more students to continue their education into university. New Labour (1997–2010) set a goal of 50 percent of students doing so. Currently, over 40 percent progress to higher education, double the number attending university in the 1970s.

Low status of vocational subjects resulted in low interest in competences in policy discourse.

Emphasis on the foundational skills of literacy and numeracy was used to support children from socially disadvantaged backgrounds.

The historically low status of vocational subjects in England, coupled with the difficulties of reconciling a vocational route through education pre-16 with a comprehensive and inclusive system of education, partly explains why key competences have low traction in English policy discourse. New Labour (1997–2010) placed great stress in their education policy on adopting a socially inclusive approach. They did so by setting out to directly tackle the historic underperformance of children from socially disadvantaged backgrounds. At the start of New Labour's administration, this led to an emphasis on ensuring high-quality teaching in literacy and numeracy in every primary school.

[1] The current Secretary of State is beginning to re-consider this with plans to introduce T levels as alternative vocational qualifications to A levels, in the near future. See Section 3.5 below.

Meanwhile, in the secondary school, New Labour placed more value on introducing vocational equivalents to GCSEs believing they would help more children leave education with qualifications they could take to the labor market. Similarly, A levels were made more accessible by modularizing the curriculum and introducing a midcourse qualification known as an AS level that could be taken as a stand-alone qualification or could count toward the eventual grade at A level. Students were assessed through both coursework and external examinations.

However, because of the association with leaving school early, vocational education has continued to be regarded by many as no more than a route to lower paid jobs. In contrast, A levels are characterized as a period of knowledge-focused study that prepares the student for university, the life of the mind, and highly paid employment. On either side of this divide, little recognition has been given to specifying the many diverse competences that could be relevant to a modern working life or preparing children along these lines.

If New Labour's approach to the curriculum was driven by a desire for social inclusion — ensuring that more children from socially disadvantaged backgrounds would realize the benefits of qualifications they could take with them to the world of work or use to enter higher study — then the Coalition and Conservative administrations have adopted a 'social mobility' approach. A high-status academic curriculum has been reinstated as the cornerstone to educational success on the expectation that, to achieve their full potential, all children must be judged against its exacting standards with those who reach them reaping its rewards, but with very little on offer for those who do not. Accordingly, the number of vocational equivalents to GCSEs recognized in the secondary sector has been significantly reduced, with much more emphasis placed in the accountability system on all students following an academic track to age 16. An additional ninth grade has been introduced at GCSE to further distinguish between high-achieving candidates. At the same time the modular approach to A levels has been rescinded with the reintroduction of a single final-stage exam.

Such an emphasis on academic achievement is designed to enlarge the pool of talent at the top while guarding against grade inflation. However, what has become increasingly urgent, yet much less well resourced, is what to do for those students who do not successfully follow an exacting academic track.

2. KEY COMPETENCES AND NEW LITERACIES? CURRICULUM REFORM IN ENGLAND, 1997 TO THE PRESENT DAY

In this section, we explore the relationship between knowledge content, key competences, and new literacies in New Labour's National Literacy and Numeracy Strategies. The strate-

gies were introduced to primary schools in 1998 and ran in various forms until 2010. By that stage, they had changed into a Primary National Strategy and begun to support many more areas of the primary school curriculum and school management.

2.1. A Curriculum for the 21st Century? New Labour and the National Literacy and Numeracy Strategies 1997–2010

The National Literacy and Numeracy Strategies were at the heart of New Labour's education policy. They were part of a considerable investment in education which included:

- Rebuilding many schools, (the Building Schools for the Future initiative saw many older buildings replaced with priority given to rebuilding schools in areas of greatest disadvantage)

- Equipping schools for the digital age by providing a computer in every classroom, adequate wi-fi connectivity, a computer suite in every school, and, lastly, funds to enhance the use of technology for teaching in every classroom (through, for example, interactive whiteboards; laptops; data projectors; school-based intranet; and peripherals such as tablets and visualizers).

- Experimenting with new ways of channeling more resources to those schools seen as operating in the most challenging circumstances (for example, Education Action Zones; the first academy schools, run by sponsors with the freedom to define their own ways of working and curriculum).

The value orientation was for a uniform entitlement curriculum which would equip all children for the more specialist secondary school programs of study that lay ahead

The intention was to use the National Literacy and Numeracy Strategies to raise standards across the board in English primary schools. The value orientation was for a uniform entitlement curriculum which would equip all children for the more specialist secondary school programs of study that lay ahead.

The National Literacy and Numeracy Strategies had a major impact on primary schools and primary school pedagogy during their lifetime. They combined:

- New frameworks for teaching, specifying what should be taught and how, year by year[2];

[2] The Framework specification (3rd edition, 2001), set out by year, can be downloaded from (available October 16, 2017): http://dera.ioe.ac.uk/4699/2/nls_fwk050001objectives.pdf

- Assessment, targets, and monitoring regimes that ensured the strategies were fully implemented;
- Resources and training to put the programs into place and maintain them;
- Data for decision making that would travel up to the dedicated central strategy team who could then initiate further developments or make other adjustments from their base in the Department for Education and Skills; and
- Ongoing support to schools provided by an infrastructure of locally based consultants who were in turn managed by the central team (See Earl, Watson, and Katz 2003 for a comparison to other large-scale education reform programs).

High quality whole-class and small-group pedagogy, explicit instructional goals

Using a combination of 'challenge and support', both strategies emphasized reintroducing high quality whole-class and small-group pedagogy to English primary schools, setting explicit instructional goals that were driven by high expectations of what every child could achieve (Stannard and Huxford 2007). For accountability purposes, schools' results were compared to other schools working in similar circumstances. Significant underperformance would incur both challenge and support for improvement from the local strategy teams, with inspection by Ofsted able to instigate further change if a school was considered to be failing.

The Literacy Framework introduced the concept of the **Literacy Hour** to English schools. This created a dedicated period for literacy teaching every day, focused on teaching the skills of reading, writing, and verbal communication (speaking and listening). The hour specified that teacher planning should cover word-, sentence-, and text-level objectives and be delivered in a sequence moving through whole-class, independent or group work, and plenary phases. This structure created the means for the teacher to provide dedicated support for each group of pupils in meeting the same objectives over the course of a week and represented a radical change from previous teaching practice in English primary schools through the way in which it balanced whole-class with small-group work.

The framework defined literacy in terms of the breadth and depth of pupil knowledge, skills, and understanding of "language in both oral and written forms."[3] Text-level objectives

Based on the premise that behaviors change beliefs (Stannard and Huxford 2007), the combination of curriculum specification and the tight pattern of daily delivery that the strategies introduced effectively reorganized the expected pattern of teaching in primary schools, placing far more emphasis on whole-class teaching planned to match the curriculum aims and objectives.

[3] NLS Framework. introduction (3rd edition) downloaded from (available October 16, 2017): http://dera.ioe.ac.uk/4699/1/nls_fwk050001rationale.pdf

drew on genre theory to specify the range of texts pupils should learn to read and write, with levels specifying how children should progress as they moved toward the target of 80 percent of pupils reaching level 4 by the end of primary school. Detailed teaching objectives for each term of each year were set out in the framework document.

Teaching materials that could support such objectives were supplied by the National Literacy Strategy (NLS) central team, with teachers encouraged to share good resources locally using cluster meetings led by regional consultants or via their schools' intranet. The strategy website increasingly acted as a national hub to distribute curriculum materials and provide resources designed to support teacher planning, curriculum innovation, pedagogy, leadership, and continuing professional development (CPD).

Integrating information and communication technology (ICT) into curriculum pedagogy and planning became an increasingly important theme to enable both teachers and pupils to be digitally literate and design and use digital resources effectively.[4]

2.2. Data and Reform: The Trajectory to Change

At first, the strategies experienced considerable success, and pupil performance rose sharply, but in concert with other large-scale reform programs (see Linn 2000) results then plateaued just short of the targets set. Although the shortfall was not large (79 percent of students reached level 4 in English against a target of 80 percent, then raised to 85 percent[5]) media coverage reported this as policy failure. As time went on, the Numeracy and Literacy Strategy teams made great efforts to identify new areas for intervention and support, they weakened top-down regulation of working practices, and encouraged teachers to exercise more agency in their planning. However, the longer pupil performance remained short of the expected targets, the more political support for the strategies began to drain away.

From New Labour to the Conservatives: Attempts to create a marketplace for innovation and reform instead of centralized support structures.

The drivers remain the high accountability measures against which school performance is judged.

As difficulties in managing public expectations multiplied for New Labour (Moss 2009), the government increasingly sought to place some distance between themselves and the school system. They turned instead to '**quasi-market' solutions** and new players such as academy chains, who could be contracted to manage the problems for them. This approach

[4] See for instance, ICT across the curriculum: ICT in English: Key Stage 3. (2004) downloaded from (available October 16, 2017): http://dera.ioe.ac.uk/5257/97/sec_ict_en_train_pck_Redacted.pdf

[5] More than 80 percent of students reached level 4 in reading but not in writing. In hindsight expecting writing skills to develop in tandem with, rather than behind, reading skills is not well supported by research evidence.

has become more pronounced under successor administrations (Coalition and Conservative governments). Having dismantled the centralized support structures that New Labour had put in place, attempts to create a marketplace for innovation and reform have intensified.

The drivers remain the high accountability measures against which school performance is judged. Successful schools are expected to act as innovation incubators, although with so many now outside of local authority control, their structural relationship with their peers is unclear; unsuccessful schools can be placed directly into academy chains who take on the responsibility for sorting things out. Such changes in direction at the center have affected how schools and colleges address the challenges of equipping students to meet the new demands society places upon them in terms of knowledge competences and new literacies. In practice, high-stakes accountability pressures have militated against much innovation that can successfully spread from school to school.

2.3. Why Key Competences and New Literacies Occupy Such Little Space in Educational Discourse in England

Towards well-rounded individuals and life-long learners — a halt, as the government changes.

The revised curriculum was never implemented.

Throughout the lifetime of the New Labour administration most weight in the assessment and accountability system in the primary phase rested with improving children's performance in literacy and numeracy tests at key stage 1 (age 7) and key stage 2 (age 11). This was seen as crucial in enhancing attainment higher up the system.

The kinds of transversal competences that are the subject of this project were not explicitly emphasized, though communication skills were embedded into the speaking and listening strand of the literacy curriculum, and critical thinking skills were promoted, for example, in problem-solving tasks in numeracy. Key competences and literacies regarded as essential for full participation in wider society (health literacy, financial literacy, collaboration, communication, and creativity) were addressed through lessons in Personal Social and Health Education and Citizenship. However, these subjects were not statutory (that is, schools are not legally bound to follow them).[6] Moreover, they remained at the periphery of school planning, as they formed no part of the accountability measures by which schools' performance was judged.

In the closing years of the New Labour administration, the Qualifications and Curriculum Authority (QCDA), a regulatory body with independent oversight of the National Curriculum and its assessment (since abolished), devised a more integrated curriculum which

[6] For the current government's curriculum guidance for citizenship education in primary schools see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/402173/Programme_of_Study_KS1_and_2.pdf (Downloaded 16/10/17)

made explicit reference to transferable competences (see Annex for a summary of how definitions of curriculum values, aims, and purposes have changed over time since 1988). Holding more in common with curriculum reforms elsewhere, the revised National Curriculum had among its aims, to "widen horizons and raise aspirations about the world of work" and "make children more aware of, and engaged with, their local, national, and international communities" (QCDA 2010, 5).[7]

The curriculum was divided into 'Essentials for learning and life' (competences considered as a necessary set of tools) and Learning Areas (disciplinary content that children should master). The essentials were defined as "the skills, attitudes, and dispositions that children need to become well-rounded individuals and lifelong learners" (QCDA 2010, 14) and were listed as:

- Literacy,
- Numeracy,
- ICT capability,
- Learning and thinking skills,
- Personal and emotional skills, and
- Social skills.

The Learning Areas grouped subjects together under these headings (each Learning Area included a range of transferable competences):

- Understanding the arts
- Understanding English
- Communication and languages
- Historical, geographical, and social understanding
- Mathematical understanding

[7] Available from http://www.ibe.unesco.org/curricula/unitedkingdom/enk_prfw_2010_eng.pdf (Downloaded 16/10/17)

- Understanding physical development, health, and well-being
- Scientific and technological understanding
- Religious education

However, before the new curriculum could be introduced the government changed. The revised curriculum was never implemented, the strategy team was disbanded and its materials withdrawn. The QCDA was abolished shortly thereafter.

The high-status academic versus low-status vocational divide.

The 'powerful knowledge' academic track and 'teaching to the test'.

The incoming Coalition and Conservative administrations have in many respects sought to create ideological clear water between themselves and New Labour in their approach to education. They have distanced themselves from what went before by championing different methods of teaching reading (for example, the use of synthetic phonics which has now come to dominate the early years literacy curriculum and testing) and by placing more emphasis in the secondary sector on an academic track curriculum based on 'powerful knowledge'. In government rhetoric, the role of the curriculum in fostering communication, collaboration, critical thinking, and creativity has been replaced by a preference for an openly didactic style of teaching which valorizes rote learning and conceptualizes the curriculum in terms of information to be transmitted rather than competences to be acquired. This is presented as a more rigorous and therefore a more valuable approach. This has been supplemented by a discourse of character, grit, and resilience that draws from the 19th century independent school system and is based on an understanding that education is competitive and there will be winners and losers.

In terms of pre-service teacher training, government guidance now very much emphasizes the teacher's subject knowledge, rather than knowledge of child development, as the prerequisite for high quality teaching. At the same time, craft routes into teaching that bypass university-based education departments have also been encouraged. Although transferable competences, such as critical literacy, can still be integrated into knowledge content at the discretion of the teacher and the school, work-related competences find little mention in National Curriculum programs of study. The high-status academic versus low-status vocational divide makes them liable to be defined as low skills, with limited transferability and serving little purpose in a race to push more students through an academic track with the pressures of selection and competition that this brings.

In a high-accountability, high-autonomy, quasi-market system, room for interested parties to suggest new ways of incorporating 'essential life skills' into the school curriculum now rests with an array of knowledge brokers who operate in a market for curriculum ideas, speaking to schools who are highly geared to meeting the performance targets the govern-

ment sets them.[8] Under these conditions only some schools are in a position to take risks and look beyond teaching to the test to ensure their own survival.[9]

2.5. Locally Driven Initiatives and Education for Employment in a Rapidly Changing World

A fragmented system based on quasi-market reforms with little joined up discussion between stakeholders.

Local, individually driven alternative initiatives.

In all this change there has been very little concerted discussion between government and other stakeholders over how the content of the curriculum should best prepare all children for the future. Instead, the academy program, first introduced by New Labour, has provided the opportunity for businesses to sponsor academies and given them the freedom to design their own curricula. In some areas this has led to more creative engagement with large local employers.[10] Elsewhere, other interested parties have tried to devise more opportunities to ensure children are equipped with high-quality engineering and technical skills. UTCs are a good example, a new type of 14–19 school, which was driven by the interests of a former Secretary of State for Education, and has emerged as a new way of offering the kind of higher-status vocational track one might find in other countries.[11]

However, such initiatives are driven locally and individually rather than nationally. They take place against the backdrop of a system of assessment and accountability which in practice keeps many institutions, including academies, sticking to the National Curriculum, and, in an effort to meet the floor targets and standards they have been set at age 16, delivering an academic curriculum to all students.

3. KEY COMPETENCES AND SKILLS IN UPPER SECONDARY EDUCATION

3.1. The 14–19 Curriculum: A Work in Progress

In this section, we examine why it has been so difficult in England to modernize and enrich the upper secondary (14–19) curriculum under a range of different governments. In many

8 Cullinane and Montacute 2017.

9 Astle 2017.

10 See the Royal Society of Arts area-based curriculum initiative, Peterborough. https://www.thersa.org/globalassets/pdfs/reports/rsa_abc_peterborough_independent_evaluation.pdf

11 See the UTCs initiative, started by a Conservative ex-Minister for Education http://www.utcolleges.org/ and http://www.edge.co.uk/projects/institutions/university-technical-colleges

ways this is linked to the historically high status accorded the academic track in secondary education in England, with only those preparing for university expected to stay on in school beyond the age of 16, up until the relatively recent past.

3.2. Enriching and Modernizing the Post-16 Curriculum: How the Past Shapes the Future

From the late 1980s numerous proposals from a range of civil society organizations, think-tanks, independent government committees, and governments in opposition in England have repeatedly raised the question of how to prepare all young people for the demands of working and adult life in the challenging global economic context of the 21st century (see Hodgson and Spours 2008, 19–38). These have stemmed from a concern to modernize the secondary curriculum even as the age at which pupils are expected to leave school has risen. This has led to powerful debates over how to meet the needs of a changing economy (that is, globalization, the rise of new technologies and digitalization, artificial intelligence and robotics, and a move from a manufacturing to a service sector base in England); to cope with the increasingly diverse nature of the population in England; and to cater for the growth in the number of young people staying on in education and training up to the age of 18.

Most of these debates have centered around

- The need for a broader curriculum to tackle the narrowness of the dominant three A level program and the early specialization it encourages;
- Tackling the divide between the academic and vocational tracks to ensure that the curriculum provides greater flexibility for 16–19-year-olds and that young people are able to change direction if they wished;
- Putting in place vocational qualifications that are intended to have the same status as GCSEs and A levels; and
- Developing a key set of 'core', 'key', 'essential' skills or a core curriculum that all 14–19-year-olds should take as part of their study programs, whether as separate courses or integrated into the main curriculum for 14–19-year-olds.

Some of these proposals have been influential with the national government of the day, but none has ultimately stood the test of time.

3.3. Education 16–19: The Status Quo

Participation age (in education) raised to the age of 18, but no National Curriculum beyond the age of 16.

From 2015 participation in some form of education or training to the age of 18 became compulsory for young people in England under legislation that was known as the Raising of the Participation Age (RPA). Yet, despite the RPA legislation, provision for 16–19-year-olds has not changed fundamentally. There is no National Curriculum or even broad curriculum aims beyond the age of 16 and the reform of education for 16–19-year-olds has normally been treated as something separate from a secondary curriculum designed for pupils up to the age of 16 (see discussion of core skills below).[12]

In practice, each 16–19-year-old's program is determined by their capacity to access an academic or vocational pathway, consisting of a small number of individual subject qualifications — normally three single subject A levels or a broad vocational equivalent.[13] Until 2013, there was no compulsion on either the education institution to offer or the young person to take anything other than these qualifications. Since 2013, there has been a small move toward a curriculum (as opposed to a free choice subject- based) approach for 16–19-year-olds through the introduction of 16–19 Study Programs. Alongside their chosen subjects, all 16–19-year-olds are now required to continue to study mathematics and English, if they have failed to gain an adequate GCSE grade in these subjects; have to be offered work experience "to give young people the opportunity to develop their career choices and to apply their skills in real working conditions"; and are expected to experience "other non-qualification activity to develop their character, skills, attitudes, and confidence, and to support progression" (DfE 2017a, 6).

The content of Study Programmes has to be carefully monitored and recorded by schools and colleges offering provision to 16–19-year-olds. This is not only inspected rigorously by Ofsted but is also a requirement of funding. The introduction of 16–19 Study Programmes may be considered a recognition by government that young people require more than the narrow diet of a small number of A Level subjects or their vocational equivalents to be able

[12] During 2002–2010, the New Labour administration began to try to align the last two years of secondary education (Years 10 and 11) more closely with upper secondary education (Years 12 and 13) through policies for 14–19 year olds. This 14–19 approach stopped immediately with the election of the Conservative/Liberal Democrat government in 2010 and policies once again reverted to those for secondary education (Years 7–11) and separate ones for upper secondary education (Years 12 and 13).

[13] For those who have not achieved adequate passes in their GCSEs at age 16 to progress to advanced level study, there are a number of broad vocational qualifications at intermediate level or below that can be taken, together with GCSE English and mathematics, as one- or two-year programs to support post-16 learners eventually to progress to advanced level study, an apprenticeship, or employment. It is not possible to repeat a full GCSE program beyond the age of 16.

to function effectively in the 21st century, but it by no means signifies a real change in the direction of policy. This continues to preserve traditional qualifications and to hold schools and colleges to account primarily through these mechanisms.

3.4. Conceptualizing Core Skills in a System Geared to the Academic Track

Perhaps the best way of illustrating the difficulties in reaching a long-term conclusion to these debates and developments is through an examination of how the issue of 'core skills' has been treated by successive governments. In 1989, the Confederation of British Industry (CBI) produced an influential report, 'Towards a Skills Revolution' (CBI 1989), which recommended that a broad range of 'core skills' should be built into both academic and vocational qualifications for 16–19-year-olds and should influence the National Curriculum more generally. They were:

- Values and integrity,
- Effective communication,
- Applications of numeracy,
- Applications of technology,
- Understanding of work and the world,
- Personal and interpersonal skills,
- Problem solving, and
- Positive attitudes to change.

Although some schools and colleges in England participating in the government- funded Technical and Vocational Education Initiative (1988–1997) were already expected to develop some of these in a cross-curricular manner in their 14–18 curriculum, the CBI call was for something more universal. In response, the Conservative Secretary of State at that time asked the National Curriculum Council (NCC) and the body responsible for secondary-level examinations to provide him with advice on how core skills could be developed and examined across all programs for 16–19-year-olds. The NCC reported in 1990, suggesting there should be six core skills:

- Communication
- Problem solving
- Personal skills
- Numeracy
- Information technology (IT)
- Modern language competence

In the event, only three of these (Communication, Numeracy, and IT) went on to be developed and only in the new vocational qualifications — General National Vocational Qualifications — that were brought in in 1992 as an alternative to A levels. Here, as several inspectors, researchers, and government committees reported, they proved problematic to teach, unpopular with students, and difficult to assess.

Despite this, the argument for core or key skills being introduced as a way of broadening and modernizing the curriculum, perhaps as part of a baccalaureate approach to replace the narrow three A level diet, did not die during the 1990s. It lived on in a number of reports by civil society organizations (for example, Finegold et al.1990; National Commission on Education, 1993, 1995; Royal Society 1991; Secondary Heads' Association 1993) and most notably in a report commissioned by government, 'Review of Qualifications for 16–19' (Dearing 1996).[14] The Dearing Report recommended the development of three main key skills (Communication, Application of Number, and IT) to remedy weaknesses perceived in the pre-16 curriculum, and four wider key skills (Team Working, Interpersonal Skills, Problem Solving, and Managing One's Own Learning).

The three main key skills were subsequently developed into a free-standing qualification that was designed to be offered to all 16–19-year-olds as part of the new 'Curriculum 2000' program introduced by the New Labour Government in 2000.[15] However, the qualification was only mandatory for young people taking a vocational program, with schools and

[14] Lord Dearing had already been tasked with reviewing the national curriculum, which ended at the age of 16, and was seen as a 'safe pair of hands' to take on a review of both the 16–19 curriculum and then, subsequently, higher education.

[15] While this reform was called 'Curriculum 2000' (because it was introduced in 2000) it was primarily a reform of qualifications for 16–19 years olds only.

colleges receiving funding if students took it. These imbalanced incentives caused huge tensions between young people and education providers with many students viewing the qualification as 'pointless', 'insulting' and 'a waste of time' (Hodgson and Spours 2003, 129).

Following a review of Curriculum 2000 by the QCDA in 2001, the government phased out the combined Key Skills Qualification and the wider key skills on the grounds that they could not be reliably assessed.

This experience of a short-lived attempted reform has subsequently been repeated many times. The three main key skills were given a central role

(a) Within the unified diploma system recommended in the final report of the government-appointed independent Working Group for 14–19 Reform, chaired by Mike Tomlinson (2004);[16]

(b) In the subsequent 14–19 specialised diplomas[17] that were developed from 2005 for phased introduction to begin in 2008. As with the Key Skills Qualification before it, the New Labour government funded a hugely ambitious development program, only for the 14–19 diplomas to be withdrawn in 2010 by the incoming Conservative/Liberal Democrat Coalition Government.

More recently, discussion of key or core skills has died down again, although, as we have seen earlier, English and mathematics are now a central part of the 16–19 study programs in England. The idea of broadening the 14–19 curriculum has not gone away, not least because there is still a strong belief among education professionals, many civil society organizations, and some politicians that the post-16 curriculum with its emphasis on the academic track is too narrow, does not allow for a mix of theoretical and practical learning, and

[16] The unified diploma system outlined in the Tomlinson Report was designed to bring all qualifications for 14–19 year olds within one certification framework, gradually subsuming GCSEs, A levels, and broad vocational qualifications over time and creating a more common and mixed curriculum for all young people at the end of secondary education (Years 10–11) and into upper secondary education (Years 12–13). This proposal was rejected by the Prime Minister, Tony Blair, although it had been supported by the Secretary of State for Education. The reason for rejection was a concern about losing A-level qualifications, which were seen as the 'gold standard' within the English system.

[17] 14–19 specialized diplomas were sector based, vocational (that is, Engineering, Construction, and the Built Environment) 'composite awards' comprising three 'components' — principal learning; generic learning; additional specialist learning. They were designed for 14–19 year olds (Years 10–13) at three levels — Foundation (EQF L1); Intermediate (EQF Ls2/3); and Advanced (EQF L4). (See Hodgson and Spours (2008) Chapter 4 for more detail.

does not equip young people adequately for adult and working life in the uncertain world of the 21st century (for example, Baker 2016; Edge Foundation 2017; Evans 2015; NUT/UCU 2008; Spours, Hodgson, and Rogers 2017;).

3.5. Rethinking a Vocational Education Pathway for the Future

Proposals from these organizations all contain the seeds of a curriculum for the future, but in the current political context they are not likely to make much headway. While the present government recognizes the demands of the modern world and the need to become ever more competitive to survive and prosper as a nation, it is not the school curriculum as a whole that it has in its sights nor academic education, which it believes it has successfully reformed. Rather there is a strong belief that the problem lies within the vocational education and training track post-16:

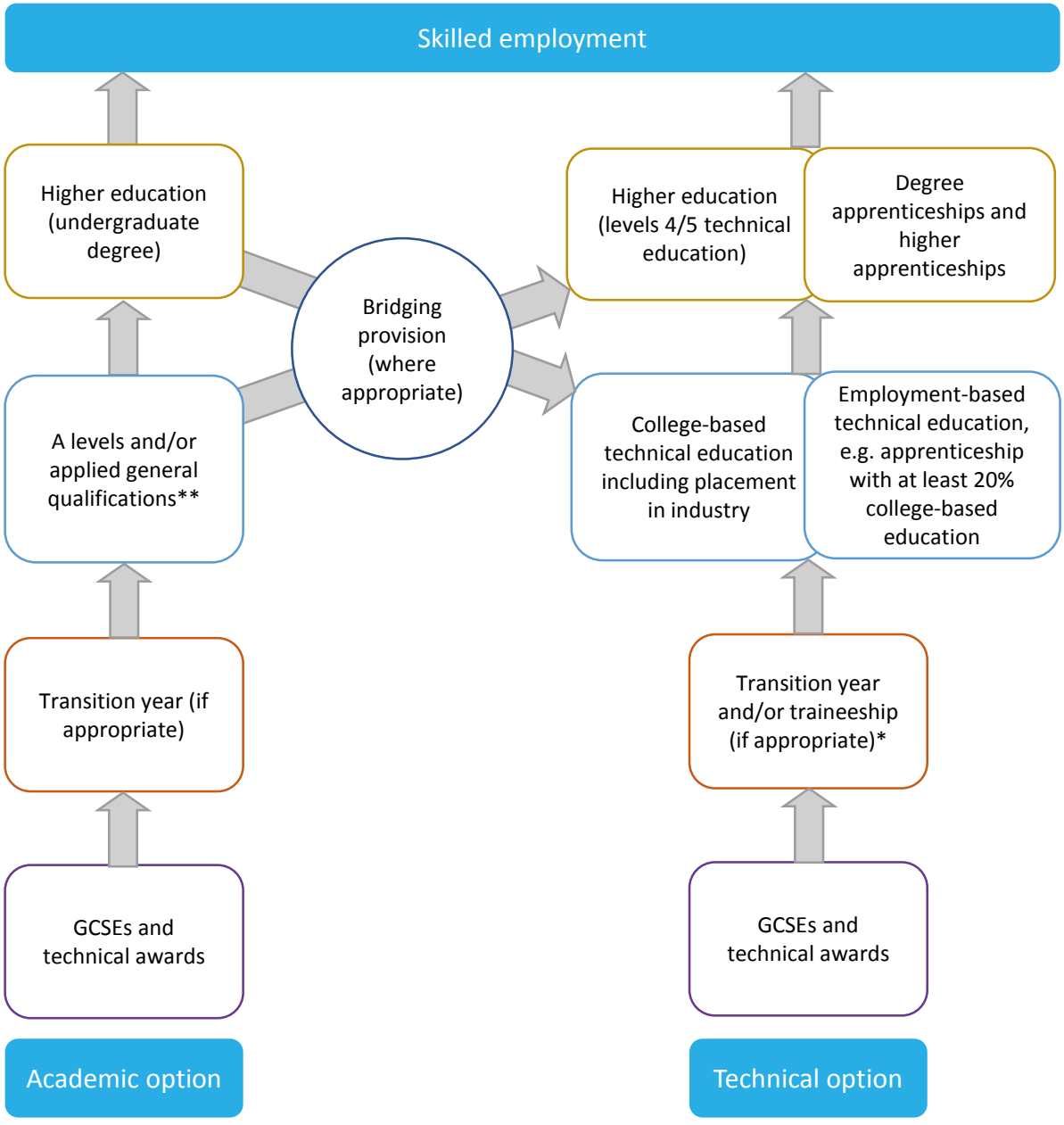
> *"We face a major challenge: the pressing need for more highly skilled people trained effectively, to grow the economy and raise productivity... Forecasts suggest greater demand for higher-level technical and specialist skills in the future. Greater international competition and faster technological change will put many roles that exist today at risk. We need young people and adults to have the skills and knowledge that better equip them for employment in the 21st Century, in order to meet the demands of the future."*
> (DFE/DBIS, 2016:10)

The Post-16 Skills Plan (DfE/DBIS 2016) sets out the government's plans for reformed technical education that will sit alongside and separate from the academic route — see figures 5.1 and 5.2. This is where government attention and funding is now directed.

Figure 5.1 shows the shape of the new system and the two pathways. The transition year programs, bridging courses, and higher-level awards noted on this figure will be developed later. (DfE 2017b)

Figure 5.2 shows the employer-led qualifications that are now under development. It is proposed that these new 'T Levels', as they are now being called, will be available at advanced level only (EQF L4) in the first instance because their primary function is as an alternative to A levels for 16–19-year-olds.

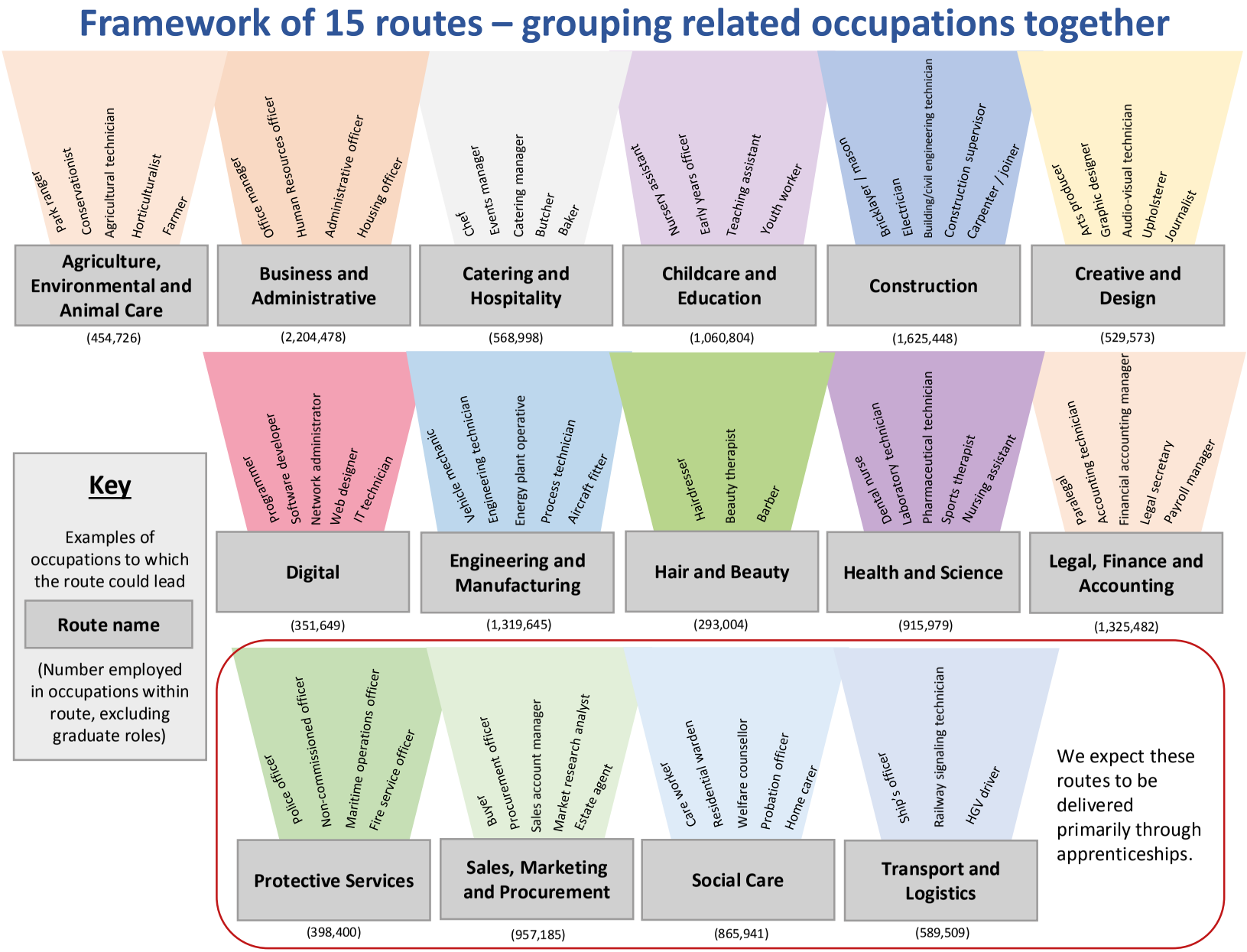
Figure 5.1. *The new post-16 options in England (reform from 2020)*



* Where a student does both, the traineeship will follow the transition year. Students doing both the transition year and the traineeship may progress directly to employment.

** Some students will move directly from A levels and/or applied general qualifications to degree and higher apprenticeships.

Figure 5.2. *The 15 proposed new T Levels*



4. FINDING LOCAL SOLUTIONS TO NATIONAL PROBLEMS

4.1. Defining Space to Innovate

In the absence of national government policies to incorporate key competences and new literacies into the school curriculum, there continue to be numerous bottom-up initiatives by a range of organizations in England that in their different ways address the challenges of the future.

4.2. Innovating in the 14–19 Curriculum: Finding Local Solutions?

Several organizations are attempting to develop a broader approach to the 14–19 or 16–19 curriculum. Some do this through a focus on new qualifications;[18] others by re- engineering the relationship between vocational and academic skills in the curriculum. The Edge Foundation,[19] for instance, advocates for "high quality technical and professional education that equips young people with the skills they need for today's global, digital economy." They believe that from the age of 14, "every young person should have the opportunity to study technical and creative subjects, alongside an academic core." To this end they support a variety of institutions and organizations committed to innovation in this area, and operating at different scales. These include:

- Three academies that integrate into their curriculum the academic and the practical with business and enterprise;

- The Studio Schools Trust, an organization which involves local employers in devising an alternative school curriculum for the 14–19 age group combining academic study with work-based learning; and

- UTCs, a new form of institution which teaches 14–18-year-olds technical and scientific subjects to a high standard. They offer two main technical specializations and enjoy both employer and university sponsorship. UTCs work closely with their employer partners who offer work placements and equipment as well as expertise in the design of a technical curriculum to meet the needs of their industrial sector. Modelled on the German system, all UTCs are designed to meet the skills gap by combining technical, practical, and academic learning in new ways.

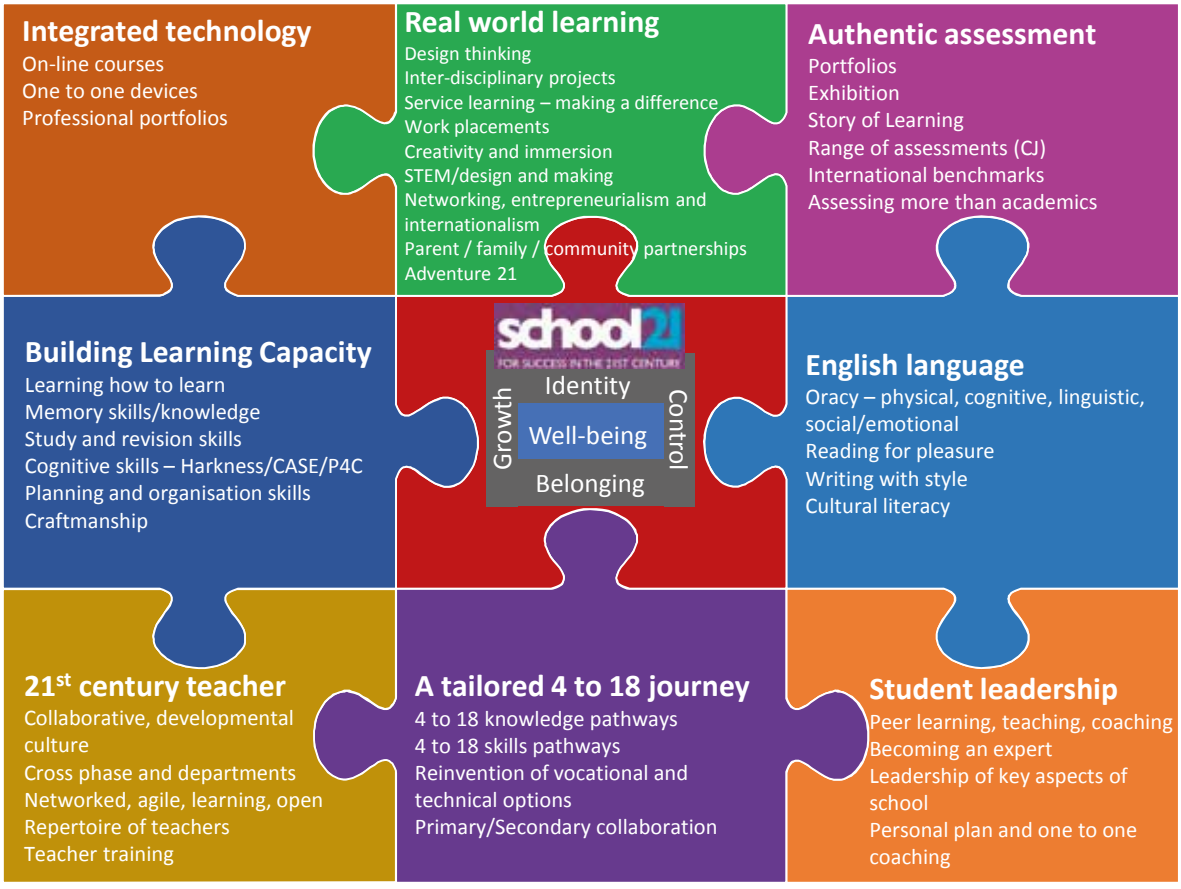
[18] See the National Bacc Trust (http://www.natbacctrust.org); Baker Dearing Trust (http://www.utcolleges.org/about/baker-dearing-educational-trust/); the Sixth Form Bac (https://www.sixthformcolleges.org/sites/default/files/a5_mailer_student_single.pdf); AQA Bac (http://www.aqa.org.uk/programmes/aqa-baccalaureate) International Baccalaureate (http://www.ibo.org), Barclays Lifeskills Programme (https://www.barclayslifeskills.com).

[19] Edge Foundation: http://www.edge.co.uk

4.3. Innovating through the School Curriculum and School Ethos

Other third sector organizations,[20] and some schools have taken the freedom that a high-autonomy, high-accountability, quasi-market system gives them to redesign their curriculum and incorporate the key competences and new literacies they consider important. School 21,[21] for instance, has built a curriculum based on rebalancing 'head, heart, and hand'. This means designing a curriculum that provides students with the breadth of cognitive skills required to ensure academic success (head), the values and attitudes necessary to develop student well-being (heart), and the craft, creativity, and problem-solving skills (hand) that are integral to entrepreneurship. The school articulates how these different elements fit together using a jigsaw diagram (see figure 5.3).

Figure 5.3. *School 21 jigsaw diagram*



[20] For instance, the Royal Society of the Arts, has supported curriculum innovation: through sponsoring academies that have adopted the Open Minds program, a competence-based and integrated curriculum in place in 200 schools http://www.rsaopeningminds.org.uk/; through developing area-based curricula https://www.thersa.org/action-and-research/rsa-projects/creative-learning-and-development-folder/area-based-curriculum; and through supporting projects based on innovative, experimental, and creative curricula https://www.thersa.org/action-and-research/rsa-projects/creative-learning-and-development-folder/innovative-education

[21] http://www.school21.org.uk/

Under the leadership of the head teacher, Peter Hyman, School 21 has established a clear set of principles for pedagogy and community engagement. This has created a community of teachers who work from a shared set of understandings and for common goals which are well-articulated and jointly owned. A core element of the curriculum involves well-structured project-based learning and design-based thinking. Against the policy trend they provide a well-rounded curriculum that does not sacrifice knowledge for skills. They comment on their website: "School 21 has developed a series of pedagogies and approaches that give students the chance to find their voice, develop deep knowledge and understanding, and create beautiful work that has real value beyond the classroom."

Their status as a 'free school' (government-funded but established with parental support outside of local authority structures) encourages them to innovate. They operate as a non-selective, state-funded 4–18 free school in an area of London that includes pockets of social deprivation. As a free school, they have control over their budget, and more freedom to experiment than other state-funded schools.

In addition, in London, the Greater London Authority has developed a range of free teaching resources and lesson plans linked to the subject content of the National Curriculum at key stages 2 and 3. These encourage all London schools to use the city itself and its many cultural, scientific, and heritage institutions as an educational resource. These materials were developed in partnership with academics and other education experts from different fields and are designed to help schools bring children who otherwise might not do so to explore the city landscape and learn from it in a dynamic way. Three common principles underpin each resource, as the London Curriculum website[22] explains:

- **Discover.** Get your hands on exciting lesson plans and resources inspired by London.
- **Explore.** Gives you the chance to extend your learning out of the classroom and into the city.
- **Connect.** Sets out a final project so your students can consolidate their learning in a fun and rewarding way.

These materials have provided new ways of connecting pupils to their immediate environment and bringing the outside world into the classroom.

4.4. Supporting Innovation in a Quasi Market

The range of organizations seeking to support school-led innovation is diverse and their motivations for getting involved vary. For instance, The Royal Society of Arts, is a charity

[22] https://www.london.gov.uk/what-we-do/education-and-youth/london-curriculum/about-london-curriculum

which was originally established in the 19th century to strengthen links between the arts, design, and manufacture (its full title is 'The Royal Society for the Encouragement of Arts, Manufactures and Commerce'). In line with its broader mission it has launched a sequence of initiatives designed to support schools in actively managing change**.** It places particular emphasis on creativity and innovation as essential elements in the curriculum:

> *"We seek to close the creativity gap by leading an approach to learning and development that enables everyone, regardless of background, to generate original, valuable ideas and make them happen.*
>
> *Through our programme of research and innovation, we aim to transform public, professional and political understanding and attitudes, so that families, schools, workplaces and other learning institutions prioritise and generate creative capacities."*

In this spirit they have supported a range of school partnerships, locally based initiatives, and research projects which in turn have ensured a range of publications designed to influence policy makers about the importance of the issues they champion and the need to find space for them within the school system. However, they do not have the same reach as the government. Such partnerships also depend upon a willingness to invest in education that can be short lived.

Certainly, the most fundamental changes to the performance of London schools, which saw their transformation from the worst educational performance in the country to one of the best, rests more with sustained investment channeled into professional partnerships within the education sector with government backing. The London Challenge, a citywide attempt to steer meaningful conversations about school improvement between heads of high- and low-performing schools, targeted investment in some of the most challenging boroughs in London (Tower Hamlets, Newham, Lewisham, Hackney, and Westminster), with a focus on leadership, capacity building, and teacher retention (Cousin 2018). Introduced by New Labour, it ran between 2003 and 2011. School-level challenges, identified through intelligent review of the attainment data, were addressed positively through a system of head teacher peer support using coaching and mentoring systems that all local partners benefitted from. This created high levels of professional engagement, collaborative problem solving, and innovation and experimentation in a context in which it was possible to learn from others without jeopardy. The improvement in school performance has endured long after the policy itself ceased.

4.5. Conclusion

In the absence of strong steerage from the government, and to some extent against the current direction of travel in education policy, many educational organizations and institutions continue to be committed to finding new ways of ensuring that they prepare students

adequately for the future and do so through a robust combination of competences, new literacies, knowledge, and skills. Under the current system, many of the schools championing such new approaches already meet the attainment targets that the government has set, and in these cases individual innovation is often feted. It is more difficult to find a route for disseminating such successful practice system-wide. Not least because, at the present time, the government seems to prefer diversity in provision over system-wide uniformity.

Yet, one unintended consequence of this approach is that it becomes much harder for schools that are more adrift from the national performance targets to innovate, especially if their students are struggling to successfully pass the necessary tests and examinations. An unintended consequence of such a system is that those schools with the least resources in terms of teacher expertise and strong leadership, serving the most disadvantaged communities, are left with the least capacity to change. There are indeed risks associated with operating a "high-autonomy–high-accountability quasi-market school system" (Greany and Waterhouse 2016) which limits the possibility of direct government or local authority support.

It remains the case that the most sustained and successful attempts to change pedagogy and reform the curriculum in England have combined the intelligent use of attainment data and changes to curriculum specifications with structures that resource and sustain professional conversations about practice. When well handled, this combination has made it possible to discuss problems as well as successes with an openness that leads to professional development and increases the capacity of the system to learn from itself. Whatever their strengths and weaknesses, the National Literacy and Numeracy Strategies did this at scale. The London Challenge applied some of these same principles at a regional level and transformed the educational performance of the city in ways that have endured. Whether and how we might return to these conditions in the future remains an open question.

SUMMARY

As a comparative study, the English case stands out, because of:

- The absence of an education policy discourse focused on key competences and new literacies
- The emphasis on academic subjects at the expense of vocational subjects in the qualifications system at 14- 16
- A preference for transmission teaching based on the transfer from teacher to pupil of high-status knowledge found valuable in the past (DfE, 2010; Simons and Porter, 2015)

- An accountability system based on high stakes for schools, in which any school failing to meet floor targets or operating substantially below national norms risks the loss of their Head and forced academisation (Greany and Waterhouse, 2016)

- System reforms which have i) substantially weakened the role of local authorities in supporting schools in their area; ii) diminished the role of university-based routes into teaching, replacing them with school-based apprenticeship routes that weight initial teaching training towards craft-based, not professional, knowledge

- Considerable bottom-up innovation that has often been successful but is difficult to scale up

- A media discourse of "education failure" that creates problems for educationists and politicians alike.

In outlining some of the history that has shaped the present system, we are aware of the constraints set by what political science describes as 'path dependency' (Page 2006). This limits what can be done at any point of time because of decisions taken in the past. These then influence the trajectory in present actions. The specific history to English education, and the strong divide between academic and vocational tracks that its examination system entrenches, have all constrained politicians' room for maneuver. So too does a public discourse around education performance data that treats 'average' performance as not good enough (Moss 2017) and thus proof of the government's failure to intervene successfully.

Yet the bigger questions remain:

1. How can we prepare all children and young people for life in the 21st century, regardless of their diverse starting points and the resources they bring to school?

2. Is it possible to reconcile building an inclusive curriculum open to all with the aims of constructing a specialized curriculum that promotes access to specialist knowledge?

3. In what ways can education promote social cohesion at times of political and economic stress?

4. How can national education systems balance entitlement for equity with room for local innovation?

5. Which key competences and new literacies matter most in these debates?

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ANNEX

Changing definitions of the values, aims and purposes of the National Curriculum, as set out in key official documents between 1988 and 2014

1. Education Reform Act, 1988[23]

The curriculum for a maintained school satisfies the requirements of this section if it is a balanced and broad-based curriculum which

- Promotes the spiritual, moral, cultural, mental, and physical development of pupils at the school and of society, and
- Prepares such pupils for the opportunities, responsibilities, and experiences of adult life.

The curriculum for every maintained school shall comprise a basic curriculum including

- Provision for religious education for all registered pupils at the school;
- A curriculum for all registered pupils at the school of compulsory school age (to be known as the National Curriculum) which meets the requirements of the subsection below.

The curriculum referred to in the subsection above shall comprise the core and other foundation subjects and specify in relation to each of them

- The knowledge, skills, and understanding which pupils of different abilities and maturities are expected to have by the end of each key stage (in this Annex referred to as 'attainment targets');
- The matters, skills, and processes which are required to be taught to pupils of different abilities and maturities during each key stage (in this Chapter referred to as 'programs of study'); and
- The arrangements for assessing pupils at or near the end of each key stage for the purpose of ascertaining what they have achieved in relation to the attainment targets for that stage (in this Chapter referred to as 'assessment arrangements').

[23] Available and downloaded 8/ 09/ 201 from http://www.educationengland.org.uk/documents/acts/1988-education-reform-act.pdf

2. 1999 The National Curriculum[24]

Values and Purposes

> *"Education influences and reflects the values of society, and the kind of society we want to be. It is important, therefore, to recognise a broad set of common values and purposes that underpin the school curriculum and the work of schools.*
>
> *Foremost is a belief in education, at home and at school, as a route to the spiritual, moral, social cultural, physical and mental development and thus well-being, of the individual. Education is also a route to equality of opportunity for all, a healthy and just democracy, a productive economy, and sustainable development. ....Education should...reaffirm our commitment to the virtues of truth, justice, honesty, trust and a sense of duty. At the same time education must enable us to respond positively to the opportunities and challenges of the rapidly changing world in which we live and work."*

Aims (these aims mean is unpacked at length)

Aim 1. The school curriculum should aim to provide opportunities for all pupils to learn and to achieve.

Aim 2. The school curriculum should aim to promote pupils' spiritual, moral, social, and cultural development and prepare all pupils for the opportunities, responsibilities, and experiences of life.

The four main purposes of the National Curriculum are:

(a) **To establish an entitlement**...to a number of areas of learning and to develop knowledge, understanding, skills, and attitudes necessary for (all pupils') self-fulfillment and development as active and responsible citizens.

(b) **To establish standards**....(which) can be used to set targets for improvement, measure progress toward those targets, and monitor and compare performance between individuals, groups, and schools.

(c) **To promote continuity and coherence** (that) facilitates the transition of pupils between schools and phases of education and provides a foundation of lifelong learning.

[24] The second revision, four years after the first Dearing Review (not covered here). *Source:* DfEE. 1999. *The National Curriculum: Handbook for Primary Teachers in England*. London: HMSO.

(d) **To promote public understanding**...of and confidence in the work of schools and in the learning and achievements resulting from compulsory education.

3. The Education Act, 2002[25]

The curriculum for a maintained school or maintained nursery school satisfies the requirements of this section if it is a balanced and broad-based curriculum which

(a) Promotes the spiritual, moral, cultural, mental, and physical development of pupils at the school and of society, and

(b) Prepares pupils at the school for the opportunities, responsibilities, and experiences of later life.

4. National Curriculum 2010[26]

Aims

The National Curriculum has 3 broad aims. It should enable all young people to become

- Successful learners who enjoy learning, make progress, and achieve;
- Confident individuals who are able to live safe, healthy, and fulfilling lives; and
- Responsible citizens who make a positive contribution to society.

These aims should inform all aspects of teaching and learning and be the starting point for curriculum design.

Values

The curriculum should reflect the values in our society that promote personal development, equality of opportunity, economic well-being, a healthy and just democracy, and a sustainable future.

These values should relate to

[25] Curriculum definition in statute law, available and downloaded 8/09/2017 from http://www.legislation.gov.uk/ukpga/2002/32/section/78

[26] Fourth revision, never implemented. *Source:* QCDA 2010.

- Ourselves, as individuals capable of spiritual, moral, social, intellectual, and physical growth and development;

- Our relationships, as fundamental to the development and fulfilment of happy and healthy lives, and to the good of the community;

- Our society, which is shaped by the contributions of a diverse range of people, cultures, and heritages; and

- Our environment, as the basis of life and a source of wonder and inspiration that needs to be protected.

Purposes

The purposes of having a statutory curriculum are

- **To establish an entitlement** for all children, regardless of…, to develop and apply the knowledge, skills, and understanding that will help them become successful learners, confident individuals, and responsible citizens;

- **To establish national standards** for children's performance;

- **To promote continuity and coherence**, allowing children to move smoothly between schools and phases of education; and

- **To promote public understanding**, building confidence in the work of schools and in the quality of compulsory education.

5. National Curriculum 2014[27]

Every state-funded school must offer a curriculum which is balanced and broad based[28] and which

- Promotes the spiritual, moral, cultural, mental, and physical development of pupils at the school and of society, and

[27] Fifth revision, introduced after New Labour had been defeated in the 2010 election. *Source*: The Department for Education. 2013. *The 2014 Secondary National Curriculum in England. Key Stages 3&4 Framework.* Romsey: Shurville Publishing.

[28] See Section 28 of the 2002 Education Act: http://www.legislation.gov.uk/ukpga/2002/32/section/78

- Prepares pupils at the school for the opportunities, responsibilities, and experiences of later life

Aims

(a) The curriculum provides pupils with an introduction to the essential knowledge that they need to be educated citizens. It introduces pupils to the best that has been thought and said; and helps engender an appreciation of human creativity and achievement.

(b) The National Curriculum is just one element in the education of every child. There is time and space in the school day and in each week, term, and year to range beyond the National Curriculum specifications. The National Curriculum provides an outline of core knowledge around which teachers can develop exciting and stimulating lessons to promote the development of pupils' knowledge, understanding, and skills as part of the wider curriculum.

Structure

Pupils must follow the National Curriculum. It is organized on the basis of four key stages and twelve subjects, classified in legal terms as 'core' and 'other foundation subjects'.

The Secretary of State for Education is required to publish programs of study for each National Curriculum subject, setting out the 'matters, skills, and processes' to be taught at each key stage.

Key Stage 4 Entitlement Areas

The arts (comprising art and design, music, dance, drama, and media arts), design, and technology; the humanities (comprising geography and history) and modern foreign language are not compulsory National Curriculum subjects after the age of 14 but all pupils in maintained schools have a statutory entitlement to be able to study a subject in each of those four areas.

The statutory requirements in relation to the entitlement areas are

- Schools must provide access to a minimum of 1 course in each of the 4 entitlement areas;

- Schools must provide the opportunity for pupils to take a course in all four areas, should they wish to do so; and

- A course that meets the entitlement requirements must give pupils the opportunity to obtain an approved qualification.

Chapter 6

REPUBLIC OF KOREA: CULTIVATING KEY COMPETENCES

Junehee Yoo, Euichang Choi, Dongil Kim, Il Lee, Hyukjun Son, Yeji An, Gyounghee So, Okseon Lee, Changwoo Chung, Chan-jong Kim, Jinsook Park, Yongsoon Kwak

Highlights

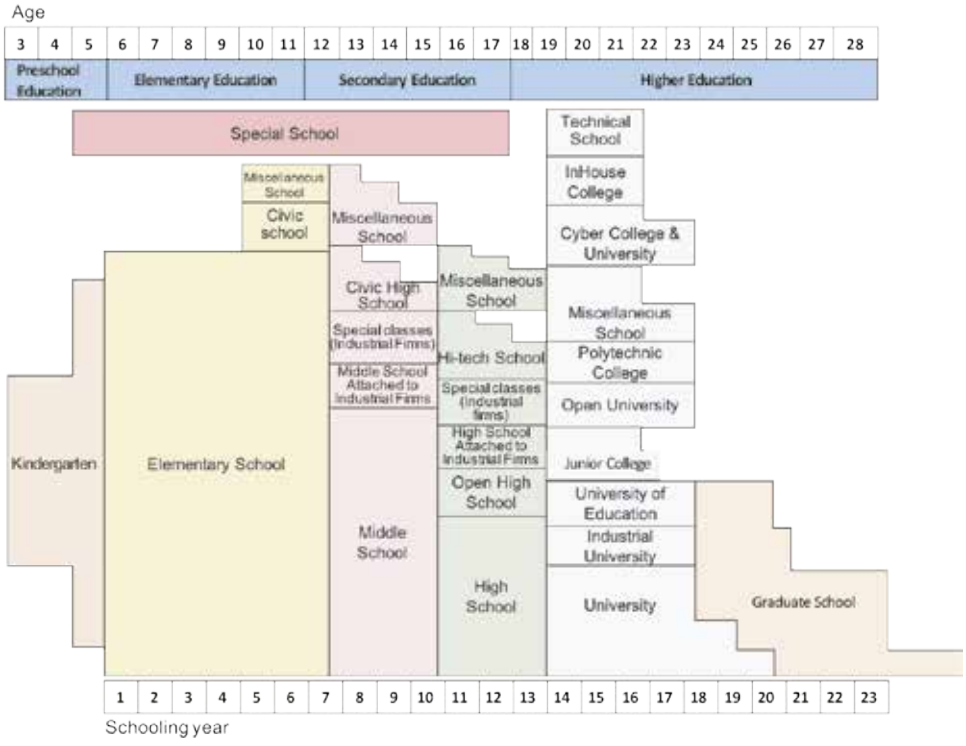
- Education in Korea is based on the ideal of *Hongik Ingan* — 'contributing to the overall benefit of human kind'.
- Traditionally very centralized, education in Korea is becoming more decentralized.
- The recent 2015 curriculum was developed in collaboration with families and local communities.
- One of the targets of the new competence-based curriculum is to minimize students' stress related to exams and other assessment
- Key competences are emphasized in general and integrated into all disciplines to embody the vision of an educated person.
- Assessment is under revision to support the 2015 curriculum and is designed to include assessment of key competences.

1. GENERAL DESCRIPTION OF KOREA'S EDUCATIONAL SYSTEM

1.1. Structure of the System

The Korean Educational System consists of preschool education (3 years), primary schools (6 years), and middle and high schools (3 years each). Compulsory education (sponsored by the government) starts at the age of 6, the 1st grade, and finishes at the age of 15, the 9th grade (Figure 6.1).

Figure 6.1. *Korean educational system*



In Korea, there are 20,835 schools, accommodating 6.6 million students and almost half a million teachers. The enrolment ratio is 98.1 percent for primary school, 94.9 percent for lower secondary, and 94.1 percent for upper secondary (see Table 6.1).

Table 6.1. *Brief statistics of education in Korea (2016)*

Schools		Number of schools	Number of students		Number of teachers	
			Total	Female	Total	Female
Total		**20,835**	**6,635,784**	**3,193,935**	**491,152**	**344,068**
Preprimary		8,987	704,138	345,177	52,923	52,047
Primary		6,001	2,672,843	1,292,430	183,452	141,248
Lower Secondary / Middle Schools		3,232	1,460,792	698,994	109,536	75,379
Upper-Secondary/ High Schools	Sub Total	2,402	1,764,350	843,742	135,523	68,819
	General	1,545	1,256,108	625,300	91,474	48,085
	Special Purpose	152	67,607	34,823	7,416	3,252
	Specialized	497	290,632	125,966	26,306	12,233
	Autonomous	159	138,110	50,419	10,231	5,218
Special Schools		170	25,502	8,726	8,720	5,944

Upper Secondary/High Schools

Individuals who graduate from middle schools or pass a qualification exam and/or an equivalent assessment can be admitted into high schools. Students are required to pay admission fees and tuition since high school is not considered compulsory education in Korea. Annual expenditure per student is US$9,570 for all programs in upper secondary school and 87 percent of it comes from the public sector and 13 percent comes from the private sector (OECD 2017). The amounts of annual tuition fee change by regions and school types. When students go on to upper secondary schools, they can choose or apply to schools according to their own track. Student selection procedures differ by school types. There are four types of high schools:

(1) **General High Schools** provide general education across diverse areas, which account for the major part of all types of high schools (71 percent of all upper secondary students). The college entrance rate for general high schools' students is 78 percent.

(2) **Special-purpose High Schools** accommodate only 3.8 percent of all upper secondary students and aim to provide professional education and/or training in specialized areas. They can be divided into multiple specialty tracks such as science, foreign languages, sports, and so on. Students are selected through a competition, based on transcripts, teacher recommendations, interviews, performance examination results, evaluations that assess students' self-directed academic skills, and so on. The college

entrance ratio for special-purpose high schools is 55.9 percent. Generally high achievers prefer to go to the special-purpose high schools, but the trends change by selection methods of university entrance.

(3) **Specialized High Schools** (16.5 percent of all upper secondary students) provide education in specialty areas through field-based experiments and experience-centered vocational education in agriculture, industry, commercial information, fishery/marine, housework/business, and so on. Students are selected based on their academic records, interviews, performances, and so on. The college entrance ratio is 35.0 percent.

(4) **Autonomous High Schools** (7.8 percent of all upper secondary students) have more autonomy in curriculum implementation compared to other schools, as well as more accountability in school management. They employ diverse and specialized educational programs. These schools can be both public and private. Students are selected based on academic records and examination scores. Private schools also involve transcripts, teacher recommendations, interviews, evaluations, and so on. The college entrance ratio for autonomous high schools is 74.9 percent.

Assessments and Tests

At primary school, based on the school curriculum, teachers perform constant assessment/process-based performance evaluations using writing assessments, essays, portfolios, self-assessments, and peer assessments. Students' achievements are recorded based on their performance, and there are no standard tests. The guides of filling in student records are distributed by the local office of education according to the directory of the Ministry of Education (MOE) and 'Elementary and Secondary Education Act'. The guideline emphasizes cumulated record of students' development and learning processes, and summative grades are not provided. So, it acts as a helpful mirror for students' learning. Mainly students' abilities by the subjects and general development are recorded. Recently, teachers can get help by using software to describe every student's development and learning processes by all aspects.

Box 6.1. Example of student record

Creative experience activities

As a class executive during the spring semester (March 1, 2017 — August 24, 2017), he tries to solve class problems through class meetings. (Club Activity: Chorus) (48 hours) His ability to make sounds by abdominal breathing has improved. He could enjoy singing with appreciation of the beauty of the harmony and learn baritone part note correctly. (Volunteer activity) He visited and served for a service organization (OO center) once a month. Through volunteer activities for sharing with and caring for other people, he could cultivate democratic

citizenship and learn how to cooperate with neighbors. He could recognize various types of jobs and tried to find dreams that match his personality type and multiple intelligence.

Subject

Korean: At first, he wrote an ill-formed travel essay, but after tutoring he could write a travel essay as a series of articles with introductions, main points, and conclusions referring examples of textbooks. He also tried to use words correctly by making and reading his own Korean language guides based on investigation of homophony, especially some words that he and his friends' misunderstood a lot.

Mathematics: He had a low understanding of the planar figure of the cuboid, but he figured out the meaning of the planar figure by cutting and attaching the cuboid. He developed little by little in the process of changing the sketch of the cuboid into a planar figure. By the end of the unit, he was able to draw up the missing parts of the sketch and the planar figure of the incomplete cuboid. It was hard to see that the area of the rectangle could be used to measure the area of the triangle, but it became possible to learn and use the principle through continuous manipulation. He had trouble representing the decimal fraction in the form of fractions, and he did not write them well for the position of each digit in the calculation system. So, he often made mistakes during the final calculation process. However, because of his own efforts, he was more accurate and more confident in calculating.

Science: He empirically knows that when it dissolves powdered material, it will melt better when hot water is used than cold water. In addition, he could share this experience with his friends. He was able to control various non-temperature variations to manipulate the variation of temperature during the experiment. He knows the meaning of humidity and can explain the effect of humidity on our life through more than two examples. He learned how our daily lives are affected by high humidity and low humidity by searching the Internet and sharing experiences with friends. He knew that adding an alkaline solution to the acid solution would weaken the properties of the acid solution and was able to explain precisely why we spray slaked lime at the site of the leakage of hydrochloric acid.

At lower secondary school, there are midterm and end-term exams each semester. Student performances are assessed by process-based performance evaluation, essay, portfolio, self-checklist, and so on. Since 2017, an exam-free semester for 7th graders has been adapted to all middle schools nationwide. During the exam-free semester, students are encouraged to figure out their talents and vision for a career without anxiety about exams.

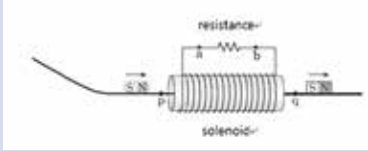
At upper secondary school, in general, students are also assessed by midterm and end-term exams. The knowledge, skills, and aptitudes of all subjects such as Korean language, mathematics, English, social studies, sciences, classical Chinese or second foreign language, and Korean history are tested. Performance assessments are emphasized even in the high schools. Students get the results of summative assessment at the end of the school year.

College admission entrance in Korea is highly competitive even though the total entrance ratio is high (69.8 percent in 2016). One of the important selection factors is the College

Scholastic Ability Test (CSAT), which assesses applicants' understanding and applying of basic concepts and ability to solve, reason, analyze, and inquire problems through given situations. It is a paper exam consisting of multiple-choice and short-answer questions, standardized and based on the national curriculum.

Box 6.2. An Example Test Item of CSAT

10. The figure shows a magnet descending along the oblique plane moving along a friction-less horizontal rail on the center axis of the solenoid. Points p and q are on the rail.



Which of the following(s) is(are) true?

a. When the magnet passes p, the induced current flows in the direction of a → resistance → b

b. The speed of the magnet is smaller at p than at q

c. When the magnet passes q, the direction of the magnetic field due to the induction current inside the solenoid is in the direction of q → p

1 a **2 b** **3 a, c** **4 b, c** **5 a, b, c**

National Achievement Tests are performed annually to support the student achievement at the basic level. The populations are the 9th graders and 11th graders. Korean language, English, and mathematics had been tested for all students up to 2016, while science and social studies are tested by random sampling. Since 2017, all National Achievement Tests are performed for randomly selected students (3 percent of the population). Korean language, English, and mathematics are emphasized in Korea because those subjects are regarded as important and crucial for entering colleges. National Achievement Tests on those subjects focused on basic academic achievement rather than practical literacy.

Learning Materials

The Korean MOE oversees the national school curriculum, as designated by the Primary and Secondary School Education Law, to ensure equal educational opportunities and maintain the quality of education. The national curriculum and regional guidelines provide flexibility to individual schools in accordance with certain characteristics and objectives of each school.

Curriculum standards form the basis for educational contents at each school and also for textbook and teachers' manuals development. Textbooks are classified into three types:

Type 1: copyrights are held by the MOE

Type 2: authorized by the MOE and published by private publishers

Type 3: recognized by the MOE as relevant and useful

For kindergartens, a collection of instructional materials for teachers has been developed as Type 1 textbooks. For primary school, the one textbook per subject rule is adopted; so, Type 1 textbooks are developed and distributed by the MOE.

Most textbooks for the lower secondary schools and most regular course textbooks, except for Korean history, are Type 2. The textbook type of Korean history has swung back and forth between Type 1 and Type 2.

School subjects at the high school are largely divided into regular subjects designed for general high schools and specialized subjects for vocational and other specialized high schools. The textbooks are largely divided into basic and advanced ones. Most regular course textbooks, except for Korean history, must be authorized by the MOE (Type 2). Most textbooks for the advanced level are developed by research organizations and universities commissioned by the MOE.

ICT Infrastructure

The National Education Information System (NEIS) is a nationwide intranet for schools to manage students' and teachers' records. Through the NEIS, students can get reports and certificates on their own education. Recently, process-oriented assessment is emphasized as are summative assessment results. So, teachers are asked to record student performance after classes. Teachers can make notes on a particular student's development and summarize them into the summative records. Parents can check their children's achievement and school records from the intranet and communicate with teachers.

All schools of Korea run their own websites (6,240,000 users) and mobile apps like School Mom or SNS (user number: 860,000) to communicate with students and parents.

There are also numerous websites to support instructions or new educational policies dissemination, such as the National Curriculum Information Center (NCIC),national educational information portal service (EDUNET), process-based performance evaluation portal service, and CareerNet. All these websites are required to meet parents' and students' needs as well as teachers' needs.

2. CURRICULUM REFORM IN KOREA

Education in Korea, based on the ideal of *Hongik Ingan*, aims to enable every citizen to lead a life worthy of human dignity, contribute to the development of a democratic state, and support the realization of an ideal of shared human prosperity, by ensuring cultivation of character and development of abilities for independent life and necessary qualities as a democratic citizen under the humanitarian ideal (MOE 2015).

Box 3. The ideal of *Hongik Ingan* (홍익인간, 弘益人間) in Korea

Hongik Ingan **was the founding spirit of the first kingdom in Korean history, 6,000 years ago. Currently, it is an important element of Korean history course.**

Hongik Ingan **means 'contributing to the overall benefit of human kind'.**

This ideal has been regarded in Korea as the vision of an educated person since 1945.

The national curriculum had been revised periodically up to the current 7th national curriculum. Since 2007, the national curriculum has been revised more frequently to reflect the newly rising demands for education, emerging needs of a changing society, and new frontiers of academic disciplines. Most of the current curriculum was revised in 2009.

After the 2009 revised curriculum was implemented, business sector and parents'/families' demands have been raised, changing the social agenda:

- Business community and society demanded new manpower for the future society: creative and integration abilities are needed to solve problems by selecting, regulating, and integrating knowledge in the new circumstances and contexts and creating new values.

- Parents/families demanded for reducing private educational expenses and high competition ratios for top-ranking universities.

By the presidential elections of 2012, politicians made suggestions and pledges to meet parents' demands and win their votes. Candidates' advisory panels included education policy makers, opinion leaders, professors, and so on. One of pledges was to develop students' dreams and potential, which would be the direction of educational policy after 2012 and new curriculum revision.

In February 2012, the new government formed, initiating the committee for education reform and the committee for general guidelines of the revised curriculum.

In September 2014, the Tentative General Guideline was announced, providing such general directions of curriculum as integration in tracks, liberal arts, and natural science. After that, the committees for all disciplines were launched.

In December 2015, the new revised curriculum had been submitted by the MOE. Its implementation started in March 2017 (1st and 2nd grades and the exam-free semester for 7th grade) and continued in March 2018 (7th grade). The full implementation of the 2015 revised curriculum is planned for 2019.

The implementation campaign included the announcement in the official newspaper and at websites (MOE, NCIC, and Korean Institute of Curriculum and Evaluation [KICE]), press releases, and specialized brochures. Public hearings and townhalls have also been conducted, and a dedicated in-service teachers' training program is planned.

3. THE 2015 CURRICULUM: KEY COMPETENCES

3.1. Key Competences in General

Based on the abovementioned ideal and aims of education in Korea, the 2015 curriculum specifies the vision of an educated person:

(a) A self-directed person who builds a self-identity and explores a career and life on the basis of holistic growth

(b) A creative person who discovers something novel by means of diverse challenges and ideas based upon basic abilities

(c) A cultivated person who appreciates and promotes the culture of humankind on the basis of cultural literacies and understanding of diverse values

(d) A person who lives in harmony with others, fulfilling the ethics of caring and sharing, as a democratic citizen with a sense of community and connection to the world.

On the other hand, six key competences (see Table 6.2) are emphasized in general and integrated into all disciplines to embody the vision of an educated person in the 2015 curriculum.

Table 6.2. *Six key competences in the 2015 revised curriculum*

1. Self-management competence	To lead one's life with self-identity and confidence based on basic abilities and qualifications necessary for life and career
2. Knowledge-information processing skills	To process and utilize knowledge and information from diverse fields to solve problems in reasonable ways
3. Creative thinking skills	To discover something novel by integrating knowledge, skills, and experiences from diverse professional fields on the basis of broad foundational knowledge
4. Aesthetic-emotional competence	To find and appreciate the meanings and values of life, based on an empathetic understanding of others and cultural sensitivities.
5. Communication skills	To respectfully listen to opinions of others and effectively express one's thoughts and feelings in diverse situations.
6. Civic competence	To actively participate in improving the community with values and attitudes required to be a member of local, national, and global communities.

To implement the 2015 curriculum, a guideline was developed in collaboration with families and local communities, imposing cross-curricular themes to be incorporated into the educational program, including subject-area teachings and Creative Experiential Activities. The ten cross-curricular themes are as shown in Table 6.3.

Table 6.3. *Ten cross-curricular themes in the 2015 revised curriculum*

Safety-Health Education	Safety disaster preparation
Character Education	Traditional ethics (filial duty and respect to the elderly) Life respect
Career Education	Career exploration Leisure use
Democratic Citizenship Education	Anti-corruption The spirit of the Constitution Law and order
Human Rights Education	The dignity of man, and respect of human rights Violence prevention
Multicultural Education	Value of diversity Global citizenship, international understanding

End of table 6.3.

Unification Education	Recognize the necessity for unification[143] National identity Patriotic sprit
Dokdo **Education**	Understanding of territory Recognition of *Dokdo* as Korean territory[144]
Economy-Finance Education	Responsibility and right of consumer Entrepreneurial spirit Welfare and tax, Understanding of finance in everyday life, Intellectual property right
Environmental-Sustainability Education	Low fertility and aging society preparation Water, and energy saving Maritime education, Understanding of agriculture and rural area

In this new curriculum, the literacies as skills to use tools (capacities) are not emphasized explicitly, but they are included in subject curricula like Korean language, mathematics, and so on. Domain-based literacies are imposed as 7 of 10 cross-curricular themes, except for Unification Education and *Dokdo* Education (emphasized in the political and social context) and Career Education (specific direction to encourage the 7th grade students having their exam-free semester to find their own career interests and aptitudes).

3.2. Key Competences in Subjects

The six key competences were linked to important skills in each subject area to enhance students' key competences through natural learning process at schools. Each subject curriculum designer developed key competence in the subject in line with the six key competences in general (see Table 6.4).

1 Refers to the potential future reunification of the Democratic People's Republic of Korea, the Republic of Korea, and the Korean Demilitarized Zone under a single government.

2 *Dokdo* (also known as the Liancourt Rocks) are a group of small islets in the Sea of Japan, under control of the Republic of Korea, but also claimed by Japan (Takeshima in Japanese).

Table 6.4. *Key competences in each subject area*

Subject			Key competences in subject
Korean Language			Critical thinking, information application, interpersonal relationship, culture enjoyment, and introspection/self-improvement
Social Studies	Social studies		Creative thinking, critical thinking, problem solving and decision making, communication/corroboration skills, and information application
	History		Understanding historical facts, analyzing and interpreting historical documents, application of historical information and communication, historical decision making, problem-solving skills, and identity and mutual respect of different viewpoints
Ethics			Self-respect and managing skills, ethical thinking skills, ethical interpersonal relationship, sense of ethical community, ethical introspection and practice tendency
Mathematics			Problem-solving, inference making, creative convergence, communication, information processing, positive attitude, and practice
Science			Scientific thinking, scientific research skills, scientific problem-solving skills, scientific communication skills, scientific participation, and lifelong studying skills
Practical Course (technology home economics / information)	Technology-home economics	Home life	Practical problem-solving abilities, independent living skills, and relationship formation skills
		Technology	Technological problem-solving abilities, technical system designing skills, and ability to use technology
	Information		Information culture literacy, computing thinking skills, and cooperative problem-solving abilities
Physical education			Health management skills, physical training abilities, game performing skills, and physical expression skills
Music			Musical sensibility competence, musical creative-convergence thinking competence, musical communication competence, cultural community competence, musical information processing competence, and self-managing competence
Art			Aesthetic sensitivity, visual communication skills, ability to understand art and culture, and self-directed art learning ability

Table 6.5 shows how the key competence in science can be linked with key competences in general (Reference). As it shows, self-management and aesthetic-emotional competences were not reflected in the key competences in science.

Table 6.5. *Key competences in general and science*

	Competence in general					
	Self-management	**Knowledge-information process skills**	**Creative thinking skills**	**Aesthetic-emotional**	**Communication**	**Civic competence**
Science						
Scientific reasoning		✓	✓			
Scientific inquiry		✓	✓			
Scientific problem Solving		✓	✓			
Science Communication					✓	
Scientific involvement and lifelong learning		✓			✓	✓

Table 6.6 shows how knowledge-information skills, one of the six key competences in general, is reflected in each subject area.

Table 6.6. *Key competences in subjects related to knowledge-information skills*

Subject	Competence	Subject	Competence
Korean	• Use of data and information	**Physical**	• Physical training ability
Math	• Problem-solving	**Ethics**	• Ethical reasoning
	• Inference-making		
	• Information process		
Science	• Scientific reasoning	**Music**	• Musical information process
	• Scientific inquiry ability		
	• Scientific problem-solving		

Subject	Competence	Subject	Competence
Social studies	• Critical reasoning • Problem-solving and decision making • Use of information	**Art**	• Visual communication • Creative-convergence ability
English	• Knowledge and information processing skills	**Technology Home Economics**	• Practical problem-solving • Technological problem-solving • Technological design ability
History	• Understandings in historical fact • Analysis and interpretation of Historical data • Use of historical information and communication • Historical judgement and problem-solving	**Information**	• Information culture literacy • Computational thinking

4. KEY COMPETENCES IN CREATIVITY EXPERIENCE ACTIVITIES

4.1. Conceptual Framework for the Curriculum Implementation

Traditionally, Korea had strongly centralized its education system. This means that laws, regulations, and official documents regulated the content as well as the whole educational system. Even though the system is currently moving to a more decentralized one, the documents of the national curriculum are still legally enforced. The national guidelines for the curriculum designate teaching and learning methods, assessment, and supports as well as ways to organize and implement school curriculum. The structure of this guideline is shown in the Table 6.7.

Table 6.7. *Structure of the national guideline for elementary and secondary curriculum*

Ⅰ. Vision of the National Curriculum	1. Vision of an Educated Person
	2. Principles of Curriculum Design
	3. Educational Goals for Elementary and Secondary Schools
Ⅱ. Standards for Curriculum Organization and Implementation by School Levels	1. Basic Guidelines
	2. Elementary School
	3. Middle School
	4. High School
	5. Curriculum Organization and Implementation for Non-regular Schools
Ⅲ. Organization and Implementation of School Curriculum	1. Basic Guidelines
	2. Teaching and Learning
	3. Assessments
	4. Equal Opportunities for All Students
Ⅳ. Support for School Curriculum	1. Support from the Central Government
	2. Support from the Metropolitan and Provincial Offices of Education (MPOE)

To supplement the curriculum documents, the MOE also develops and disseminates 'the guideline for organization and management of municipal level curriculum' and 'National Standard for Evaluation'. These documents do not have a legal power as does the national curriculum, but they provide details for practice.

Municipal offices of education and schools develop lower-level documents in turns as shown in Figure 6.2. As of 2016, the municipal offices of education comprise 17 MPOEs and 176 District Offices of Education. Textbook publishers and authors are supposed to follow the above documents to pass through the deliberation.

Figure 6.2. *Roles and responsibilities for the curriculum implementation*

5. CURRICULUM TRANSLATION INTO PRACTICAL MATTERS

(a) Educational Standards

Each subject curriculum provides achievement standards. In the past, such standards were related more to the subject knowledge than to key competences. Achievement standards related to the six key competences are developed by research institutes like KICE with evaluation standards and examples of assessment items. The MOE formed a committee to examine the standards and decided to adopt them.

New standards distribution is provided through an in-service teachers' training program and uploading materials to websites and other channels of communication. (See Table 6.8 for an example)

Table 6.8. *An example of achievement standards for science (7th grade)*

Achievement standard (2015 revised curriculum) *A combination of numbers and alphabets that represent individual achievement standard	▸ Force • [9Sci02–01]* Know that weight is magnitude of gravitational force, and compare mass and weight • [9Sci02–02] Investigate examples of using elasticity in everyday context and explain the characteristic of elastic • [9Sci02–03] Know friction force as a force which interfere with the movement of an object and compare the magnitude of frictional forces through ramp experiments • [9Sci02–04] Know buoyancy acts on an object in gases or liquid and measure the magnitude of buoyancy using a spring balance

(b) Teaching Techniques and Guidelines

In the curriculum of each subject, teaching techniques and guidelines were mentioned as 'Directions of Teaching, Learning and Evaluation'. An example of such directions for science is in Box 6.4.

Box 6.4. The directions of teaching, learning, and evaluation in the science curriculum

Direction of teaching and learning

'Science' should be taught to cultivate the core scientific concepts as well as the scientific key competences: scientific reasoning, scientific inquiry ability, scientific problem-solving, scientific communication, involvement in socio-scientific issues, and lifelong learning ability through inquiry learning. The following should be emphasized:

…

3) **Student-centered instructions** are provided by using various teaching-learning methods such as lecture, experiments, discussion, investigation, projects, and out-of-school activities like visiting a science center.

4) **Basic investigation skills** (observation, classification, measurement, expectation, inference, communication, and so on) and the investigation (problem recognition, hypothesis establishment, variable control, data interpretation, concluding, generalization, and so on), mathematical reasoning and using computer, modeling, evidence-based discussion, and argumentation should be taught with relevance to contents.

…

6) **By encouraging cooperative learning of small group investigations**, the importance of cooperation for scientific investigation should be recognized.

…

14) Student-centered inquiries **should be encouraged rather than teacher-centered experiments**

Direction of Assessment

In science, core concepts, key competences through scientific inquiry learning, and scientific aptitudes are evaluated in a balanced way. The following should be emphasized.

(a) Ability to understand and apply core concepts of science.

(b) **Scientific key competences.** Scientific reasoning, scientific inquiry ability, scientific problem-solving, scientific communication, involvement, and lifelong learning.

(c) Interest and values in science, active involvement in science learning, **cooperation**, attitude of solving problems scientifically, and creativity.

(d) Variety of assessment methods. Multiple choice, free responses and essays, observation, reports, performance, interview, and portfolio.

(e) To develop and use actively materials and contexts to help cultivate creative-infusion, problem-solving ability, personality, and aesthetic emotion.

(f) **Group assessment** as well as individual assessment can be used to evaluate students' cooperative mind.

(g) Teachers develop assessment tools as far as possible to get high validity and reliability.

(h) Evaluation should be performed on the basis of achievement standards and the results should be fed back on lesson plans, instructional methods revision, and career education.

(i) The process of evaluation should follow the process of plan, development of test items and tools, performance, results, and use of results.

(c) Textbooks

For primary schools, the textbook is Type 1, government-published. The MOE selects author groups and forms an Inquiry Committee to decide whether the textbooks reflect the national curriculum and asks to revise the textbook to meet standards, if needed.

Secondary schools' textbooks are government-authorized. The Inquiry Committee decides whether the textbooks reflect the national curriculum. If a textbook does not meet the standard, it is not authorized and not to be published.

New textbooks will be applied to 7th grade from 2018. Each discipline's key competences are integrated with core concepts and activities. For example, the new 7th grade science textbook that will be available from 2018 fosters scientific key competences through various inquiry activities and materials (see Figure 6.3 and Figure 6.4).

Figure 6.3. *An inquiry activity in the new 7th grade science textbook of the 2015 revised curriculum*

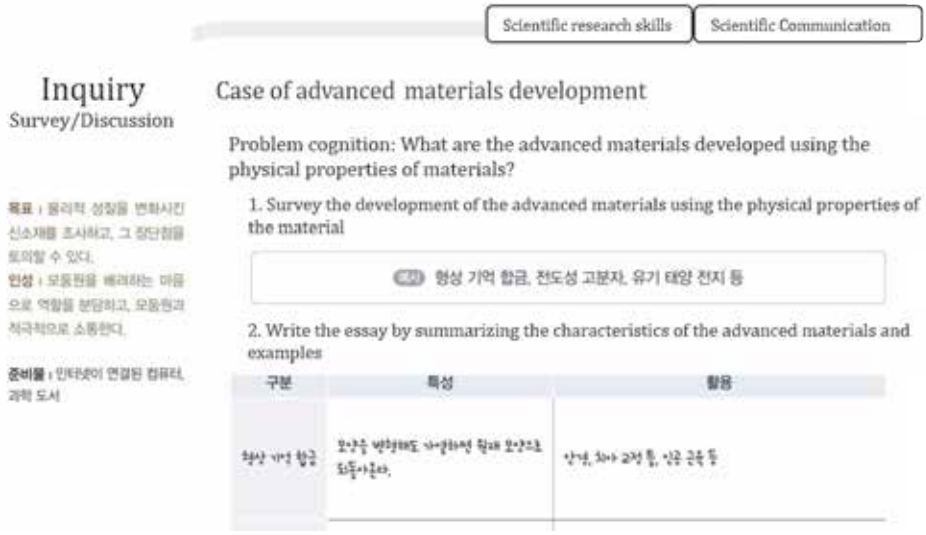


Figure 6.4. *An inquiry material in the new 7th grade science textbook of the 2015 revised curriculum*

(d) National Curriculum Information Center

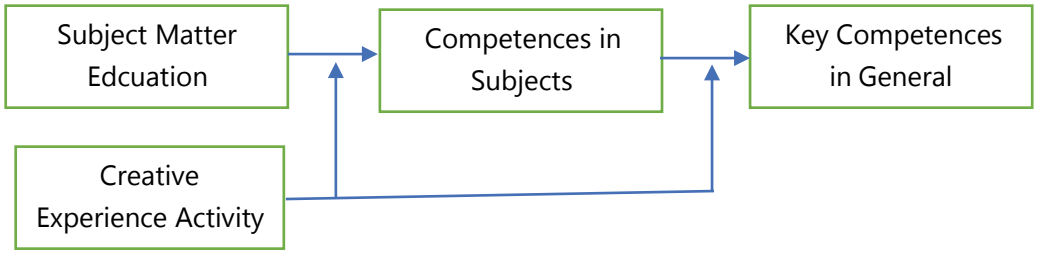
The NCIC (www.ncic.re.kr) is an information sharing system on Korean national curriculums, administered by KICE.

6. KEY COMPETENCES INTEGRATION INTO SCHOOL ACTIVITIES

(e) Competence-based Activities

In addition to subject matter education, new activities dealing with key competences (creative experiential activities [CEAs], school sports club activities [SSCAs], and exam-free semester) are implemented at schools. Figure 6.5 shows how to cultivate the competences in schools.

Figure 6.5. *Cultivating competences in schools (KICE 2017)*



CEAs are designed to develop students' talent and potential and to nurture a sense of community. The 10 cross-curricular themes should be incorporated into the entire educational program and delivered in collaboration with families and local communities. CEAs include

- Discretionary activities,
- Club activities,
- Community services, and
- Career-related activities.

Schools can selectively organize and implement CEAs by focusing on different areas, considering the degree of students' development, school circumstances, and other factors.

Schools develop and use school-based assessment standards, considering CEA contents and characteristics. Features of CEAs vary by grades, as shown in Table 6.9.

Table 6.9. *CEAs, by grade*

Grade	Time allocation, hours	Features
1–2	336	Safe Life (safety) as part of CEAs (64 hours)
3–9	714 (average 102 per year)	In grades 7–9, CEAs may be connected to SSCAs and/or diverse activities offered during the exam-free semester
10–12	408 (average 136 per year)	High schools also organize and implement CEAs to provide diverse experiences related to students' career plans

SSCAs were organized and implemented in middle schools (grades 7–9) to cultivate a balanced development of mind and body and to promote socio-emotional skills. The term 'balance of mind and body' as used here refers to the whole personal education approach which emphasizes not only knowledge-intensive education but also character building and physical education. This educational approach is rooted in the concept of *Hongik Ingan*, which is the basic element in Korean education. SSCA is a part of CEAs. Schools need to allocate 34–68 hours per year (total 136 hours in three years) for SSCAs. Schools allocating 68 hours per year may substitute up to 34 hours of physical education. The hours for SSCAs should be acquired by reducing the disciplinary instructional hours by up to 20 percent or by increasing the instructional hours of CEAs. However, if this is not possible, schools may use for SSCA up to 68 hours allocated for CEAs. Schools should consider students' interests in determining SSCA types and contents; yet, they must open two or more courses to ensure students' right of choice.

An **exam-free semester** is implemented for middle schools to help students develop self-directed learning skills and attitudes by exploring their aptitudes and career plans. During this semester, subjects and CEAs are to be organized in accordance with its aims. Schools should find resources inside and outside the school, including collaboration with local communities, to offer experience-based activities such as

- Career-exploration activities,
- Selective theme activities,
- Club activities, and
- Arts/physical activities.

Assessments during the exam-free semester are also focused on the process of learning to foster students' growth, and to avoid the use of standardized, paper-based midterm and

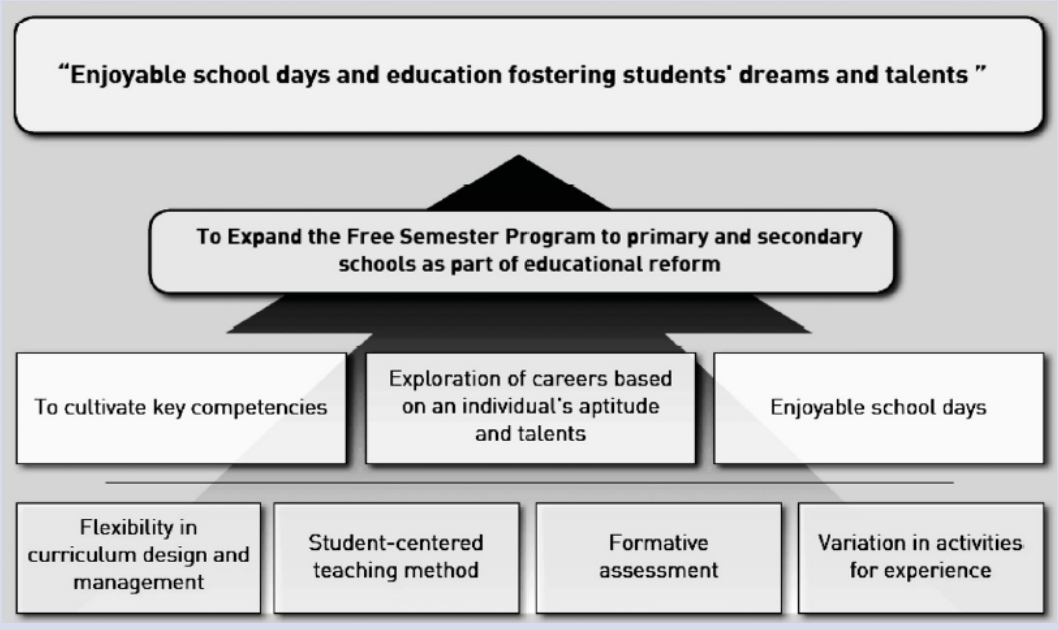
final tests. The exam-free semester is expected to promote students' participatory learning such as collaborative learning, discussions and debate learning, project-based learning, and so on.

The MOE administers the website (www.ggoomggi.go.kr/) to support the exam-free semester.

Box 6.5. Exam-free semester

What is the free-semester program?

1. **The vision of the free semester program**



2. **Objectives and practices**

   (a) Objectives

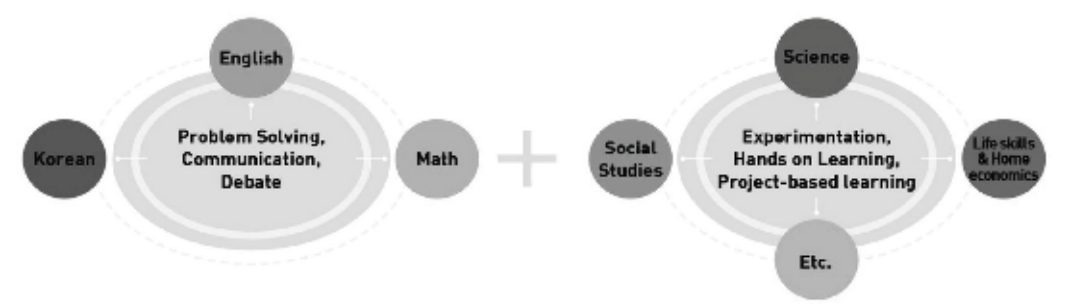
   - To reduce academic pressure on students
   - To enable students to enjoy school activities
   - To allow students to pursue their dreams and talents
   - To foster future capabilities (for example, creativity, character, and self-directed learning capacity)

(b) Practices

- 1 single semester during 1st–2nd academic year in middle school
- No midterm or final examinations (excluded from grade point average calculation period)
- Student participation-based courses (for example, discussions and field activities)
- Variety of electives (for example, subject-based, arts and physical education, club activities, and career exploration)

3. **Curriculum of the free semester program**

(a) Common curriculum (subject)



Teaching and Learning Method	Curriculum Organization	Assessment
- To encourage students' participation through various activities - To increase integrative teaching and linkages between subjects - To strengthen co-teaching and co-learning, and cooperative learning	- To maximize flexibility in organizing and operating curriculum - To reconstruct curriculum based on core-achievement standard	- No examination (Not reflected on high school entrance records) - Record student learning outcomes focusing on 'student's activity performance related to dreams and talents'.

(b) Flexible curriculum (activities)

(i) Career exploration activities

— Systemic career education to allow students to explore career options based on their aptitude and talents

— The 'career and occupation' class is delivered along with the 'remote video mentoring' program to set career goals

(ii) Art and sports education activities

- Art and sports education is operated to bring out students' talents and potential
- Provide the 'Dreams and Talents' program in which students participate in three art programs
- Provide 15 different art and physical education activities such as musical production, cheerleading, and table tennis during one semester. Students participate in a '5-week art program' and a '5-week sports program' in school, with a '5-week after-school program'.

(iii) Club activities

- Survey students' preferences and open clubs based on the results.
- Students join clubs based on their personal interests.
- Sample: Reflect on the characteristics of a student's career by using a career development test. With the results of the test, set up 11 clubs (for example, writing a career-search book and integrating English and history) and coordinate an 8-day 'Free Semester Club festival' where students present their findings.

(iv) Elective activities

- Survey students' prefernces, and develope 5–17-week programs based on results.
- Sample: Provide 2 hours of 3-D printer modeling practice every Wednesday and Thursday during one semester. This encouraged those who want to become scientists by using the 3-D printer to make a lamp with recyclable materials.

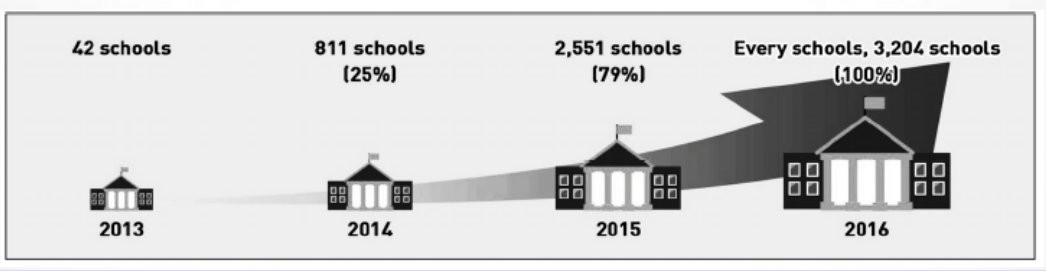
(v) An example of school time table of exam-free semester

<table>
<tr><th>Day / Hour</th><th>Mon</th><th>Tues</th><th>Wed</th><th>Thur</th><th>Fri</th></tr>
<tr><td>1</td><td colspan="5" rowspan="4">subject(22 hours)
· Curriculum. Core achievement standard</td></tr>
<tr><td>2</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td><td rowspan="3">Career</td><td rowspan="3">Elective activities</td><td rowspan="2">Club activities</td><td rowspan="3">Art and sports</td><td rowspan="3">Career</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td><td></td></tr>
</table>

* Career exploration 5 + Elective activities 2 + Club activities 2 + Art and Sports 3 = 12 hours

4. **The expansion of the free semester program**

   - Progressive expansion plans
   - Rapid rate of expansion due to high demands from the actual classrooms



5. **Assessment in exam-free semester: Basic direction of exam-free semester assessment (MOE 2015)**

   (a) Conduct a process-oriented evaluation to support student learning and growth instead of midterm and final examinations.

   (b) Implement and formulate self-reflection evaluations to evaluate students' achievement level according to core achievement standards by subject.

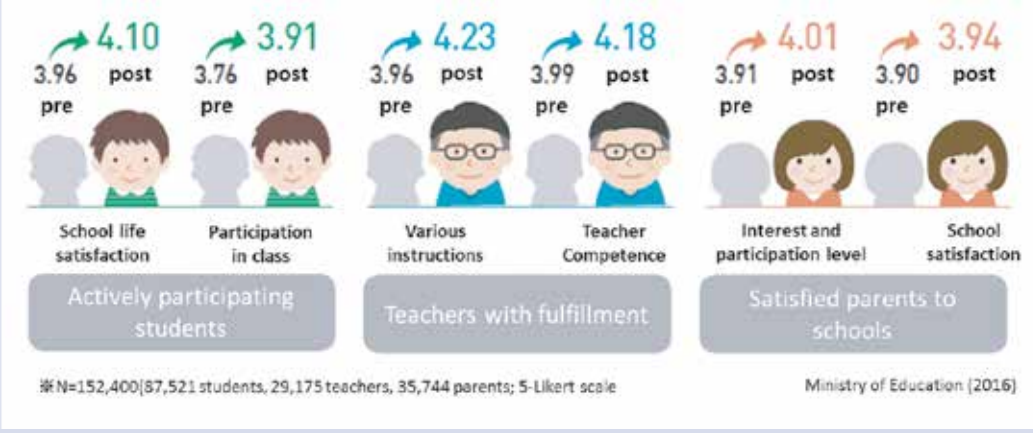
   (c) Described in the school record by focusing on student's activities, achievement, participation, and attitude.

   (d) Assessments during the exam-free semester are also focused on the process of learning to foster students' growth and to avoid the use of standardized, paper-based midterm and final tests.

   (e) Assessment principle and guidance for evaluating key competences included in the 2015 curriculum have been provided, but no standardized testing tools are available yet.

   (f) Currently, the government is supporting key competence evaluation in schools through various ways such as distributing key competence-based activities and assessment case books

6. **Major achievement of exam-free semester**



Based on the effectiveness of the exam-free semester and the high level of satisfaction of students, teachers, and parents, it was fully implemented in 2017 since it was piloted at 42 research schools in May 2013.

7. CULTIVATING KEY COMPETENCES IN INFORMAL EDUCATION

Key competences are also emphasized and implemented in Korea's informal education. Specifically, key competences evolve in such youth activities as after-school program, Boy Scouts, and Girl Scouts. An example of key competences in Korean informal education can be understood in terms of the Youth Policy Basic Plan. Such a plan is to be established for every five years to support youth's healthy growth, in accordance with the Youth Act. The 5th Youth Policy Basic Plan (2013–2017) highlights strengthening youth's competences. Its subareas include

(a) Activating youth competence promotion activities,

(b) Strengthening global/multicultural competences, and

(c) Strengthening personality and civic education.

According to this plan, Korea's administrative agencies and municipalities provide activities and create environment to enhance youth's competences (see examples in Table 6.10).

Table 6.10. *Examples of youth competence enhancement activities by city*

City	Title	Contents
Seoul	Strengthen creativity competence through experience programs and municipal participation	Activating of visiting 'Surprising Saturday' program
		Organization and operation of youth council
		Finding youth policy through holding a meeting for hope for children and adolescents
Sejong	Strengthening various competences of youth	A-reum youth training center erection
		Youth career experience card support program
		Youth overseas volunteer exchange support program
		Development and dissemination of youth personality education program
		Activating of peer counseling

End of table 6.10.

City	Title	Contents
Gwangju	Strengthening various competences of youth	Extension and maintenance support for youth space Activating of various activities for youth
Daegu	Strengthening various competences of youth	'Education sharing in our village' program Youth career experience support activity support program 'Youth adventure' management Youth creative-personality activity program Youth international exchange program, 'Friendship project'

8. KEY COMPETENCES IN SPECIAL EDUCATION

The revision of the 2015 curriculum has made a significant change in the educational paradigm not only for general, but also for special education. Korean special education is aiming at inclusive education for students with disabilities as it is prescribed by Article 21 of the Special Education Law for people with disabilities.

The 2015 revised special education curriculum focuses on fostering creative-convergence students with the emphasis on righteous personality by cultivating key competences based on the educational ideology and good citizenship. It adopted and emphasized six key competences and one literacy area for students with disabilities:

1. Humanity, society, and science/technology related to literacy should be harmoniously cultivated, and selective learning should be strengthened according to student's aptitude and career goals.

2. The quality of learning should be improved by structuring and restructuring learning contents and optimizing the atmosphere of learning-centered on the key concepts of the subject.

3. Self-directed learning should be encouraged and experienced by implementing various student class participation according to each subject.

4. Assessments of learning processes should be strengthened for students to reflect their own learning, and evaluation results are to be seriously considered to improve the quality of teaching and learning.

5. The consistency of the curriculum objectives, contents, teaching/learning, and evaluation should be strengthened.

6. Specialized high schools and special education high schools should use National Competency Standards (NCS) to cultivate basic competences and job skills required by the demands of the social industry.

7. Individual students' competence should be strengthened by emphasizing individualized education for students with disabilities for their unique educational needs.

Over 70 percent of students with disabilities in Korea are placed in special or inclusive classes in general schools, while others study in special schools. The general curriculum is prioritized; yet, special education curriculum and modifications are to be applied whenever necessary to meet individual students' needs.

9. KEY COMPETENCES ASSESSMENT IN KOREA

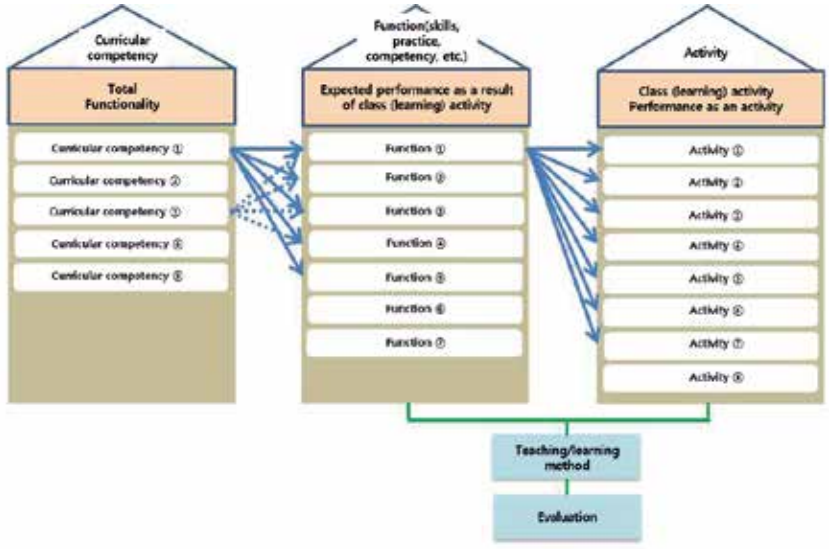
(f) Assessment Principles in the 2015 Curriculum

The main high-stake examination in Korea — CSAT — is performed for those who have already graduated from schools. There is no nationwide assessment of school children; only sample tests are performed.

The 2015 revised curriculum is being applied now, and its assessment approach is still in progress. To assess the quality of the curriculum at the national level, a set of achievement standards has been developed and distributed to meet three objectives for evaluation:

(a) **To reflect curricular competences**. The concept of function has been proposed for the achievement evaluation. By combining the key competences with content elements of each subject (curricular competences), the achievement standards reflecting key competences have been emphasized (see Figure 6.6).

Figure 6.6. *Teaching/learning methods and evaluation framework of the 2015 revised curriculum*



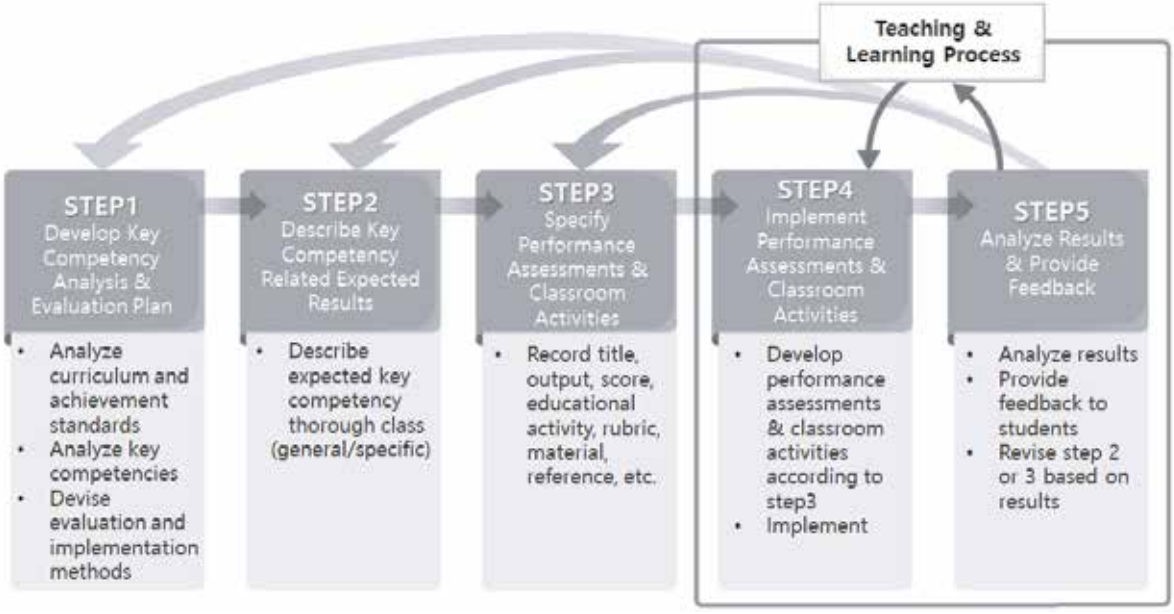
Source: *MOE et al. (2015, 26).*

(b) **To promote students' participation.** 20 percent of standard time should be secured for teachers to improve instructional methods/lectures and to deliver improved lesson plans to reinforce creative convergence/key competences in classrooms. A variety of assessments facilitating student participation and learning activities is also required.

(c) **To utilize a variety of evaluation methods.** Key competences should be measured with formal and informal evaluation within the learning context instead of implementing standardized measurements. To do this, various evaluation methods are to be enforced rather than traditional paper-based evaluation.

The evaluation principle mentioned can be further elaborated as follows. It is important to state the actions or performances of students who reveal key competence-related factors and to evaluate them with the various tasks and methods that can lead students to learn. The more specific classroom assessment steps will be explained with specific examples here (Lee, Koo, and Lee, 2016).

Figure 6.7. *Recommended classroom evaluation steps*



As shown in Figure 6.7, in Step 1, the teacher is asked to clearly grasp the meaning and evaluation factors of key competences to be evaluated and analyze the relevant curriculum achievement standards. Table 6.11 shows the examples of achievement standard and key competences evaluating factors that are derived from the Korean language curriculum analysis.

Table 6.11. *An example of communicative and community competence evaluation criteria for Korean language achievement standards*

Achievement standard (2015 revised curriculum)	▸ Listening/speaking • [9K01–04][a] Communicate at a discussion and resolve the problem reasonably. • [9K01–06] Speak with the consideration of the audience's interests and needs. • [9K01–08] Give an organized presentation which can deliver key information. • [9K01–10] Determine the validity of the information as the student listens. • [9K01–11] Determine the effectiveness of media as the student listens. ▸ Reading • [9K02–03] Summarize the content of the texts considering the purpose and the nature of it. • [9K02–07] Evaluate various expressions and intentions expressed in the medium during the reading. • [9K02–08] Read texts while referring to related materials in the library or the Internet.

End of table 6.11.

	▸ Writing • [9K03–07] Write with variety of expressions to reveal the thoughts, feelings, and experiences. • [9K03–08] Expressing thoughts, feelings, and experiences in consideration of media characteristics such as video and the Internet. ▸ Grammar • [9K04–08] Understand the origins of *Hangul* (Korean alphabet). ▸ Literature • [9K05–09] Shape the valuable experience with unique ideas and expressions.		
Key competences	Communication skill	K-I-2[b]	Understand genre and language customs.
		K-I-3	Understand various media and media data.
		K-II-2	Understand the purpose of communication.
		S-I-1	Understand the key contents.
		S-I-2	Infer intention, purpose, and contents.
		S-I-3	Show critical, reflective acceptance.
		S-II-2	Communicate and share information
		S-III-3	Check and adjust communication contents.
		S-III-2	Check and adjust communication process.
		V/A-I-1	Listen, with sympathy.
		V/A-II-1	Show confidence in communication.
		V/A-III-1	Accept communication results and willingness to practice.
	Civic Competence	I-S-1	Show community value seeking and willingness to practice.
		I-V/A-1	Show identity and belonging.
		II-K-1	Understand the problems of the community.
		II-S-1	Explore the causes of community problems and solutions.
		II-S-2	Participate in the community problem-solving process.

Note: a. A combination of numbers and alphabets that represent individual achievement standard; b. A combination of numbers and alphabets that represent each key competence evaluating factor.

In Step 2, the teacher describes the expected results when the student is equipped with the key competences identified in Step 1 during the lessons. It is also necessary to incorporate the key competences evaluation criteria with curriculum achievement standards at this time. In Step 3, the details of how to organize the tasks in the performance assessment and the classroom activities are summarized. This procedure can take the form of Table6.12.

Table 6.12. *An example of Korean language tasks and evaluation methods*

Session	Achievement standard	Evaluating factor	Tasks	Outputs	Evaluating methods
1	[9K01–06] [9K02–03] [9K02–08] [9K04–08]	K-I-2 I-V/A-1 S-I-2 S-I-3	1. Understand the origins and excellence of *Hangul* • Group discussion after watching a video • Record in worksheet 2. Research and organize data • Materials supporting the excellence of *Hangul* • Materials that show the actual conditions and problems of using *Hangul* • Organize the used materials	▸ Worksheet 1 • The origins of *Hangul* • The excellence of *Hangul* • Personal thoughts on the value of *Hangul* • Find a case of feeling identity and belonging as a Korean ▸ Data collection • Attach the researched data ▸ Worksheet 2 • Organize the data contents	▸ Self-evaluation ▸ Teacher evaluation ▸ Evaluation of outputs

The teacher who is ready to move on to the next step can implement activities and evaluation in line with the plan and collect data from students.

In the final step, the teacher will evaluate students to determine if they show expected characteristics of key competences and provide feedback on the results. If needed, the teacher can provide new assignments or conduct assessments to improve students' key competences.

Finally, a table summarizing the necessary considerations in each of the evaluation steps is presented as in Box 6.6.

Box 6.6. Specific considerations for each step of key competence classroom evaluation

1. **Develop key competency analysis and evaluation plan**
   - **What are the key competences that can be cultivated through this achievement standard?**

2. **Describe key competency related expected results**
    - What are the characteristics of the key competences associated with these achievement standards?
    - What can a student who achieves this achievement standard do?
3. **Specify performance assessments and classroom activities**
    - What tasks will you use to assess students' 'performance'?
    - How will the class activities be structured?
    - What are the outputs of each activity step?
    - How will each output be evaluated?
    - How will the results be reported and recorded?
4. **Implement performance assessments and classroom activities**
    - Is the activity in line with the plan?
5. **Analyze result and provide feedback**
    - What are the characteristics of the student who achieves the expected results?
    - What is lacking for students who have not achieved the expected results?
    - Where and how to record?
    - How will you modify your future goals and expectations?

(g) Existing Key Competence Assessment Practices in Korea

The assessment principle and guidance for evaluating key competences included in the 2015 curriculum have been provided, but no standardized testing tools are available yet. Currently, the government is supporting key competence evaluation in schools through various ways such as distributing key competence-based activities and assessment case books shown in Figure 6.8.

Figure 6.8. *Examples of key competence-based activities and evaluation casebook for exam-free semester*

There are no standardized tests officially developed and distributed in the country, but key competence-related measurements have been developed in the private sector. Kim (2015) developed a standardized measurement, Key Competence Test for Children and Adolescents, with the support of Korea Guidance Testing Company. This test was designed for providing comprehensive information by understanding the level of cognitive and personality competence development of middle school students. The test has been used to evaluate the effectiveness of the exam-free semester. It consists of two parts: key personality competence test and key cognitive competence test (see Table 6.13).

Table 6.13. *Overview of Key Competence Test for Children and Adolescents*

Configuration of the test		Time	Number of items	Items by area	
1	How to use	5 minutes	—	—	
	Key cognitive competence test	28 minutes	75	Language	35 items (8minutes)
				Logical mathematics	20 items (10minutes)
				Space	20 items (10minutes)
2	Key personality competence test	12 minutes	81	Individual personality competence (vision, self-initiative, and emotional stability)	24 items
				Individual personality competence (communication, conflict resolution, social sensitivity, civic communication, decision making, and social leadership)	24 items
				Learning competence (learning motivation, self-esteem, cognitive-metacognitive strategy, and resource management strategy)	32 items
				Sincerity of response	1 item
Total		**45 minutes**	**156 items**		

Such competence assessment framework has been established at the national level and district level. However, schools vary in implementing their own assessment tools and methods. Further discussion and studies are required.

10. TEACHERS' TRAINING IN KOREA

(h) Preservice Teachers' Training

The teachers' qualification standards and preparation programs are overseen by the MOE. Elementary school teachers are exclusively educated at four-year national education universities and departments of primary education in two specific universities. There are 11 national education universities in Korea. Secondary school teachers are trained at four-year colleges of education or two-year graduate schools of education. After the four-year training, preservice teachers can get the second degree teacher's license as well as bachelor's degree. A secondary teacher certificate can be issued as a master's degree by graduate schools (at least 42 credits of major subjects and 20 credits of pedagogy subjects).

Preservice elementary school teachers take courses in all subjects to be taught in elementary school as well as courses in general education. There are 31 credits of general education courses and 103 credits of special major courses, including content knowledge (for example, Korean language, mathematics, and music) and pedagogical content knowledge.

Secondary school teachers teach their own specific disciplines. The preservice teacher training curriculum requires a minimum of 130 credits consisting of general courses (20 percent), specialized major courses (60 percent), and electives (20 percent).

Apprenticeship is mainly done by one-month-long teaching practicum, one-week class observation, and two credits of educational voluntary activities.

Competences are regarded important in the 2015 revised national curriculum. Any specific regulations related to competences in the curriculum for preservice teachers have not been launched. Focus on competences is expected to be included in the evaluation criteria for teacher training institutions in 2019. Development of evaluation criteria is still ongoing. Customarily, the importance of subject competences is emphasized in teaching methods and curriculum classes in each subject area. The practice of competences is partly done in many different classes, such as methods and curriculum classes.

(i) In-service Teachers' Training

Generally, teachers are required to attend at least 60 hours of continuing professional development (CPD) a year. There are three types of in-service teacher education, led by the MOE and specialized education institutions under the provincial offices of education:

(a) **'Education for Certificates'** is a program for principal qualification, vice principal qualification, a head teacher qualification, and first-class regular teacher qualifications.

(b) **'Professional Job Education'** is the core of in-service training, led by specialized institutions. It is carried out to cultivate the various abilities necessary for job performance by qualifications and job types.

(c) **'Other Education'** is based on the teacher community. Teachers can share their teaching and classroom management skills for professional development. The forms of in-service programs are consulting, self-supervision, and other various forms depending on school conditions and circumstances.

The results of teachers' attendance in CPD are reflected in the school evaluation and teacher evaluation. Teachers can get certificates or credit, which can enhance their promotion and wage prospects: the MOE recommends supporting US$220 a year to teachers attending CPD.

(j) Teachers' Key Competence Assessment

Key competences in the 2015 National Curriculum have not yet been actualized in the current preservice teacher education. Thus, preservice teachers' ability to develop key competences has not been formally assessed. The MOE plans to develop and implement the teachers' education and evaluation policy based on the 2015 National Curriculum. Research is being conducted to identify and develop the necessary details for their key competence assessment.

After four years of teachers' education, students can get certificates, but it does not guarantee employment. Teachers are recruited through the National Teacher Employment Test (NTET), which includes a government-supervised national test and a regionally based test.

Several subject areas have prepared national competence standards for in-service teachers. For example, the physical education teachers' competence standard, developed in 2008 and revised in 2016, consists of nine domains:

(a) Teacher's character

(b) Understanding students

(c) Subject knowledge

(d) Curriculum development and implementation

(e) Planning and management of physical education instruction

(f) Monitoring and evaluation of learning

(g) Program design, implementation, and evaluation

(h) Understanding and implementation of physical education policy

(i) Development of cooperative relationship with other teachers and professionalism

Each domain includes three specific competences, so the total of 27 competences are regarded as necessary for physical education teachers. However, this standard has not been fully implemented in the actual teacher selection practice yet.

11. BEST PRACTICES IN NEW CURRICULUM AGENDA IMPLEMENTATION

(k) Competence-based Subject Matter Education: Physical Education

In 2018, the introduction of new textbooks reflecting the 2015 key competence-based curriculum begins (see Figure 6.9).

Figure 6.9. *New physical education textbooks for the 2015 National Curriculum*

Elementary physical education textbook

Secondary physical education textbook

By participating in physical activity and internalizing its value, students will develop the following four physical education specific competences:

(a) **Health management.** Promote individual's physical, mental, social, and environmental health.

(b) **Physical training.** Achieve new goals through sustained and active efforts while understanding and accepting their physical level.

(c) **Game performance.** Interact to achieve personal or collective goals by exercising appropriate strategies and functions in a competitive environment.

(d) **Physical expression.** Express and accept thoughts and feelings through the body and movement.

(l) Case 1. Seonyoo Middle School

School physical education programs have been promoted in Korea for its potential for character development in the last several years. Seonyoo Middle School located in Seoul has led this movement from the beginning.

Various new sports, such as Netball, Kin-Ball, and Futsal, are introduced for school children. Other ball games such as soccer, basketball, and volleyball are also provided. More than one-third of students are members of 13 sport clubs. Such sport clubs are integrated with regular physical education classes and Saturday Sports Day program.

As a result, from students' participation in sport clubs, several key competences are being developed, such as health care ability and interpersonal skills. In addition, the fitness test level increased from 41.6 percent in 2010 to 62.3 percent in 2014, while students' violent behaviors decreased from 6 in 2011 to 1 in 2014.

Exam-free Semester: Physical Education

The free-semester initiative allows students to participate in various activities such as watching documentaries, discussing issues, visiting sport industrial factories and companies, and listening to athletes' lectures, as well as playing sports. Students can be free from the academic works and tests during one semester of the first year in middle school.

(m) Case 2. Bundang Middle School

The free semester program in Bundang Middle School has been developed around the theme of careers in physical education, with a variety of diverse in-class and outdoor activities. It consists of physical activities, career-related activities, and humanities-based experiences, such as sport paintings, sport poems, and sport music. The program is based on the model of Humanitas-Oriented Physical Education (HOPE).

The main purposes of this program is to give students basic understanding of careers in physical education and to cultivate sport literacy. Students get an initial understanding on

10 sport careers, including sport agent, exercise specialist, sport journalist, sport manufacturer, sport retailer, sport team supervisor, and physical education teacher. These experiences are contributing to the development of each student's sport literacy, with which they can enjoy sport in various ways.

Students participating in this program improve their knowledge of sport-related jobs, sport cultural understanding, and love of physical activity. It consists of various indirect activities such as watching, drawing, writing, visiting, listening, and talking, not exclusively of physical activities.

12. MAJOR/TYPICAL ISSUES AND CHALLENGES IN IMPLEMENTING THE NEW CURRICULUM

(n) From General to Subjects? or from Subject to General?

The relationship between Korea general competences and subject competences has not been clearly identified. In Korea, key competences in general have been developed at first and then reflected to competences in subjects. Through that way, some specific aspects of subjects cannot be included in general competences. For example, practical aspects, such as doing experiments, regarded as crucial in science subjects are missing in the general competences. In the worst case, general competences and subject competences seemed to be going their ways separately. Recently, subject education researchers are looking into competences in subjects from the view of subjects and are exploring the possibility of extracting common competences among subjects.

A new type of literacy originated from physical education and sport is worthy of consideration. For example, Margaret Whitehead (2000; 2010) defined physical literacy as follows:

> *"Physical literacy is the motivation, confidence, physical competence, knowledge, and understanding to value and take responsibility for engagement in physical activities for life."*
> (Margaret Whitehead 2000; 2010)

The importance of physical literacy is being recognized as an integral concept for balanced development in physical, intellectual, and moral aspects of students with the physical dimension being the axis of the development as follows.

- **Motivation and confidence (affective).** Motivation and confidence refers to an individual's enthusiasm for, enjoyment of, and self-assurance in adopting physical activity as an integral part of life.

- **Physical competence (physical).** Physical competence refers to an individual's ability to develop movement skills and patterns and the capacity to experience a variety of movement intensities and durations. Enhanced physical competence enables an individual to participate in a wide range of physical activities and settings.

- **Knowledge and understanding (cognitive).** Knowledge and understanding includes the ability to identify and express the essential qualities that influence movement, understand the health benefits of an active lifestyle, and appreciate appropriate safety features associated with physical activity in a variety of settings and physical environments.

- **Engagement in physical activities for life (behavioral).** Engagement in physical activities for life refers to an individual taking personal responsibility for physical literacy by freely choosing to be active on a regular basis. This involves prioritizing and sustaining involvement in a range of meaningful and personally challenging activities, as an integral part of one's lifestyle.

The way of conceptualization of competences and literacies should be reconsidered because they will affect the organization of contents in the subjects and the pedagogies necessary for teaching them. We should consider whether we can teach each competence and literacy by themselves and students will be equipping each of them. In other words, discussions on how to integrate and combine them to work together in an individual student's everyday life and work are needed.

(o) Innovation in the Methods of Teaching and Learning and Evaluation: Learnings from Research Schools and Exam-free Semester

The MOE has run 18 research schools for pilot adaptation of key competence-based curriculum from 2014. The research schools conducted their own designed curriculum for cultivating key competences and reported the results. KICE analyzed the reports and interviewed the teachers to get suggestions from the research schools. One of the main conclusion is that the key competences would be cultivated through innovations of teaching and evaluation methods.

> *"…the key competency building curriculum design method needs to actively consider characteristics of teaching and learning (student participation class, real-life problem-oriented class, cooperative and discussion focused class etc.), and evaluation methods (process-oriented performance assessment, peer- and self-assessment, assessment of affective features etc.)."* (KICE, 2017)

The above conclusion would mean that the improvement of teaching and learning methods and evaluation methods are one of the keys for implementing a competence-based curriculum.

13. INITIATIVES ABOUT TO BE LAUNCHED AND EXPECTED TO HAVE NOTICEABLE EFFECTS FOR THE CURRICULUM REFORM, DEVELOPMENT, AND IMPLEMENTATION

(p) Information Sharing System

The MOE, provincial office of education, and institutions run various websites to share information about new curriculum agenda. Documents, research reports, examples, and various teaching and learning materials are shared through the websites. Communities are activated through the websites.

Table 6.14. *Examples of information sharing system and institutions*

Web Site	Purpose	Address
NEIS	Educational administrative support system	https://www.neis.go.kr/pas_mms_nv99_001.do
NCIC	To share information of national curriculum with teachers, researchers, publishers, and the public	http://ncic.go.kr/english.index.do
Ggoomggi	Support and share information about exam free semester	http://www.ggoomggi.go.kr/page/new/page_new_main
Crezone	Support and share information about creativity experience activity	*https://www.crezone.net/*
Career Net	Career education	*https://www.career.go.kr/cnet/front/main/main.do*
Donation for Education	Link industry, research institutes, university, and so on that want to donate their resources to schools	*https://www.teachforkorea.go.kr/*

Chapter 7

FINLAND: IMPROVING PUPILS' OPPORTUNITIES FOR EXPERIENCING THE JOY OF LEARNING, FOR DEEP LEARNING, AND FOR GOOD LEARNING ACHIEVEMENT

Jarkko Hautamäki, Raisa Ahtiainen, Natalia, Gustavson, Risto Hotulainen, Sirkku Kupiainen, Marja Tamm, Helena Thuneberg, Mari-Pauliina Vainikainen

Motto. Wittgenstein on learning to look for things and learning how to ask questions. Sentence 315:

It would be as if someone were looking for some object in a room; he opens a drawer and doesn't see it there; then he closes it again, waits, and opens it once more to see if perhaps it isn't there now, and keeps on like that. He has not learned to look for things. And in the same way this pupil has not learned how to ask questions. He has not learned the game that we are trying to teach him.

Ludwig Wittgenstein: On Certainty (Uber Gewissheit)[1]

Highlights

- **A fundamental dynamic feature of Finnish education is the role of the national curriculum, renewed approximately every 10 years.**
- **Teaching and learning according to the new curricula started in August 2016. For the first time, transversal competences are described in the curriculum.**

[1] Eds. G.E.M. Anscombe and G.H. von Wright, Translated by Denis Paul and G.E.M.Anscombe. Basil Blackwell, Oxford 1969–1975.

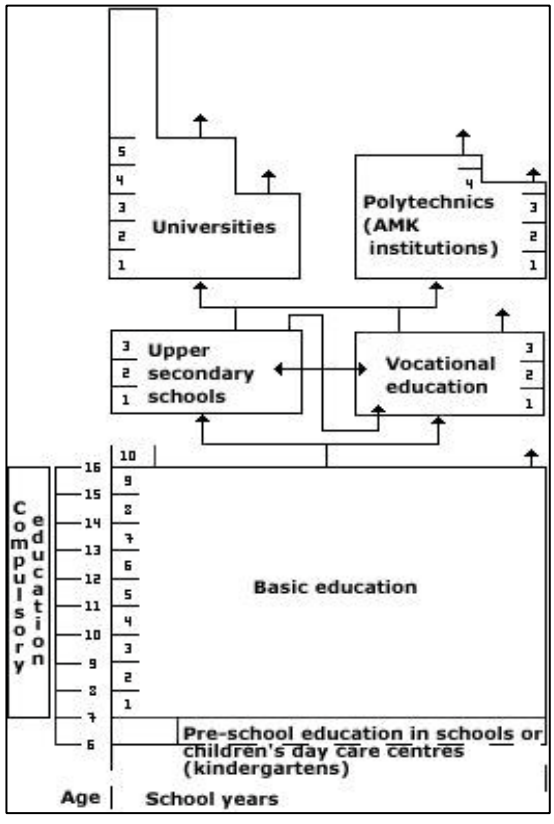
- **Transversal competences are seen to relate to the personally experienced meaningfulness of learning and the integration of different school subjects.**

- **Transversal competences are to be promoted in teaching and learning in every school subject and in multidisciplinary learning modules (MLMs).**

1. A GENERAL DESCRIPTION OF THE EDUCATION SYSTEM

Finnish education (Figure 7.1) for children under 16 is made up of a nine-year comprehensive basic education preceded by one year of preprimary education. These form the compulsory part of education even if school attendance is not obligatory. After completing basic education, approximately 96 percent of students continue their studies in non-compulsory upper secondary education.

Figure 7.1. *The system of education in Finland*



All these stages of education are governed by their respective national core curricula. The present system of comprehensive education was adopted in 1968–1970 and implemented across the country between 1972 and 1978, beginning in Lapland in 1972 and reaching Helsinki and the other municipalities of the metropolitan region in 1978 (Aho, Pitkänen, and Sahlberg 2006; Hautamäki et al. 2008; Kupiainen, Hautamäki, and Karjalainen 2009; Simola 2015). Even if basic education is comprehensive by decree and curriculum, it still carries the heritage of primary (Grades 1–6) and lower secondary (Grades 7–9) education in the form of classroom teachers (Grades 1–6) and subject teachers (Grades 7–9) and often in the form of separate smaller schools for the primary grades. After basic education, there is an option for an extra year (Grade 10) for students to improve their marks, if needed to enter the upper secondary education of their choice. The vast majority (approximately 96 percent) of students continue their studies in upper secondary education, either in the general (academic) track or in vocational education (about 54 percent versus 46 percent of students, respectively). Both tracks provide access to tertiary education in academic universities or in universities of applied sciences (polytechnics).

In Finland, the main providers of basic education are the 311 municipalities. There are also some private, state, or university-run schools. Most of these act as part of the regular municipal school supply, but some have a special status and are able to select their students. All educational providers and all schools are obliged to follow the key national educational standards: the Basic Education Act, the basic education decrees that include, among others, the distribution of lesson hours, and the National Core Curriculum for Basic Education (NCCBE). Municipalities and other providers of education as well as individual schools are obliged to write their own local curricula aligned with the National Core Curriculum (NCC) and other national standards. These local interpretations do not need formal approval by any state authority, however. Likewise, textbooks, whether printed or e-books, do not need approval by national authorities but are provided by commercial enterprises in the field. The authors are mostly experienced teachers or educational scientists and the contents of the books closely follow the core curriculum of the respective subjects and grade levels. Schools are free to select the textbooks they use within the guidelines of the municipalities. The steering system is described in the Box 7.1 in relation to basic education, but the same rules are also true for preschool and upper secondary education.

Box 7.1. The steering system of basic education: from national level to classrooms

"The purpose of the steering of basic education is to ensure the equality and high quality of education and to create favourable conditions for the pupils' growth, development and learning. The normative part of the steering system comprises the Basic Education Act and Decree, Government Decrees, the National Core Curriculum, and the local curriculum and annual plans of individual schools based on it. Various parts of this system are being updated to ensure that changes in the world around the school can be responded to and that the school's role in building a sustainable future can be strengthened in the organisation of education.

The National Core Curriculum is formulated pursuant to the Basic Education Act, Decree, and Government Decrees that specify the goals of education and the distribution of lesson hours. The core curriculum is a national regulation issued by the Finnish National Board of Education, in compliance with which the local curricula are prepared. The purpose of the core curriculum is to support and steer the provision of education and schoolwork and to promote the equal implementation of comprehensive and single-structure basic education. …

The education provider carries the responsibility for the preparation and development of the local curriculum. Decisions on the implementation and organisation of the educational task of basic education, instruction, assessing and supporting learning, guidance counselling and pupil welfare, cooperation between home and school and other activities are contained in the curriculum. The local curriculum complements and emphasises the goals, policies that direct the activities, key contents and other aspects related to the organisation of education specified in the core curriculum from a local perspective. When preparing the curriculum, the education provider takes into account the pupils' needs, local special features and the results of self-evaluation and development efforts.…

When preparing the curriculum, the fact that the instruction may be either mainly subject-based or integrative must be taken into account. When opting for integrative instruction, an integrative curriculum may also be formulated for grade units. …

All personal plans for pupils are based on the local curriculum. A school's annual plan specifies how the curriculum will be implemented in each school during the school year. The Basic Education Decree lays down the obligation of informing the pupils and their guardians of key decisions contained in the annual plan."…

Sources: **Finnish National Board of Education (FNBE) 2016. National Core Curriculum for Basic Education 2014. Printed with the permission of the EDUFI (previously the FNBE). Sections 1.1. and 1.2 (2–15).**

A fundamental dynamic feature of Finnish education is the role of the national curriculum, renewed approximately every 10 years. The core curricula for the different education levels are prepared by the Finnish National Agency for Education (EDUFI) (former Finnish National Board of Education, FNBE) in collaboration with relevant stakeholders (for example, universities and teacher unions).

The first curriculum after the approval of the reform was very detailed, but since 1985, the curricula have become less so. This change was accompanied by another salient feature of the Finnish education system, that is, the abandonment of national inspection in 1985 despite the lack of high-stakes testing (Aurén 2017; Halinen 2018; Sahlberg 2015; Simola 2017; Vainikainen et al. 2017: Varjo, Simola, and Rinne 2016). The only exception to the lack of common testing is the National Matriculation Examination at the end of general upper secondary education. This examination, with its origins in the oral entrance examination of the University of Helsinki in 1852, has withstood time despite the educational reforms of more than 160 years and is currently expected to be fully computerized in spring 2019.

The last four curriculum reforms are briefly described in Box 7.2. In this case study, we concentrate on the basic education reforms of 2014.

Box 7.2. The four 21st century curricula reforms in Finland

(1) National Core Curriculum for Basic Education 2014

The core curriculum is a national regulation issued by the FNBE, based on which the local curricula are drawn up. The purpose of the core curriculum is to provide a common ground for the local curricula and thus promote equality and equity in education and the rights of the pupils within the whole country. The core curriculum supports and steers the provision and implementation of basic education.

The NCC contains the guidelines for the provision of education as well as the objectives and key contents of instruction. The core curriculum also addresses development of the school culture and cooperation, implementation of education, instruction, and guidance, support for learning, pupil welfare, as well as assessment of learning. To support the work of the education providers, the core curriculum also contains references to the legislation that underpins the norms laid down in this document and the field of basic education as well as guidelines for preparing the local curricula.

Annexed to the core curriculum are the recommendations for the objectives and contents of instruction as well as assessment of pupil's learning in three subject syllabi (Sámi language, Roma language, and pupil's own mother tongue) that complement basic education.

(2) National Core Curriculum for Pre-primary Education 2014

The National Core Curriculum for Pre-primary Education is a national regulation. The local curricula for preprimary education are prepared in compliance with the NCC. The National Core Curriculum for Pre-primary Education supports and directs the organization of preprimary education and promotes the implementation of unified preprimary education in different parts of Finland. The core curriculum includes references to the legislation governing preprimary education and instructions for preparing and developing a local curriculum.

(3) National Core Curriculum for General Upper Secondary Schools 2015

The National Core Curriculum for General Upper Secondary Schools 2015 is a national regulation issued by the FNBE, based on which the provider of General Upper Secondary Education will take decisions respecting the local curriculum. The core curriculum constitutes a common foundation for drawing up the local curricula, thus promoting equality and equity in education in Finland. The National Core Curriculum for General Upper Secondary Schools 2015 determines the objectives and core contents intended for young people as referred to in the General Upper Secondary Schools Act, specifying the cross-curricular themes, subjects, subject groups, and other instruction within the remit of upper secondary education. It also addresses preparation and contents of the local curriculum, the mission and underlying values of general upper secondary education, implementation of education, guidance and support for students, as well as assessment of student learning.

(4) National Core Curriculum for Early Childhood Education and Care 2016

This National Core Curriculum for Early Childhood Education and Care is a national regulation issued by the EDUFI. It is used as the basis for preparing local curricula for early childhood education and care. The purpose of the core curriculum is to provide a common basis for local curricula. The core curriculum document steers the provision, implementation, and development of early childhood education and care as well as promotes the implementation of high-quality and equal early childhood education and care in the entire country. The core curriculum contains references to the legislation governing early childhood education and care as well as instructions for preparing and developing local curricula. The municipality, joint municipal authority, or other service provider shall prepare and adopt a local curriculum compliant with this core curriculum at the latest on August 1, 2017.

Source: **Excerpts taken from the descriptions of the respective publications in English. https://www.ellibs.com/fi/books/publisher/0/opetushallitus.**

The core curriculum provides general guidelines, values, and goals of education as well as the more concrete goals and contents for the different subjects at all grade levels. With no inspection and only sample-based assessments as guidelines, the implementation of the core curriculum in schools can vary substantially despite the alignment of the municipal and school curricula with the NCC.

The providers of education are obliged to evaluate the education they provide (Basic Education Act, § 21, 21.8.1998, 30.12.2013) and participate in the national sample-based evaluation studies when included in them. When systematic between-school variation in school marks (grades) began to be observed in the national curricular assessments in the 1990s, descriptive criteria for marking were introduced in the next core curriculum of 2004. The aim was to guide teachers in their assessment of students' learning to promote uniformity and fairness, especially in view of the use of school marks in the form of grade point average (GPA) in choosing students for the different upper secondary schools and programs.

Municipalities differ somewhat in how school districts are formed, but all children are allocated a place at a nearby neighborhood school. There is no open achievement-based tracking or streaming in the Finnish basic school system. However, the parents' right to choose a school for their child and the increasing social segregation of neighborhoods, in conjunction with some selective schools and a wider offering of selective classes, have an effect comparable to open streaming, especially in cities (Kupiainen 2018; Kupiainen and Hienonen 2015). Accordingly, classes based on student selection have lately emerged as a growing source of between-class differences. Whereas in the Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) studies Finland has repeatedly stood out due to its small between-school differences, the results of the 2011 Trends in International Mathematics and Science Study (TIMSS) study revealed the Finnish between-class differences to be manifold compared to those of

its close neighbors Sweden and Norway (Yang Hansen, Gustafsson, and Rosén 2014). This difference has also been found in national assessments (Hautamäki and Kupiainen 2015; Kupiainen 2016; Kupiainen and Hotulainen 2018).

Since the curriculum reform of 1985, the curriculum process is made up of four levels: (1) the Government of Finland gives the educational acts as well as the decree regarding the distribution of lesson hours, (2) the EDUFI prepares the NCC, (3) municipalities prepare their own local curricula in compliance with the NCC but adapt them to local circumstances, and (4) schools prepare their own detailed curricula based on the above. Despite the requirement for compliance, municipalities and schools have certain degrees of freedom regarding lesson plans (the decree only states the minimum to ensure the students' rights for education) and even wider freedom regarding the implementation of the curriculum. This multilevel structure is a typical modern solution in educational systems, due to the practical difficulties of providing detailed national curricula regulations, which would inform teaching to the smallest detail. Fullan's tri-level reform theory makes a distinction between state, district, and school, and this model has also been found relatively useful in analyzing the latest Finnish reforms (Ahtiainen 2017; Pietarinen, Pyhältö and Soini, 2017).

It is a separate research issue how to model the position of global trends in relation to national reforms. This means, in our case, how 21st century discussions of key competences and new literacies are transmitted to national educational policies, to national regulations and reforms, to municipalities and, finally, to schools and the classroom. Developing a better understanding of this transmission or adaptation process is the key issue of the present consortium.

2. TOWARD TWENTY-FIRST CENTURY EDUCATION IN THE FINNISH BASIC SCHOOL

The latest renewal of the NCC had its roots in a wish for a more comprehensive reform. Even if this reform did not get enough political support, it left its marks in the new curriculum of 2014 with its explicit orientation to the demands of the 21st century. In Box 7.3, there is a summary of the 2014 curriculum process, written by the then head of the NCC 2014 reform team.

Box 7.3. Curriculum reform 2012–2016

In Finland, a significant reform concerning an innovative reorganization of disciplines was proposed in 2010. All subjects were to be regrouped as 'themes' and the aim was to increase the share of optional studies. This suggestion faced a strong opposition from some of the parties in the government and did not proceed to the parliament.

In 2012, the government approved a new decree on the goals and allocation of teaching hours between subjects. Based on that, the EDUFI has drawn up new core curricula for pre-

primary and basic education. These core curricula were given at the end of 2014. Municipalities, which are the main bodies responsible for providing education, have designed the new local curricula based on this NCC.

Teaching and learning according to the new curricula started in August 2016. The main goal of the reform is to improve pupils' opportunities for experiencing the joy of learning, for deep learning, and for good learning achievement. For the first time, transversal competences needed in the rapidly changing and complex world are described and a new tool for integrative teaching and learning, an **MLM**, is defined as obligatory.

Value basis and guiding principles for the development of the school culture

In the NCCBE, there is a strong emphasis on values as well as the development of school culture based on those values. The value basis consists of four value pillars, on which every school is expected to build its operating culture:

(a) Respecting the uniqueness of each pupil and guaranteeing the right to a good education

(b) Promoting each pupil's growth as a civilized human being and as an active citizen of a democratic society

(c) Valuing cultural diversity and regarding it as a richness

(d) Understanding the necessity of a sustainable way of living

The core curriculum also includes **seven principles** that guide the development of the operating culture in the basic education system as a whole and in each municipality and school. These seven principles are based on the four value pillars.

(a) Development as a learning community

(b) Well-being and safety in daily life

(c) Interaction, collaboration, and versatile working approaches

(d) Cultural diversity and language awareness

(e) Participation and democratic action

(f) Equity and equality

(g) Environmental responsibility and sustainable future orientation

Transversal competences and MLMs

The NCCBE includes descriptions of **transversal competences**, which should be **promoted in teaching and learning in every school subject and in MLMs**. Transversal competence refers to an entity consisting of knowledge, skills, values, attitudes, and volition. Competence also means an ability to apply knowledge and skills in a given situation or context. The manner in which pupils use their knowledge and skills is influenced by their values, attitudes, and their willingness (volition) to take action. These competences cross the boundaries of disciplines and link together different fields of knowledge and skills.

The seven transversal competences are defined based on the four value pillars, the seven development principles of the school culture, and the conception of learning that is also

defined in the core curriculum. All seven competences are interconnected. It is emphasized in the core curriculum that it is particularly important to encourage pupils to recognize their uniqueness and their personal strengths and development potential in all these areas of competence and to appreciate themselves.

These competences have been taken into account in the definition of the objectives and main content areas of the obligatory school subjects. The **subject descriptions also point out the links between the objectives of the subject and the transversal competences.**

One of the main goals of the curriculum reform is to promote an **integrative approach in teaching and learning**. The reform made so-called **multidisciplinary learning entities** obligatory.

The purpose of this integrative approach is to enable pupils to see the relations and interdependencies between the topics to be studied in school and the phenomena of real life. It should help pupils link knowledge and skills of different disciplines, in interaction with others, to structure them as meaningful entities. Inquiry-based and exploratory study periods and projects create opportunities to apply knowledge and skills learned in different subjects, and to have experiences of participation and democratic action, problem-solving, and constructing and creating new knowledge together. This should allow pupils to perceive the significance of the topics they learn at school for their own life and for the community, the society, and the humankind. In the learning process, pupils are supported to expand and structure their worldview. The modules offer excellent opportunities for cooperation between different learning groups, between pupils of different ages, and between the school and the society around it.

The main principles given in the core curriculum regarding the multidisciplinary learning entities are few:

- Schools are responsible for planning and implementing at least one extensive MLM every school year (every pupil has a right to study at least one module in every grade of his/her basic education)
- Teachers collaborate in planning and implementing the module
- Pupils participate in the planning, implementation, and assessment of these modules
- The objectives and content of the modules must be interesting and meaningful from the pupils' perspective
- Modules must be based on the values and development principles of the school culture and promote the development of transversal competences

Everything else — the number of modules, the actual objectives, content, ways of working, use of learning environments and materials, organizing the cooperation, planning and assessment procedures, and so on — will be planned and decided at the local/school level. MLMs do not increase the learning time of pupils but instead use the lesson hours of the subjects involved in the planning and implementation of the module. Pupils' learning process and achievement in the module are assessed, feedback is given to the pupils (formative assessment), and the results of the assessment are taken into account when forming the grades in the year report (summative assessment).

The first school year based on the new curriculum and implementing transversal competences and MLMs is now nearly finished. The first experiences have been good. Teachers seem to

be inspired by the new approaches (especially by the MLMs), but they also express the need to have more in-service training to better master the objectives of the new curriculum.

Source: **Halinen 2017. Printed with the permission of Irmeli Halinen, Former Department Director of EDUFI, Head of the 2014 Curriculum Reform.**

As explained earlier, the reforms take their true start, when the government officially gives the list of school subjects and the lesson hours. For the present NCC 2014 reform, Figure 7.2 gives the distribution of lesson hours in basic education.

Figure 7.2. *Distribution of lesson hours in basic education*

Distribution of lesson hours in basic education

(Government Decree, 28.6.2012)

Subjects / Grades	1 2	3 4 5 6	7 8 9	Total
Mother tongue and literature	14	18	10	42
A1-language	----------	9	7	16
B1-language	----------	2	4	6
Mathematics	6	15	11	32
Environmental studies	4	10		
Biology and geography[1]			7	
Physics and chemistry[1]			7	
Health education[1]			3	
Environment and nature studies in total		*14*	*17*	31
Religion/Ethics	2	5	3	10
History and social studies[2]	----------	5	7	12
Music	2	4	2	8
Visual arts	2	5	2	9
Crafts	4	5	2	11
Physical education	4	9	7	20
Home economics	----------		3	3
Artistic and practical elective subjects		6	5	11
Artistic and practical subjects in total				*62*
Guidance counselling	----------		2	2
Optional subjects		9		9
Minimum number of lessons				**222**
(Optional A2-language)[3]	----------	(12)		(12)
(Optional B2-language)[3]	----------		(4)	(4)

--- = Subject is taught in the grades if stated in the local curriculum.

[1] The subject is taught as a part of integrated environmental studies in the grades 1-6.

[2] Social studies are taught in grades 4-6 for at least 2 hours per week and grades 7-9 at least 3 hours per week.

[3] The pupil can, depending on the language, study a free-choice A2 language either as an optional subject or instead of the B1 language.
The pupil can study the B2 language as an optional subject. The free-choice A2 and B2 languages can, alternatively, be organised as instruction exceeding the minimum time allocation. In this case their instruction cannot be organised using the minimum time allocated in the distribution of lesson hours for optional or B1 language as defined in this paragraph. Depending on the language the pupil receives instruction in a B1 language or optional subjects instead of this B1 language. The distribution of lessons hours would be a minimum of 234 annual lessons for a pupil studying the A2 language as instruction exceeding the minimum time allocation. The corresponding number of annual lessons is a minimum of 226 for a pupil with the B2 language. The total number of annual lessons would be a minimum of 238 for pupils studying both the A2 and the B1 languages as instruction exceeding the minimum time allocation.

Source: *Government Decree June 28, 2012.*

In the English version of the Finnish NCC 2014, the term 'transversal competences' has been adopted for what is variously referred to in the literature as 21st century skills, key competences or new literacies. The 'integrative instruction and multidisciplinary learning modules' mentioned in the excerpt in Figure 7.2. are also an integrative part of the designed solutions to advance competences necessary for future working life. Yet, in the spirit of school autonomy governing all implementations of the core curriculum, the detailed design and evaluation of these have been left to the providers of education.

However, there have been precursors paving the way for the new 2014 core curriculum. Both the language and the new tools reflect the European and worldwide discussions of the past 20 years on cross-curricular competences, key competences, literacies, and 21st century skills. Since the 1970s, Finland has participated in the International Association for the Evaluation of Educational Achievement (IEA) Science, Reading, and Math Studies (Progress in International Reading Literacy Study [PIRLS] and TIMSS), since the 1990s, in the European Union Key competences projects (Kupiainen, Hautamäki, and Rantanen 2008; Hautamäki and Kupiainen 2015), and since 2000, in the OECD PISA studies. Finland also participated in the Assessment and Teaching of 21st Century Skills (ATC21S) project (Ahonen and Kankaanranta 2015; Ahonen and Kinnunen 2014). Finland also participates in United Nations Educational, Scientific, and Cultural Organization (UNESCO) educational projects (Aurén 2017; Halinen, 2018).

The role of the European Network of Policy Makers for the Evaluation of Education Systems has been significant for Finland in introducing the concepts of cross-curricular and basic or key competences at the time they were only just emerging in the international forums. The network aimed at introducing options to and establishing European comparisons of education using methodologies that would be relevant and sensitive at the national level (Bonnet 2004). In Finland, the history of the transversal competences introduced in NCC 2014 can be traced back to the 1996 Evaluation Framework for Education (English translation of FNBE 1999), which benefitted from the active Finnish participation in the Network.

In 2009, a special tool, 'The Future of Learning 2030 Barometer', was launched by the FNBE as part of the preparation for the new core curriculum (Airaksinen, Halinen, and Linturi 2017). As the authors point out, the barometer, based on the Delphi method, was one of the first occasions when such a tool was systematically applied in Finland in the curriculum reform process: "The Barometer offered new ways of proving opportunities for participation, knowledge-sharing, and collaborative design of visions. It was crucial to the FNBE to have the possibility to look beyond today's problems and conflicts. The objective was to recognise different developmental paths and to utilise the knowledge produced by the Barometer when making decisions on the core curriculum" (Airaksinen, Halinen, and Linturi 2017, 2). International examples were also important, and in particular the educational reforms implemented in Scotland and in Canada offered examples of how to transform an existing

education system into a system for 21st century education. Early in the process, the FNBE also published a Curriculum Road Map, which described the phases and suggested steps to be taken at the local level (Halinen 2018; Halinen et al. 2016; Halinen, Harmanen, and Mattila 2015).

The next stage in the time line for preparing for the new NCC 2014 took place in 2012–2013. There was an open FNBE platform, where new versions of the outlines and details were put out for discussion. At the same time, the FNBE invited members to the 36 working groups established to work on the different parts and dimensions of the curriculum. The groups had more than 300 participants: teachers, researchers, education administrators, parents, and other stakeholders. There were also unofficial reviews and comments from municipalities and other education providers throughout the process. When the first version of the curriculum was published, requests were sent to providers of education and other stakeholders for their official views on it.

Workshops were held with teacher education departments of research universities and with providers of textbooks and other teaching materials. Before the final version was printed, regional workshops were held to introduce the new core curriculum and help regional authorities and municipal education providers understand the reforms and support the latter in writing their own local curricula.

The FNBE launched the NCCBE in December 2014 and published supporting material on their web pages. With the Ministry of Education and Culture, the FNBE provided financial resources for national and local organizations, including universities, to provide in-service courses on the new core curriculum (or curricula as the curriculum for general upper secondary education was renewed in 2015) and the new requirements it sets on teaching and assessment, a sector newly emphasized in the curriculum. During the preparations for the implementation of the new curricula in 2016, the FNBE supported municipalities with in-service training and publishing extensive new supporting materials on their web pages. Special attention was given not only to the new emphasis of and ways to describe the goals of school subjects, but also to assessment, how to plan and manage formative assessment as an integral part of teaching, and how to relate this to summative assessments at the end of the year, especially at the end of Grades 1–2, 3–6, and 7–9 with their specific criteria for assessment. The FNBE/EDUFI also provides extra materials for assessment, MLMs, and multiliteracy — itself a new concept in the core curriculum;all these can be downloaded from their website.

Schools started to implement the new curriculum in the school year 2016–2017 at Grades 1–6, followed by Grades 7, 8, and 9 in autumn 2017, 2018, and 2019, respectively. The general parts of the curriculum are, however, already effective at all grade levels while the subject-specific regulations and assessment criteria will be implemented stepwise according to the aforementioned schedule and students' progress through the assessment stages

of Grades 1–2, 3–6, and 7–9. Accordingly, the first students whose basic school certificate will fully reflect the new curriculum will only graduate in spring 2020, so well into the 21st century.

Major educational reforms are to be followed (Box 7.2). The follow-up of the 2014 NCCBE reform is set up in three ways. First, the EDUFI has collected local curricula from 70 municipalities to see the variation in local adaptations and to have evidence on how municipalities have included or covered transversal competences in the local curricula and on the design of the MLMs. Unfortunately, the results of this inquiry are not presently available. Second, The Finnish Education Evaluation Centre (https://karvi.fi/en/) has launched a national evaluation of the assessment of learning and competences in basic education and upper secondary education. The results of the evaluation will be published in 2018. Third, the road to the 2014 NCCBE has been recorded and analyzed in a research project 'School Matters' with several publications (Pietarinen, Pyhältö, and Soini 2016, 2017; Tikkanen, Pyhältö, Soini, and Pietarinen 2017; Salonen-Hakomäki, Soini, Pietarinen, and Pyhältö 2016). The main reported result of these participant observation studies is that the 2014 NCCBE creation process can be read from a point of view of sustainability (Halinen 2018) and has been an example of an 'interactive bottom-up-and-top-down approach' (Pietarinen et al. 2016). At the time of writing, the preliminary unpublished results of Pietarinen group refer to the strong role of knowledge and understanding sharing in the curriculum work at schools.

Based on Fullan's (2007) and Hargreaves' (2003) theories on educational change, Ahtiainen (2017) has presented a synthesis of the stages of reform using the Finnish Special Education Reform (for example, Thuneberg et al. 2014) as the empirical basis of her modelling. She summarizes the Fullan-Hargreaves model with five stages or categories: preparation, entry, objective, dissemination, and impact. Applying these to the adoption of the 21st century skills in the Finnish education system, the preparation, entry, and objective stages can be said to have been activated and passed while the dissemination stage is being currently enacted in schools and classrooms across the country.

The 'objectives' of the 2014 curriculum reform in terms of the 21st century education are discussed in the next section. The true 'impact' of the new curriculum remains an open issue until at least 2020 and very possibly beyond that. In view of the constant changes of the world outside of school, and the lack of an even quasi-experimental design in the reform, it will be hard, if not impossible, to evaluate or even recognize its effects. Therefore, a follow-up of the implementation of the reform will be valuable in indicating how the reform toward adopting the 21st century skills as part of the curriculum is advancing. Given the cutting-edge situation of the Finnish 2014 NCCBE, this will have more than national interest. In addition, along with the 2014 NCCBE, the core curricula of the preprimary or kindergarten year, general upper secondary education, and early education were renewed following the same principles.

3. A NOTE ON SPECIAL EDUCATION

The current role of special education in Finland dates back to the origins of the comprehensive school reform in the late 1960s. The ideal of a new comprehensive school system as education for all replaced earlier ability-based tracking and meant the teaching of the same curriculum for the whole age cohort in non-differentiated classes. Due to the challenges of this requirement in view of the full extent of variance in an age cohort, special education was extended to cover (potentially) all students, and study counselling was introduced to lower secondary education. A major reform of Finnish special education took place in 2011, with a separate amendment to the Law on Basic Education and the then current NCC of 2004, introducing a three-tier model based on a strong emphasis of early intervention (see Sabel et al. 2011; Thuneberg et al. 2014).

The reform also acted as a model for the NCC reform in terms of the importance of meticulous preparation and financial and other support for municipalities, ensuring the orientation to and acceptance of the reform. Reflecting the special education reform of 2011, the NCC 2014 includes a separate chapter on support for learning and special education, based on principles of neighborhood school attendance, early intervention, rules for decision making, and continuous evaluation of the receiving student's response to intervention.

One tool for this is the multi-professional Student Welfare Group (SWG), obligatory in every school (Sabel et al. 2011; Vainikainen et al. 2015). There are reasons to believe that the well-established provision of support for learning and of special education has contributed to Finnish students' high achievement in the OECD PISA studies over the years (OECD 2015; Vettenranta 2016). This is especially salient in the small percentage of poor performers, the main reason for the small variance in the Finnish results (Hautamäki et al. 2008; Kupiainen, Hautamäki, and Karjalainen 2009). The preparation, entry, objective, dissemination, and partial impacts of this reform on special education have been studied extensively (Ahtiainen 2017; Ahtiainen et al. 2014; Thuneberg et al. 2014).

4. OBJECTIVES OF THE 2014 NATIONAL CURRICULUM REFORM IN RELATION TO FUTURE COMPETENCES AND SKILLS

In the reform process leading to the NCC 2014, there were three major aims: (a) to increase the meaningfulness of learning, (b) to integrate teaching in basic subjects, and (c) to change the culture of schooling (FNEB, presentation October 21, 2017: in Finnish oppimisen mielekkyys, perusopetuksen eheys, toimintakulttuurin muutos). Within these planning objectives, two offered solutions or tools, to use a Vygotskian concept, are most rele-

vant for the current discussion: (a) transversal competences and (b) integrative instruction and multidisciplinary learning modules.

Transversal competences are seen to relate to the personally experienced meaningfulness of learning and the integration of different school subjects. There are seven transversal competences, which are written in the NCC 2014 as aspects aligned with the different subjects through processes, which can be found and included in the teaching of each subject in its specific form of appearance. MLMs are the form in which the two latter aims of integrated teaching and a new culture of schooling are realized in school, integrating the teaching and learning of two or more subjects in one extended entity, bringing forth a change in the daily culture of school learning. Through shared planning and teaching, the MLMs also enhance and increase cooperation between teachers and make the transversal characteristics of the different school subjects visible, supporting the development of students' transversal competences.

(q) Transversal Competences in the Finnish NCCBE 2014

The general definition given for transversal competences in the NCC 2014 is "Transversal competence refers to an entity consisting of knowledge, skills, values, attitudes and will. Competence also means an ability to apply knowledge and skills in a given situation. The manner in which the pupils will use their knowledge and skills is influenced by the values and attitudes they have adopted and their willingness to take action. The increased need for transversal competence arises from changes in the surrounding world. Competences that cross the boundaries of and link different fields of knowledge and skills are a precondition for personal growth, studying, work and civic activity now and in the future" (NCC 2014, Section 3.3: Aiming for transversal competence).

The NCC 2014 lists seven transversal competences:

- T1 Thinking and learning to learn
- T2 Cultural competence, interaction and self-expression
- T3 Taking care of oneself and managing daily life
- T4 Multiliteracy
- T5 ICT Competence
- T6 Working life competence and entrepreneurship
- T7 Participation, involvement, and building a sustainable future

The NCC 2014 provides a description for all the competences justifying their significance. In Box 7.4, the definitions for T1 (Thinking and learning to learn) and for T4 (Multiliteracy) are given as an example.

Box 7.4. The NCC 2014 definitions of two transversal competences, T1 and T4

T1 Thinking and learning to learn

"Thinking and learning skills underlie the development of other competences and lifelong learning. The way in which the pupils see themselves as learners and interact with their environment influences their thinking and learning. The way in which they learn to make observations and to seek, evaluate, edit, produce and share information and ideas is also essential. The pupils are guided to realize that information may be constructed in many ways, for example by conscious reasoning or intuitively based on personal experience. An exploratory and creative working approach, doing things together and possibilities for focusing and concentration promote the development of thinking and learning to learn.

It is crucial that the teachers encourage their pupils to trust themselves and their views while being open to new solutions. Encouragement is also needed for facing unclear and conflicting information. The pupils are guided to consider things from different viewpoints, to seek new information and to use it as a basis for reviewing the way they think. Space is given for their questions, and they are encouraged to look for answers and to listen to the views of others while also reflecting on their personal inner knowledge. They are inspired to formulate new information and views. As members of the learning community formed by the school, the pupils receive support and encouragement for their ideas and initiatives, allowing their agency to be strengthened.

The pupils are guided to use information independently and in interaction with others for problem-solving, argumentation, reasoning, drawing of conclusions and invention. The pupils must have opportunities to analyze the topic being discussed critically from different viewpoints. A precondition for finding innovative answers is that the pupils learn to see alternatives and combine perspectives open mindedly and are able to think outside the box. Playing, gameful learning and physical activities, experimental approaches and other functional working approaches, and various art forms promote the joy of learning and reinforce capabilities for creative thinking and perception. Capabilities for systematic and ethical thinking develop gradually as the pupils learn to perceive the interactive relationships and interconnections between things and to understand complex issues.

Each pupil is assisted in recognizing their personal way of learning and in developing their learning strategies. The learning-to-learn skills are improved as the pupils are guided to set goals, plan their work, assess their progress and, in an age-appropriate manner, use technological and other tools in learning. During their years in basic education, the pupils are supported in laying a good foundation of knowledge and skills and developing an enduring motivation for further studies and life-long learning."

T4 Multiliteracy

"Multiliteracy is the competence to interpret, produce and make a value judgement across a variety of different texts, which will help the pupils to understand diverse modes of cultural

communication and to build their personal identity. Multiliteracy is based on a broad definition of text. In this context, text refers to knowledge presented by systems of verbal, visual, auditive, numeric and kinaesthetic symbols and their combinations. For example, text may be interpreted and produced in a written, spoken, printed, audiovisual or digital form.

The pupils need multiliteracy to interpret the world around them and to perceive its cultural diversity. Multiliteracy means abilities to obtain, combine, modify, produce, present and evaluate information in different modes, in different contexts and situations, and by using various tools.

Multiliteracy supports the development of critical thinking and learning skills. While developing it, the pupils also discuss and reflect ethical and aesthetic questions. Multiliteracy involves many different literacies that are developed in all teaching and learning. The pupils must have opportunities to practice their skills both in traditional learning environments and in digital environments that exploit technology and media in different ways.

The pupils' multiliteracy is developed in all school subjects, progressing from everyday language to mastering the language and presentational modes of different ways of knowing. A precondition for developing this competence is a rich textual environment, pedagogy that draws upon it, and cooperation in teaching and with other actors. The instruction offers opportunities for enjoying different types of text. In learning situations, the pupils use, interpret and produce different types of texts both alone and together. Texts with diverse modes of presentation are used as learning materials, and the pupils are supported in understanding their cultural contexts. The pupils examine authentic texts that are meaningful to them and interpretations of the world that arise from these texts. This allows the pupils to rely on their strengths and utilize contents that engage them in learning, and also draw on them for participation and involvement."

T6 Working life competence and entrepreneurship

"Working life, occupations, and the nature of work are changing as a consequence of such drivers as technological advancement and globalization of the economy. Anticipating the requirements of work is more difficult than before. Basic education must impart general capabilities that promote interest in and a positive attitude towards work and working life. It is important for the pupils to obtain experiences that help them to understand the importance of work and enterprising, the potential of entrepreneurship and their personal responsibility as members of their community and society. School work is organized to allow the pupils to accumulate knowledge of working life, learn entrepreneurial operating methods and understand the significance of competence acquired in school and in leisure time for their future careers.

The pupils are familiarized with the special features of businesses and industries and key sectors in their local area. While in basic education, the pupils are introduced to working life, and they gather experiences of working and collaborating with actors outside the school. On these occasions, the pupils practice appropriate conduct required in working life and collaboration skills and understand the importance of language and interaction skills. The pupils also get acquainted with skills in employing oneself, entrepreneurship, risk assessment and controlled risk-taking through various projects. The pupils learn team work, project work and networking.

The pupils must have opportunities to practice working independently and together with others and acting systematically and over a longer time span. In shared tasks, each pupil can perceive his or her own work as part of the whole. They also learn about reciprocity and striving for a common goal. In functional learning situations, the pupils may learn to plan work processes, make hypotheses, try out different options and draw conclusions. They practice estimating the time required for a task and other preconditions of work and finding new solutions as circumstances change. At the same time, they also have opportunities for learning to anticipate any difficulties that they may encounter in the work and to also face failure and disappointments. The pupils are encouraged to show tenacity in bringing their work to conclusion and to appreciate work and its results.

The pupils are encouraged to grasp new opportunities with an open mind and to act flexibly and creatively when faced with change. They are guided to take initiative and to look for various options. The pupils are supported in identifying their vocational interests and making reasoned choices regarding further studies from their own starting points, conscious of the impacts of traditional gender roles and other role models."

Source: **FNAE (Finnish National Agency for Education). 2015.** *National Core Curriculum for Basic Education 2014.* **Section 3.3 Aiming for transversal competence (34–41). Printed with the permission of FNAE.**

In essence, the heart of the NCC 2014 is the idea that transversal competences are not separate school subjects but are embedded in the curricular objectives of each subject. The practical tool for supporting the implementation of the identification and formation of transversal competences is a matrix model, a kind of mapping table that has entries as given, as an example, in Table 7.1. These mapping tables contain the subject, specified for a grade transition period, the objectives of instruction, content areas related to the objectives, and, then, the list of those transversal competences considered to be aligning with content areas/the objectives. In the example, we do not write out the contents, but in the NCC 2014 the contents are also given.

Table 7.1. *An example of the way transversal competences are presented and tied to the objectives and content to the different subjects in the FCC: objectives of history in Grades 4–6*

Objectives of instruction	Content areas related to the objective	Transversal competences
Significance, values, and attitudes		
O1: To guide the pupil to become interested in history as a field of knowledge and a subject that builds his or her identity	C1-C5	T1–T7

End of table 7.1.

Objectives of instruction	Content areas related to the objective	Transversal competences
Acquiring information about the past		
O2: To guide the pupil to recognize different sources of history	C1-C5	T1, T2, T4, T5, T7
Understanding historical phenomena		
O4: To help the pupil to perceive different ways of dividing history into eras and to use historical concepts related to them	C1-C5	T1, T2, T3
O8: To teach the pupil to perceive the continuity in history	C1-C5	T1, T2, T4, T7
Applying historical knowledge		
O9: To guide the pupil in finding reasons for changes	C1-C5	T1, T2, T4
O11: To guide the pupil to explain human activity	C1-C5	T2–T4, T6, T7

Source: *Printed with the permission of UNIFI, 496.*

These tables, taken all together with the lists of transversal competences, also allow empirical studies, like the separate study applying graph theory in analyzing the connections between T1 and T7 (Parandekar and Hautamäki, Forthcoming) in different subjects and grades. Two of these seven transversal competences are more frequent: Thinking and learning to learn and Multiliteracy. Furthermore, these two are often presented together.

(r) MLMs in the Finnish 2014 NCCBE

MLMs are described in Box 7.5.

Box 7.5. MLMs in the NCC 2014

MLMs promote the achievement of the goals set for basic education and, in particular, the development of transversal competences. A precondition for integrative instruction is a pedagogical approach to both the content of instruction and working methods where phenomena or themes of the real world are examined as a whole in each subject and, especially, in multidisciplinary studies. The manner and duration of integrative instruction may vary depending on the pupils' needs and the objectives of the instruction. The objectives, contents, and implementation methods of MLMs are decided in the local curriculum and specified in the school's annual plans. The duration of the modules must be long enough to give the pupils time to focus on the contents of the module and to work in a goal-oriented and versatile manner over a longer term. The local curriculum and annual plan may also contain other forms of integrative instruction.

The integrative instruction may take place by

- **Parallel study, that is, studying a single theme in two or more subjects simultaneously;**
- **Sequencing, that is, organizing topics related to the same theme into a sequence;**
- **Functional activities, including theme days, events, campaigns, study visits, and school camps;**
- **Longer MLMs, which are planned and implemented in cooperation between several subjects and which may contain some of the aforementioned integrative instruction techniques;**
- **Selecting content from different subjects and shaping it into integrated modules; and**
- **Holistic, integrated instruction where all instructions are provided in an integrated form similarly to preprimary education.**

Source: **NCC 2014, 32–33. Published with the permission of the EDUFI.**

These specifications imply two relevant issues:

The introduction of transversal competences and MLMs does not affect the distribution of lesson hours allocated to the different subjects. Instead, transversal competences are presented as features or contents to be embedded within the teaching of different school subjects (see Section 5). The MLMs do not add to the distribution of lesson hours either. Yet, the NCC 2014 mandates schools to offer every student at least one MLM per year through basic education. No specific content for the MLMs is given in the NCC, but these are to be included in the local curricula and annual plans to allow for their topicality. The cumulative set of MLMs must be such that all subjects are part of at least one MLM during each student's basic education.

(a) Transversal competences are to be evaluated within subjects and the outcomes and students' level of participation in the MLMs will be taken into account in the grading of the respective subjects. Accordingly, there are two fundamental details, where, as William Blake would say, the devils are: what are the transversal competences and how to assess the transversal competences as part of the formative and summative assessments of the subjects.

(b) Transversal competences are meant to be embedded in, and assessed as, parts of the different school subjects. To guide this process, a new intellectual tool has been introduced in the NCC 2014: The Subjects, Objectives, Contents, and Transversal Competences Model (SOCTC) to help schools introduce 21st century skills in the curriculum.

The name SOCTC is provided by us, to name and to refer to the role of these descriptions of the intended goals for the NCC 2014 reform. The distribution of lesson hours specified in the Government Decree determines the transition points that divide basic education into the units of Grades 1–2, 3–6, and 7–9. In the NCC 2014, these units are used in presenting the wider objectives, the more specific contents, and the assessment criteria for the different subjects. In the NCC 2014, one(?) side of the contents is related to each objective, and the distinct transversal competences included in them are listed.

5. THE ASSESSMENT OF TRANSVERSAL COMPETENCES IN BASIC EDUCATION

Assessment is a powerful tool to introduce changes in educational systems: change the final examinations, and the teaching will follow and change as well. In the NCC 2014, a distinction is made between formative and (a final) summative assessment: "Under the Basic Education Act, the aim of pupil assessment is to guide and encourage learning and to develop the pupil's capability for self-assessment. The pupil's learning, work and behaviour shall be variously assessed. […] In basic education, two types of assessment are carried out: assessments during the studies and a final assessment" (NCC 2014, 49). The formative role of all assessment and feedback is strongly emphasized: "The school plays a crucial role for the self-concept the pupils form of themselves as learners and persons. The feedback given by teachers has a particular significance. Versatile assessment and the provision of instructive feedback are the key pedagogical means used by teachers to support the pupils' overall development and learning"(NCC 2014, 50).

The linking of all assessment to curricular objectives is also emphasized: "Assessment of a pupil's learning, working skills and behaviour and the provision of feedback to a pupil must always be based on the objectives set in the core curriculum and the more detailed objectives of the local curriculum. The pupils and their achievements are not compared to those of other pupils, and the assessment shall not focus on the pupil's personality, temperament or other personal characteristics. The teachers ensure that the pupils are aware of the objectives and assessment criteria. Reflecting on the objectives and examining their personal learning in proportion to the objectives is also an important part of developing the pupils' self-assessment skills" (NCC 2014, 49).

Regarding the summative assessment, the NCC 2014 states: "When assessing a pupil's knowledge and skills for the purpose of issuing reports and certificates, assessment criteria derived from the objectives defined in the core curriculum are used. Assessment criteria have been drawn up for the transition point between grades 6 and 7 and for the final assessment to support the teachers' work and to promote more uniform assessment. Rather

than being targets set for the pupils, the criteria define the level required to receive a verbal assessment that describes a good achievement level or the level required for the grade 8 [in a scale of 4–10 where 4=fail and 10=excellent]." It is to be noted that the NCC requires schools to issue numerical grading only from Grade 7 onward; until then (just) descriptive grading is allowed in all subjects. At all grade levels, the yearly report shall also provide an assessment of the pupil's behavior and contain a decision on the pupil's promotion to the next grade or his or her retention. (NCC 2014, 2016, 50).

However, even if the NCC meticulously lists the transversal competences involved or covered in the learning objectives of the different subjects, there are no concrete guidelines as to how this should be done or how they should be assessed as part of the learning toward that objective. Likewise, as no contents for the MLMs are given in the NCC, no guidelines for their assessment as part of the involved subjects are or can be given either. Hence, the burden of finding solutions to the assessment of transversal competences and MLMs can be seen to lie with municipalities and schools and can hardly contribute to fair and comparable assessment and grades across the country — critical for students' transfer from basic school to upper secondary studies. Additionally, without such guidelines, there is a danger that despite the formative spirit of the NCC's chapter on assessment, the actual assessment in schools will continuously center on the more easily measurable parts of each subject. This, in turn, threatens to weaken the attention that teachers pay to the transversal competences meant to be included in their teaching and learning. As a consequence, the goal of offering students a basis for transfer across the different subjects might be lost.

The question remains: Is it possible to assess or give guidelines for the assessment of transversal competences — the ones included in the NCC or more generally — either independently or within subjects in a way that would fulfil the requirements set for all assessment: fairness and a transparent relationship to the objectives stated in the core curriculum? The task is not easy but might be the only way to truly incorporate them in the different national syllabi. Current efforts toward their assessment (for example, Hautamäki, Kupiainen, and Hautamäki 2014) have a weakness in their merely speculative claim regarding the role of school in their formation. Consequently, new research is needed, maybe including the replacement of the constructs listed in the current NCC with ones based on a stronger theoretical foundation. Because this issue is important, we will present more details given in the NCC 2014 to advance a fair assessment protocol.

(s) Educational Standards in Finnish NCC (Grade Value 8)

Table 7.2 is an example of assessment criteria for good knowledge and skills (verbal assessment) or a grade value of eight (numerical assessment) at the end of Grade 6 in Finnish language and literature. We have included in this example only one topic — language-learning skills — with two objectives (O5 and O6) and each with one content (C2) and have deleted

other objectives and contents. However, the FNAE, Regional Authorities, Finnish Education Evaluation Centre (FINEEC), and university-based studies in educational assessment are supporting this work, and the success of this work is critical for the national success of NCC 2014.

Table 7.2. *Defining educational standards for mark 8 for selected objectives and contents in Finnish language and literature for Grade 6*

Objectives of instruction	Content	Assessment targets in the subject	Knowledge and skills for the verbal assessment good/numerical Grade 8
Growth into cultural diversity and language awareness			
O1: To encourage the pupil to pay attention and develop an interest in the variety and selection of Finnish material that supports his or her own learning and to help the pupil become familiar with the typical characteristics of Finnish-language culture	C1	Perception of linguistic environment	The pupil is able to describe the typical characteristics of the Finnish-language culture and knows where Finnish-language material that interests him or her can be found.
Evolving language proficiency, text interpretation skills			**Level of proficiency B1.1**
O9: To offer the pupil opportunities for listening to and reading versatile texts that are meaningful to him or her in standard language and popularized texts from various sources and to interpret them using different strategies	C3	Text interpretation skills	The pupil understands the main ideas and some details of clear, nearly regular-tempo, standard language speech and popularized written text. The pupil understands speech or written text based on shared experience or general knowledge. The pupil is able to find the main ideas, keywords, and important details without preparation.

Source: *NCC 2014, 246.*

(t) Search for Solutions for Measuring Transversal Competences

The objectives, contents, and assessment criteria given in the NCC for each subject act as binding guidelines for municipalities and schools in outlining their local curricula and rules of assessment — just like in the previous NCC of 2004. However, what has changed is the new weight given to assessment by dedicating a whole chapter for it in the NCC 2014. This has given rise to an unprecedented discussion on assessment and calls for in-service training on the topic. The UNIFI and regional authorities as well as subject-specific

Teacher Associations have responded to this call by offering widespread in-service training for basic school and general upper secondary school teachers. The emphasis has been on formative assessment and diverse subject-specific questions regarding the different dimensions of assessment (the relative role in assessment of the general and subject- or course-specific objectives, knowledge, and skills). These discussions and training have also addressed the question of how to interpret the NCC 2014's introduction of transversal competences and the MLMs into assessment in relation to students' advancement in the traditional subjects.

However, a problem arises from the NCC giving instructions regarding factors that have to be taken into account in assessment (learning, working habits, and behavior — including its 'level' and progress) without any indication as to their respective weight in assessment. In addition, the requirement to tie summative assessment to the criteria given for grade 8 (good) seems not to give space but for the dimension of learning. The task can be formalized for any subject as (in the formula, w stands for unknown weight and constant could be the lowest value 4 in the grading scale of 4–10):

$$School\ Mark^{4-10}ijk = constant + w11Learning\ Criteria + w12Change\ in\ Learning + w21Working\ Criteria + w22Change\ in\ Working + w31Behaving\ Criteria + w32Change\ in\ Behaving + w4Transversal\ Competences + w5MLMij + error$$

In addition, for each subject, the formula should include the same for the transversal competences listed as relevant for the subject's objectives and the MLMs involved. As stated earlier, there are no recommendations for the weights of these either. However, this formula is our interpretation of the issues and complexities related to Finnish and to any reforms of curricula in the light of 21st century skills.

The results of the national sample-based assessments of learning outcomes in the different subjects have repeatedly shown that the constants and weighting in the formula differ by municipality, school, and probably even class. This school dependency of grading has probably been one of the reasons for the new emphasis on assessment in the NCC 2014. However, taking into account the hard-to-define dimensions to be assessed (working habit, behavior), the lack of indicators for their respective weights, and the descriptive nature of the criteria against which the student's achievement should be assessed, it is hard to see that the NCC 2014 would succeed in alleviating the problem (Hautamäki et al. 2013, 2018; Ouakrim-Soivio 2016; OuakrimSoivio, Kupiainen, and Marjanen 2017). The earlier empirical evidence of the national assessments shows that the descriptions given for the assessment criteria are interpreted without taking into account the context of the class within which the assessment takes place, leading to stricter assessment in classes of more able students and a more lenient approach in classes of weaker students. The requirement to take into account the change or development in the respective dimensions further obscures which of the directives of the NCC are concerned with just formative assessment and which

ones are concerned with summative assessment as well. As mentioned earlier, the problem is further complicated by the transversal competences, which get tied in the NCC to specific subjects and learning objectives only in relation to the assessment criteria for Grades 6–7 and 7–9.

Therefore, the question remains: How to assess the transversal competences? One solution could be that within some set of lessons, the teacher should ensure that the preordained transversal competences have been present in teaching and learning and can therefore be assessed as part of students' achievement for that course entity. Even this is not a trivial task, but it would give the transversal competences the same status as the subject-specific content of the respective lessons. All other solutions are bound to lead to a diversity of interpretations and hence to less commensurate results. One such solution would be to have measurable descriptions for the different transversal competences within the contexts of the different subjects, but this would obviously lead to an impossible task for both the national authorities (uniformity) and the local providers of education (implementation). However, the situation would be fatal in terms of commensurability due to too many un-unified parts, leading to possibly an even aggravated between-school variation in students' final grades, which have a high stakes value in the choice of upper secondary education. The same arguments are valid for the MTMs if the communal themes are not drawn from the actual objectives and contents from the participating subjects.

Another alternative for the assessment of transversal competences is the introduction of independent indexes for them as integrated parts of a traditional subject-based curriculum or as independent entities in the curriculum. The current Finnish NCCs of early, preprimary, basic, and general upper secondary education represent the former, and to our knowledge there is no education system that would currently represent the latter, even if the division of subjects in the different national syllabi were not always the same. Regarding the current Finnish NCC, any step toward an independent assessment of transversal competences would require a critical evaluation of the totality and formulation of the seven transversal competences with detailed descriptions of their contents to allow for applicable criteria for assessment. Even if this could be done (see NBE 1999; Hautamäki et al. 2002), it clearly runs counter to the expectations set for transversal competences in the NCC 2014 as common contents or dimensions embedded in the teaching and learning of the different subjects.

6. NATIONAL AND LOCAL SUPPORT FOR THE IMPLEMENTATION OF THE NCC

In Finland, employers have legal responsibility for their employees' professional development. In education, this primarily means municipalities' responsibility for providing neces-

sary in-service education for teachers and principals. Furthermore, as professionals, teachers themselves can be seen to have a responsibility to update their knowledge and skills and to follow the overall development of the teaching profession and the national education policy. As part of their employment contract, teachers are obliged — or allowed — to participate in three professional development days a year. Some municipalities and schools allow teachers more freedom in how to fulfil this requirement whereas some others may have a common policy and plan for shared practices (Hammerness, Ahtiainen, and Sahlberg 2017, 46). Government-allocated resources for teachers' in-service education are managed by the EDUFI. Universities, teacher associations, and other organizations in the field act as providers of the education.

It is too early to say how municipalities have solved the new assessment requirements of the NCC 2014. Random case explorations indicate that municipalities and schools have looked for and taken advantage of the additional material provided by the EDUFI and other actors to clarify and enrich their own curricula on assessment. However, at least for now, we have found no local solutions for the assessment of transversal competences or the local MTMs. The EDUFI is currently following the advancement of the implementation of the NCC with first results expected in 2018.

The Ministry of Education and Culture together with the EDUFI has launched several programs to support the NCC reform by allocating resources for in-service education for its implementation:

- The Teacher Education Forum
- The Tutor Teacher Programme,
- The Innovative Schools Network

The unifying catchphrase for these programs is The New Basic School, maybe carrying in it an echo of the aborted attempt for a much more radical reform in 2010.

The Teacher Education Development Programme of 2016–2018, which carries in Finnish the more succinct name of the Teacher Education Forum, is a multisite program to develop and enhance transition of teacher education departments to assist in the implementation of the NCC and, equally important, to modify teacher education programs for the 21st century requirements in line with the new curricula. The forum is made up of several networks and developmental projects to design and share information, experiences, and results.

Tutor Teachers (2017–2019) is also a national program, supported with extra money to municipalities, to nominate and train some of the teachers to work as mediators in implementing the new curriculum.

The Innovative Schools Network, financed and supported by the EDUFI, was established to act as a vanguard in implementing the NCC 2014. The network, covering 265 schools in 53 municipalities, has already come up with innovative solutions to enhance student participation and co-operational teaching, ideas for MTMs and the use of information and communication technology (ICT) in schools, and ways to support building a new education culture in schools and municipalities. The network shares experiences using an e-platform supported by the EDUFI and a limited-access social platform run by the network.

(u) Global, International, and Research-based Support to Schooling in Finland

In education, a pandemic has been brewing since the last decades of the last century — the search for a definition and understanding of 21st century education. All nations and other actors with a stake in education have entered the discourse: the OECD and the World Bank, the European Union and UNESCO, global corporations from Microsoft to major banks, teacher and parent unions, universities, and think tanks. The participants have different interests, ranging from concerns about the future workforce to financial interests regarding investments in technology solutions, knowledge constitution to solutions to the present pervasive issues of global climate change, renewable energy, politics, and markets. No country or nation can stay removed from these discussions. The discourse on 21st century skills is one effort by the education establishment to help find a sustainable solution to these and other global problems.

Already before the launch of the concept of 21st century skills or competences, the OECD entered the field with the Definition and Selection of Competences (DeSeCo) Project (Rychen and Salganik 2003). Soon after, the OECD continued with the introduction of the PISA, currently the most powerful tool for setting the agenda for discussions on global trends in education. To close the gap between the work of the DeSeCo and schools, the OECD developed (or extended the coverage of) the concept of literacy to refer to an individual's ability to apply and adapt school learning to situations outside of the class. However, to be able to use the assessments as indicators for the effectiveness of national education systems, the concept was adapted to cover the key subjects of reading, mathematics, and science. Later, the OECD extended the coverage of PISA deeper into the realm of transversal skills through the subfields of problem-solving, complex problem-solving, and collaborative problem-solving, in 2003, 2012, and 2015, respectively, while the adoption of computer-based assessment can be seen to represent another salient strand of the 'new' 21st century skills.

Finland has participated in international assessments since 1958, first in the strictly curricular assessments of the IEA and later in the OECD's PISA. In addition, Finland was a central contributor to and participated in probably the first ever effort to measure transversal competences at a transnational level in a project financed by the European Commission to study the measurability of learning to learn, one of the key competences according to the

European Union (Fredriksson and Hoskins 2007; Hoskins and Fredriksson 2008; Kupiainen, Hautamäki, and Rantanen 2008).

The English sociologist of education Basil Bernstein (2000, 2004) makes a distinction between singulars, regions, and generics. Applying his concepts, the 21st century discourse is a search for generics. The concerns of the business world, if based on accurate observations of unfulfilled needs, are thus valid demands for a workforce with a new type of generic competences received through education. Educational discourse, on the other hand, with its disciplines and subjects represents singulars, the other end of the Bernsteinian scale. The competences needed in working life cannot be directly conceptualized using the singular, subject-related contents of education, making the middle field of regions necessary to bridge the gap met by students when entering the workforce. Regions are in the middle, reconceptualizing singulars as units, which operate both in the intellectual field of disciplines and in the field of external practice. In this framework, the literacies of PISA can be understood as regions bridging the respective school subjects and their application in the 'life like' contexts of the PISA tasks while the Finnish transversal competences represent the generics even if tied in the curriculum to specific disciplinary contents. This interpretation opens an understanding of transversal competences as stemming from working within the singularities of school subjects while simultaneously representing generic processes that could be conceptualized independently from the outcomes of the learning of the subjects.

One solution for measuring transversal competences is represented in the work of the Centre for Educational Assessment, University of Helsinki. The center has theorized and executed large-scale assessment on learning to learn as one of the key transversal skills since 1996 with a test comprising a cognitive and an affective dimension (Hautamäki et al. 2002; Hautamäki et al. 2006; Hautamäki, Hautamäki, and Kupiainen 2010; Hautamäki and Kupiainen, 2016; Vainikainen 2014). Lately, the work has been extended to collaboration with the University of Szeged in Hungary regarding computer-based assessment of inductive reasoning (Csapó, 2004; Csapo and Funke 2017) and with the University of Luxembourg regarding complex problem solving (Greiff et al. 2016). The center has also made a pilot study on combining a sample of open PISA tasks with its own 'learning to learn' test to study the relations of the two approaches. The results showed that a large portion of the variance in Grade 9 students' performance in the PISA sample tasks could be explained by their earlier and concurrent achievement in the 'learning to learn' tasks (Hautamäki, Kupiainen, and Vainikainen 2017; Kupiainen and Hautamäki, 2017). The question is whether the measurements of transversal competences, be it in the form of PISA, learning to learn, or complex problem-solving, still show reliable unexplained variance after curricular evidence (learning, working, and behaving together with school marks) has been accounted for. Only then would a quest for separate indicators for transversal skills be worth pursuing.

Whereas the Finnish study aimed at predicting students' attainment in PISA, the Canadian study 'Pathways to Success' (OECD 2010, 2012) followed students who had taken part in

PISA 10 years earlier. The predictive power of PISA was ambiguous due to the confounding factors of family and school characteristics and of many of the best performers still at university at the time of the study. Yet, there was a (weak) positive correlation between girls' — but not boys' — PISA scores and future earnings even after controlling for family background and educational attainment (OECD 2010). The Canadian follow-up did not include school achievement, but the writers note that PISA scores correlate highly with it. Regarding the predictive power of PISA, the report notes that the timing of the study was too early to disclose the potential full effect of students' performance in PISA on their later success in the labor market (OECD 2010, 6). Thus, the results do not give a definite answer to whether the competences measured in PISA offer predictive power that would surpass students' school achievements as indicated by GPA.

Without clear evidence of the predictive value above school marks of PISA, learning to learn, or complex problem solving, a reform such as the NCC 2014 can only be seen as a brave attempt to reach something more by going beyond the traditional discipline-oriented education. Yet, the venture is supported by research at least regarding the first of the NCC's transversal competences, thinking and learning to learn. For example, Adey and Shayer (2006) have shown that it is possible to enhance cognitive development through science education, where different forms of scientific thinking are taken into account (Adey et al. 2007; Adey, Shayer, and Yates 1989; Demetriou and Bakracevic 2009). To support the adoption of the new transversal skills in schools, a book on thinking skills (Halinen et al. 2016) was published as a joint venture of experts from the EDUFI and the University of Helsinki, offering both theoretical backing and concrete ideas for their advancement in class through differentiation and MLM projects. Yet only time will tell how well the new constructs will be incorporated into daily schoolwork and whether they will help today's students meet the future any better than the old discipline-oriented syllabus assisted their peers. As in all reforms, there are potential threats — but possible victories as well.

(v) Challenges in Implementing the New Curriculum

Implementation of the NCC 2014 can be seen to face three major challenges:

- The lack of concrete advice on how to incorporate the transversal competences listed in the tables for the objectives and contents of the different subjects (TOCs) into teaching.

- The lack of concrete guidelines on the assessment of the transversal competences and MLMs to ensure the commensurability of assessment across municipalities and schools.

- How well-prepared teachers and education administrators are to accommodate and adapt the principles from educational and development psychology required by the full implementation of the new NCC

The NCC 2014 reform did not threaten the structure of the distribution of lesson hours. Yet the new weight given to transversal competences and the introduction of the MLMs are both expected to and inevitably will bring about changes in the implementation of the lesson hour distribution. Something new will be done and emerge, and something old will disappear or change. The lack of concrete indications as to how the transversal competences should be brought into the respective contents as implicated in the TOCs will lead, by default, to widely varying practices across the country with repercussions to the time spent on the subject-specific content of the lessons. The same is true for the MLMs as the actual objects or contents as well as the involved subjects of the modules are left in the NCC to be decided on at the local level. There are already examples of innovative projects enhancing learning in different subjects and collecting whole schools to work around a common theme. It remains to be seen whether the modules succeed in just providing students with an understanding of the complexity and multidisciplinary nature of actual phenomena or also providing them with a sound understanding of the integrity and internal logics of the different disciplines. Regarding the lack of common guidelines, a concern for the quality of the modules to be built across schools and for different grade levels is thus warranted. The MLMs can also be seen as a concern in terms of assessment due to their varying content, length, and involved subjects and as a result of problems related to the assessment of group work, especially in view of the high stakes the basic school grades play in students' transition to upper secondary education.

Bernstein (2000) discusses how an academic (in this case pedagogical) field can accept rather general interpretations from another field. Developmental or even educational psychology cannot give prescriptions on how to teach generic and transversal competences. By definition, generic is formed through the specific, by mastering the contents and intellectual frameworks of the different scientific disciplines. Currently, effective intervention programs for the advancement of thinking are available, the most successful embedded in traditional school subjects (physics, chemistry, mathematics, history, and arts; see Adey et al. 2007; Adey and Shayer 2006; Kuusela 2000). Furthermore, psychological sciences can inform education of possibilities and mental frameworks, which assist teachers in gaining a deeper understanding of learning processes, learning difficulties, and factors that support transfer of learning, expanding its coverage from one content area to another. In this spirit, participation in international studies such as the TIMSS and PIRLS, PISA, and the UNESCO surveys is accompanied by reporting that offers a possibility for professional training for teachers.

To support the implementation of the NCC 2014, the Ministry of Education and Culture and EDUFI have supported local, regional, and national projects for designing and testing practical ways to integrate the transversal competences into learning and to build meaningful and age-appropriate MLMs. For example, the City of Helsinki Education Division has decided on two major points of emphasis for its work on the local curriculum: phenomenon-based learning (MLMs) and thinking and learning to learn. The division's web pages

(ops.edu.hel.fi) parcel out the two main novel dimensions of the NCC, transversal skills and the MLMs, into grade-appropriate subthemes. However, these are best understood as just interesting attempts to interpret and adapt the new understanding of basic education for a city with a rapidly diversifying student population. The evidence of this and other local adaptations indicates careful work in breaking the NCC into smaller pieces for more detailed local guidelines aiming at a relatively uniform implementation. At the same time, these adaptations are a way to inform teachers, parents, and students of the goals of the present reform and in this manner enhance the commitment of the city to advancing educational institutions toward the renewed goals.

7. CONCLUSION: HALFWAY THERE?

The MLMs and the mapping of the objectives, contents, and transversal competences in the subject-specific TOC-tables of the NCC 2014 are new tools intended to loosen the strict borders of school subjects while also preserving their academic integrity and structure. The goal is to advance conceptual and competence-related integration between different sources and kinds of knowledge. The reason behind the goal is a new understanding of the labor market's need for skills to integrate and apply different kinds of information, knowledge, and competences — and a belief that the current discipline-based syllabus does not provide students with these skills. The need is for a new mind-set of work (FYA 2017) comprising interest, habits, and manners, which support collaborative work toward the economy of the 21st century.

The idea of a 'new school' for a 'new society', visible in the frameworks of the OECD PISA and the IEA TIMMS, and in the recommendations of UNESCO and of the World Bank, is an example of Bernstein's generics, an external power to push countries to change their singulars, the traditional syllabi, and curricula. The concepts of key competences, literacies, cross-curricular competences, and transversal competences can be understood as regions, mediators to bring in changes in the understanding of the traditional subjects and curricula. These tools do not aim to refute or demolish academic subjects but to complement them by widening the understanding of their singularity and encouraging teaching to cross the boundaries between them. In the NCC, this is made through the introduction of transversal competences and MLMs. These can be seen to aim at revising the understanding of subject-specific learning goals and even a competence when transversal competences are viewed through the lens of — or infiltrate — each subject. However, just adding these to the different subjects might not cover all the aspects of the transversal skill. For example, multiliteracy has different forms and practices in science, history, languages, and mathematics, just like the rules, even if not the requirement for validity, of reasoning differing in mathematics, different natural sciences, and history (Kuusela 2000).

The pedagogical means to take into account transversal competences and ways to build MLMs into concrete contributions to school subjects, as well as tools for their valid and reliable assessment, are still waiting for a solution. Thus, the final verdict is that Finnish basic education is on its way to 21st century schooling and society but is not yet there.

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Chapter 8

POLAND: THE LEARNING ENVIRONMENT THAT BROUGHT ABOUT A CHANGE

Maciej Jakubowski, Jerzy Wisnewski

Highlights

- Poland is one of the countries which has made the biggest progress in the development of student competences measured by the Programme for International Student Assessment (PISA) international comparative study based on the concept of key competences needed in contemporary society and economy. As a result, the country has been considered as a top performer in the development and promotion of key competences in school education.

- In Poland, a clear and coherent 'key competence strategy' has never been adopted — but key competences, even if not labelled as such, were introduced into the national core curriculum (2007) and promoted by several programs and initiatives.

- Poland demonstrates that a change of a broadly defined learning environment can have a significant impact on students' outcomes, even though such objectives were not clearly articulated and operationalized.

This situation refers to Poland's education policy, changes, and their effects over the last twenty years.

1. BASIC DATA ON THE SCHOOL EDUCATION SYSTEM OF POLAND

The structure of Poland's school system includes the following elements:

- Primary level: 8-year primary school
- Secondary level: 3 options
    - 4-year general education (*licea*)
    - 5-year secondary vocational schools (*technika*)
    - 3-year sectoral vocational school of the First Stage (*szkoła branżowa pierwszego stopnia*) with the possibility of continuing education at a 2-year sectoral vocational school of the Second Stage (*szkoła branżowa drugiego stopnia*).

From 1999 to 2017 Poland also had a system of lower secondary schools (*gimnazja*), which is currently being phased out by structural reform of the educational system (on the basis of an act of December 14, 2016, Law on School Education), which is described in this chapter.

Special education is an integral part of the Polish education system. Children are eligible for suitable school arrangements based on psychological, pedagogical, and medical examinations. More than half of all children with special educational needs are taught in special schools or special classes in mainstream schools, and the other half attend mainstream schools' integrated or standard classes.

Kindergartens and other preschool institutions are supervised by the Ministry of National Education. Preschool education is optional for children ages 3–5 years and obligatory for 6-year-olds.

The tables below contain general facts and figures about the educational system of Poland, with data from the School Education Information System of the Ministry of National Education.[1]

[1] https://cie.men.gov.pl/sio-strona-glowna/dane-statystyczne/

Table 8.1. *Preschool education in Poland*

Kindergarten *(przedszkola)*	Urban	8,202	820,080
	Rural	3,944	260,782
Preschool classes in primary schools *(oddziały przedszkolne w szkołach podstawowych)*	Urban	1,977	76,595
	Rural	6,053	167,291
Preschool centres *(zespoły wychowania przedszkolnego)*	Urban	758	13,666
	Rural	970	21,423
Preschool units (*punkty przedszkolne dla dzieci starszych*)	Urban	8	184
	Rural	68	1,162

Table 8.2. *Number of schools for students and number of students (2016)*

	Number of schools		Number of students	
Type of school	Public run by local authorities	Non-public	Public run by local authorities	Non-public
Primary	11,505	1,244	2,158,481	96,034
Lower secondary	6,364	881	988,524	50,052
Basic vocational	1,393	177	147,804	12,891
General secondary	1,662	448	446,139	26,678
Technical secondary	1,622	199	475,056	16,720

Table 8.3. *Key facts and figures of Poland's educational system*

Number of schools	**27,906** (without special education, including artistic schools) 89% — public schools (run by local governments), 11% — non-public schools (private, run by associations or by religious organizations)
Number of teachers	**497,534** (full-time equivalent)
Number of pupils	**4.75 million**

End of table 8.3.

Key laws regulating education in general	The Constitution of the Republic of Poland, School Education Act of September 7, 1991 (with further amendments) replaced by The Law on School Education and an act introducing the Law on School Education (both of December 14, 2016) The Teachers' Charter (with further amendments).
Key laws regulating curriculum	The Ordinance (Regulation) of the Minister of National Education on Core Curriculum for General Education (*Podstawa Programowa Kształcenia Ogólnego)* The Ordinance (Regulation) of the Minister of National Education on framework teaching plans (*ramowe plany nauczania*) The Ordinances (Regulations) of the Minister of National Education on Core Curricula for Vocational Education (*Podstawy programowe kształcenia w zawodach*)
Documents that schools use to regulate their own activities	The school care, moral educational and preventive program approved by both Teacher Board and Parents' Council of the school; The school organization chart, accepted by the regional school superintendent (*kurator*) and the authority running the school (local government for public schools).

The school education system is managed centrally by the Ministry of National Education which, together with regional pedagogical superintendents, supervises schools and kindergartens. The ministry decides on educational policy, outlines the content of education defining the national core curriculum, sets the requirements for schools and regulates the conditions of teacher employment. The Central Examination Board (an agency of the Ministry of National Education) organizes national tests and exams at the end of primary school (grade 6 till 2015 and grade 8 from 2019 on), end of lower secondary school (till 2019), and the final secondary exam (*matura*). The *matura* exam serves as an entrance examination to higher education programs.

Local authorities are responsible for administration and management as well as funding allocation for kindergartens and schools. Communes — the lowest level of public administration — are responsible for public kindergartens and primary and lower secondary schools, while districts are responsible for public upper secondary schools. The greater part of school financing comes from the public budget. The amount of general spending for all local government units is defined annually in the budgetary act.

Teacher employment in public institutions as well as their salaries and promotion are regulated by the Teacher's Charter — a parliamentary act which grants teachers a unique professional position.

Non-public Schools

Non-public schools first appeared on the educational scene of modern Poland after the reforms of 1989–1990. Most of them were initially set up by groups of teachers and parents involved in foundations or associations. Such schools in Poland have a right to offer qualifications equivalent to public schools provided they follow the national core curriculum and employ qualified teachers. These requirements are controlled by the regional school superintendents (*kurator*).

Non-public schools have more freedom in teaching programs and methods of instruction. They apply curricula developed by teachers, often with the active involvement of parents and students. Such innovative approaches are spread through the whole system of school education, influencing public schools teaching as well.

Teachers' Training

There are two types of initial teacher training in Poland. Teachers of preschool and elementary education are trained on integrated BA or MA courses at education departments (faculties) of higher education institutions. Secondary school teachers start their education from subject-specific faculties (that is, mathematics, biology, and so on) and then (consecutively) take relevant teacher training courses (pedagogy, psychology, and didactics), which are considered a minor specialization.

Key competences are not specified in any of these teacher training programs. Moreover, when new ideas are promoted and introduced into school programs (like teamwork projects in lower secondary schools) the change in teacher training programs usually lags behind, or remains unchanged.

Teacher studies are popular among secondary school graduates. However, this is not a result of the prestige of these studies nor the prospects for a future career. Teachers' salaries, particularly in big cities are not competitive. Studies on pedagogy are considered as not difficult, so it is a relatively easy way to obtain a higher education diploma. They are often offered by small private universities which charge relatively low fees.

Table 8.4. *Teacher age group distribution 2017*

Age				
35 Years or less	**36 To 45 years**	**46 To 55 years**	**56 To 65 years**	**More than 65 years**
Rural schools				
24.60%	30.50%	33.90%	10.60%	0.40%
Urban schools				
24.20%	30.60%	30.60%	13.40%	1.30%

Source: *Calculations on the data from School Education Information System.*

2. EMPLOYERS' EXPECTATIONS

Polish employers often complain in the media that school graduates are not prepared for the jobs they apply for, especially mentioning the attitudes of young people and lack of skills in areas such as communication, the ability to work in a team, readiness to learn and master new skills, and the ability to act in a changing environment.

Among the few representative studies into the opinion of employers, the most important is 'The Study of Human Capital' research project (the *BKL* Study[2]). This has been conducted annually since 2010, by the Polish Agency for Enterprise Development in cooperation with the Jagiellonian University of Warsaw. This systematic research allows the monitoring of changes in the competences in Poland's labor market. According to this study, Polish employers expect the following competences from candidates:

- Self-organization (indicated by 44 percent of employers), involving independent organization of one's work and its effectiveness — self-starting, independence, time management, decision making, initiative, and resilience to stress

- Interpersonal skills (important for 40 percent of employers), including contacts with others, communication, team cooperation, and the ability to solve problems

- Professional skills (mentioned by 26 percent of employers)

[2] Bilans Kapitału Ludzkiego. http://www.parp.gov.pl/publicationslibrary/ebook/762

3. MAJOR MILESTONES IN THE NATIONAL CURRICULUM TRANSFORMATION

1989–1990: Transition to Democracy and Market-based Economy

Following the great political and economic changes when Poland passed from a former Eastern Bloc country to a democracy, some changes in the curriculum were introduced. They affected such disciplines as history (elimination of 'blank spots') and Russian language (this stopped being compulsory and received equal status with other foreign languages).

Soon English became the most in-demand foreign language at schools, and the lack of English teachers forced the Ministry of National Education to launch programs to attract native speakers as schoolteachers. In collaboration with foreign nongovernmental organizations (NGOs) such as the Peace Corps, British Council, and Voluntary Oversees, such programs attracted people of very different backgrounds, from retired teachers to young enthusiasts. They influenced Polish schools with a different organization culture and alternative pedagogical ideas.

English learning materials also came to the country, as complete sets of student textbooks, workbooks, and manuals for teachers (in contrast to the previous practice of Polish publishers). Attracting teachers as clients, international publishers provided teacher training, promoting new learning methods and developing, in particular, communication skills (language as a tool for communication).

During the same period, non-public schools started to be established, demanding flexibility in the application of the rigid and detailed national curriculum and other regulations (number of lessons for each discipline, interdisciplinary coordination, even class size). Responding to this, the Ministry of National Education introduced the concept of 'authorship programs'. This opportunity has been used by a relatively small number of school and teachers and such programs have not been properly evaluated, attracting critics of the national curriculum regulations.

At the beginning of the 1990s the Polish economy suffered from a major economic crisis. The public sector budget was slashed, along with the budget for education. The Ministry of Education needed to reduce the number of compulsory learning hours at schools, as well as the curriculum content. A minimum curriculum was provided, containing the core knowledge or the most important content necessary for all schools. At the same time, schools and local governments were allowed a certain degree of independence in defining their own curricula. Head teachers obtained several teaching hours to use for the school's specific needs. Between 1991 and 1998, attempts to make the curriculum less detailed continued,

offering more freedom to schools and teachers in deciding on learning methods, resources, and even content.

1998–1999: Comprehensive Educational System Reform

The government formed after the parliamentary elections of 1997 decided to launch a comprehensive reform of the whole educational system of Poland with the following targets:

- Raising educational attainment in society by increasing the number of graduates with secondary and higher education qualifications
- Ensuring equal educational opportunities
- Improving the quality of education

To achieve these objectives, the Ministry of Education introduced a major system reform in 1998–1999 to change the structure of the school education, redesign the core curriculum, introduce new pupil assessment tools, and modernize the school inspection system.

At this time, the discussion on key competences was at its initial stage internationally (Council of Europe seminar in Bern took place in 1996 and the launch of the DeSeCo project happened in 1997) and did not directly affect the policy debate in Poland.

Curriculum reform was a key element of these changes. The new core curriculum replaced previous detailed and uniform curricula and opened opportunities for teachers to use various programs, methods, and approaches. Schools could choose from curricula available in the market or develop their own curricula. The textbook market was liberalized, and teachers were able to decide which textbook to use from a ministry approved list.

By extending the autonomy of teachers, and giving them more freedom, the ministry sent a clear message that it trusted their professional competences.

To measure learning achievements, a system of national tests and examinations was introduced, covering all pupils at the end of successive stages of education (primary, lower secondary, and upper secondary education). The responsibility for examination preparation, administration, and evaluation was given to the newly established central and regional exam boards.

The reform can be described as a revolution since it led to a visible change in the school system structure and, in particular, the introduction of new lower secondary schools (grades 7 to 9) and the reduction of primary education from 8 to 6 years. After graduating from a lower secondary school, students can continue their education in 3-year general second-

ary schools (academic track), technical secondary vocational schools (4 years) or in 3-year basic vocational schools (not offering full secondary education). Most students aspired for general education with the prospect of continuing their education at university level. Basic vocational schools had low prestige and were considered the worst option.

The biggest impact on learning outcomes (or delivered curriculum) was the introduction of external exams at the end of each level of schooling: primary, lower secondary, and upper secondary. In particular, that impact was made by high-stakes exams: the one at the end of lower secondary school (selection to general or vocational secondary schools) and the final secondary school exam — *matura*, which replaced entrance exams for universities.

Since 2003, Poland has continuously and noticeably improved student competences measured by PISA. Rigid data analysis showed that the improvement was an effect of the 1999 reforms, especially the extension of comprehensive general education as a result of the newly created lower secondary schools[3] and the postponement to different types of secondary programs by one year.

Undoubtedly, this has not been the only success. The whole idea of lower secondary schools and new opportunities released the energy of teachers, school directors, and local authorities. New curricula opened market opportunities for educational publishers who then invested in teachers' professional development. Also, NGOs found a niche for their activities both in formal and non-formal education. All these factors (and many others) were important, but structural reform was probably the key one.

The 1999 reforms were introduced within a very short time frame and one which did not allow a wider debate, both among experts and the public. It was therefore not surprising that discussions started almost immediately after the launch of the reform.

Communicating the reform, the Ministry of Education focused on convincing teachers that the change was feasible and would bring good results. There was not enough promotion of the main goal of the reform: equal access to good quality education at all levels, especially in rural areas, where new schools well equipped with human and material resources could make an impact.

However, public discussions focused on the problems of lower secondary schools and stereotypical views on teenagers misbehaving — that reflected in public opinion polls. At the early stage of the reform it was difficult to argue, as there were real problems with the or-

[3] Jakubowski, M., H. Patrinos, E. Port, and J. Wisniewski. 2016. "The Effects of Delaying Tracking in Secondary School: Evidence from the 1999 Education Reform in Poland." *Education Economics* 1–16. doi:10.1080/09645292.2016.1149548

ganization of new schools, development and implementation of new curricula, provision of textbooks, and so on.

Real results in learning outcomes and participation rates were seen after a couple of years and sound evaluation procedures. An opportunity to promote this success story appeared when the 2003 PISA results were released. However, this was a time of big political change in Poland, and there was no one taking ownership of the 1999 reform. So, despite evidence of the success of the reforms, public opinion remained unchanged, continuing to see lower secondary schools as problematic.

The debate became more heated when new external exams were introduced in 2002. The most discussed issue was the level of detail in the core curriculum and in the examination standards, which were described in two separate documents. These debates led to the revision of the national core curriculum in 2007–2009.

2007–2009: New Core Curriculum

Improvement in the average PISA results could not cover the difficulties Polish students had with PISA test items that required a non-standard, problem-solving approach. Young Poles were very good at applying algorithms, but most of them were hopeless when facing a new, unfamiliar problem. Taking this into account, the Ministry of National Education decided to initiate work on the modification of the national curriculum, which would:

- Describe the expected learning outcomes for each stage of education;
- Indicate the main objectives of teaching each school subject; and
- Define the requirements of central assessments.

Joining the European Union in 2004, Poland also joined the European debate on the role and quality of education and training in the Union within the framework and limits of the 'open method of coordination'. In 2006, the European Parliament adopted recommendations on key competences for lifelong learning. However, this debate at the European level did not influence national policy directions.

Following intensive work by experts and public consultation, a new national core curriculum was introduced in 2008.[4] It was characterized by a shift toward learning outcomes which were linked to examination standards integrated in the core curriculum.

[4] Regulation of the Minister of National Education of December 2008. http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20090040017/O/D20090017.pdf

The core curriculum was organized in two layers:

- The basic layer comprises 3–5 general requirements for each discipline, defining the main objective for learning a certain discipline at a certain education level. For example, for mathematics at lower high school, the general requirements include mathematical modelling, strategic thinking, and mathematical reasoning and argumentation. This implies that the whole teaching process should be oriented toward developing these skills.

- The second layer consists of detailed requirements, describing the specific knowledge and skills to be mastered by students, that is "a student can solve simultaneous equations". However, these specific requirements serve only as a tool for achieving the more general aims, as defined by the general requirements.

2013–2015: Lowering the School Age

A new reform initiated by the ministry aimed to raise the preschool enrolment rate by lowering the starting school age of compulsory education from 7 to 6. This decision triggered strong opposition among parents, and the ministry was not able to offer convincing arguments.

Box 8.1. Lowering the school age in Poland

Parents were concerned about the readiness of school buildings, teaching programs and methods, and especially the quality of after-school activities for 6-year-olds. In kindergartens, children were properly cared for and educated 8–9 hours a day, allowing parents to work normally, while at many schools the only option for a student to stay after 4 hours of study was to join a big group with a very limited program of activities.

Protesters launched a campaign 'Save the kids' and organized a civic movement in 2014 which collected more than 1 million signatures calling for a national referendum about the educational reform. This proposal was supported by the opposition, but Parliament rejected it, arguing that its questions were too specific for a national referendum.

Eventually, school education in Poland became compulsory for 6-year-olds in 2015. However, just few months later, following parliamentary elections where the opposition came to power, the new government started to reverse this educational reform. It was very clearly explained by the Prime Minister in an interview in November 2015:

> ***"In the context of education, as well as the problems of Polish families, it is important to talk about the compulsory education of six-year-olds introduced against the will of parents. Our government will reverse these changes. Polish parents will have the right to choose, because they know their children best. Parents will decide whether their child will go to school at the age of six or seven. This change will be carried out within the first hundred days of our government".***

2017: Next Initiatives to Transform Poland's Educational System

Poland's current government came to power in 2015 with a promise to reverse most of the previous education reforms and, most importantly, to bring back the old system with 8 years of primary schooling, removing lower secondary schools. The authors of this reform referred to the widespread opinion of the population, which was demonstrated by the aforementioned support for a referendum. In their view, this was a stronger argument than expert comments based on the results of international studies like PISA.

In the first months of office, the government amended the School Education Act returning the mandatory school starting age to 7 years. This reversed the decision of the previous government to start primary schooling at the age of six years.

In December 2016, despite the protests of teachers, parents, local governments, and key opposition parties, the government passed a new Law on School Education, eliminating lower secondary schools.

The Ministry of National Education used surveys of public opinion as the main argument to support the proposed changes, with virtually no sound rationale for the changes being presented. The ministry used as 'arguments' small, one sentence quotations from various studies and papers, presenting them out of context. Some 200 researchers submitted a letter to the minister protesting against the misuse of their studies, but there was no official response to this.

Poland's largest trade union of teachers, ZNP (Związek Nauczycielstwa Polskiego), collected almost 1 million signatures and submitted a motion to Parliament calling for a referendum. Parliament deliberated on the proposal until the summer holidays of 2017 and then rejected it, arguing that it was now too late to organize a referendum. From the beginning of the school year 2017–2018, intake to lower secondary schools (gimnazja) has been suspended.

This reform has been accompanied by changes to the national core curriculum. This started in September 2017 at grades 4 and 7 of primary schools and they will be introduced, grade by grade, until 2023. The curricula for general and vocational secondary schools are still being discussed.

The updated curriculum put more emphasis on knowledge acquisition within narrow disciplines. Such focus is motivated by public opinion on the overall low quality of secondary schools, offering easy access to low-quality tertiary educational institutions. Reformers insist that more centralized and strict regulations, as well as a discipline-based focus should structure the curriculum as it is easier for assessing.

As the changes are still in progress, it is too early to draw any firm conclusions on the possible impact on students' competences and performance of the system.

4. THE CORE CURRICULUM AND ITS FRAMEWORK

The core curriculum for general education is discipline based. It focuses mostly on specific, discipline-related results, but also includes some more general learning outcomes. For each level of education, the core curriculum defines objectives, key skills, and tasks for schools and teachers.

The educational objectives are threefold and encompass the acquisition of knowledge and skills, as well as the development of attitudes for living in the modern world. The attitudes are not described in detail.

Key skills are defined for each educational level. For example, for primary education they comprise

(a) **Reading,** including understanding the text and the use of knowledge permitting intellectual, emotional, and moral development and social participation;

(b) **Mathematical thinking,** which includes at primary level the use of basic mathematical tools as well as basic mathematical reasoning in everyday life;

(c) **Scientific thinking** — the ability to formulate conclusions about the natural and social world;

(d) **Communication in mother tongue and foreign languages;**

(e) **Information and communication technology (ICT) use,** including searching for information;

(f) **Ability to learn,** including the pursuit of natural interest in the world, discovering one's interests, and preparation for further education; and

(g) **Teamwork.**

The key skills for secondary education are similar, but the requirements are more advanced.

A new element was introduced in the core curriculum concerning the development of key competences and social skills. It was a requirement for each lower secondary school student

to participate in a team project. This was the only example in the core curriculum when a specific learning method was defined (suspended in 2017).

The tasks for schools and teachers refer to transversal, interdisciplinary competences and are described in general terms, including:

- Development of the ability to use Polish language, with a rich vocabulary;
- Preparation for living in the information society, developing the skills to search, select, organize and use information from various sources using ICT;
- Media literacy;
- Health education — taking care of one's own health and the creation of a healthy environment; and
- Development of attitudes important for social life, such as honesty, reliability, responsibility, self-esteem, respect for others, intellectual interests, creativity, entrepreneurship, cultural awareness, individual initiative, teamwork, civic attitude, respect for tradition and national culture, respect for other cultures and traditions, and preventing discrimination.

Clearly, although the term 'key competences' was not explicitly used, they are defined in the core curriculum.

The core curriculum also defined the **requirements for centralized exams**. Based on analysis of the PISA results, more focus was put on scientific reasoning and problem solving. For example, each mathematics exam task should contain a problem starting with words "prove that…" to evaluate the level of mathematical reasoning and argument. Scientific tasks also require analysis and arguments, not only quoting facts and numbers. One of the general requirements for history was "critical analysis of information sources".

Following the change to the structure of the school education system introduced in 2017, the core curriculum was modified as well. The changes mostly concentrated on the subjects and distribution of the content (themes) among grades. The description of the general requirements (in the introductory part) remains almost unchanged but the 'names' of key competences (scientific reasoning, mathematical thinking, team work, and so on) were removed.

5. PRACTICES OF KEY COMPETENCES DEVELOPMENT AND EVALUATION IN POLAND

When Poland joined the European Union (2004), funding from the European Social Fund became available for schools and other educational institutions. Key competences (defined in the European Parliament's recommendation) were mentioned in several documents. However, the calls for projects were focused on 'traditional', domain-based competences: math, science, ICT, and foreign language. The projects selected through competitive procedures offered organization of additional — after-school or out-of-school — activities but were not integrated into the curriculum. This, therefore contributed to the knowledge and skills of some students but probably failed to change school culture and the provision of key competences in 'mainstream' schools.

Projects for Key Competences Promotion in Schools

School practices and the learning environment are crucial for the development of key competences. These aspects are very generally mentioned in the Polish core curriculum and other official documents, but no coherent strategy or program has been proposed and implemented. The development of key competences in school has never been evaluated or inspected. There was neither broad public debate on key competences nor consultations with stakeholders.

However, there have been a number of small, independent initiatives, contributing to the key competences promotion and understanding. The KREATOR project (see Box 8.2) is particularly interesting, as it successfully translated the broad concepts of policy debates at the European level into recommendations and guidelines for daily school practices.

Box 8.2. KREATOR Project[5]

In 1995, the Ministry of National Education began implementation of the KREATOR Project, supported by European Commission funds (PHARE[6]), the aim of which was to "include key competences into the teaching process."

The KREATOR project used as a starting point the conclusions of the Council of Europe symposium on 'Key competences in Europe' (Bern, March 1996) and proposed the following list of key competences:

[5] *Key Competences in Europe: Opening Door for Lifelong Learners across the School Curriculum and Teacher Training,* final report for the project commissioned by EC DG EaC, CASE, EC Warsaw, Brussels 2009.

[6] https://ec.europa.eu/neighbourhood-enlargement/instruments/former-assistance/phare_en

- **Planning, organization, and assessment of self-learning**
- **Effective communication in various situations**
- **Effective team work**
- **Problem solving in a creative way**
- **Efficient use of computers and IT**

The project was implemented by a group of teachers working in teams in several Polish towns. Several guidebooks were prepared, describing ways to introduce key competences and organize classes and school operations. It is worth quoting an extract from of one of these guide books:

If, in your school, you want to undertake the task of including key competences into your teaching, remember some issues that seemed important to us.

- *Think together, what do your students need key competences for? Develop the school's own task, considering the actual needs of your students after graduation and what you can and want to give them instead of looking only into regulations. Doing anything against self mostly leads to time losses, serving no purpose.*
- *Remember, if you require your students to use their key competences, you need, first, to use these competences yourself. We have, many times, found ourselves breaking the rules of discussion or effective team work. We are aware that it is more difficult for teachers to communicate with students than for students to communicate between themselves.*
- *A teachers' working style during classes is the most important thing. Key competences can be acquired by students only when performing their tasks independently. The so-called 'hints' are only cheating our own conscience and making real learning practically impossible for students. This change of our own role can become a nightmare, but without it we are only reciting beautiful slogans while the essence remains the same.*
- *We do not have to move away from skills and knowledge in subject teaching if we want to shape key competences. Each group task should begin with an understanding of one's role in a team; each exchange of views should follow the rules of effective communication. If a teacher, after the task performed, asks not only for results but also for methods applied, the students will think in terms of the learning process. This reflection becomes — for both the student and the teacher — a source of planning the development of key competences.*
- *Assessing the use of key skills by the students is the most important and, at the same time, the most difficult process. There are no ideal methods of assessing key skills. The teaching staff in each school has to agree on their own ways and means. This debate has an extremely high value that justifies undertaking efforts toward key skills at schools.*

When the European Commission PHARE financing stopped (in 2000), the team was dissolved and the process of defining key competences was discontinued. The project results were used only to a minor extent in further curriculum reform work.

NGO Initiatives

NGOs have played an important role in promoting competence-based learning in Poland. Several powerful organizations were established in the early 1990s, such as the Polish Children and Youth Foundation (PCYF, *Polska Fundacja Dzieci i Młodzieży*),[7] the Centre For Citizenship Education (CEO, *Centrum Edukacji Obywatelskiej*),[8] the Junior Achievement Foundation of Poland (*Fundacja Młodzieżowej Przedsiębiorczości*),[9] and many others on a smaller scale. Inspired by western best practices, they carefully honed their programs and sought financial support and courted media coverage.

One of the most innovative examples of an NGO's work in partnership was the CEO's campaign **Classy School** ('*Szkoła z klasą*'). It was co-run by CEO and Poland's biggest daily newspaper, 'Gazeta Wyborcza'. The idea was that the pedagogic framework and guidance were provided by educational experts from CEO, but all the operations were carried out at and by Gazeta Wyborcza. The aim was to promote the initiatives of students, individual teachers, and schools. When the project started in 2002, it was initially planned for 400 schools, but eventually the campaign involved over 5,000. Because of its success, several phases were undertaken, and the project developed into a complex, multi-stage system of facilitating change in education, with sub-programs focused on whole schools, individual students, informal student groups, individual teachers, and student-teacher teams.

Successful participants of the project got the opportunity to take part in further training in the 'Classy School Academy'. Two innovative features of this program were its 'online-only' format (all tasks were reported via online forms and most communication was via email) and social control as the main form of validation (the reports were published on the web; no one formally checked what happened, but all activities were transparent for all the community). Thus, the project contributed to promoting ICT competency and building a spirit of trust (possibly the most important effect). CEO also runs several other comprehensive programs promoting innovation at schools (improving teaching, school environment, and school leadership).

Another NGO, Educational Research Institute (IBE, *Instytut Badan Edukacyjnych*) also developed and runs an open database of 'good practices and didactic tools',[10] involving history, Polish language, mathematics, and science. Although mainly addressed to teachers, students and parents can also benefit from it. User comments show it is highly appreciated by teachers as a helpful tool for their everyday work. The database development was funded by the European Social Fund in 2007–2014 (since then, the scope of activities has been reduced).

7 http://www.pcyf.org.pl/index.php?lang=en&s1=fundacja&s2=onas

8 https://glowna.ceo.org.pl/english

9 https://junior.org.pl/pl

10 http://bnd.ibe.edu.pl/

Another program that explicitly promoted competence-based learning was PCYF's projects 'Life Skills for Employability' (2006) and 'Life Skills: Social Skills Coaching' (2007). They were delivered as part of an international program run by the International Youth Foundation and supported by General Electric. The program was directed to vocational and technical secondary schools. Students were trained in three areas:

(a) Personal development, understood as the skill of appropriately evaluating one's resources, setting goals, and leadership

(b) Problem solving, consisting of communication skills, the ability to reach agreement, and conflict management

(c) Development of work-related skills, understood as the ability to work in teams, work ethics, self-evaluation, the ability to take risks, project management, and time and money management.

The program consisted of teacher training and offered syllabi that could be adapted and used in vocational schools. It also provided microgrants for student projects.

6. KEY COMPETENCES EVALUATION: POLAND IN PISA

Before 2000 and the first PISA study, Poland did not participate in any international comparative assessment of student achievements (except for the International Association for the Evaluation of Educational Achievement Civic Education Study in 1997). The decision on joining PISA was taken at a very advanced stage of its conceptual framework and the development of instruments. Hence, Polish experts neither contributed to that work nor were the concepts and assumptions debated in Poland.

No systemic monitoring focused on key competences has been undertaken in Poland in recent years. As a result, PISA remains the main and most reliable source of data on the key competences of Polish youth.

Figure 8.1 shows significant improvements in Polish students' performance in PISA. The results in all areas (reading, math, and science) improved from a level below the Organisation for Economic Co-operation and Development (OECD) average (500 points) to well above that average in 2012. The scores in 2015 were lower (but still slightly above the OECD average). This is probably the effect of the change from traditional paper tests to computer-based tests. Earlier additional components of PISA which used computers have shown that Polish students had difficulties responding to computer tests.

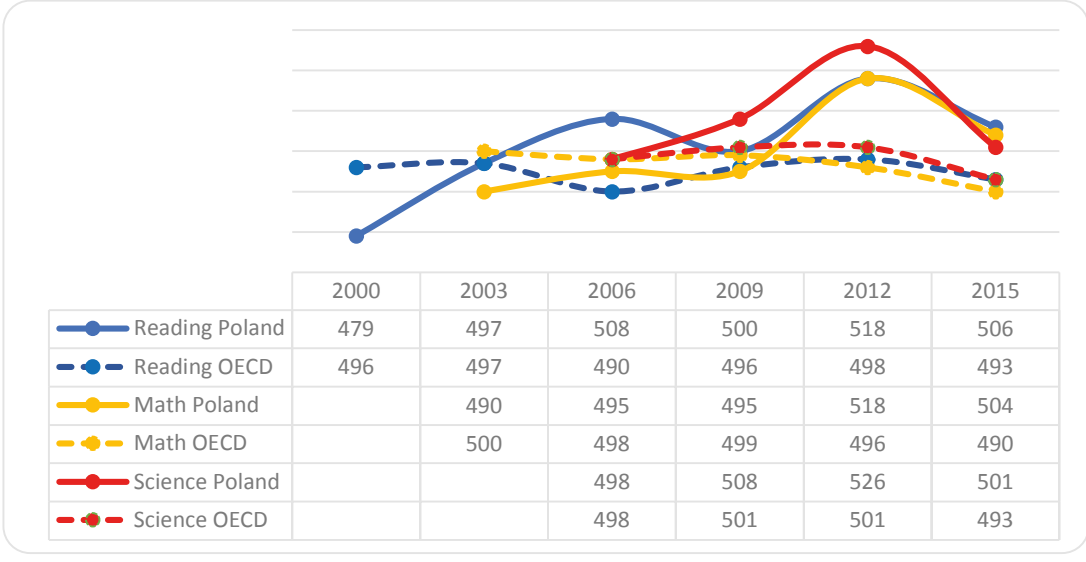
The results of PISA 2000 show the competences of 15-year-old secondary schools' students had not yet been affected by the system reform of 1999, while 15-year-olds in 2003 were the first group attending lower secondary schools introduced as a result of the reforms. The results in 2000 varied hugely depending on the school type: the mean score of vocational schools' students was 358 points, while the mean for general academic schools was 543. The significant progress between the first and the second cycle of PISA was the effect of the delay in general versus vocational track selection by students, as they continued in lower secondary schools, and this helped to improve the results of low- achievers.

The pupils covered by the following wave of PISA in 2006 had been part of the reformed education system for most of their school years. They took the final primary school test in 2003 and were prepared for the final lower secondary school exams a few weeks after PISA in 2006.

In math, Poland improved its score from 470 points in 2000 to 495 in 2006. Reading scores improved from 479 to 508, while science scores increased from 483 to 498 (see Figure 8.1).

The next significant leap in Poland's PISA results occurred between 2009 and 2012. This was probably the effect of the new core curriculum being introduced in 2009, which promoted such skills as problem solving, critical analysis of information, scientific reasoning, and argumentation. These skills/competences are similar to those measured by PISA and are widely recognized as relevant for the 21st century. If we agree that developing such competences is one of the priorities of education, we can argue that PISA results provide support for a positive evaluation of the 2009 curriculum reform and appropriate modification of national exams. It is important to note, however, that there is no strong evidence to confirm this evaluation.

Figure 8.1. *Poland's PISA scores (compared with OECD)*



	2000	2003	2006	2009	2012	2015
Reading Poland	479	497	508	500	518	506
Reading OECD	496	497	490	496	498	493
Math Poland		490	495	495	518	504
Math OECD		500	498	499	496	490
Science Poland			498	508	526	501
Science OECD			498	501	501	493

After PISA 2003, experts in the Ministry of Education claimed that the improvement in results was caused by the extension of comprehensive general education. Based on this, the ministry decided to use the so-called 'national option of PISA'. The PISA test was applied to assess Polish first-grade students in upper secondary schools (they are one year older than the PISA standard target group).

This test, applied with the main PISA study from 2006, revealed significant differences in achievement among students of various types of upper secondary schools (see Table 8.5). In 2006 and 2009, upper secondary school students performed better than lower secondary school ones. However, in 2012 younger pupils had similar results to the older group.

Table 8.5. *International PISA results for 15-year-olds and national PISA test for 16-year-olds*[11]

	2006			2009			2012		
	Math	**Reading**	**Science**	**Maths**	**Reading**	**Science**	**Math**	**Reading**	**Science**
General upper secondary	566	581	572	559	565	565	571	570	575
Technical upper secondary	495	503	496	495	487	505	506	502	507
Basic vocational	410	389	410	402	392	413	417	409	430
16-year-olds (1st grade of secondary schools)	**514**	**520**	**516**	**506**	**503**	**514**	**519**	**516**	**524**
15-year-olds (international PISA, 3rd grade of lower secondary schools)	**495**	**508**	**498**	**495**	**500**	**508**	**518**	**518**	**526**
Difference in PISA scores at 15 and 16	**19**	**12**	**18**	**11**	**3**	**6**	**1**	**–2**	**–2**

Students at basic vocational schools were getting lower results, thus confirming that selection, although postponed by one year, still affected negatively on student achievements. In any case, the results of students in vocational education were still considerably better

[11] Results of the PISA international survey in Poland and national option for testing with the same PISA instruments first grade students of upper secondary schools. (MEN 2014).

than those of similar students in PISA 2000, demonstrating the long- lasting effects of an additional year of comprehensive education, a positive implication of the 1999 educational reform. The negligible differences in the results of 15- and 16-year-olds in 2012 resulted from a significant increase in the scores of the younger group. This could be linked to the introduction of the new core curriculum in 2008 and new type of lower secondary school exam (2011), both of which affected this group of students.

7. EVALUATION OF NEW CORE CURRICULUM IMPLEMENTATION

Between 2009 and 2014 Poland's Educational Research Institute carried out several studies to evaluate the implementation of the new core curriculum. Two of them are particularly of note, as they relate to key competences:

- 'The school of independent thinking' (problem solving, reasoning, and argumentation in reading and mathematics).
- 'The laboratory of thinking' (inquiry in science education)

The aim of the study 'The School of independent thinking' was to diagnose the competences of pupils in the fourth year of primary schools, first year pupils in middle schools and first and last year students in secondary schools. The study covered complex skills applied in Polish language and mathematics: formulation of problems, creating strategies for problem solving, interpretation, reasoning, arguing, analysis, and synthesis.

The inspiration for this study came from the results of PISA 2009, which showed that Polish students do better in regular, imitative tasks while they have problems when independent, critical thinking is required.

The study discovered that the biggest progress in the development of the complex skills occurred between grades 4 and 6 of primary schools. At the higher levels of education, students mainly use and master those skills and do not learn new ones. The other finding is the big difference between vocational school students (who have a very basic level of competences) and students of general secondary schools. Although even in that group there was the tendency to follow the methods proposed by teachers.

The study 'The Laboratory of Thinking — Diagnosis of Science Education in Poland' aimed to measure the level of scientific knowledge of lower secondary schools' graduates who had been taught according to the new core curriculum. It focused on such key skills as reasoning in science, formulating hypotheses, designing experiments, searching for and critical anal-

ysis of information, and scientific inquiry. The study assessed whether students were able to distinguish facts from opinions.

Standardized testing tools were used, covering core curriculum subjects: biology, chemistry, geography, and physics. Additional student questionnaires concerned, among others, the forms and methods used in science lessons by teachers. The study was carried out in four cycles — in 2011, 2012, 2013, and 2014, each year involving 7,200 pupils from around 180 schools.

In 2011, the tested students followed the old core curriculum and the results of that group were standardized to set a mean score of 500, to be used as a benchmark to measure the effects of the curriculum modification. Based on the students' results, 6 levels of competences were defined: level I: <350; level II: 350–449; level III: 450–549; level IV: 550–649; level V: 650–749; and level VI: >750. For each level the characteristic competences were identified and described.

The mean results in every discipline increased between 2011 and 2014, reaching 516 in biology, 523.5 in chemistry, 513 in physics, and 515 in geography.

At the same time the share of lower achieving students (level II or below) remained the same (approximately 20 percent), except chemistry where the change was small, but statistically significant. The share of students at top levels, levels V and VI, significantly increased (see table 8.6). Thus, the core curriculum modification caused an increase in the share of higher performing students, while the share of low achievers remained the same.

Table 8.6. *The results of 'The Laboratory of Thinking'*

Discipline	**% of students below level II**			**% of students at levels V and VI**		
Year	**2011**	**2014**	**Change**	**2011**	**2014**	**Change**
Biology	21.5	20.3	–1.2	15.9	23.4	7.5
Chemistry	21.7	18.0	–3.7	16.3	24.6	8.3
Physics	21.9	20.4	–1.5	16.2	21.4	5.2
Geography	21.5	20.0	–1.5	16.2	22.0	5.8

The lesson from Poland is complex and interesting. On the one hand, PISA was used by experts, researchers, and policy makers to defend reforms and to propose new policies that seem to have been successful in further improving the key competences of Polish students. However, the reformers were not that successful in convincing the public that the changes were beneficial. In effect, a popular and nostalgic sentiment toward the old system and the forceful encouragement of negative emotions about the type and speed of the reforms

introduced in 1999 are in large part driving popular opinion supporting a reversal of the post-1999 changes.

8. CONCLUSION

To sum up, we would like to list the challenges that need to be addressed if Poland is going to develop an overall key competences strategy (it is very likely that this would be called a 'skills strategy' in line with the present OECD trend).

1. A comprehensive key competences strategy should encompass curriculum, teaching methods, and teachers' professional development as well as good information and promotion activities.

2. The scope of such strategy should not be limited to narrowly defined key competences like literacy, numeracy, and ICT.

3. Key competences cannot be 'taught' as traditional school subjects. They need to be developed in a student-centered, democratic, pro-innovative learning environment. To create and foster it schools must enjoy a level of autonomy, and teachers need to feel trust in their professional skills.

4. The crucial issue is getting the support of all stakeholders through a well-prepared information strategy containing two-way communication and solid, evidence-based arguments. Lessons should be learned from Poland's efforts to extend its general education: the introduction of lower secondary schools and the lowering of the school starting age.

Chapter 9

TWENTY-FIRST CENTURY SKILLS AND LEARNING: A CASE STUDY OF DEVELOPMENTS AND PRACTICES IN THE UNITED STATES

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Highlights

- Across the United States, there is general agreement that the range of skills students develop in school must expand for the nation to remain an economic leader. The non-centralized, locally controlled nature of the U.S. school system, however, has resulted in diverse perspectives on what exactly this fuller range of skills should entail.

- While most state education systems include information about 21st century skills in their curricular materials, none has adopted a formal set of standards on which students are summatively assessed.

- While most states have not aggressively prioritized 21st century skills in their standards, curricular guidance, assessment programs, and professional development programs, there are a few states that have done so.

- Adoption and implementation of 21st century skills have been left largely to the school and district levels. In some cases, schools are working with experts, such as EdLeaders21, to target 21st century skills, and in rare cases, schools have fundamentally restructured themselves. However, concerted efforts such as these are currently clear exceptions.

The phrases '21st century skills' and '21st century learning' are frequently used by schools, business leaders, and politicians throughout the United States. The focus on 21st century skills and learning is driven largely by a desire to remain economically competitive and provide today's students with opportunities to thrive in a changing workplace. The root cause of this drive for 21st century skills and learning is a perception that digital technologies and the Internet have fundamentally altered the ways in which businesses function. In turn, these changes in the business world demand a new set of core competences people entering the workforce must possess to succeed. In addition, it is up to U.S. schools to help today's students develop these new competencies.

At first glance, the rhetoric regarding 21st century skills and learning employed by schools, business leaders, and politicians across the United States creates an image of unity regarding the nature and importance of these new competences. Upon closer inspection, however, the story is more complex and disjointed. In part, this complexity results from the decentralized structure of education in the United States. In turn, this decentralized structure results in several different definitions of 21st century skills, different approaches to developing these skills, and a lack of consensus about how to assess achievement of these new competencies.

Given the decentralized nature of education in the United States, it is impossible to tell the full story of 21st century skills and learning across the nation succinctly. Instead, this case study is a brief attempt to tell one part of the story of 21st century learning in the United States.

The story begins by providing an overview of general developments that have occurred nationwide. We then focus on efforts made by one of the nation's 50 states to establish the supports required for 21st century learning in schools. To understand how these supports translate into practice, we then provide a brief overview of the ways in which public high schools are addressing the development of 21st century skills by their students. The case study ends by highlighting what we see as the most significant developments to date and areas in which further progress is likely to occur next.

1. AN OVERVIEW OF EDUCATION IN THE UNITED STATES

Education in the United States is decentralized. The federal constitution delegates authority for education to each individual state and each U.S. district and territories. This designated authority results in 56 different educational systems. The level of authority for education delegated to the state government, however, varies further across states. In some cases, individual states, such as Texas and Florida, retain considerable authority over edu-

cational practices across its districts and schools. Other states, such as Massachusetts, New Hampshire, and Michigan, grant considerable authority to local districts and schools for making decisions about the curriculum, learning resources, and administrative functions.

This decentralized and diverse structure has several implications for education across the nation. Two of the most visible products of this diversity are the structural features of each state's education system and the funding for education provided within each state.

Structurally, the U.S. education system can be conceived of as a set of branches. Within each branch, a top organization provides funding for education that is tied to regulations. The top-most branch has the federal government at the top and state governments below. At the state level, the state government is at the top and local school districts are below. And, in some cases, at the local level the district office is at the top and each school in the district is below.

At the national level, a set of federal laws and programs make funding available to states contingent on the states adhering to federal guidance. As an example, the federal Elementary and Secondary Education Act establishes policies regarding a variety of educational practices and provides funding to states contingent on their adherence to those policies. Federal acts, such as Title I, the Individuals with Disabilities Act, and the Perkins Act, provide funding for specific subgroups of students and programs such as students living in poverty, students with disabilities and special needs, and students pursuing career and technical education (CTE) paths, respectively. Because authority for education resides at the state level, many of these federal programs are binding only if states elect to accept the funding associated with them. In almost all cases, however, states accept the funding and thus agree to adopt and implement the regulations linked to that funding.

At the state level, the state education department is the highest authority and school districts operate at a local level. The manner in which districts are defined, however, differs noticeably among states. In many states, particularly those in the south and western areas of the nation, districts are defined at the county level. Each city or town operating within a county belongs to a single district. In other states, districts are defined at the town or city level. This difference in the structure of local districts results in two notable differences. First, in those states with county districts, there tends to be significantly fewer districts, but these districts serve a much larger geographic region and often a larger number of students. As an example, the state of Florida has a student population of approximately 2.8 million students. In contrast, Vermont has only 89,000 students. Florida is a county-based system that has 74 districts[1] and Vermont is town-based district system containing 361

[1] Florida has 67 counties, four laboratory schools that operate as independent districts, the Florida School for the Deaf and Blind, the Florida Virtual School, and the Okeechobee Youth Development Center that serves students in the state juvenile system.

districts. In effect, these structural differences result in Florida's districts serving approximately 37,500 students, on average, while Vermont's districts serve an average of only 246 students.

A second important effect of these structural differences is the variation in local policies and practices that occur across districts in a state. Since county districts represent a larger geographical region and a large population of residents, the specific policies and practices tend to be homogenous across districts because a wider diversity of views must be accommodated within each district. In effect, this structure tends to produce a consensus approach to district-level decision and policy making. In contrast, the smaller number of people represented by town-based district systems coupled with more homogeneity that tends to occur within a smaller region results in more diversity among local policies and practices. In extreme cases, this leads to some local districts opting to embrace policies that differ greatly from the other districts in their states, such as teaching about evolution and creationism or permitting time from prayer during the school day.

These differences in the structure of state systems also affect the authority of the state over education within each district. As an example, some states, such as Texas, California, Florida, and North Carolina, review and approve textbooks and other learning materials, which limits the use of materials in each district to those materials on the approved list. In effect, this approval process provides a partial control over the curriculum employed within each district. In contrast, other states allow each district to make its own decisions about the curriculum and curricular materials.

Perhaps the most visible difference among state educational systems is the wide variation in the amount and sources of funding that support public education. One way to represent this diversity is to examine per pupil expenditures among states. Per pupil expenditures represent the amount of funding per student provided by a school system to support all aspects of schooling. These expenditures support a variety of expenses associated with the provision of education for each student and include items such as teacher salaries, the principal's and superintendent salaries, administrative and janitorial staff salaries, special education services, maintenance of school buildings, text books, computers, heat and air conditioning, snow removal, busing to and from school, and so on. In 2015/16, the mean per pupil expenditure across the nation was US$11,787. Yet, in states such as Vermont, New York, and the District of Columbia, the mean expenditures were US$23,557, US$21,606, and US$21,297, respectively. In contrast, mean expenditures in Idaho and Utah were US$6,538 and US$6,843, respectively.[2] This represents a difference exceeding US$15,000 per student.

[2] National Education Association. 2017. "Rankings of the States 2016 and Estimates of School Statistics 2017." http://www.nea.org/assets/docs/2017_Rankings_and_Estimates_Report-FINAL- SECURED.pdf

Another way to represent the variation among state educational systems is to compare the sources of funding for education. The source of funding for schools is an important factor that influences the amount of funds available to school and the flexibility schools have to use those funds to support the purchase of curricular materials and technology and provide professional development. In effect, the more funding is provided at the local level, the more flexibility schools have in using those funds. But dependence on local funding often also contributes to inequities in the amount of funding available. In the United States, there are three primary sources of funding for schooling: (a) federal tax revenue, (b) state tax revenue, and (c) local (for example, city, town, and/or county) tax revenue. Across the nation, the percentage of federal funding for all educational expenses ranges from a low of 4.1 percent in New Jersey to a high of 16.4 percent in South Dakota. Similarly, the percentage of education funding coming from state expenditures ranges from 27.6 percent in Illinois to 85.7 percent in Vermont.[3]

Examining one level lower in the system, the variation in spending within each school system also differs widely among states. In some states, strategies are adopted at the state level that attempt to equalize funding across districts, regardless of differences in the local tax base. As an example, Vermont employs a formula-based approach in which local tax dollars from districts that have a higher tax base are transferred to districts with a lower base. This results in approximately equal per pupil expenditure within districts across the state. In contrast, in states such as Arizona local expenditures differ widely and there is no attempt by the state to equalize per pupil expenditures among districts. This results in wide differences among districts, such that in some districts (even those that boarder each other) the per pupil expenditure ranges from more than 40 percent above the national average to 40 percent below that average (a difference of approximately US$8,000 per student).

The decentralized nature of the U.S. education system also affects the availability of digital technologies in schools. In 2016, it was estimated that 54 percent of public school students had access to a school-issued computing device. Some states, such as Maine, have a decade long history of investing in programs that provide a digital device for each student. Other states, however, have been less aggressive in supporting access to technology. As a result, the student to digital device ratio differs among states, although this difference has become less pronounced in recent years.

In summary, the decentralized structure of the U.S. educational system results in considerable differences at both state and local levels in funding, policies, and practices. While many people in the United States see local control as an asset, the diversity that results

[3] IES: National Center for Education Statistics. Web released in January 9, 2018. "Revenues and Expenditures for Public Elementary and Secondary Education: School Year 2014–15 (Fiscal Year 2015)." https://nces.ed.gov/pubs2018/2018301.pdf

makes it challenging to characterize educational practices within the United States at a national level.

Educational Standards and Student Assessment

Standardized testing has a long history in the United States that dates back to the late 1800s. National and state-level efforts to assess student learning also have a well-established history dating back to the late 1960s and early 1970s. At the national level, the National Assessment of Educational Progress (NAEP) was launched by the federal government in 1969. During the 1970s, some states also began testing students in specific grades, in some cases requiring students to pass tests to earn a diploma. In the 1990s, state testing expanded significantly and in the early 2000s, the federal No Child Left Behind Act (NCLB) further increased the volume of testing within each state by requiring all students in Grades 3–8 and in at least one grade in high school to be tested annually in language arts and mathematics. While the details of these programs have evolved over the past 15 years, these general policies remain in effect. In the two sections that follow, we briefly describe the National Assessment of Educational Progress (NAEP) and state-level assessment programs.

- *National Assessment of Educational Progress*

Technically, the NAEP is a voluntary assessment program. The federal government, however, requires states that receive Title 1 funding (which supports students from low-income families) to participate in the NAEP. Given that all states rely on Title 1 funding to support public education, this requirement results in all states participating in the NAEP.

It is important to emphasize that the NAEP is a national assessment program. However, because there is a no national curriculum and instead each state develops its own curriculum, the NAEP is not designed to assess achievement of a curriculum. Rather, it focuses more broadly on knowledge and skill that was identified as important for students to develop at the time the NAEP was first implemented.

The NAEP employs a sampling approach to periodically assess student learning in English language arts, mathematics, science, history, and the arts. The primary goal of the NAEP is to examine trends in student achievement over time. Initially, the trend focused on the national level. But, in the early 1980s the focus was expanded to provide information at the state level. While the details for each subject area differ, the NAEP typically selects a sample of approximately 5,000 students per state in Grades 4 and 8 and one grade of high school. Selected students then perform one of several versions of the test, each of which contains a combination of selected-response and short open-response questions. Students do not receive individual scores. Instead, student performance is aggregated and reported at the state level, as a well as at the subgroup level within states (for example, male/female, race and ethnic groups, socioeconomic status). Because the NAEP is designed to

document trends in student learning, it is conservative in making changes to the content assessed within each subject area and in the design and structure of the test. In the past two years, however, the NAEP has begun to transition from a paper-based to a digital mode. This transition has allowed the program to begin experimenting with new item and task types, including simulated experiments in science and the assessment of problem-solving. More recently, the NAEP also convened a panel of experts to explore the development of an assessment focused on collaborative problem-solving. It should be emphasized, however, that these newer foci have not yet been used operationally.

- *State-level Assessment Programs*

The story of today's state assessment programs begins in 1983. Still in the Cold War and concerned about increasing economic competition from Japan, the federal government convened a panel to examine how to increase U.S. economic and global competitiveness. The result was a report, titled 'A Nation at Risk', that raised concern about the quality of education provided by the nation's K-12 public education system. In response to this report, efforts were made to establish and implement standards for the content and skills students were expected to achieve at each grade level. Again, because the federal government could not demand what was taught in each state, nonfederal but nationwide organizations, such as the National Council of Teachers of Mathematics, worked with representatives from other national and state organizations to develop national standards. In some cases, states adopted these national standards directly. In many cases, states modified the standards to create state-specific versions. In a few cases, states developed their own standards (although they were often similar to the national version). In all cases, these content standards were organized by content area and took the form of descriptive lists of knowledge and skills that were expected to be the focus of instruction within each grade level.

To measure achievement of these standards, several states developed summative tests that were administered to students in select grades. As an example, in the 1980s Massachusetts developed the Massachusetts Educational Assessment Program (MEAP). Like the NAEP, the MEAP employed a sampling approach to test students in Grades 4, 8, and 10 in select subject areas each year. With the establishment of common standards, in the 1990s, several states revised their assessment programs so that the tests employed were aligned with the content standards adopted by a given state.

One challenge with this state-level approach to what was termed standard-based assessment was differences in what each state's standards entailed and how they were assessed. Because each state had autonomy to design and develop its own assessment program, and nearly all did, results were not comparable across states. In response to this shortcoming, during the 1990s there were multiple calls for developing a national test that was aligned with national standards. It is important to note three aspects of this effort. First, because the federal government could not compel states to adopt a national test, the proposed test-

ing program would be voluntary. Second, because there were no federal standards, the testing program would be aligned with standards established by these nationwide organizations. Third, despite strong interest among national leaders in this program, the program was never implemented.

Instead, the 2002 reauthorization of the Elementary and Secondary Education Act, also known as the NCLB, included a requirement for all states accepting Title 1 funding to establish achievement standards for Grades 3–8 and high school for language arts and mathematics and to assess student achievement of those standards each year. Again, because all states depended on Title 1 funding, this requirement led to adoption of this assessment practice by all states. However, because the federal government could not mandate the content of the standards adopted by each state, the NCLB allowed variation in standards and the tests used to assess achievement of those standards to persist.

To address this disparity, the 2010 federal Race to the Top (RTTT) program provided grants to states that agreed to adopt common standards for language arts and mathematics. In the years just before this program, two nationwide organizations developed what were known as the Common Core Standards.[4] Again, these were not federal standards, but rather intended to be nationwide. Although the federal RTTT program could not mandate adoption of the Common Core, because the Common Core was the only nationwide set of standards, it was understood that states that opted to participate in the program would adopt the Common Core.

Shortly after launching this program, the federal government then launched a second program called the Race to the Top Assessment (RTTTA) program that provided substantial funding for states to work together as a consortium to develop tests aligned with common standards jointly adopted by participating states. In addition, the RTTTA program required these assessment programs to focus on assessing high school students' readiness for college or careers and elementary- and middle-school students' progress toward readiness. In addition, the program encouraged states to capitalize on digital technologies to develop next-generation educational tests. This program led to the formation of two consortia of states, namely, the Smarter Balanced Assessment Consortium and the Partnership for Assessment of Readiness for College and Careers (PARCC). Initially, all but four states became members of one or both consortium and participated in the initial effort to develop new tests. When the first round of testing was launched four years later, however, this number had decreased by about half, and today stands at less than 30 percent of states. In many cases, states left a consortium for political reasons, often due to pressure within the state

[4] The Common Core Standards were developed through a partnership involving content area experts and organizations interested in improving student achievement. The development effort was spearheaded by the National Governors Association (NGA) that convened two teams, one that focused on English language arts and the other on mathematics. The effort was also supported by the Council of Chief State School Officers (CCSSO) that represents state-level education leaders and initiatives at a national level.

to drop support of the Common Core Standards or to develop tests over which the state had more direct control.

Collectively, the federal programs and nationwide efforts implemented over the past 40 years have produced several results. Most notable among these outcomes are as follows:

(a) All states have developed and/or adopted content standards that detail the knowledge and skills students are expected to develop in each grade level.

(b) All states administer summative tests annually to students in Grades 3–8 and at least one grade in high school to assess achievement of their state's standards.

(c) Nearly all states have transitioned or have begun to transition their assessment programs to a digital format.

(d) Some states have expanded the types of items and tasks employed by their test to include new item response types and, in a few cases, simulation-based scenarios.

As detailed next, despite these advances, all state assessment programs remain focused on the achievement of content-based standards in traditional subject areas (for example, language arts, mathematics, science, social studies), without reference to 21st century skills. It is also important to note that annual testing in these subject areas have raised concerns among some educators, parents, and the public about the amount of time required for testing each year. This concern creates an obstacle for expanding the range of knowledge and skills addressed by state testing programs.

Table 9.1. *Initiatives to develop nationwide content standards*

Content standards	Developers	Year released	Adoption
Common Core Standards in Mathematics	NGA and CCSSO	2010	Initially adopted by 46 states, but dropped or modified by about half over time
Common Core Standards in English Language Arts	NGA and CCSSO	2010	Initially adopted by 46 states, but dropped or modified by about half over time
Next Generation Science Standards	26 states working with National Science Teachers Association, American Association for the Advancement of Science, National Research Council, and Achieve, Inc.	2013	19 states and the District of Columbia

Twenty-First Century Skills Learning Expectations and Assessment

The first effort to establish formal standards for student learning in the United States began in the 1980s and was soon followed by the development of tests to assess achievement of those standards. This first effort focused on traditional content areas and took the form of lists of discrete knowledge and skills students were expected to develop at each grade level or grade span (for example, Grades 3–5) within a content area.

Since the turn of the century, two important developments regarding student learning standards have occurred. First, the focus of content standards for language arts, mathematics, and science has shifted from discrete knowledge and skills to a more comprehensive and integrated application of those skills. This shift is most pronounced for science where the Next Generation Science Standards[5] emphasize three aspects of science. The first aspect, termed core concepts, is similar to previous science standards and focuses on the core knowledge students are expected to develop. The second aspect, termed scientific and engineering practices, emphasizes the skills required to apply knowledge in specific areas of science and engineering. The expansion to include engineering, rather than simply science, is also noteworthy. The third aspect, cross-cutting concepts, focuses on ideas, habits of mind, and approaches to exploring problems that are common across areas of science and engineering. By addressing all three aspects of science and engineering, the standards aim to develop not just student knowledge of science, but also the ability to conduct scientific inquiries and to understand and critically interpret inquiries performed by others.

More recent mathematics standards have also expanded to place greater emphasis on mathematical practices and problem-solving. Language arts standards, however, still place considerable emphasis on developing reading comprehension and writing skills, but these skills are now expected to be applied across disciplines (for example, science, mathematics, and history) rather than only with literary texts (for example, fiction). In addition, the language arts standards have expanded to include spoken communication and listening skills. All these changes reflect the view that simply developing knowledge and core language arts skills is not sufficient for success in a workplace that now places greater demand on collaboration, communication, and creative problem-solving within and across disciplines.

In addition to these changes in the foci of content area standards, the United States has witnessed several efforts to expand the focus of learning expectations from traditional content areas to what is commonly referred to as 21st century skills. Like the U.S. educational system itself, these efforts have been diverse and have occurred without active participation

[5] Similar to the Common Core Standards, the Next Generation Science Standards were developed by nationally recognized experts in science but are not national standards. Instead, similar to the Common Core, many states have opted to adopt the Next Generation Science Standards. However, other states have retained their own standards or have modified the Next Generation Standards.

of the federal education system. Instead, various business and educational interest groups, and in some cases, scholars have taken the lead in developing and propagating these 21st century skills standards.

As listed in Box 9.1, at least 12 different efforts have been made to establish 21st learning expectations. Across these efforts, the focus of the resulting frameworks varies. All consider the development of content knowledge and skills important, but not sufficient for 21st century learners. To be competitive in the new workplace, these frameworks add additional skills and abilities that fall into five broad categories:

- Use of digital technologies
- Research and communication skills
- Collaboration and creativity/innovation
- Life skills
- Social/emotional skills

Box 9.1. Efforts to establish 21st century learning standards, frameworks, and expectations

- Occupational Information Network (1999)
- EnGauge 2003
- OECD (2005)
- Neomillennial Learning Styles (2005)
- New Media Literacy (2006)
- Partnership for 21st Century Skills (2006)
- Liberal Education and America's Promise (2007)
- International Society for Technology in Education (2007)
- Digital Literacy Standards (2007)
- 21st Century Skills (2010)
- National Research Center Taxonomy of 21st Century Competencies (2012)
- Assessment and Teaching of 21st Century Skills (2012)

Within each of these broad categories, the specific focus of the various frameworks also differs. As an example, some frameworks that highlight use of digital technologies focus on the development of coding skills while others focus more generally on use of the many digital technologies now available in homes, schools, and the workplace. Similarly, those frameworks that include creativity and/or innovation focus on the ability to approach problems from multiple perspectives while others focus more narrowly on entrepreneurship with the aim of preparing students to create new solutions that have economic potential. In these frameworks, innovation is coupled with leadership and business skills.

As one might expect, some of these efforts have gained more traction than others. In terms of impacting K-12 educational practices, perhaps the most influential to date is the Partnership for 21st Century Skills (P21). Founded in 2002, the P21 was a coalition of business leaders, education leaders, and policy makers who aimed to increase 21st century readiness of K-12 students. Figure 9.1 presents a visual representation of the P21 framework for 21st century learning. As indicated by the green arch, content knowledge in key subject areas serves as the foundation of the framework. For P21, key subject areas include English, reading and language arts, mathematics, world languages, arts, economics, science, geography, history, government, and civics. In other words, the framework calls for a well-balanced and comprehensive grounding across traditional disciplines.

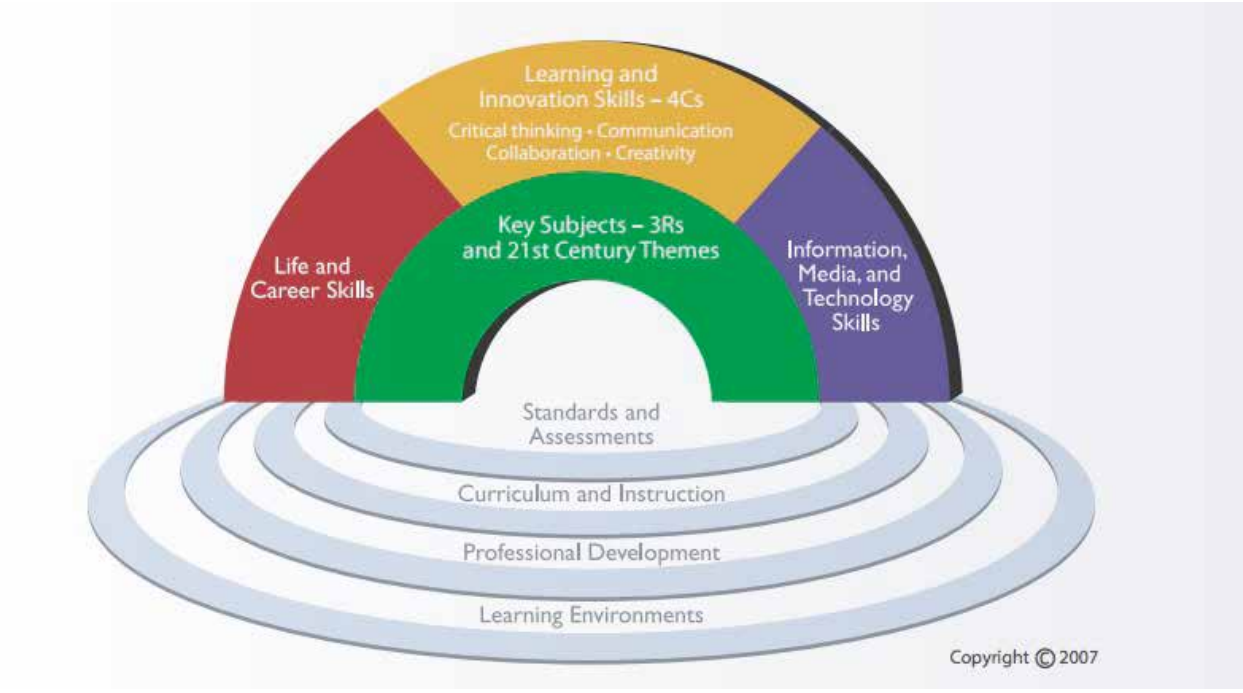
Around this core knowledge, there are three additional areas of focus. Life and career skills include flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility. These skills are not taught in isolation but are expected to be embedded in instruction throughout the curriculum.

Learning and innovation skills focus on creativity and innovation, critical thinking and problem-solving, communication, and collaboration. In effect, development of these skills is also embedded throughout the curriculum. However, these skills also require students to actively engage with and apply knowledge developed in the core content areas. That is, the content area knowledge serves as the 'what' with which students engage as they solve problems, communicate, collaborate, and think critically.

Finally, information, media, and technology skills focus on students' ability to be literate with each of these elements and to be selective about when and how specific instances of these elements are employed.

Below this four-component arch, the P21 framework identifies supports required to help students develop this knowledge, skills, and habits of mind. It should be noted that P21 did not develop these supporting elements, but rather acknowledged that educational systems must be intentional in adopting and/or developing standards, curriculum and instructional practices, and assessments that support these learning outcomes.

Figure 9.1. *P21 Framework*



To aid in the implementation of the P21 Framework, several founding members of P21 formed a not-for-profit organization called EdLeader21. In addition to advocating for the adoption of the P21 framework, EdLeader21 works directly with schools and educational systems to support the implementation of the framework. Rather than providing a prescriptive approach to implementation, EdLeader21 works collaboratively with school leaders, educators, and the local community to refine their school mission, establish key learning outcomes aligned with the framework, and develop a strategy and plan for modifying practices to help achieve these new outcomes. This flexible approach tailored to locally defined priorities is well aligned with the locally controlled structure to the U.S. educational system.

To date, EdLeader21 has established working relationships with more than 200 districts across the nation. While EdLeaer21 has been highly effective in supporting implementation of the P21 Framework, it should be noted that there are more than 13,000 school districts in the United States.

The leading yet limited outreach achieved by EdLeader21 highlights an important challenge that results from the U.S. local-control approach to education: shifting the focus of learning is a slow and arduous process that must occur state by state and often district by district. It should also be noted that although most school districts are not members of

EdLeader21, many have embraced the concept of 21st century learning and have expanded their curricular focus to include several of the learning outcomes represented in the P21 framework.

- *Assessment of Twenty-First Century Skills*

While there has been notable progress in expanding the focus of curriculum from traditional content areas to also include components of 21st century skills, the development of instruments that assess the development of these skills has been less robust. In contrast to assessments in traditional subject areas, for which all states administer summative tests each year in several grade levels, no state has introduced a summative assessment that focuses on any of the non-content area 21st century skills. Instead, efforts to develop assessment of 21st century skills have largely taken the form of research-based efforts that explore how one might assess these new skills. As noted below, in one case, however, research has resulted in an assessment that is used by some school districts, but not at a state level.

Efforts to develop assessments of 21st century skills fall into three general categories: (a) federally funded research projects, (b) experimental extensions to existing programs, and (c) institutional development projects. Select examples within each of these categories are described briefly in the following subsections.

- *Federally-Funded Research Projects*

Federal agencies, such as the National Science Foundation (NSF) and the Institute of Education Sciences (IES), have funded several moderate-size research projects that explore methods for assessing select 21st century skills.

As an example, the Calipers Project has explored the use of technology-based simulations to assess problem-solving in science. Funded by the NSF, this project was based at WestEd, a not-for-profit research organization. In one assessment task, students use a simulation in which they must apply their knowledge of motion and forces to help dispatch a back-country rescue team. In this scenario, two rescue teams take different paths to reach injured skiers. Initially, the student must evaluate features of the terrain associated with a given route to estimate travel time. Once an estimate is made, the simulation modifies conditions and the student must refine his/her estimate. Throughout this activity, students must use data about factors affecting the motion of the snowmobiles on which the rescue teams travel to make recommendations to the teams. Another example focuses on life sciences and uses a simulated fish ecosystem in which students must explore factors that affect populations of various fish found in the region.

A second example of a federally funded research effort is the Virtual Performance Assessment (VPA) project led by Chris Dede at Harvard University. The VPA focuses on the assess-

ment of science inquiry skills. In each example, students control an avatar to play the role of a scientist exploring an issue occurring in a local environment. In one example, the scientist avatar is situated along the Alaska coastline where the kelp (a form of seaweed) population is rapidly declining. In another example, the scientist avatar is located in a system of ponds in which frogs with mutated legs are found. Playing the role of the avatar, students encounter other people who reside in the area from whom they can collect observational and historical data. Students also have access to various instruments that they can use to collect data from different areas of the virtual environment. As students explore the area, they can maintain a data log and can create plots and tables displaying select data. In these virtual worlds, students can move through the environment in any manner desired and have autonomy with respect to what actions they take or do not take. In this way, the VPA provides an opportunity to perform an open inquiry into the problem presented. Assessment focuses on the actions students opt to take, the analyses undertaken, and ultimately the conclusions and recommendations reached based on those analyses.

- *Extensions to Existing Programs*

The NAEP has explored assessment of student ability to solve problems in technology-rich environments. These experimental assessments focus on the intersection of content and technology environments to examine student ability to solve problems within a specific content area using technology-based tools. Depending on the problem scenario, students can use tools to conduct simulated experiments, consult digital resources to learn more about a topic, and/or use tools, such as databases, spreadsheets, and graphical displays, to both explore the problem and communicate solutions.

As an example, one problem scenario requires students to explore factors that affect payload capacity of helium balloons. In this scenario, students are able to access and explore digital information related to the problem. They are then able to conduct a variety of simulated experiments in which several variables are manipulated such as the size of the balloon, volume of helium in the balloon, temperature, and the size of the payload. Using data generated through these simulated experiments, students are asked to conduct analyses and reach a conclusion about the problem. This scenario has been used with small samples of students to begin exploring psychometric issues and understand its utility as a tool for assessing student problem-solving in the digital age.

A second example is the California Information and Communication Technology (ICT) Digital Literacy assessment and curriculum framework. As part of its state content standards, the state of California includes a section on ICT Digital Literacy. Key elements of the standards focus on students' ability to work with digital information and include their abilities to access, manage, integrate, evaluate, create, and communicate digital information. To assist schools in assessing these skills, the state developed a set of performance indicators along with guidelines on how to assess achievement of each indicator. It should be noted

that the state did not develop an actual assessment task for any of the indicators but instead provides recommendations to schools on the focus of assessment tasks that might be developed locally to assess achievement of each indicator.

- *Institutional Development Projects*

The Council for Aid to Education (CAE) is an independent not-for-profit organization that advances corporate support for higher education. Recognizing the growing importance of 21st century skills, the CAE initiated an effort to develop assessments that schools and institutions of higher education can use to assess student development of these new skills. As one example, the College and Work Readiness Assessment (CWRA) employs a performance assessment and a set of selected response items to assess critical thinking, communication, critical reading, and scientific and mathematical reasoning skills. In the performance task, students are required to demonstrate the following types of abilities:

- Recognize when information is relevant or irrelevant to the task at hand
- Analyze and understand data in tables and figures
- Evaluate the credibility of various documents
- Distinguish rational arguments from emotional ones
- Determine the difference between facts and opinions
- Identify questionable or critical assumptions
- Deal with inadequate, ambiguous, or conflicting information
- Spot deception, possible bias, and logical flaws in arguments
- Identify additional information that would help resolve issues
- Weigh different types of evidence
- Organize and synthesize information from several sources
- Marshal evidence from different sources in a written response

The end product is a written essay that is assessed on three dimensions: analysis and problem solving, writing effectiveness, and mechanics. In effect, the last two dimensions are

similar to those found on many current state summative writing tests. The analysis and problem-solving dimension, however, aims to assess a component of 21st century skills.

Today, more than 700 schools and institutions have administered the CWRA to its students but has not yet been employed for a state-level summative assessment program.

Summary of National Landscape

Across the United States, there is general agreement that the range of skills students develop in school must expand for the nation to remain an economic leader. The non-centralized, locally controlled nature of the U. S. school system, however, has resulted in diverse perspectives on what exactly this fuller range of skills should entail. In turn, this diversity has led to the development of several frameworks and sets of standards for 21st century skills. While most state education systems include information about 21st century skills in their curricular materials, none has adopted a formal set of standards on which students are summatively assessed. While there have been several efforts to develop assessments of some 21st century skills, these efforts have been smaller in scale and have not yet produced assessment instruments or methods that are employed by a given state or by a significant number of schools. Finally, while organizations like EdLeader21 are working with several schools to modify curriculum and instructional practices to support the development of targeted 21st century skills, efforts to develop a truly 21st century skills-oriented curriculum are in an early stage and, where it exists, stands as an exception rather than a rule.

Again, this nationwide pattern is not surprising given the limited power the federal government has to directly influence educational practices. And, while most states have not aggressively prioritized 21st century skills in their standards, curricular guidance, assessment programs, and professional development programs, there are a few states that have done so. It is one of these states, North Carolina, that we focus on next to understand one approach taken at the state level to promote and support the development of 21st century skills.

2. DIGITAL-AGE LEARNING: THE STORY OF NORTH CAROLINA

Introduction

In 2015, North Carolina launched a statewide Digital-Age Learning Initiative. This comprehensive initiative aimed to prepare students for an increasingly competitive workplace by capitalizing on a variety of digital technologies to personalize student learning and de-

velop an expanded array of skills and knowledge. To date, the initiative has helped connect every school across the state to high-speed broadband; placed hundreds of thousands of digital devices in the hands of students and teachers; provided training to school leaders, technologists, coaches, and educators; provided access to a wide variety of digital tools and resources; provided flexibility and freedom for schools to experiment with new approaches to teaching and learning; and helped personalize learning for millions of students. While there remains much work to do, North Carolina's initiative represents one of the United States' most comprehensive, coordinated, and well-funded state-level initiatives to support learning in the digital age.

The story of Digital-Age Learning in North Carolina, however, began 15 years ago and is built on a strong foundation established through a series of programs and initiatives that function in a complementary manner. These programs and initiatives have focused on several aspects of education including expanding access to the Internet and to digital learning resources (for example, devices, software, and online tools and repositories), expanding educators' skills in teaching with digital resources, providing tools and training for schools to self-evaluate their progress toward implementing digital-age personalized learning, and supporting leadership within schools to guide change. North Carolina's 15-year story is presented below in a chronological order that documents the various programs that have contributed to the state's transition to digital-age learning. Many of these programs focused on just one or two components of digital-age learning. Yet, collectively, this string of programs and initiatives has created a context that provides essential conditions for equitable implementation of digital-age learning across the state.

As also revealed through this chronological presentation of the state's various programs and initiatives, the state's path to its current position was not linear or prescribed, but rather was grounded by a vision that guided the state as it capitalized on opportunities as they arose. It is for this reason that North Carolina's path to digital-age learning is unlikely to be replicable in other contexts. However, the vision and principles that undergird the strategic decisions made over the past 15 years can serve as a vehicle for moving a large and diverse educational system toward digital-age learning.

Background on the State

North Carolina is a moderate-size, diverse state that serves approximately 1.3 million K-12 students. The state is located along the southern Atlantic coastline of the United States, and its geography is diverse, with a moderate-size coastline, several moderate-size urban areas, expansive rural areas, and mountainous regions in its west. With a population of just over 10 million people, North Carolina is the 10th largest state in the nation.[6] North Carolina also ranks 10th in its gross domestic product; yet, its per capita personal income ranks

[6] https://upload.wikimedia.org/wikipedia/commons/f/f3/US_state_historical_population_FRED_SMIL.svg.

39th.[7] At the turn of the century, there were considerable differences in the distribution of economic opportunities across the state, with several urban and suburban areas experiencing rapid growth, while expansive rural regions were stable. On average, though, both the population and economic productivity have increased steadily over the past 30 years. Most notable is the rapid economic growth that has occurred in what is known as the Research Triangle, an area connecting two cities and three major research universities located in the north-central region of the state. As described below, North Carolina's research universities have contributed to their digital learning initiatives in multiple ways including providing a digital network that served as a backbone for connecting K-12 schools to the Internet and providing resources and expertise to assist in training and the evaluation of the state's programs.

North Carolina has a tradition of strong state leadership for its K-12 education. Before the turn of the century, the state maintained relatively tight control over the education system. The state also has a well-established history of establishing content standards and performance standards for its students. Between the early 1990s and 2010, the state developed its own standards. In 2010, the state adopted the Common Core State Standards and began working with the Smarter Balanced Assessment Consortium to develop achievement tests aligned to those standards. Shortly thereafter, however, the state added several extensions to the Common Core State Standards that focused on additional mathematics and language arts skills not addressed by the Common Core State Standards and established the North Carolina Extended Common Core Standards. In turn, North Carolina resumed control of developing achievement tests aligned to its standards.

Despite its relatively strong economy, its per pupil expenditure ranks as the 7th lowest in the nation,[8] and its student-to-teacher ratio is 25th.[9] In terms of student achievement level, North Carolina ranks 16th out of 50 on the 4th grade NAEP reading test and 36th on the 8th grade NAEP reading. The state has a long history of establishing content and performance standards, maintains tight control of its student assessment program, and uses test scores for accountability purposes at the school, but not at the teacher level.

Supporting Digital Learning

Shortly after the turn of the century, North Carolina's state leaders became acutely aware of disparities in educational and economic opportunities that had emerged between its rapidly growing research triangle and its more rural regions. In response, the then-Lieutenant Governor Beverly Perdue crafted a vision of learning in which all students had access to the

[7] https://www.bea.gov/regional/bearfacts/pdf.cfm?fips=37000&areatype=STATE&geotype=3.

[8] http://www.governing.com/topics/education/gov-education-funding-states.html.

[9] http://www.statemaster.com/graph/edu_ele_sec_pup_rat-elementary-secondary-pupil-teacher-ratio.

same high-quality education. To enable this access, Perdue believed digital technologies were key to the solution. In turn, she challenged state leaders by asking "What must be done to fully integrate technology into the education system?"[10] To help address this question, the state's General Assembly (that is, the legislative body) established the Business Education Technology Alliance (BETA). This alliance brought together key legislators, business leaders, academics, and educators from across the state. To help lead this alliance, Perdue enlisted the assistance of Myra Best, the then-Chair of BETA. Through Best's leadership, a shared vision emerged for transforming teaching and learning across the state. Over the next decade, this transformation focused on creating equity across the state with respect to students' access and opportunity to learn, increasing learning opportunities through the use of digital tools and resources, and expanding the focus of student learning and depth of student learning in response to new demands in the workplace and the world.

Three aspects of BETA are important to note. First, Perdue's strong leadership established a clear focus on increasing equity in educational opportunity through the strategic use of digital technologies. Second, a working committee was established that comprised not just stakeholders from various sectors of the state, but stakeholders who had power to support initiatives that would be launched in future years. Third, members provided strong commitment to use their influence among their constituency to support these initiatives. Collectively, strong leadership, strategically selected membership, and lasting commitment by participants created not just a vision, but a support structure for expanding the state's capacity and capability to apply digital technologies to support learning in the 21st century.

- *North Carolina Virtual Public School*

The North Carolina Virtual Public School (NCVPS) initiative contributed to two components of the state's digital-age learning. These components include expanding connectivity in and between schools and developing online resources to support learning. The NCVPS was initiated in 2005. At that time, an important challenge faced by the state was the provision of access to a diverse array of courses for all students across the state. With higher concentrations of students and access to more resources, many urban and suburban schools were able to provide a wider range of courses and learning opportunities for their students than could schools located in more rural and remote regions of the state. To help equalize access, one of BETA's first recommendations acted upon by the state focused on establishing the NCVPS.

To establish the NCVPS, four key steps were requisite. First, every school required access to a high-speed Internet connection. Second, a diverse set of online course offerings had to be developed. Third, educators who could teach in a virtual environment had to be recruited and trained. Finally, schools had to be given the freedom to experiment with integrating

[10] Strategic Policy Playbook, 2017, page 2.

virtual learning with the established face-to-face learning that was the current practice in schools across the state.

To address the need for a robust statewide digital network that could provide access to digital course content to all students, the state partnered with the Friday Institute. Three aspects of this collaborative effort are of note.

First, the Friday Institute had been recently established within the North Carolina State University to help support state educational initiatives through research- and data-based guidance. Partnering with the Friday Institute provided personnel with technological expertise who could focus their attention on the challenging issue of equitable connectivity across the state.

Second, rather than launching a new and independent initiative to connect public K-12 schools to a common network, the state capitalized on an existing network established to connect the higher education research and education community. By partnering with the North Carolina Research and Education Network (NCREN), the state was able to capitalize on existing infrastructure to begin providing lower-cost connectivity to schools in an efficient manner.

Third, rather than attempting to address connectivity across all schools in the state at once, a pilot study involving strategically selected schools from across the state was undertaken. This pilot study served multiple purposes, which included providing a proof of concept, identifying potential challenges with scaling, and, perhaps most importantly, demonstrating the potential for the initiative to benefit schools in all regions of the state (not just those in the more affluent regions). In turn, this pilot informed the creation of the state's School Connectivity Initiative to which the state legislature allocated US$22 million in recurring funds. This investment rapidly increased school access to the Internet, which enabled the NCVPS to reach more than 15,000 students by 2009 and 60,000 students by 2016.

Over the years, efforts to connect all schools to the Internet has evolved in two important ways. First, as access to the Internet has expanded, demand for the use of online resources has also expanded. In turn, this has required the state to continually expand the capacity of its broadband network to support the increased flow of content in and out of schools. Second, as described below, increased access to personal digital devices in schools by students and teachers not only increased demand on connectivity to external networks, but also created challenges for the flow of content within school networks. In turn, to meet this emerging need, the focus of digital connectivity efforts has expanded to include creating robust networks both between and within schools.

A more recent outgrowth of this effort to support robust connectivity to and within schools is the creation of a cooperative process for purchasing digital resources. Specifically, the

state has established purchasing agreements with several technology providers that capitalize on the size of the state to negotiate lower rates. In turn, districts are encouraged to purchase technological resources and services through the state pricing agreement. In many cases, the technology purchases made by districts are supported by the federal e-rate program. This federal program establishes reduced pricing for several technology purchases based on the economic needs of students served by the school. Depending on the characteristics of the student body, these discounts range from 5 percent to 80 percent. In turn, the state technology acquisition program reimburses the district for the cost not covered by the discount if the district agrees to apply those funds for additional technology purchases. By decreasing the initial cost of resources and services, capitalizing on e-rate discounts to further decrease the costs, and providing additional funding to support further technology purchases, this approach has allowed the state to rapidly increase bandwidth connectivity to all schools, improve connectivity within schools, and expand student access to digital devices. While connectivity and device access alone does not yield digital-age learning, they are a necessary prerequisite that the state has aggressively and successfully provided.

- *Golden LEAF Foundation and the IMPACT Model*

Tobacco is a significant crop produced in North Carolina. As a result of a major legal settlement with cigarette manufactures, several tobacco-growing states received sizable financial awards. Rather than spending the awards to meet immediate needs, North Carolina opted to use the funds to create a foundation whose focus was on supporting the economic well-being of its citizens and transforming its economy. Education was viewed as a critical contributor to both of these foci.

The Golden LEAF Foundation's contribution to digital-age learning focused primarily on increasing student access to digital devices in schools. Following the BETA Commission's recommendations regarding virtual learning and infrastructure development, the Golden LEAF Foundation invested considerable funds to provide students computing devices in school. Initially, device purchases focused on laptops and the foundation's investment allowed several schools across the state to acquire a laptop for each high school student. More recently, device purchases have allowed schools to acquire significant numbers of Chromebooks and tablets. In addition, funding has supported professional development focused on using digital devices to support teaching and learning.

At the same time the Golden LEAF Foundation helped increase access to digital devices, the state launched the IMPACT Model whose key contribution to digital-age learning was the provision of professional development to support use of technology for educational purposes and tools to evaluate changes in their instructional practices. At its core, the IMPACT Model provides a road map and resources to help schools integrate technology into teaching and learning. Key components of the model include

- Hiring and training full-time technology and media coordinators,
- Providing targeted professional development that exposes educators to models for employing technology to support teaching and learning,
- Providing access to high-quality educational software, and
- Creating flexible access to technology on an as-needed basis.

Each year, a subset of schools applies and is selected to participate in IMPACT Model training. During this time, the schools gain access to professional development and receive support implementing the key features of the model. In addition, schools undertake self-assessments of their instructional technology needs, challenges, and successes to inform continuous improvement.

Collectively, the BETA Commission, the Virtual Public School, the School Connectivity Initiative, the Golden LEAF Foundation's investment in digital devices, and the IMPACT Model helped provide a strong foundation for North Carolina's more recent efforts to support digital-age and personalized learning.

Career and Technical Education

In North Carolina, most students, particularly those aspiring to attend four-year colleges and universities, attend high schools that focus instruction on the core content areas. While these schools provide a variety of elective courses that expose students to fine arts, technical arts, business, and social sciences, these courses supplement the primary curriculum, which focuses on English/language arts, mathematics, science, and history. For students whose interests focus on technical areas, North Carolina offers a CTE curricular program. While both programs receive strong support from the state, they have traditionally operated independent of each other. Nonetheless, the effort to prepare students for the 21st century workplace through the use of digital technologies is valued equally in both settings. In addition, over the past decade, efforts to advance CTE has helped advance personalized and digital learning across the state. These advancements are most apparent in the several plans and initiatives developed and undertaken since 2008.

- *2008 Comprehensive State Plan*

In 2008, North Carolina launched a five-year plan for CTE. The 2008 five-year plan was developed in response to an opportunity to receive federal funds provided by the Perkins Act. This federal act, which amended the Vocational Educational Act of 1963, aims to strengthen and expand the economic base of the nation, develop human resources, reduce structural unemployment, increase productivity, and strengthen the nation's defense capabilities by

assisting the states to expand, improve, and update high-quality programs of vocational-technical education, and for other purposes. To meet these aims, the act provides funding, through a competitive grant process, the purpose of which is to develop fully the academic and career and technical skills of secondary students.

A core goal of the plan was to 'improve the academic and technical skills of students by strengthening the academic and career and technical components…through the integration of academics with CTE to ensure learning in core academic subjects and CTE subjects'. To accomplish this goal, several actions were detailed including

- Strengthening state coordination of programs of curriculum and assessment,
- Developing up-to-date competency-based curriculum and assessments that emphasize the integration of academics with CTE,
- Updating content standards to reflect the integration of English language arts, mathematics, science, and social studies competencies with technical competencies, and
- Aligning the competency-based curriculum, including course blueprints, instructional support materials, and assessments (both formative and summative) with updated standards and competency expectations.

The state plan also emphasized the need to deepen students' experience in and understanding of all aspects of industry including planning, management, finances, and principles of technology. As part of this effort, emphasis was placed on infusing entrepreneurship across the curriculum.

To support implementation at the school and classroom levels, the plan called for extensive support for professional development. To this end, the state enlisted the support of colleges, universities, and other professional organizations to provide a variety of professional development opportunities. These ranged from traditional workshops and courses to online and virtual classroom experiences. In addition, the state capitalized on its Centers of Teaching Excellence located in community colleges in three geographic areas of the state. Through these centers, educators working in CTE schools received professional development focused on expanding the technical competencies students are expected to develop and more tightly integrating the core curriculum into technical and career training.

Efforts were also made to update preservice education to prepare incoming teachers to provide instruction and learning opportunities aligned with the new standards, curriculum materials, and learning outcomes. Specific emphasis was placed on increasing educators' and preservice educators' skills in

- Reinforcing core academic skills, like reading, writing, speaking, and mathematics, during the teaching of career and technical content;

- Incorporating hands-on and contextual opportunities for knowledge and skill development; and

- Using assessment results to design instruction and target remediation.

A final aspect of the plan focused on updating assessments of student learning to focus on both attainment of core academic competencies and development of technical skills. While students in CTE schools are required to take the state's English/language arts and mathematics tests, assessments focused on the development of technical competencies are optional. As part of the plan, the state aimed to increase the percentage of students who took and succeeded on the technical competencies assessments.

Given that the state's plan was developed in response to the Perkins Act, the plan had a strong emphasis on enhancing technical education to meet the needs of the 21st century workforce. This plan, however, focused the state on 21st century learning and established a foundation for the development of the state's 2009 CTE Strategic Plan and 2015 Digital Learning Plan.

- *2009 Career and Technical Education Strategic Plan*

The 2009 Career and Technical Education Strategic Plan extended the previous year's plan by emphasizing the personalization of learning and the importance of informing the public and marketplace of student preparation through active marketing.

The primary aim of the plan was to reinvent and reposition North Carolina's CTE system. As the plan states, "our state [North Carolina] and nation face global economic challenges that will only be met successfully through a dynamic, agile and continually calibrated secondary and postsecondary education system." The report then states "…90% of the fastest growing jobs and over 60% of all new jobs will require some postsecondary education or training, but not necessarily a bachelor's degree…Very simply, jobs are changing. But how we educate today's students to be tomorrow's workers has not kept pace with that shift."

To align the state's education outcomes with its economic outcomes, the plan called for CTE to

- Develop critical math, science, and technology knowledge and skills through a focused curriculum and

- Build strong employability foundation skills, soft skills, problem-solving skills, teamwork, and organization.

Many of the suggested paths to these ends were consistent and overlapped with those detailed in the 2008 plan. A notable addition, however, was the development of a marketing plan to inform the business sector and the general public of this shift in preparation and skill development of CTE students. This marketing aimed to strengthen connections between school and work and bolster support for this shift in emphasis in schooling.

There are three aspects of North Carolina's CTE plan and programs that are notable. First, the 2008 and 2009 plans highlight an awareness that the economy and workplace in North Carolina were changing. To remain competitive, the state's technical and career program needed to fully integrate core content with technical content to develop communication, problem solving, and a spirit of entrepreneurship as well as the technical skills required for a given trade. Second, this expansion of goals led to an increased focus on developing both core and technical competencies. Third, the 2009 plan in particular recognized the importance of personalizing learning and the role technology can play in facilitating personalization.

Race to the Top

In 2010, the federal government launched the RTTT program. This program was part of the federal economic stimulation program and provided US$4.3 billion to states through a competitive grant process to spur innovations and reforms to educational practices. The program placed strong emphasis on the adoption of rigorous learning standards, evaluation of school and teacher effectiveness, data-based decision-making, and innovative uses of technology to support teaching and learning. In addition, the 2010 federal RTTT program expanded the focus to college and career readiness of students in all educational programs.

North Carolina was one of 19 states to receive an RTTT grant, the value of which was US$400 million. As described above, before the RTTT program, North Carolina had established a clear vision for supporting learning of all students through the use of digital technologies and had taken several important steps toward that vision. Chief among those steps were expanding school connectivity to the Internet across the state, launching professional development programs, such as the IMPACT Model, to increase teacher and school capability to use of technology to support student learning, and establishing the Virtual Public School to provide all students with access to rigorous and advanced coursework. For North Carolina, the RTTT program provided a valuable opportunity to accelerate progress toward that vision through strategic investments in several areas.

Chief among North Carolina's focus was the development of the North Carolina Education Cloud (NCEdCloud). The School Connectivity Initiative had established a backbone that connected all schools to the Internet. The NCEdCloud initiative aimed to capitalize on this backbone by providing a variety of digital resources and tools for schools to use in a cloud server environment. In part, the concept was to decrease burden on schools to purchase,

install, and maintain these digital tools and resources on their own networked servers. Instead, the state could negotiate better pricing of these resources and tools and make them available to all schools through a state portal.

As part of its RTTT digital initiative, North Carolina developed Home Base. In reality, Home Base serves as a hub that links schools and educators to five digital tools that support personalized learning:

- Schoolnet. Allows educators to develop lesson plans, produce instructional and learning material, and access digital resources that support teaching and learning. Educators can also access and develop assessments and view student performance data.

- PowerSchool. Student information system that allows educators to tailor the instructional path for each student. It also supports course scheduling, transportation, and other administrative functions.

- Truenothlogic. Supports improvements in educator effectiveness by providing tools to evaluate educators and target professional development to meet their current needs.

- Canvas. A course management system used by educators to organize and deliver digital curricular materials to students and to assign, receive, and assess student work.

- NCWiseOwl. Provides subscriptions to a large repository of articles from periodicals, online encyclopedias and reference sources, and other sources. Used by educators to identify and assign reading aligned with instructional goals and/or personalized learning needs of their students. These tools are used by

    - Educators to access student data, develop and distribute learning materials, and track student progress;

    - Students to access learning materials and receive feedback on their work;

    - Parents to view attendance information, monitor their child's progress, and interact with teachers; and

    - Administrators to monitor student progress and educator effectiveness, plan professional development activities for their school, and manage schedules.

Again, while schools are not required to use Home Base, its provision ensures all schools have access to tools that support implementation of digital learning practices.

A separate component of North Carolina's RTTT program focused on expanding the course offerings provided by the Virtual Public School specific to science, technology, engineering,

and mathematics. This effort exemplifies North Carolina's strategic effort to capitalize on various opportunities to build toward a common vision. In this case, the Virtual Public School was well established when the RTTT program was launched. Given that one focus of the RTTT grant competition was on science, technology, engineering, and mathematics (STEM) learning, North Carolina saw this as an opportunity to strengthen and expand its Virtual Public School program and included the development of additional courses as part of its proposal.

Similarly, North Carolina had long recognized the importance of access to digital devices for supporting personalized and digital learning. For several years, the state had been providing funding to schools to increase access to such devices. RTTT provided an additional funding source that helped increase the pace with which device access was provided for all schools.

Recognizing the value of data-based decision making, North Carolina also employed RTTT funding to develop a state-level longitudinal data system. As part of this system, tools to assign and track unique student identifiers were acquired. Both the unique identifiers and the data system empowered the state and its schools to maintain better records about their students and to use this information to conduct data analyses that informed local decisions. This data system is also used to inform instructional decisions and courses of study for individual students in an effort to personalize the learning experience of each student. Although not directly related to digital-age learning, this data system also supports analyses by researchers at the Friday Institute and other organizations that support the state's education program. Ultimately, the longitudinal system became one of the many tools available through Home Base.

- *2013 Digital Resources Transition*

A final act that added strength to the foundation for North Carolina's Digital-Age Learning initiative occurred in 2013. Recognizing the widespread access to digital devices and high-speed Internet connectivity, the General Assembly passed legislation requiring all schools to transition from paper-based textbooks to digital-based resources by 2017. To aid this transition, the legislature provided significant funding. More importantly, it created a demand for careful planning and thoughtful decisions about the criteria used to select high-quality digital learning and teaching resources. This demand set the stage for the development of the state's Digital Learning Plan.

- *2015 Digital Learning Plan*

Whereas the 2008 and 2009 plans focused on a subset of students attending CTE schools, the 2015 Digital Learning Plan addressed the need to prepare all students for the digital age. This plan continued and expanded the emphasis on personalized learning evident in the 2009 CTE Strategic plan. As the plan states, "North Carolina is committed to providing

the personalized digital-age education its K-12 students need to be successful in college, in careers, and as productive citizens." It is important to recognize that personalized learning focuses on each student's development of the knowledge and skills articulated in the state standards and which are believed necessary for the student to succeed in the workplace. Many of these skills are located in traditional content areas, such as mathematics, science, and English language arts. However, workplace success also requires development of 21st century skills such as collaboration, communication, and creative problem solving. Personalized learning focuses on the totality of these traditional and 21st century skills and encourages educators to focus attention on the knowledge and skills most in need of further development for each individual student.

The plan highlights several legislative actions that occurred since 2012 that produced a strong foundation for the plan. Most notable among these actions were the provision of funds to support

- Purchase of a variety of digital devices, software, and learning tools;
- Expansion of professional development to support adoption and implementation of digital learning tools and strategies;
- Increasing of broadband access in schools and homes across the state;
- Expansion of the course offerings provided by the North Carolina Virtual Public School; and
- Support for innovative digital learning initiatives within local schools and districts.

The plan also advocated for several important shifts in the instructional model employed by schools and their teachers. Among these shifts were moving from

- One-size-fits-all instruction to personalized learning,
- Advancement based on seat time to demonstrated mastery and competence,
- Fixed time and locations for learning to anywhere and anytime learning,
- Teacher-centered instruction to student-centered learning,
- Print-based learning materials to digital content and tools,
- End-of-course summative assessment to integrated assessment, and
- Isolated content focus to project-based and community learning activities.

The plan recognized the variation in progress schools had made toward implementing digital learning, and thus recognized that a differentiated approach was needed to support schools. Strong emphasis was placed on developing professional development opportunities that were tailored to each school's need. Two key components of the professional development plan were a focus on developing school and district leadership capacity and the creation of coaches to provide support to schools and teachers. The instructional coaching model supports the tailoring of support to meet the specific current needs of a school and its educators. The instructional coaching model required the state to invest in professional development and preparation for facilitators to ensure adequate access and consistent provision of support across the state.

Another important element of the plan was establishing a statewide procurement service for networks, devices, and digital content. While this service did not dictate what schools and districts must implement, it provided a mechanism to alleviate the need for specialized knowledge and skills at each local site and decreased costs.

To support personalized digital learning, the plan also invested in digital tools that support educators' use of data to identify learning needs for each student. To help meet these needs, the plan supported the acquisition and use of high-quality open educational resources as well as teacher-developed resources that can be accessed by an educator across the state. In addition, the plan provided grants for schools and districts to develop local innovative digital learning models and strategies and to then disseminate those models to other schools.

To support implementation of the many features of the plan, the North Carolina Digital Learning Collaborative was established. This collaborative entailed representatives from the state's Department of Public Instruction, the Golden LEAF Foundation, various school leadership associations, an advisory board with members from several stakeholder groups, and the Friday Institute. Of note, the Friday Institute, a not-for-profit research, development, and professional support organization located within North Carolina State University's College of Education, played a key leadership role in the development and oversight of several professional development aspects of the plan and the acquisition of digital access and tools.

To assist schools in advancing their digital learning practices, a rubric was designed to support self-assessment of a school's transition to digital learning. This rubric allowed schools to identify their strengths, weaknesses, and stage of progression and provided a vehicle for monitoring their progress toward digital learning over time. In addition, the rubric created a common language and expectations regarding digital learning and in effect established targets toward which all schools across the state now strive.

A final component of the plan focused on professional development. Considerable funding was allocated to supporting schools and educators in this transition to digital learning. The funds were used primarily to support two sets of professional development programs, one

run through the Department of Public Instruction and another through the Friday Institute. While the details of each program differed, the aims were the same.

It is important to recognize that the development of the 2015 Digital Learning Plan and its subsequent implementation was a well-supported collaborative effort that included active involvement and support from the Governor, legislative leaders, universities, the business sector, and the K-12 educational community. This level of active collaboration was exemplary and signals a high-level of interest in maximizing opportunities to develop students for the 21st century workplace.

Key Accomplishments of North Carolina's 15-year Effort

The most recent efforts have refined the focus to supporting personalized and digital-age learning of all students. An underlying theme of the various efforts focuses on a desire to maintain and improve the state's economic competitiveness by providing all students with the knowledge, skills, and habits of mind necessary to succeed in the workplace. Although the 2015 Digital Learning Plan has only had two years of implementation, several impacts have already occurred. Some of these impacts fall into four general areas that are summarized below.

- *Digital Infrastructure*

As the various plans developed over the past decade specify, North Carolina has taken several steps to support the creation of a digital infrastructure that will support personalized and digital learning within each school across the state. Key accomplishments to date include

- Providing high-speed broadband access to every K-12 school in the state;
- Establishing a centralized structure for procuring technology resources including devices, software, and online resources;
- Creating a centralized student information system that can be used by school leaders and educators to support data-based decision making about student learning and to assist in personalize that learning; and
- Establishing a centralized repository of digital learning assets and resources, as well as a common digital content management system all educators across the state may use.

- *Professional Development*

The Department of Public Instruction and the Friday Institute have provided professional learning opportunities for a wide variety of school personnel, each of which is summarized below.

Leadership. Professional development for leadership is divided into three categories: district leadership teams, superintendents, and principals.

District leadership team professional development requires a district to identify 5–8 people who participate as a team. The team then participates in five days of face-to-face sessions designed to develop participants' capacity to understand, model, and lead digital learning and to address four key areas of digital learning: human capacity, curriculum and instruction, data and assessment, and technology and infrastructure. The aim of this team approach is to create consensus within the district about critical needs and to begin identifying approaches to meeting those needs.

Superintendent support takes the form of cohorts of 50 people who participate in 4–5-day face-to-face sessions designed to build capacity to lead digital learning in their districts and create a network of superintendents implementing a common vision for digital learning.

Principal support occurs as a cohort of 75 principals meeting for five days to develop capacity to use data to create goals for personalized and digital learning, establish a culture in their school community that supports personalized and digital learning, and be able to model digital learning in their schools.

In addition to these extended face-to-face sessions, a variety of just-in-time support is also provided. This takes the form of one-day in-person events and shorter web-based sessions.

Instructional coaches. A five-day in-person session for cohorts of 75 instructional leaders is provided to deepen understanding of personalized and digital learning, explore challenges encountered by educators as they implement these approaches to learning, and create instructional resources for teachers' daily use. Following completion of this session, just-in-time support is provided through a series of in-person and virtual sessions that focus on innovative approaches to teaching and learning in the digital age, innovative pedagogy that model digital learning, and approaches to personalize learning through digital resources.

Educator. In addition to the support provided by instructional coaches, sessions are provided throughout the year in which innovative educators share strategies and methods they have used when implementing personalized and digital learning.

These sessions provide mastery models of digital learning and provide opportunities for educators to explore challenges and approaches to implementing such practices in their classrooms.

In addition to the above programs, the Friday Institute formed an alumni network. This network allows past participants in a professional learning program to remain connected

and to come back for shorter sessions in which they exchange lessons learned through their own work and explore potential next steps.

While the content of each professional learning program is tailored to the needs of its target participants, a key focus across programs is on organizational change management. This topic emphasizes the importance of developing a culture around a shared vision of what teaching and learning should look like in 3–5 years. This vision then serves as a foundation for identifying needs and developing a plan to meet each need. To help create a vision, considerable time is spent exposing participants to examples of digital learning that is occurring in other schools, both in North Carolina and in other areas of the country. Consideration is also given to flexibility and responsiveness to changes in technologies that may occur while striving toward a given vision.

A second major focus across professional learning programs is the concept of personalized learning. For this focus, equity serves as a lens through which teaching and learning are viewed. The goal is not to create the same learning opportunities for all. Rather, by focusing on each student's individual needs, instruction is tailored so that each student's needs are met. Doing so requires flexibility in the pacing of instruction. In addition, educators must be sensitive to and aware of the specific learning needs, preferences, and interests of each student to effectively personalize teaching and learning. Given the access to a diverse array of learning resources and the ability to easily modify many resources, several uses of technology to personalize learning are explored.

- *Curriculum and Self-assessment*

Over the past decade, North Carolina has revamped its standards for CTE to increase integration of core content knowledge and skill with technical skills. It has also expanded its assessment of these skills and has set targets to both increase the number of students performing these assessments and increasing performance on the assessments.

The state has also established new and more rigorous standards aimed at improving students' readiness for college and careers. New assessments were also developed to assess progress toward and achievement of these standards.

To support achievement of the standards while also encouraging adoption of personalized and digital learning, the state has provided a variety of curricular resources. (see description above of PowerSchool, NCWiseOwl, and Canvas).

- *Flexibility That Supports Local Experimentation*

While the state developed and has invested heavily in supporting the Digital Learning Plan, considerable flexibility has been provided to districts and schools regarding their im-

plementation of personalized and digital learning. To support schools in developing and adopting new practices, a variety of grants have been awarded. These have been used in a variety of ways to meet schools' specific needs.

(oo) Summary of North Carolina's Digital Learning Initiative

As this case study details, North Carolina's path to its current state of support for digital-age learners was the result of many factors. Perhaps the most important factor was the establishment of a clear vision of learning in the digital age established by Perdue and embraced by a diverse range of leaders within the state. While the details of the vision evolved in response to a variety of developments, including introduction of new technologies and the availability of new funding sources each with their own focus areas, recognition that digital technologies had potential to both equalize and advance educational opportunities was a guiding force for the state's collection of initiatives.

The state also applied considerable ingenuity in responding to various funding opportunities in a manner that provided stepping stones toward its vision. As an example, the federal Perkins program, which focused on CTE, allowed the state to introduce a focus on personalized learning. The RTTT and then Digital Learning Plan were then used to expand personalized learning from schools focused on career and technical training to all schools.

Similar ingenuity supported the expansion of digital resources to schools across the state. To support Perdue's quest for virtual learning, the state initially capitalized on a digital backbone initially established to support university research and development to increase Internet access for K-12 schools. Later, the state capitalized on its expertise in digital technologies and experience acquiring technology services from providers to create a statewide purchasing system. By combining this approach with benefits offered by the federal e-rate program, the state decreased costs to schools for improving their access to digital resources and also decreased the need for every school to possess the technical expertise necessary to identify and negotiate the purchase and installation of specific digital resources. This tactical approach enabled schools to more rapidly acquire the resources necessary to support digital learning.

In summary, North Carolina provides an interesting example of a U.S. state that has successfully positioned itself to support learning in the digital age. While schools are in the early stages of capitalizing on the state's most recent digital learning initiative, the increased focus on personalized learning, coupled with access to a variety of digital resources and professional development, has positioned schools to develop both the traditional content knowledge represented in learning standards and the new competencies associated with 21st century skills.

The next section shifts focus to the school level and briefly describes the various ways in which high schools are responding to the recent focus on 21st century skills development.

3. 21ST CENTURY SKILLS DEVELOPMENT IN U.S. HIGH SCHOOLS

The opening section of this case study emphasizes the decentralized nature of the educational system and the diversity this structure creates. This diversity is clearly seen in the response of schools to 21st century skills development. As Figure 9.1 details, several frameworks have been established that detail different, although overlapping, conceptions of 21st century skills. To date, none of these frameworks has come to dominate the nation's conception of 21st century skills. Moreover, while several states include elements of 21st century skills in their learning standards, none have explicitly established 21st century skills standards or assessments that focus specifically upon such standards. This lack of consensus, at both the national and state levels, leaves districts and schools with considerable flexibility with respect to their embrace of and efforts to support 21st century skills development.

The approach taken by U.S. high schools to incorporate 21st century skills into their educational programs can be classified into at least six categories. The first category includes schools that have largely ignored 21st century skills and have taken little or no actions to formally incorporate 21st century skills into their learning program. These schools are not discussed further here.

The remaining five categories of response are as follows:

1. **Embedded in typical instruction.** This category represents the lowest level of adoption of 21st century skills. While schools that fall into this category recognize the growing importance of 21st century skills and may make mention of such skills in their missions or other informational materials, they leave it to the discretion of teachers and/or content area departments to determine whether and how to integrate these skills into instruction. In many cases, these skills are developed through learning activities focused on traditional content areas and, in effect, are a secondary priority. As an example, collaboration, problem-solving, and/or media skills may be developed through group projects that are designed to develop students' knowledge or ability of traditional content. While students are required to work together to solve a problem or develop a media-based project, the primary intent of the project is not to develop 21st century skills, but traditional content knowledge and skills. In some cases, rubrics employed when assessing the group product may include criteria specific to collaboration, problem-solving, and/or media skills. However, here again, the primary focus of assessment is often on the demonstration of understanding of traditional content or skill development. Because assessment of 21st century skills is a secondary component, these skills are not given priority in instruction or the learning activities in which students engage. In short, when 21st century skill development is embedded within typical instruction, focus on 21st century skills is

left to the discretion of the individual teacher, both in terms of development and assessment of these skills.

2. **School-wide adoption.** This category represents the second-lowest level of adoption. In these schools, a commitment is made to embrace one or more aspects of 21st century skills. Agreement is also made for all teachers in a select content-area department or across departments to employ one or more common assignments or activities that are specifically designed to develop the select 21st century skill(s). In many cases, the activities experienced by students may be similar to those employed by individual teachers in Category 1; however, all teachers employ the same or a very similar activity. In addition, assessment of students focuses specifically on the 21st century skill(s) selected by the school. Schools that adopt the P21 and work with EdLeader21 tend to fall into this category during their initial efforts to adopt 21st century skills.

3. **Career and technical schools.** This category focuses on a specific subset of high schools that are designed to support students with specific career interests. Often, these types of schools benefit from the federal Perkins program described in Section 1 and serve a subpopulation of students that have opted out of a traditional high school education. These high schools deeply value 21st century skills, particularly those associated with the career areas upon which they focus. As an example, a school that supports a focus on automotive engineer will often deeply value the problem-solving and digital technology aspects of 21st century skills development. Similarly, a school that supports graphic design may embrace problem-solving, digital technology, and entrepreneurship skills. Often these schools structure instruction and learning as two tracks. During one track, instruction focuses on traditional content area skills and often occurs in a traditional classroom setting. During the other track, instruction and learning focus on the career skills that are of direct interest to the student. Some schools split the day into two parts, with each part focusing on a given track. Other schools organize the tracks by day of the week, and others alternate between tracks each week. In most cases, however, the tracks are treated in a coordinated but independent manner.

4. **Traditional school with career focus.** This category represents a blend between categories 2 and 3. In these schools, the primary focus is on developing students' content skills. All students participate in courses that focus on traditional content areas. In addition, students with a defined career interest also participate in courses that focus on developing 21st century skills specific to their career interest. As an example, a student interested in the food industry might participate in an extended course that focuses on all aspects of running a food service including food safety, food preparation (for example, cooking and baking), restaurant management, inventory management, client services, and accounting. Through these various foci, students develop fluency with the digital tools, collaboration, media, inter- and intrapersonal, and problem-solving skills associated with the career field. Often, these courses occur during extended blocks of time.

In addition, in many cases, the courses allow students to run fully functioning entities (for example, a school restaurant open to the public, a print shop supporting school and public orders, and a mechanic shop providing services to the public). In these schools, assessment within the courses focuses specifically on the 21st century skills, as well as traditional skills, associated with the career field.

5. **Restructured schools.** The final category represents the highest level of 21st century skills adoption. In these schools, 21st century skills are fully embraced, and the school is centered on the development of these skills. In many cases, the school is restructured such that traditional content area courses (for example, English class, algebra class, and U.S. history class) are replaced by seminars and/or courses that cross disciplines (for example, Evolution of Racism in U.S. Society or Impact of Digital Technology on U.S. Culture). In addition, the majority of learning is performed through extended group projects that require students to collaborate to conduct research on a topic, develop a theory or theme, and co-develop a product that communicates that theory or theme. Such projects occur over an extended period sometimes lasting several months. For both seminars and group projects, the teacher's role shifts from providing directed instruction to providing support and critical feedback on student's ideas and proposed solutions to the problems they encounter. Similar to the Coalition of Essential Schools in the 1990s, these schools focus assessment of student learning on exhibitions, demonstrations, and/or portfolios developed over an extended period. Often, the amount of traditional content covered through learning opportunities is reduced, but the depth at which students explore topics is increased significantly. In addition, students are often given more choice about the specific content they explore in depth. In these schools, teachers tend to serve as coaches or guides for students as they work on their projects rather than as the deliverer of knowledge.

Firm data do not currently exist regarding the percentage of schools that fall into each category of 21st century skill adoption and implementation. It is reasonable to assume, however, that a large majority of schools fall into the first and second categories (as well as the no-adoption category). The percentage of schools classified as career and technical schools varies by state, but in all cases, several of such schools exist within each state. The fourth category is an atypical exception but is likely significantly more prevalent than the fifth category. Schools that have restructured around 21st century skill development and/or learning in the digital age are indeed rare (less than 1 percent) but are garnering increasing public interest.

Again, concrete data on 21st century skills adoption do not exist. As noted above, at least 700 schools are currently working with EdLeader21 on the implementation of 21st century skills. Many others have incorporated verbiage about 21st century skills in their school missions and other informational materials. Nonetheless, it is fair to say that high schools that have aggressively implemented initiatives that support implementation

and assessment of 21st century skills represent a very small minority of U.S. public high schools.

4. CONCLUSION

In 1983, the federally sponsored report titled 'A Nation at Risk' sparked a drive for establishing content standards for the K-12 educational system. The formation of the committee that authored this report was driven by concerns about maintaining U.S. economic competitiveness in an economy that was becoming increasingly global. In short order, organizations responded to the report by developing content standards and states either adopted the standards outright or developed their own similar versions. States then followed by developing large-scale testing programs designed to assess student achievement of the standards. In addition, the federal government then established clear requirements for such assessment programs. In turn, states responded by modifying and, in many cases, further expanding their programs to meet these requirements. While standards and assessment programs still vary among states, the end result was the assessment of nearly every student each year in grades 3–8 and at least one year in high school.

In the early 2000s, similar concern about U.S. competitiveness in an increasingly digital global market also arose. Like concerns 20 years earlier, these new concerns also led to efforts by several organizations to identify an expanded set of skills deemed essential for the 21st century. However, unlike the development of content standards in the 1980s, the United States has not yet seen widespread adoption of these standards, particularly at the state level. In turn, no formal assessment programs focused on student development of these new skills have been established.

At the state level, some states have launched initiatives to support learning in the digital age. As detailed above, North Carolina is among those states that have been proactive in establishing the conditions believed necessary to support digital-age learners. As an outgrowth of the leadership and vision established 15 years ago, the state has made significant progress in improving access to technology in schools and has provided a variety of resources and professional development programs that support implementation of digital learning practices in schools across the state. However, even in this rich 21st century learning environment, formal establishment of expectations specific to 21st century skills and assessments that measure progress toward developing these skills in all students has not yet emerged.

Consistent with the U.S. educational system's value of local control, adoption and implementation of 21st century skills have been left largely to the school and district levels. In some cases, schools and districts are working with experts, such as EdLeaders21, to target

21st century skills and modify their educational practices to support development of these skills. In rare cases, schools have fundamentally restructured themselves to create robust opportunities for students to work collaboratively with modern technologies to develop and demonstrate achievement of such skills. However, concerted efforts such as these are currently clear exceptions. In the coming years, the number of exceptional schools may increase. However, if the standards-based movement serves as a model for creating change across the majority of U.S. schools, it will require federal regulations tied to financial incentives to fully stimulate states and their schools to rapidly embrace 21st century skills as a focal point for teaching and learning.

Chapter 10

RUSSIAN FEDERATION: AT THE CONCEPTUAL CROSSROADS

Kirill Barannikov, Igor Remorenko

Highlights

- In Russia, the term "competence" in the field of education rose to prominence at the end of the 20th century. However, its roots stretch back far further ("labour education" in the 1920s, "developmental education" in the 1950–1960s, "experimental schools" in the late 1980s — early 1990s).

- The federal state educational standards do not contain a clear list of competences. In the three groups of educational objectives (disciplinary, metadisciplinary, and personal), however, competences are clearly associated with metadisciplinary and partly with personal outcomes. Mentioned explicitly throughout the standards, the list are not consistent, no continuity is provided between levels of education.

- Competences remain but vain declarations; they are not supported either in external assessment, or in school practices and teacher training. Teachers are confused as to what is expected and how to achieve it.

- There are several independent attempts to launch new schools, which would embrace both knowledge and competences-oriented education.

- Finding a balance between competences and disciplinary knowledge is a serious challenge for Russia.

Russia is a federal state with a total population of 146.8 million people. The structure of Russia includes 85 territorial entities.

General education in Russia is made up of 4 levels: Preschool (ISCED 0) for children aged 3–7, elementary (ISCED 1) — for 7–10 year olds, basic (ISCED 2) for those aged 11–15, and secondary (ISCED 3) for 16–17 year old pupils. There are 14.2 million children in total learning at all education levels. The total number of teachers is 3.47 million, and they work in 44,480 schools. More than 95% of schools are state owned.

Until 2018, there was a Ministry of Education and Science in Russia that supervised both secondary and higher education. In 2018, the Ministry was divided into two administrative bodies, and today secondary education is controlled by the Ministry of Education. Every entity also has a regional ministry or department of education.

In Russia, there is a final examination (high-stakes examination) at the end of basic (9th grade) and secondary school (11th grade). Enrollment in universities is carried out according to results of the state final examination (SFE-11, also called the unified state examination (USE)).

Russia ranks 1st in the PIRLS-2016 results. According to the results of PISA-2015, Russia was 32nd, while a specific PISA study showed that Moscow schools rank among the top ten in the world.

Currently the educational system of Russia is at a "conceptual crossroads." The reforms that have been introduced over the past two years (2016–2018) once again bring up the issue of curriculum content. Such a situation is reproduced in Russia fairly regularly and, as a rule, is associated with new teams of policy makers in education coming into power. The seemingly simple question of 'What to teach' becomes the subject of heated debate. One of the topics most discussed now is "21st century skills." Moreover, it is not only academics and politicians that are involved in the public debate, but also parents and teachers.

In Russia, the term "competence" in the field of education rose to prominence at the end of the 20th century. However, its roots stretch back far further.

1. PREHISTORY: PROJECTS ON DEVELOPMENT OF COMPETENCIES IN THE SOVIET SCHOOL

Labor education, project training and cultural and historical concept of Vygotsky at school. In the 1920s, after the October Revolution, the People's commissariat for education announced the policy of unified labor schools. In addition to the overall aim of

eliminating illiteracy, this policy assumed that knowledge was mastered not by learning and memorization, but by the participation of children in activities, and the teacher's task was to involve children in such activities. Experimental pedagogical sites sprang up across the entire country. Eight schools in Moscow collaborated with D. Dewey and his pupils, and one school network was engaged in labor education (P. P. Blonsky, A. S. Makarenko, S. T. Shatsky, etc.). While describing his impressions of the Soviet Russia of the 20s, John Dewey noted: in the post-revolutionary period, the Russian schools tested various approaches, the implementation of which was impossible in Tsarist Russia[1]. Special attention was drawn to interaction between the school and the family, with additional education of children taking place outside of school life and in summer camps, as well as through collective and group learning. Undoubtedly, Soviet education was closely connected with propaganda and the promotion of Marxist-Leninist ideology, bringing the forcible inculcation of communism values to all citizens. However, the training techniques developed and applied in the Soviet schools were useful for study and adoption in schools abroad. In the same period, ideas of cultural and historical psychology by L.S. Vygotsky were developed and the first field experiments of his concepts were conducted. However, in the 1930s, during the period of Stalin's industrialization, experiments in pedagogy ceased and the school system returned to the classical model, focusing on the transfer of knowledge.

"Developmental education." In the 1950s and 60s, after the death of I.V. Stalin, pedagogical experiments resumed. Pupils and followers of L.S. Vygotsky organized a series of experiments on activity-based pedagogy including early experiments on "Developmental Education" (V.V. Davydov, L.V. Zankov, D.B. Elkonin, and others.). They believed that the tasks solved by pupils should focus on the field of the immediate development of children. The process of solving such tasks should lead to the development of thinking, cooperation, communication skills, etc. In the course of such experiments, new curricula for mathematics, Russian language, natural science, and other school subjects were developed. However, these experiments were again stopped in the period of stagnation during the Brezhnev era (1970s — beginning of 1980s were the "stagnant" period when the Communist Party was headed by L.I. Brezhnev). At the same time, the impact of these innovations on Soviet schools turned out to be very significant. For example, it became a tradition for teachers to plan lessons with a description of not only study, but also the educational and developmental tasks. School inspectors supervised the ways the teachers developed the personal qualities of children during lessons and educational activities outside of school hours. Schoolchildren made plans for independent improvement of personal qualities (honesty, sympathy, diligence, ability to help others, etc.). Thus, there were Pioneer and Komsomol organizations in each school and the education, of course, was closely associated with Marxist-Leninist ideology.

[1] Impressions of Soviet Russia and the Revolutionary World, John Dewey, 1929. URL: https://archive.org/details/in.ernet.dli.2015.169066/page/n9

It's interesting to know...

The concept of developmental education is ideologically close to the concept of competence-based education (CBE) and objective-based education (OBE). Both concepts (CBE and developmental education) emerged around the same period in foreign practice. One of the specific features of both concepts was shift of attention from the educational material to the pupil's activities — their skills.

The federal state educational standard which is currently in force in Russia and focuses on the competency model, originates from this period.

"Experimental schools" and the "pedagogy of cooperation" in the era of perestroika (restructuring of the USSR). The next wave of innovative education development emerged in the period of perestroika. In the late 1980s — early 1990s, many innovative and original schools opened in Russia. "Developmental education" became popular again. The more innovative teachers of that time focused on developing the qualities that were close to the required skills of the 21st century and the pedagogical techniques suitable for them: joint determination of the syllabus by pupil and teacher (humanistic pedagogy of Sh.A. Amonashvili), competence of thinking (thinking based on the logical schemes of V.F. Shatalov), development of independence and teamwork skills (proactive training of S.N. Lysenkova), "big ideas" (aggregative didactic units of P.M. Erdniev), competence of interaction with other people and project training (collective training of V.K. Dyachenko), etc. Educational innovators drew up their key ideas in the "Manifesto of cooperation pedagogy", the basic principles of which include collaboration between teachers, children and parents, the creative growth and development of a child's personality and self governance of schools. During this period, the Iron Curtain was lifted and active interaction between Russian teachers and teachers from other countries began to occur. As a result, schools based on the pedagogical model of M. Montessori, the Waldorf pedagogy of R. Steiner, the pedagogy of S. Freinet, A. Neill, and others started to appear in Russia.

Innovative teachers become popular in the country, gaining respect from society, and are were often elected to the authorities. Their experience was researched in theses, and studied in ministries and departments. During this period, more than 80 Russian regions received the right to establish their own educational development strategy. These strategies sometimes differed radically from each other, depending on the tradition in which innovative teachers in the region worked.

However, the social movement of teachers-innovators gradually declined in popularity. On the one hand, this happened because their work recieved very little support from the institutional structure of the education system: the structure of educational standards (manda-

tory ones) remained focused on the memorization of information by children[2]; pedagogical innovations were not considered when allocating of funds; pedagogical high schools and teacher advanced training courses continued to prepare teachers for the transmission of factual knowledge and its memorization. On the other hand, in the 1990s, economic reforms that were painful for the whole country began. Redistribution of enterprises' property, late payment of wages, severe economic crisis of 1998, inflation, sharp worsening of the population's standard of living, crime wave have led to the need to find system solutions and revise of the educational policies.

2. AFTER PERESTROIKA — ON THE WAY TO THE "NEW EDUCATION"

The main document regulating the content of education in Russia is the state educational standard. Since the start of perestroika, there have been three attempts to update it — all these attempts, in one way or other, sought to integrate competences into the school education.

The concept of modernization of Russian education adopted by the Government of the Russian Federation between 2001 and 2010 can be considered as inception of system changes. It was this document that first mentioned the competence-based approach and specified the target for forming modern skills. In the spring of 2004, the Ministry of Education approved[3] new state educational standards. These standards presupposed the development of state-of-the-art skills and competencies, but did not mention any specific qualities. The main breakthrough of this standard was an attempt to form a list of measurable educational results for each subject. However, the developers did not associate the subject results with the skills of the 21st century, and the new standard still focused on the idea of the “minimum educational level” — a detailed listing of topics for study in all academic subjects at every level of education.

In 2005, the situation began to change. At the end of 2004, the Government of the Russian Federation approved the priority directions for development of the educational system of the RF and adopted a plan for their implementation in the spring of 2005. These documents show the intention to change the educational standard structure and a rejection of a strict focus on a specific list of educational results. They proposed excluding a list of

[2] Also, there were exceptions. As a rule, the schools used curricula offered at the federal level without significant changes. However, in some cases, the so-called “school” and “regional” components appeared in the curricula — these were changes in the federal curriculum adapted to the school's local context. Some classes in the school curriculum were chosen by the schools independently, including those agreed with the local community, pupils, and parents.

[3] During the administrative reform, 4 days before the end of its existence.

topics that need to be covered in each subject from the structure of educational standards. However, the Government of the Russian Federation did not yet have a clear strategy on how to move from memorization pedagogy to the pedagogy of skills of the 21st century and so these changes were slow to take place. Nevertheless, in the fall of 2005, the President of the RF launched a priority national project "Education" that was focused on this particular task.

In 2008, amendments to legislation were adopted and the structure of state educational standards was renewed[4] again. One of the most important principles was the introduction of requirements to above-subject (metasubject) educational results which, in fact, set up a certain model of competencies.

In 2010–2012, the Ministry of Education and Science of the RF adopted new federal state educational standards (hereinafter — FSES) for primary, basic, and secondary general education, as well as the pre-school education standard. All these documents describe not only the substantive results of education, but also the pupil's metasubject and personal results. However, they all turned out to be far from the teaching practice: it was assumed that teachers would be able to compare a given set of results with the reality of teaching specific subjects independently. For most teachers, this task was unclear.

This version of the educational standard is valid in Russia today.

3. FORMAL MODEL OF COMPETENCES IN THE RUSSIAN SCHOOL

In Russia, the curriculum contents is defined by several documents:

— federal state educational standard determining the general scope of requirements (educational results, conditions for implementation, etc.) of the general education content. This standard sets the structure of the school's curriculum. It is developed by the state and is mandatory;

— exemplary basic educational program providing recommendations for developing every specific educational program of the school. Developed by independent developers (for example, universities), incl. upon the state's order; has advisory nature;

[4] The project was developed by the Ministry of Education and Science of Russia and the State Duma of the Russian Federation.

— main educational program of the school — local document drawn up by the school and describing the goals, results, and conditions for arranging the educational activities in this particular school;

— work program of a course or a subject is a part of the main educational program and is created by each teacher who describes the educational results that are to be achieved and the content to be used for this, with regard to the teacher's specialization in this school.

The foundation for preparing the entire chain of the educational documents is the Federal State Educational Standards (existing at all four levels of the general education). These standards determine, among others, the structure of system for forming the competences and skills in a school. It is these standards, not the Federal Law "On Education in the Russian Federation," which specify the semantic position on the issues of competences.

At the same time, the FSES remains a framework document; many issues related to competences and various kinds of skills remain outside of "direct sight" of the standards. The federal state educational standards do not contain a clear list of competencies, unlike many national curricula of a number of countries (for example, Finland, Canada, Australia). The term "competence" is used in the standard in fragmentary way. At the same time, however, the standard sets three groups of requirements to educational outcomes: disciplinary, metadisciplinary, and personal. In this triad, metadisciplinary (and partly also personal) outcomes are similar to a list of competencies, though defined rather fuzzily.

It's interesting to know...

The structure of educational results in the current federal state educational standard is similar to the typical scope of "21st century skills." The scope of 21st century skills usually includes three blocks: knowledge, competences, values and attitudes. The educational standard of Russia also sets out three groups of results: subject (functional literacy, knowledge), metasubject (competence), personal (values and attitudes).

The metadisciplinary educational outcomes mentioned in the federal standard include: the ability to set goals, the ability to plan, regulatory skills, semantic reading, informational and communicative skills, etc. It should be stressed once again that there is no clear list. To date there are four educational standards in Russia — one for each level of general education: preschool, elementary, basic, secondary, and each of them contains its own list of metadisciplinary results; there is almost no continuity between the levels. A full list of requirements for the metadisciplinary results (in fact, competences and

various kinds of skills) is given in Annex A. The federal state educational standard for pre-school education does not contain a list of competences in explicit form, but their analogue can be found in the paragraphs describing the target references (the list is given in Annex A).

The list of requirements includes a number of non-core entities — some of which are personal cognitive skills or even actions (for example, "the ability to use verbal means consciously" from subclause 10 of clause 10 of FSES GBE), and some are abilities (for example, "semantic reading" is essentially the reading literacy, subclause 9 of clause 11of FSES GBE), and and some of which are competences (for example, “IC competence”, scl. 5 of cl. 8 of FSES GBE) One of the crucial issues is the lack of a unified model or methodology for determining and selecting the competencies.

The exemplary (tentative) basic educational programmes (EBEP) have been developed for each of the four levels of general education, taking into account the standards. The programs specify the requirements of the standard in more details — up to a specific example. Based on this example, the educational organization can develop its own programme.

It’s interesting to know...

In Russia, more than 100,000 teachers from all over the country took part in the creation of EBEP. Beginning in the late 2000s, public online discussion of educational documents using crowdsourcing technologies became popular in Russia. A special web site (edu.crowdexper.ru) has been created for discussion of EBEP. This was one of the largest scale debates in the history of Russia. It is important to note that during the discussion the documents were not just approved or disapproved, but their wordings were clarified and supplemented with various changes. In this sense, EBEP is really a product of work of the professional community.

While keeping the wording of requirements for metadisciplinary results from the standards, the current EBEP specify them and divide them into smaller skills and operations. For example, “the ability to determine the goals of learning, set and form new tasks in study and cognitive activities, develop the motives and interests of own cognitive activity” which appears in the text of the FSES of the general basic education has the following refinement in EBEP: the ability to "analyze the existing and plan future educational results" and the ability to "identify own problems and determine the main problem", etc.

Although EBEP was initially meant as the basis for the practical work of schools and teachers, the reality has proved to be different. Exemplary programmes are used by schools and teachers not as a guideline, but as a reference. Schools and teachers consider EBEP as man-

datory requirements and use them strictly according to the original wording, without trying to adapt them for specific local needs. This is largely caused by the habit of teachers to obey the strict regulation of education in the Soviet time. The past three decades have not been enough to overcome this tradition and break this habit.

4. UNIVERSAL COMPETENCES AND NEW SKILLS IN THE RUSSIAN SCHOOL: REALITY AND PRACTICE

4.1. Most schools: declare competence, practice memorization

The inertia of the "knowledge-based" paradigm in Russian education remains and largely determines the school practice. A competence-based approach, despite its declaration in the FSES and EBEP, remains unusual for schools and teachers.

In most schools, the category of competencies is rather a "ritual" element of school life. In declarations, the competence and metadisciplinary issue appear in the main educational programme (local school programme) and work programmes of teachers. However, in practice, the main thing for them is so-called "working with educational material": memorizing the facts, dates and surnames, instead of the ability to apply them to a real life situation.

One of the reasons for this is that the current versions of standards and exemplary programs offer rather vague wording and do not show how to link the mentioned competencies with the subject knowledge. The teachers do not understand how to develop competences or skills and how to assess them in the process of studying the subject material; they don't understand what needs to be changed in their lessons to achieve this goal.

According to a survey of Russian teachers conducted in 2018[5], only 47% of teachers believe that school should teach children how to apply knowledge for real-life problem-solving; no more than 25% associate school with the task of fostering children's social and emotional skills; only 15% of teachers mentioned that school should help develop skills of self-organization and planning. In other words, most teachers do not associate the competence

[5] The survey was conducted by the Institute of Education NRU 'Higher School of Economics' in Winter and Spring 2018, in partnership with the Russian Textbook Corporation and the Moscow City University. More than 4500 teachers from 85 regions of Russia took part in the survey.

of interaction with other people and the competence of self-organization with learning objectives that school is responsible for and can help with. Learning ways of respectful behaviour towards other people is totally seen as an area of families' responsibility (only 2.9% of teachers mentioned it in relation to school).

A significant part of teachers do not believe that critical thinking skills and creativity are malleable (20% doubt that critical thinking can be fostered, and 63% see creativity as an innate personality trait). Neither do teachers see the potential of most of the school subjects to develop thinking skills, limiting the task of developing literacy to the National Language and Literature and the task of developing numeracy entirely to Mathematics.

Parents[6] also do not expect school to help develop either real-life skills or social and emotional skills — they mostly expect only knowledge-related outcomes and see knowledge and competences as communicating vessels. However, they do expect that school, i.e. teachers, should try to motivate children and get them interested in learning — whereas teachers regard motivation as something to be generated by children on their own. Here lies the striking difference between teachers' and parents' views: learning motivation and learning-to-learn skills are left in between, in nobody's land, belonging to no one.

4.2. Exceptions: Best Practices

Among the state (municipal) schools, a group of leaders attempting to rethink the usual practice can be singled out.

a) Experiments with educational spaces and project activities

In School No. 548 "Tsaritsyno" (Moscow), a subject-spatial environment that promotes teamwork skills and the independence of pupils is being created. School No. 1788 (Moscow) conducts "project days", when the groups of children have lessons on "mixed subjects" (drawing and English, physical education and history) in order to promote creativity.

The schools of the RUSNANO Corporation ("RUSNANO School League") use a three-step model of project activities: young schoolchildren are asked to perform a sample project,

[6] The survey of parents was conducted by the Institute of Education NRU 'Higher School of Economics' in Spring 2018, 3300 parents of school children from the Moscow region took part in it.

pupils of middle school age — a transformation project, elder pupils — an invention project. All three project stages consistently develop the project competencies of the children, including the ability to work in a team, plan their activities and reflect, developing critical and creative thinking.

b) "Experimental schools"

As mentioned above (see section 1 in this chapter), "experimental schools" started to appear in the post-Soviet period. Their founders were looking for alternative models of school education. Two striking examples of such schools have emerged.

A.N. Tubelsky self-regulated school No.734 focuses on formation of democratic values and the culture of self-definition. The school has its own constitution and laws, as well as its own court of honour. Children actively participate in school-wide events.

"School 200" (structural unit of the Moscow educational complex "School No. 1212") works in accordance with the concept of humane pedagogy (author — Shalva Amonashvili). The main focus is not on learning the teaching material, but on values and attitudes. Teachers focus on the development of children's self-understanding and positive attitude to life. However, these practices of humane pedagogy are better implemented at the elementary school level.

c) International baccalaureate schools

Schools offering the international baccalaureate (IB) appeared in Russia more than 20 years ago and can be found today in many regions — in Moscow, St. Petersburg, Samara, Perm, etc. Such schools undergo an authorization procedure (certification of IB school status) and feature an educational programme that differs from the programmes of most other schools. The IB school model does not abolish FSES requirements, but supplements them, so that school graduates can enroll in universities all over the world. IB schools have a more cross-subject approach. For example, in secondary school, the pupils learn some of the subjects in English and can choose the subjects to be learned in a foreign language. Also, the curriculum includes metadisciplinary elements, such as "Theory of cognition" and CAS-projects (CAS: creativity, activity, service). CAS projects aim to develop children's independence and creativity; the pupils learn to set goals, plan their activities, reflect on their results and weaknesses.

It is interesting to know...

The educational environment in the Engineering department of school No. 548 "Tsaritsyno" includes not only ordinary classrooms. A Movie theatre, television studio, kitchens for technology lessons, and even corridors all become places for developing a culture of independence.



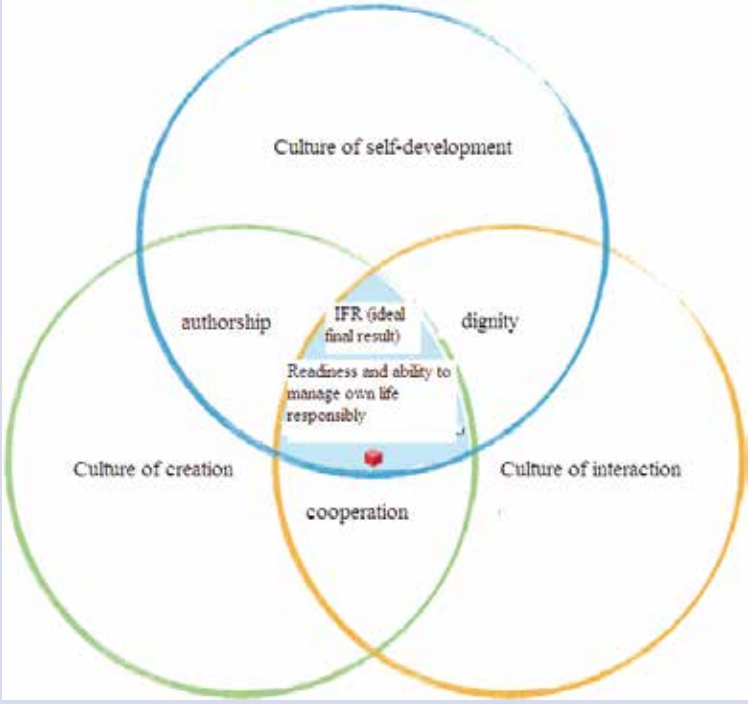

d) Private schools

The share of private schools in Russia is small — not more than 4 or 5% of the total number of schools. Thus, many of them continue to work in the usual (i.e. "knowledge-based") paradigm, while offering more comfortable learning conditions — both in terms of the number of pupils in a classroom and with regard to equipment and facilities.

However, in the past few years, private schools of a new type have emerged and become noticeable. They are trying to find their own new education model for the 21st century. The projects "Smart School", "New School", "Letovo", and "Khoroshkola" relate to this new type of school. Some of the more striking examples of experiments by such schools include

a competence model developed by "Smart School" and the introduction of the taxonomy of educational objectives of Robert Marzano in "Khoroshkola" (a project of Sberbank). The example of Marzano is significant: a three-level system of objectives (essentially, educational results) has an obvious competence-based format and includes objectives both in the cognitive sphere and in the sphere of self-definition, including interaction with self ("I-system").

It's interesting to know...



The scope of the new model developed by "Smart School" includes the concept of three cultures of a pupil that are being formed: the culture of self-development, culture of creation, and culture of interaction. Each type of culture has its own set of competencies, for example, the ability to interact efficiently with other people, skills of reflective thinking, and so on[7].

The model is described as a matrix. The values and competencies correlate with each other in the matrix.

Almost all the examples of the "best practices" mentioned here are united by a common task: to shift the emphasis in learning from memorizing information to developing compe-

[7] http://умная-школа.рф/документы/modiel-obrazovatiel-nykh-riezul-tatov-obrazovatiel-nogho-komplieksa-umnaia-shkola-v-irkutskie

tencies related to their individual and collective application in various situations. This raises the question of the balance of educational material (as a set of facts) and competencies. The assessment system is one of the decisive factors.

5. ASSESSMENT SYSTEM — THE MAIN FOCUS IS ON ASSESSMENT OF KNOWLEDGE

In Russia, the assessment system has several key stages and formats:

— State Final Examination (SFE) after completing general basic education (9th grade) and a similar examination after completing the general secondary education (11th grade, unified state exam);

— intermediate monitoring work: first of all, the all-Russian verification works, as well as monitoring conducted within the scope of Russia's participation in international comparative studies on education quality assessment;

— various regional or municipal monitoring surveys.

Although the modern version of educational standards formally declares a competence-based approach, it is poorly considered in the assessment system. The main focus in the Russian assessment system is verification of subject knowledge — the facts learned, while the competences remain out of focus[8].

Against this background, the final state examination at the end of the 9th grade is illustrative. These are the exams with “high stakes”, since according to their results, pupils who do not plan to study at school up to the 11th grade get the right to continue their studies in vocational educational establishments. If students continue their education to the 11th grade, the pupils take another state exam (Unified State Exam — ESE). As a rule, control and measurement materials (tests) are created based on various lists of topics and so-called “didactic units” (fractional elements of the educational material). The pupil has to show formal knowledge of these "units".

Currently, new tests for the final state examination are being developed; however, they are to appear only in 2020 and in 2022, for the 9th and 11th grades respectively, due the stage-by-stage mode of transition to the new federal education standard. As a result, most of the current measurement materials are still aimed at checking how well knowledge has been memorized.

[8] The exception are some regional education quality monitoring surveys.

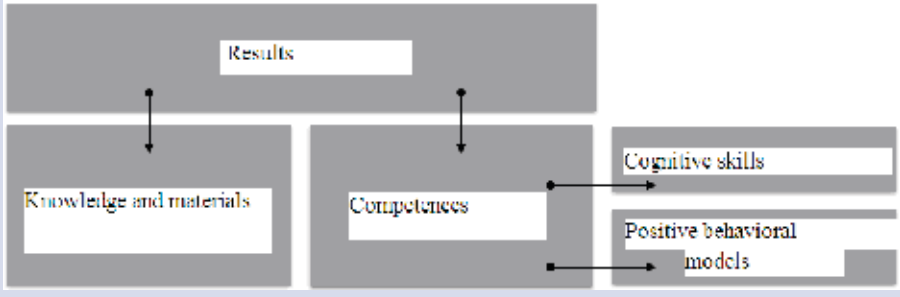
However, despite the prevailing knowledge format of tasks, there are certain tendencies towards change. First, the composition returns as a preliminary kind of test in the middle of 11th grade; the essay format is used in various school competitions and contests. Five years ago, universities received the right to award the winners of creative contests and competitions with additional points towards competitive admission process of the entrants. Secondly, participation in international research, especially PISA, has been considered as an incentive to change the focus in the assessment system and more and more competence-based tasks in the natural sciences are being introduced into the national assessment process after the 9th grade.

Thirdly, relatively local initiatives that are not binding, but showing alternative approaches to assessment are emerging. The experience of Moscow is a good example. The Moscow centre for quality of education launched the "My Achievements" electronic service (www.myskills.ru), in which traditional tasks were supplemented with meta-disciplinary tasks. The service can be used by any pupil of the city for free. The diagnostics tools focus on two areas:

— diagnostics of interdisciplinary concepts intended to identify the level and consistency of interdisciplinary concepts development;

— metadisciplinary diagnostics aimed at assessing the level of cognitive and communicative skills of a student.

It's interesting to know...



Independent research teams also conduct surveys as part of updating the assessment models. For example, the group of Galina Kovaleva (one of the leading Russian researchers into education quality assessment systems, and a PISA expert) offers a competence model that includes two blocks — cognitive skills and behavioral models. Cognitive skills are structured in the logic of B. Bloom's taxonomy and describe the basic mental operations (comparison, analysis, interpretation of examples, etc.). Thus, the researchers show the need to correlate the competences with the educational material, which, in its turn, should be mastered as a coherent system of concepts.

Fourthly, the new accent, skillfulness assessment, is penetrating into the Russian system of assessment. This trend logically continues the aim of synchronizing the Russian and the international assessment systems (PISA) and can be seen, first of all, in attempts to improve the system of assessing the reader's skillfulness. Some regions (for example, Moscow and the Krasnoyarsk region) are developing materials for these procedures. In other regions, materials developed by the Center for education quality assessment of the Russian Academy of Education are used: the centre develops tasks requiring the application of knowledge of different school subjects — pupils are invited to find solutions in different types of real-life situations — educational, public, personal.

6. TRAINING AND PROFESSIONAL DEVELOPMENT OF TEACHERS: ON THE WAY TO A REAL SHIFT

In Russia, most teachers are trained at pedagogical universities or at teacher-training programmes at classical universities. At the same time, graduates of other universities, without a pedagogical background, also can teach in schools (although in practice such cases are very rare). The market for advanced training courses for teachers is also very extensive and includes both universities and independent players — primarily, so called regional institutes of teacher professional development.

Teacher training in Russia follows the federal state educational standard (FSES) of higher education (which is uniform for all areas of training), similar to the standard which is applied for schools. The standard of higher education clearly gives “common cultural” and “general professional” competences. The full list of competencies is given in Annex B.

A competence-based approach penetrated into the standards of higher education before it appeared in the text of the FSES for the general education. This is the result of many years of the higher education standards' evolution. As early as the mid-1990s, both the category of “knowledge”, and also the category of “proficiency” began to be used in the description of the educational objectives and requirements for graduates. Since 2000, the aforementioned general cultural competences and general professional competencies have appeared in the text of the standard. There is still no clear list of competencies in the text of the general education standard.

Secondly, FSES of higher education is closely related to another document — the teacher’s professional standard. However, the professional standard is not a document for training a teacher, but for their work. In fact, professional standards are formalized market requirements. The standard includes a description of teacher's work functions and actions. It serves as the basis for developing and implementing advanced training programs.

In spite of the declaration of competence-based approach both in training and advanced training of teachers, in practice the situation is often different. Many advanced training courses still look like simple "delivering" of the lecture hours. Most advanced training institutes adhere to traditional lecture formats. In such courses, teachers find themselves not in an environment that focuses on competencies, but in a system of memorizing. That is why such concepts as "competence", "metasubject", and "activity-based approach" remain only words. This situation was particularly acute during the transition to new standards in the early 2010s, when the need to train a large number of teachers became more important than quality.

Box. Preparation of teachers for transition to a new educational standard

When the federal state educational standard providing support of the competence-based approach at school was adopted in 2010–2012, a wave of professional development courses washed over the entire country. Teachers of various education levels (due to the stage-by-stage introduction of standards) took part in them. As a rule, regional advanced training institutes (ATI) were involved in arranging such advanced training courses. Due to tight deadlines and the large number of teachers, such courses often had an explanatory, informational format. There was no time left for setting new techniques and mastering new pedagogical technologies (and many ATI were not ready to organize such works). The result of this advanced training was "imitation": the teachers mastered the new rhetoric and learned to adapt to new forms of monitoring, but continued to apply the old familiar ways of work in practice.

To a lesser extent, imitation affected elementary school system. This is probably due to the fact that elementary school teachers have always enjoyed greater methodological freedom compared to secondary school teachers in Russia. In the elementary school, the learning results in all subjects are concentrated "in a single pair of hands", since, as a rule, there is a single teacher here who teaches all core subjects. This creates more natural conditions for the emergence of the metasubject concept and focus on competencies. In addition, the importance of subject-based training is not so high in the elementary school. Perhaps that is why the elementary school turned out to be more ready for the competence-based standard than basic and secondary schools.

For a certain period of time, the situation in the field of teacher training was similar. Bachelor programs were of a "craft" — applied professional — nature. Over 4 years of intensive conducting of targeted courses (in subject, teaching methods, etc.) there was no place for self-defining and development of competencies.

However, in the recent years, two trends have emerged that might gradually change the situation. Firstly, some universities began to fragmentarily introduce the Liberal Arts model and integrate it with advanced training programs. This model will refocus graduates towards the actual mastering of competencies.

Secondly, in the assessment of pedagogical training quality, the emphasis is shifting from the assessment of subject-specific knowledge of a teacher to assessment of skills. One example of this trend is the participation of teacher education in the WorldSkills movement. Over the last three years, students of pedagogical colleges (non-university professional education) have been actively involved in the Russian version of the WorldSkills movement. This is a national competition for future elementary school teachers (1–4 grades) and nursery teachers. In the competition, students demonstrate their skills in communicating with children's parents and their skills in organizing various lessons. Experts assess these events, awarding points under a formalized criteria system. The best students receive prizes, and get to meet politicians, with these WorldSkills events having good media support.

In addition to WorldSkills, other professional competitions that evaluate the skills, not just knowledge, are gaining in popularity too:

— since 2017, several leading universities in the country have been holding a professional competition “I am a professional”, as part of which the students are asked to undergo a series of tests to show their competencies;

— The "Moscow Teacher" project (implemented with support of the Government of Moscow). Graduates of pedagogical universities who receive a “Moscow Teacher” certificate are provided with free advisory support in the first year of work, and schools pay them a higher salary.

An important new element in such competitions is the use of the demonstration format. Instead of ordinary tests and oral exams, participants carry out real-life activities. Special descriptors which evaluate the skills and competencies of participants are used for assessing lessons.

Such new formats for the assessment and certification of teachers are gradually becoming more and more popular in the professional community.

7. PUBLIC DISCUSSION OF CHANGE, INVOLVEMENT OF TEACHERS

Although it is obvious that the category of competencies has clearly become a part of the political context of Russia, this issue still remains obscure for the majority of the teaching community. One of the reasons for this is the lack of a clear understanding of the "benefits" of competencies development, as well as ignorance of technologies for their formation.

In the period of updating the standards, there were attempts to involve different categories of stakeholders. Politicians, parents, teachers, methodologists, and school directors from all over the country participated in the discussions. Since the end of the 2000s, large scale public discussions on education documents using crowdsourcing technologies via the Internet have become popular in Russia. The Ministry of Education and Science of Russia has arranged these processes. People responsible for organizing discussion and public involvement were appointed in every region. From time to time, workshops and conferences were held, at which the results of the public discussions were summed up and the tools of public discussion changed. Discussion of best practice educational programmes based on the new educational standards produced most discussion (see more on it in subsection 3 of this chapter). Of course, this kind of public discussion can increase the confidence of citizens in the ongoing reforms.

Another format of involvement is the emergence of expert sites based on competitions and festivals for teachers and directors in recent years. Although teaching contests have long existed, their topics now relate to 21st century skills. At these competitions, schools or individual teachers present their practices. The events have additional impact — their participants from different regions learn from the experience of their colleagues and share contacts. And so a community of teachers with a new vision of education is appearing.

One example of these contests is the “School of Skills of the 21st Century”. This competition is held by the National Research University "Higher School of Economics" and the Sberbank charity foundation “Contribution to the future”. The competition involves schools that present their projects on their experience or plans to adopt new pedagogical models — new educational spaces, curricula, lessons, and practices.

Another example is the teacher competition “i-Teacher” arranged by the “Rybakov Foundation.” This competition is focused on finding new practices and formats for teaching work.

Interestingly, both competitions are sponsored by non-state charitable foundations. However, despite the importance of such competitions, they still cover only a small share of teachers and educational institutions in Russia. For example, about 160 schools took part in the “School of skills of the 21st century” competition (out of about 44,000 schools in Russia).

8. THE ROLE OF EMPLOYERS IN THE EDUCATIONAL STANDARDS DEVELOPMENT

Employers were not actively involved in the process of updating the content of education, although many of them took part in the work groups on the development of the standards.

However, a clear synchronization of educational standards with requirements of the labor market has not been achieved yet.

A number of independent organizations regularly survey the labor market in Russia, trying to discover the demand for various kinds of competencies needed by employers. For example, in 2012, a joint study of the World Bank and the Higher School of Economics “Skills deficit in Russia: challenges for the education system during transition to the innovative economy" was carried out[9]. One important result was the discovery of a need for “problem solving skills” — this was in demand among all categories of workers (managers, experts, workers). This skill is closely related to creativity, the ability to make non-standard decisions, leadership skills and attitudes. However, if we compare this list of competencies with the list of competencies listed in the FSES, we see there are no such competencies in it. There are also no such competences in the standards governing other education levels (e.g. bachelor’s training) and other fields of activity (e.g. professional standard of an educator).

In recent years, due to growing attention on educational content, the need to consider the requirements of the labor market has arisen. So, one of the Orders of the President of the Russian Federation[10] contains the following wording: "To develop a set of measures aimed at regular updating the content of general education, based on results of monitoring surveys and taking into account modern achievements of science and technology and changing needs of pupils and society." However, political decisions do not always find a way to be implemented in an organized fashion. In pursuance of this order, the new Ministry of Education of the RF began to return to the knowledge-based paradigm of the education content, having drawn up a version of the standards which was focused on memorizing information.

9. KEY CHALLENGES

The main challenges in Russia are similar to the global ones. Firstly, it is the concept of **digital education**. Alongside great opportunities, digital technologies are raising a large number of questions. The main questions concern the competences a pupil needs, the abilities of a teacher, and the organization of school in a world where most information can be accessed with a single click.

A large state project (as part of the national program) “Digital educational environment” will be launched in 2018 and should serve as one of the responses to the “digital” challenge.

[9] Vasiliev K. B. Skills deficit in Russia: challenges for the education system in the transition to innovation economy. Summary of the report of the World Bank and the HSE. WorldBank, ACS1549. (In Russian)

[10] as of January 2, 2016 No. PR-15GS following the meeting of the State Council of the Russian Federation on December 23, 2015

Among other things, the project presupposes an update of educational content. Within the scope of the project, field-specific additional educational centers will appear — so-called “IT-cubes”, in which the digital competencies of pupils will be developed.

Development of digital educational environments has become an important task. In some regions, such environments appeared even before the launch of the "Digital school." For example, "Moscow Electronic School" is a specialized platform for drawing up the lessons by teachers. The technical capabilities of the environment allow users to register their “digital footprints” — how a teacher and students work with the educational material and how their competences develop. This digital footprint can then become the basis for subsequent data analysis.

The second challenge is **expanding the usual "educational space**." The school does not have a monopoly on education anymore. More and more children receive education outside the usual schools, including homeschooling. In Moscow alone, the number of pupils being schooled at home now exceeds 5000 and has more than doubled over the past few years. Families draw up their programme independently using various educational services and digital resource bases.

Various out-of-school educational resources also intrude into the reality of the school. So, teachers draw up educational programs with the help of special designers (for example, www.prok.edu.ru), watch video lectures (for example, www.interneturok.ru), keep electronic journals (for example, www.dnevnik.ru), create their own tasks and tests (for example, www.yaklass.ru).

Finally, the third challenge, which is also crucial and has global scale, relates to the search for a **balance between knowledge and competencies in the curriculum**.

Since the beginning of the 2010s, the competence-based approach has been noticeably gathering momentum in Russia. However, a change in this trend was observed between 2016 and 2018, with more recent changes strengthening the "knowledge-based" model.

Between 2016 and 2018, the composition of the Ministry of Education and Science of the RF has changed and the priorities have shifted accordingly. According to statements by the new governing body of the Ministry of Education and Science of the RF, the revision of the educational standard structure carried out by the department earlier was a mistake. The ministry heads believe that "at first, knowledge needs to be formed and only then can talk about the formation of competencies can begin.” At the initiative of this authority, the revision of the Federal state educational standards started. This process caused heated public debate. In the spring of 2018, the educational department was divided into two bodies — one responsible is for general education (Ministry of Education of the RF), and the other — for higher education and science (Ministry of Science and Higher Education of the RF).

Certain social circles continue to believe that the focus of educational standards on 21st century skills was a mistake and that the current school system should, as a priority, provide its pupils with factual knowledge. Others believe that it is impossible to deviate from the previously chosen path.

Finding a balance between the competencies and the education content is a serious challenge for Russia (although Russia is not the only country facing it).

ANNEX A

The list of targets and requirements to metasubject results by levels of the general education[11]

Target references at the stage of completing the preschool education (Order of the Ministry of Education and Science of the RF dated October 17, 2013 No. 1155 "On approval of the federal state educational standard of preschool education"):

— the child masters the main cultural activities, shows initiative and independence in various activities – playing, communicating, cognitive and research activities, designing, etc.; able to choose the activity and participants in joint activities;

— the child has positive attitude towards the world, different kinds of work, other people and self, has dignity; actively interacts with peers and adults, participates in joint games. The child is able to negotiate, take into account the interests and feelings of others, empathize with the misfortunes and rejoice in the successes of others, show own feelings in proper way including the feeling of self-confidence; tries to resolve conflicts;

— the child has developed their imagination which is implemented in various activities and, first of all, in games; the child knows different forms and kinds of games, distinguishes between conditional and real situations, can obey different rules and social norms;

— the child is fluent in spoken language, can express own thoughts and desires, can use speech to express own thoughts, feelings and desires, builds speech statements in communicative situations, can single out the sounds in words; the child has the prerequisites for literacy;

[11] Without requirements for children with special health needs

— the child has developed gross and fine motor skills; the child is active, enduring, knows the main movements, can control and manage own movements;

— the child is capable of conation, can follow social norms of behavior and rules in various activities, in relations with adults and peers, can follow the rules of safe behavior and personal hygiene;

— the child is curious, asks questions to adults and peers, shows interest in cause-effect relations, tries to invent explanations for natural phenomena and actions of people; tends to observe and experiment. The child has basic knowledge of himself/herself, of the natural and social world surrounding the child; knows the works of children's literature, has basic knowledge in the fields of wildlife, natural science, mathematics, history, etc.; the child is capable of making own decisions based on own knowledge and skills in various activities.

Requirements to metasubject results for elementary general education (Order of the Ministry of Education and Science of the RF dated October 6, 2009 No. 373 "On approval and implementation of the federal state educational standard of elementary general education"):

— mastering the ability to accept and maintain the goals and objectives of educational activities, finding the means for their implementation;

— learning the ways to solve creative and exploratory issues;

— formation of the ability to plan, monitor, and evaluate learning activities in accordance with task and conditions for their implementation; determine the most efficient ways to achieve the results;

— formation of the ability to understand the reasons for success/failure in learning activities and the ability to act efficiently even in conditions of failure;

— mastering the initial forms of cognitive and personal reflection;

— the use of sign and symbolic means of presenting the information for creation of models of objects and processes under study, schemes for solving the learning and practical problems;

— active use of speech tools and means of information and communication technologies (hereinafter referred to as ICT) for solving communicative and cognitive tasks;

— the use of various techniques for searching (in reference sources and open educational information space of the Internet), collecting, processing, analyzing, organizing, transmitting, and interpreting the information in accordance with the communication and cognitive tasks and technologies of the subject; including the ability to enter the text using the keyboard, register (record) the measured values numerically and analyze the images, sounds, prepare own speech and speak with audio, video and graphical accompanying support; observe the rules of information selectivity, ethics, and etiquette;

— mastering the skills for semantic reading of texts of various styles and genres in accordance with goals and objectives; form speech statements consciously and in accordance with communication objectives, ability to compose texts in oral and written forms;

— mastering the logical actions of comparing, analyzing, synthesizing, generalizing, classifying by generic characteristics, finding analogies and cause-effect relations, constructing the reasoning, referring to known concepts;

— readiness to listen to the interlocutor and hold a dialogue; readiness to recognize the existence of different points of view and the right of everyone to have own point of view; ability to state own opinion and reason own point of view and attitude to certain events;

— determination of a common goal and ways to achieve it; ability to negotiate on distribution of functions and roles in joint activities; exercise mutual control in joint activities, assess own behavior and behavior of others properly;

— willingness to resolve conflicts efficiently by taking into account the interests of the parties and cooperating;

— mastering the basic information about the nature and characteristics of objects, processes, and phenomena of reality (natural, social, cultural, technical, etc.) in accordance with the content of a specific subject;

— mastering the basic subject and cross-subject concepts reflecting the essential connections and relations between the objects and processes;

— the ability to work in the material and information environment of elementary general education (including with educational models) in accordance with the content of a specific subject; formation of the basic standards of using the dictionaries in a system of universal educational actions.

Requirements to metasubject results for basic general education (Order of the Ministry of Education and Science of the RF dated December 17, 2010 No. 1897 "On approval of the federal state educational standard of basic general education"):

- ability to independently determine the objectives of study, set and formulate new objectives in learning and cognitive activity, develop the motives and interests of own cognitive activity;
- ability to independently plan the ways to achieve goals, including alternative ones, to consciously choose the most efficient ways to solve educational and cognitive tasks;
- ability to correlate own actions with the planned results, to monitor own activities in the process of achieving the results, to determine the ways of actions within the scope of proposed conditions and requirements, to correct own actions in accordance with the changing situation;
- ability to assess the correctness of a learning task, own capabilities of solving it;
- knowledge of the basics of self-control, self-assessment, decision-making, and taking conscious decisions in educational and cognitive activities;
- ability to determine the concepts, create generalizations, establish analogies, classify, independently choose the grounds and criteria for classification, establish cause-effect relations, build logical reasoning, deduction (inductive, deductive, and by analogy), and draw the conclusions;
- ability to create, apply, and transform the signs and symbols, models and schemes for solving educational and cognitive tasks;
- semantic reading;
- ability to organise educational cooperation and joint activities with a teacher and peers; work individually and in a team: to find a common solution and resolve conflicts by coordination of positions and taking into account the interests; formulate, reason, and defend own opinion;
- ability to consciously use speech means in accordance with the task of communication to express own feelings, thoughts, and needs; planning and regulation of own activities; handling of spoken and written language, monologue contextual language;

— formation and development of competence in the use of information and communication technologies (hereinafter — ICT competence); development of motivation to master the culture of active use of dictionaries and other search engines;

— formation and development of environmental way of thinking, ability to apply it in cognitive, communication, social practice and vocational field.

Requirements to metasubject results for secondary general education (Order of the Ministry of Education and Science of the RF dated May 17, 2012 No. 413 "On approval of the federal state educational standard of secondary general education"):

— ability to independently determine the goals of activities and draw up the plans for activities; to independently carry out, monitor, and correct the activities; to use all possible resources to achieve the goals and implement the plan of actions; to choose successful strategies in different situations;

— ability to communicate and interact efficiently in the process of joint activities, take into account stances of other activity participants, resolve the conflicts efficiently;

— skills in cognitive, educational, research, and project activities, problem solving skills; ability and readiness to search for methods for solving the practical issues and using various methods of cognition independently;

— readiness and ability for independent information and cognitive activities, skills in obtaining the required information from different kinds of dictionaries, ability to navigate various sources of information, evaluate and interpret information obtained from various sources critically;

— ability to use the means of information and communication technologies (hereinafter — ICT) in solving cognitive, communication, and organizational tasks according to requirements of ergonomics, safety, hygiene, resource saving, legal and ethical standards, information security standards;

— ability to determine the purpose and functions of various social institutions;

— ability to independently assess and make decisions determining the strategy of behavior, taking into account civic and moral values;

— proficiency in language means — the ability to clearly, logically, and accurately express own point of view, to use proper language tools;

— proficiency in skills of cognitive reflection as awareness of the actions performed and the mental processes, their results and bases, the limits of own knowledge and ignorance, new cognitive tasks and the means to achieve them.

ANNEX B

The list of competencies a graduate teacher with degree in "Education and Pedagogy", the level of higher education, should have (Order of the Ministry of Education and Science of the RF dated December 4, 2015 No. 1426 "On approval of the federal state educational standard of higher education in degree 44.03.01 Pedagogical education (bachelor degree)")

Common cultural competences

— ability to use the basics of philosophical, social and humanitarian knowledge for formation of a scientific world outlook (OK-1);

— ability to analyze the main stages and patterns of historical development for formation of patriotism and civic stand (OK-2);

— ability to use natural science and mathematical knowledge for orientation in the modern information space (OK-3);

— ability to communicate in oral and written forms in Russian and foreign languages for solving the problems of interpersonal and cross-cultural interaction (OK-4);

— ability to work in a team and accept social, cultural, and personal differences in a non-judgemental manner (OK-5);

— ability to self-organize and self-educate (OK-6);

— ability to use basic legal knowledge in various areas of activities (OK-7);

— readiness to maintain the level of physical training ensuring fully-fledged normal activities (OK-8);

— ability to use first aid techniques, methods of preservation in emergency situations (OK-9).

General professional competencies:

— readiness to recognize the social significance of own future profession, to be motivated to carry out professional activities (OPK-1);

— ability to carry out teaching, education, and development taking into account social, age, psychophysical and individual features including special educational needs of the pupils (OPK-2);

— readiness for psychological and pedagogical support of the educational process (OPK-3);

— readiness for professional activity in accordance with legal regulations in the field of education (OPK-4);

— knowledge of the basics of professional ethics and speech culture (OPK-5);

— readiness to ensure the pupils' life and health preservation (OPK-6).

ANNEX C

The list of skills[12] detailing the work functions in accordance with the requirements of the Professional Standard "Teacher (pedagogical activity in the field of pre-school, elementary general, basic general, secondary general education) (educator, teacher)" (Order of the Ministry of Labor and Social Protection of the RF dated October 18, 2013 No. 544n)

Labor function: General pedagogical function. Teaching

Required skills:

— To know forms and techniques of teaching including those that go beyond the scope of lessons: project activities, laboratory experiments, field practice, etc.

— To objectively assess pupil's knowledge, based on testing and other control methods in accordance with the actual educational capabilities of children.

[12] Without labor functions associated with subject modules

— To develop (master) and apply modern psychological and pedagogical technologies based on the rules of personality development and behavior in a real and virtual environment

— To use and test special approaches to learning in order to involve all pupils into the educational process including pupils with special educational needs: pupils showing outstanding abilities; pupils for whom Russian is not a native language; pupils with limited health capacities

— To have ICT competences: general user ICT competence: general pedagogical ICT competence; subject-pedagogical ICT competence (reflecting the professional ICT competence of the relevant field of human activity)

— To arrange various kinds of out-of-school activities: play, learning and research, artistic and productive, cultural and leisure activities taking into account the possibilities of educational organization, place of residence, and historical and cultural identity of the region

Labor function: Educational activities

Required skills:

— To build educational activities taking into account the cultural differences of children, age and gender, and individual features

— To communicate with children, recognize their dignity, understand and accept them

— To create communities of different ages consisting of children and adults, i.e. pupils and their parents (legal representatives) and teachers in learning groups (class, circle, hobby group, etc.)

— To manage study groups to involve pupils in the process of learning and education by promoting their learning and cognitive activities

— To analyze the real state of affairs in the learning circle; to maintain practical and friendly atmosphere among the children

— To protect the dignity and interests of pupils, to help children in conflict situations and/or adverse conditions

— To find the value aspect of academic knowledge and information and to ensure its understanding and perception by pupils

— To have skills in organizing excursions, tours, expeditions, etc.

— To cooperate with other pedagogical workers and other experts in solving educational tasks

Labor function: Developmental activities

Required skills:

— To have a professional set of skills to assist any child, regardless of his/her real educational capabilities, behavioral features, mental and physical health

— To use psychological approaches in the work practice: cultural, historical, and developmental approaches

— To carry out (together with a psychologist and other specialists) psychological and pedagogical support of the main educational curricula

— To understand the documentation of specialists (psychologists, speech pathologists, speech therapists, etc.)

— To draw up (together with a psychologist and other specialists) a psychological and pedagogical description (portrait) of the pupil's personality

— To develop and implement individual educational routes, individual development programs and individual-oriented educational programs taking into account personal and age characteristics of pupils

— To know standardized techniques for psycho-diagnostics of personal and age characteristics of pupils

— To evaluate educational results: subject and cross-subject competences formed in the subject taught, as well as to monitor (together with a psychologist) personal characteristics

— To form communities consisting of children and adults

Labor function: Pedagogical activities for implementation of pre-school general education programs

Required skills:

— To organize the activities carried out in early and preschool years: subject, cognitive research, game (role-playing, directing, game with a rule), productive; designing, creating ample opportunities for development of free play of children including ensuring time and space for the game

— To apply methods of physical, cognitive, and personal development of children of early and preschool age in accordance with the educational programme of the organization

— To use techniques and tools for psychological and pedagogical monitoring analysis allowing to assess the results of mastering the educational programs by children, the degree of their qualities required for further education and development at later education levels

— To master all kinds of preschool developmental activities (play, productive, educational and research)

— To build partnership interaction with parents (legal representatives) of children of early and preschool age for solving educational problems; to use the methods and means for their psychological and pedagogical education

— To have the ICT competencies required and sufficient for planning, implementing, and assessing the educational work with children of early and pre-school age

Labor function: Pedagogical activities for implementation of elementary education programs

Required skills:

— To respond to direct forms of appeal of a pupil to a teacher and to recognize serious personal problems behind them

— To set different types of educational tasks (educational and cognitive, educational and practical, educational and playing) and organize the solving of them (in individual or team form) in accordance with the level of cognitive and personal development of young children, while maintaining the balance of subject and metasubject component of their content

— In cooperation with parents (legal representatives), other pedagogical workers and psychologists, to develop and correct the individual educational path of a pupil in accordance with the objectives of achieving all kinds of educational results (subject, meta-subject, and personal ones) beyond the scope of elementary general education

Labor function: Pedagogical activities for implementation of basic and secondary general education programs

Required skills:

— To apply modern educational technologies including information and digital educational resources.

— To conduct lessons based on achievements in the field of pedagogical and psychological sciences, age physiology and school hygiene, as well as state-of-the-art information technologies and teaching techniques

— To plan and carry out the educational process in accordance with the basic education curriculum

— To develop a work program for the subject or the course on the basis of exemplary basic general education curricula and to ensure its implementation

— To organize the independent activities of pupils, including research activities

— To develop and implement problem-based training, to correlate the learning of subject (course, program) with practice; to discuss the relevant events with pupils

— To carry out monitoring and evaluating activities in the educational process To use modern techniques of assessment in terms of information and communication technologies (maintaining electronic forms of documentation including electronic journals and pupils' school record books)

— To use various forms, techniques, methods, and means of education including those intended for individual curricula, accelerated courses within the scope of federal state educational standards of basic general education and secondary general education

— To know the basics of working with text editors, electronic spreadsheets, e-mail and browsers, multimedia devices

— To master the techniques of persuasion and reasoning of a teacher's stance

— To establish contacts with pupils of different ages and their parents (legal representatives), pedagogical employees and employees from other fields

— To master technologies for detecting the causes of conflict, its prevention, and solving

Chapter 11

CURRICULUM REGULATIONS FOR COMPETENCES: A CROSS-COUNTRY ANALYSIS

1. A SUMMARY OF APPROACHES

Numerous attempts to handle competences at the national level have spread globally since the early 2000s. National educational standards and curricula have started to claim competences as their foundation. In a number of countries, this path of development took such a turn naturally, without any external push (like the PISA-shock, which became a push for many other countries). Thus, England started its curriculum reform back in the 1990s, and was developing national education strategies aimed at fostering various aspects of literacy. Its *National Literacy and Numeracy Strategy* (1998), despite its name, was in fact aimed at developing universal competences among primary school children in order for them to make a smooth transition into secondary school. Similar processes took place in Poland: a curriculum reform started in 1997, and by 2003 the country had made good progress in international comparative tests.

Over the last eighteen years, a number of countries and territories have reformed their national frameworks for curriculum regulations introducing — in various ways — the idea of competences. The USA with its Common Core Initiative (2004), Canada with its Ontario Curriculum (2007), the national curricula of Australia (2010), Finland (2014), England (2014), and Singapore with its National Syllabus (2012) are among them, to name but a few. At the same time, the country-specific shift of the underlying paradigm may vary quite considerably depending on a number of cultural, historical, social and economic circumstances and priorities. Some countries, like China, developing its model of the Comprehensive Developed Person, are still working on reforming their

curriculum. Others, like England, Poland, or US, with the change of their political elites, experience certain counter-trends, which do not quite abolish the earlier reforms but make a much less explicit emphasis on competences.

Two main questions should be addressed, particularly if we seek to analyse the differences in how curricula in the area of competences are regulated at the national level: what is the object of regulation and what are the methods of regulation.

1. What is the object of curriculum regulation, i.e. what does national regulation focus on and what does it aim to control?

Our analysis reveals four typical objects for regulation:

a) Competences, most frequently described in educational standards and national curricula as complex phenomena embracing knowledge, skills, experience, personal attitudes;

b) Educational outcomes that usually describe fairly isolated actions based on specific skills, usually they are also closely related to subject contents;

c) Subject contents describing in a more or less detailed and structured way the related disciplinary knowledge adapted for school children;

d) Values formulated as desirable personal beliefs or attitudes.

All the four targets are usually present in most national curricula, though they may also appear under different names, and in varied proportions. Thus, competences can be explicitly called competences — but they may also come under the name of aims, as in the National Curriculum for England.

"Educational outcomes" also make their entrance in curricula in various disguises. Two main semantic approaches can be singled out: a focus either on the final product (described in such terms as results, outcomes, achievements, experience), or on the purpose (described as goals, objectives, or expectations).

Approaches featuring targets 1 and 2 (competences and educational outcomes) follow the outcome-based paradigm of education (Ron Brandt, William Spady[1]). Content-oriented approaches (target 3) stem from the time-based paradigm. As for the values-oriented ap-

[1] E.g. Spady, W.G. Outcome-based education: Critical issues and answers. Arlington, VA: American Association of School Administrators, 1994; Spady, W.G., and K.J. Marshall, (October 1991), "Beyond Traditional Outcome-Based Education," *Educational Leadership* 49: 67–72;

proach (target 4), it presents a most tricky intellectual challenge: while almost everyone recognizes values to be an essential part of education — and it would have been more logical to start with values and then move on to competences, outcomes and contents, i.e. from higher to lower levels of abstraction — values remain beyond the immediate focus of policy makers and those developing the curriculum (mainly due to the difficulties of their assessment). However, value orientation is becoming more prominent in curriculum regulation, and it is well illustrated by the OECD Education-2030 framework, as well as by the Chinese or Finnish national curriculum efforts.

What are the methods of regulation, i.e. what are the instruments for transferring and implementing national educational strategies (i.e. targets) to regional and school levels?

Methods of regulation oscillate between two extreme poles, with centralization, on the one hand, and autonomy, on the other. Centralized systems tend to consolidate policy in one decision-making centre. If this is the case, regulation and designing of curricula — otherwise two distinct processes — coincide. In other words, the national curriculum is prescribed from the centre and cannot be significantly changed by teachers and schools, who should use it 'as is'. In a distributed autonomy system, autonomy of constituent subjects is key, and the curriculum can be rendered, modified and adapted for local contexts.

A country may be a straightforward illustration of either of the approaches and present a centralized model or a autonomous model — or it may combine the approaches making the overall model more blurred. Anyway, Each country needs to make a decision (consciously or not) as to whether it should retain all the powers with the state or delegate autonomy to schools.

2. GLIMPSES FROM THE COUNTRIES

2.1. Targets of curriculum regulation

Approach 1 — Ontario-Canada: Competences are the main focus of regulation

In this approach, competences are seen as a benchmark to evaluate the other curricular elements — educational outcomes, contents (and, in a certain way, values). In practice, i.e. in educational standards and formal curriculum, a distinction is made between two parts: one part describes competences (which, however, may appear under a different name), and the other sets out educational outcomes and contents. Educational outcomes and contents are bridged by competences. The bridge is usually erected on constituent educational outcomes, which are formulated in a way that implies both an action (thus leading to a com-

petence) and a fragment of content. In this approach, educational outcomes integrate both competences and contents. Each competence is specified in a list of educational outcomes, and to achieve the level of mastery performance, students are trained using related educational contents. Such a curriculum is, thus, developed linearly: from competences, through educational outcomes, to contents.

This approach is well illustrated by the Ontario Curriculum (Canada). The structure of the curriculum includes *an achievement chart*, which describes key competences in their relation to different subjects (disciplines), as well as educational outcomes (in the document they are called expectations). The achievement chart essentially describes the structure of foundational cognitive, communicative, and other skills — and the 'expectations' part sets out detailed descriptions of educational outcomes, which also include contents.

Let us illustrate it with an example from the achievement chart. It mentions the following item: "Use of processing skills"[2]. This 'achievement' is further subdivided into two smaller 'achievements': 1) "carrying out a plan (e.g., collecting data, questioning, testing, revising, modelling, solving, inferring, forming conclusions), 2) looking back at the solution (e.g., evaluating reasonableness, making convincing arguments, reasoning, justifying, proving, reflecting)" [1]. Curricular expectations are broken into two groups: overall and specific. And even overall expectations — which seem to focus on competences, — also include specific disciplinary contents. "Expectations" are structured by larger thematic areas. For example, in mathematics, in the "analytical geometry" topic, the following outcomes are specified: "identify, through investigation with technology, the geometric significance of m and b in the equation $y=mx+b$». [3] These examples reveal quite a significant diversity in the way educational outcomes (i.e. expectations) and competences (i.e. achievements) can be formulated. It should also be noted that there is no separate section describing contents in this curriculum.

In Canada, this approach can be observed not only in the structure of the national curriculum, but also in the way it is communicated to stakeholders. We would like to stress (and we shall describe it in more detail in the next section): the famous 6Cs framework introduced by Michael Fullan is a foundational pillar in the Canadian system of education, it comes down to schools as a target orientation. But this framework developed at the national level is then fine-tuned by provinces and further elaborated by schools.

Educational standards and national curricula that follow this approach often group outcomes not only by competences, but also by so called *lines* or *threads*. This helps to bring the competences framework closer to the subject structure.

[2] This is an example from *The Ontario Curriculum, Grades 1–8: Mathematics*, 2005. http://www.edu.gov.on.ca/eng/curriculum/elementary/math18curr.pdf

[3] http://www.edu.gov.on.ca/eng/curriculum/secondary/math910curr.pdf, p, 34.

In such a linear model of curriculum, content is conceived in a specific way, because the emphasis on competences makes it more instrumental. The example of Ontario is most demonstrative in this respect: here, 'big ideas' have become part of the curriculum. The idea of 'big ideas' is to replace the fragmented contents with questions and concepts meaningful for students — it is what is to stay with a person after they graduate from school. The Ontario Curriculum states it clearly: "Big ideas" are the broad, important understandings that students should retain long after they have forgotten many of the details of something that they have studied"[4].

Approach 2 — Finland, Australia: Educational outcomes are in the focus of regulation

Another approach to curriculum development emphasises educational outcomes as the main focus of regulation. Although, such a curriculum does make competences explicit, educational outcomes here are not used to bridge competences with subject contents. Rather, they make up the core structure against which competences, subject contents, assessment instruments and various educational resources are laid out and mapped. So, if the linear model of curriculum is developed from competences to subject contents, here, in the educational outcomes approach, one outcome can reach out towards several competences at once and involve varied contents. This is a non-linear but rather matrix-like approach, and this approach is reflected not only in the underlying logic of the curriculum but also in the way the body of the curriculum (as a document) is structured.

The linear model relies mostly on "list-structure": lists of competences, lists of outcomes, lists of contents — they may be structured differently but essentially they are lists. Whereas in the matrix-like curriculum, matrices of educational outcomes are at the core — usually they are presented as tables describing how educational outcomes and competences, educational outcomes and subject contents are intertwined.

The new Finnish National Curriculum (2016) is a good illustration of this approach. The National Core Curriculum for Basic Education [3] features 'objectives of instruction' which, essentially, are a different name for educational outcomes. Such outcomes are described for every grade and for every subject, and are grouped into larger conceptual clusters (like comprehension, application, values, etc.)

The Finnish curriculum highlights the so-called transversal competences. There are seven transversal competences, and they are described in the introductory section of the curriculum; however, their interpretation evolves from year to year for different grades. Each grade in each subject area is linked to transversal competences and content areas. Each educa-

[4] The Ontario Curriculum, Grades 1–8: Science and Technology. http://www.edu.gov.on.ca/eng/curriculum/elementary/scientec18currb.pdf

tional outcome (objective of instruction) can be linked to several transversal competences and content areas (see Fig. 1).

Figure 11.1. *A matrix of educational outcomes (objectives of instruction) for mathematics, Grades 1–2, The National Core Curriculum for Basic Education, Finland*

Objectives of instruction in mathematics in grades 1–2

Objectives of instruction	Content areas related to the objectives	Transversal competences
Significance, values, and attitudes		
O1 to support the pupil's enthusiasm for and interest in mathematics and the development of his or her positive self-image and self-confidence	C1-C4	T1, T3, T5
Working skills		
O2 to guide the pupil to improve his or her ability to make mathematical observations and to interpret and use them in different situations	C1-C4	T4
O3 to encourage the pupil to present his or her solutions and conclusions through concrete tools, drawings, speech, and writing, also using information and communication technology	C1-C4	T2, T4, T5
O4 to guide the pupil to develop his or her reasoning and problem-solving skills	C1-C4	T1, T4, T6
Conceptual objectives and objectives specific to the field of knowledge		
O5 to guide the pupil to understand mathematical concepts and notations	C1-C4	T1, T4
O6 to support the pupil in developing an understanding of the concept of numbers and the principles of the decimal system	C2	T1, T4

In this figure, the first column describes educational outcomes (objectives of instruction), the second features content areas, and the third highlights transversal competences. As we can see, one outcome can lead to three different competences and be rooted in several content areas. In this approach, we observe a multi-dimensional structuring of educational outcomes, competences and contents. Let us illustrate it with an example from mathematics curriculum for Grades 3–6: "O13 to guide the pupil in preparing and interpreting tables and diagrams and using statistical key figures as well as to offer experiences of probability". This objective (=outcome) is linked to only one content area: "Data processing and software, statistics, and probability" and to several transversal competences: multi-literacy, ICT-competence [3]. For assessment, a similar matrix-like structure is provided. In the example given, the assessment criterion is formulated as follows: «the pupil is able to prepare a table based on a given set of data and to interpret tables and diagrams».

The Australian National Curriculum largely shows a similar approach [4]. Although educational outcomes are presented under the label of Year Content, i.e. the content to be studied in the corresponding year of studies, essentially they are closer to the idea of outcomes. They are packed into a table (matrix), and each outcome is linked to key competences (in the document, they are called General Capabilities). Every general capability is broken into specific skills, which result in a corresponding educational outcome. Moreover, for many educational outcomes, the related terms, concepts and digital educational resources are provided. As in the Finnish case, one educational outcome can be linked to several competences and areas of subject contents. The outcomes, competences and contents are also laid out as a matrix.

For example, the Year 5 mathematics curriculum states the following educational outcome: "Describe and interpret different data sets in context", and links it to the following general capabilities: Literacy (Comprehending texts through listening, reading and viewing), Numeracy (Interpreting statistical information), Critical and Creative Thinking (Inquiring — identifying, exploring and organising information and ideas). [4]

A special website[5] was developed to support this approach, it allows users to browse the curriculum in a non-linear way, linking educational outcomes, competences and contents, as well as helpful pedagogical and assessment resources — and even to modify and download a personalised version of the curriculum depending on the educational outcomes selected.

Approach 3: Disciplinary contents as the key focus of regulation

The third approach in curriculum regulation focuses on disciplinary contents. It consists in an effort to develop a list of topics or even smaller fragments of disciplinary knowledge — i.e. bits and pieces highlighting specific facts, dates, rules, formula, etc. The degree of detail is quite high, and this is the very essence of this approach: to regulate what students are to study. In this approach, competences may be mentioned — however, they are but a formal, often lip-service component, and expected to bring about an optional — as contrasted to mandatory — effect. In this approach, educational outcomes merge with the list of topics and are formulated with the focus on knowledge of specific disciplinary and some cultural facts. This formality-oriented model has a long historical tradition and is rooted in the time-based paradigm of education.

This approach to curriculum regulation is gradually becoming less widespread. Today, it is quite unusual for a national system of education to follow a pure model of this type. However, a number of countries, which are either in the process of transition to competen-

[5] http://www.australiancurriculum.edu.au/

cy-based standards or, on the contrary, are undergoing a period of reactionary reform, feel its influence.

Examples of reactionary approaches can be found in the recent educational policy in England, UK. Attempts to carve out a new model of education arose here in the late 1990s, and until 2010 the New Labour government was developing a system which clearly emphasised competences. Initially, the National Literacy and Numeracy Strategies,conceived as early as 1998, shifted the focus towards developing skills and competences. This shift influenced both teaching and instruction practices, and assessment. This decade's experience allowed the development of a brand new national curriculum by 2010[6]. The curriculum was divided into "Essentials for learning and life" (competences considered as a necessary set of tools) and Learning Areas (disciplinary content that children should master). It, thus, continued to be structured around subjects (the 'core subjects' of English, mathematics and science, and the 'foundation subjects' of art and design, design and technology, geography, history, ICT, music and physical education) but also featured

(a) two distinct two non-statutory skills frameworks:

- Key Skills, covering communication, application of number, information technology, working with others, improving own learning and performance and problem-solving skills, and

- Thinking Skills, covering information-processing, reasoning, enquiry, creative thinking and evaluation skills;

(b) five non-statutory cross-curricular elements: creativity; ICT; education for sustainable development; literacy across the curriculum, and numeracy across the curriculum.

But before the new curriculum could be introduced the government changed. The revised curriculum was never implemented, the Strategy team was disbanded and its materials withdrawn. Though formally key skills were not totally abandoned, a course was steered towards a knowledge-based curriculum.

In 2014 a new curriculum was adopted. It integrated hardly any of the innovations suggested by the former (New Labour) government. The key skills framework was not formulated

6 https://publications.parliament.uk/pa/cm200809/cmselect/cmchilsch/344/344i.pdf

in any detail, remaining but a general declaration. The disciplinary part, at the same time, became much more elaborated and detailed. The 2014 curriculum is much more knowledge-oriented as compared to the 2010 curriculum.

However, the existing 2014 curriculum does embrace certain competence-focused messages and preserves a relative freedom for teachers to choose disciplinary contents, Thus, educational objectives specify statutory and non-statutory recommendations. Disciplinary contents partly fall into the non-statutory category. In practice, however, the amount of disciplinary content listed in the curriculum results in a shift of focus both among teachers and controlling bodies.

Similar processes are taking place in Russia and Poland. In Russia, the on-going counter-reforms are more pronounced. If the English National Curriculum still preserves teacher's autonomy, in Russia the new Ministry of Enlightenment strictly regulates the list of topics to be delivered by a teacher. Both in England, and in Russia the reforms are heatedly debated.

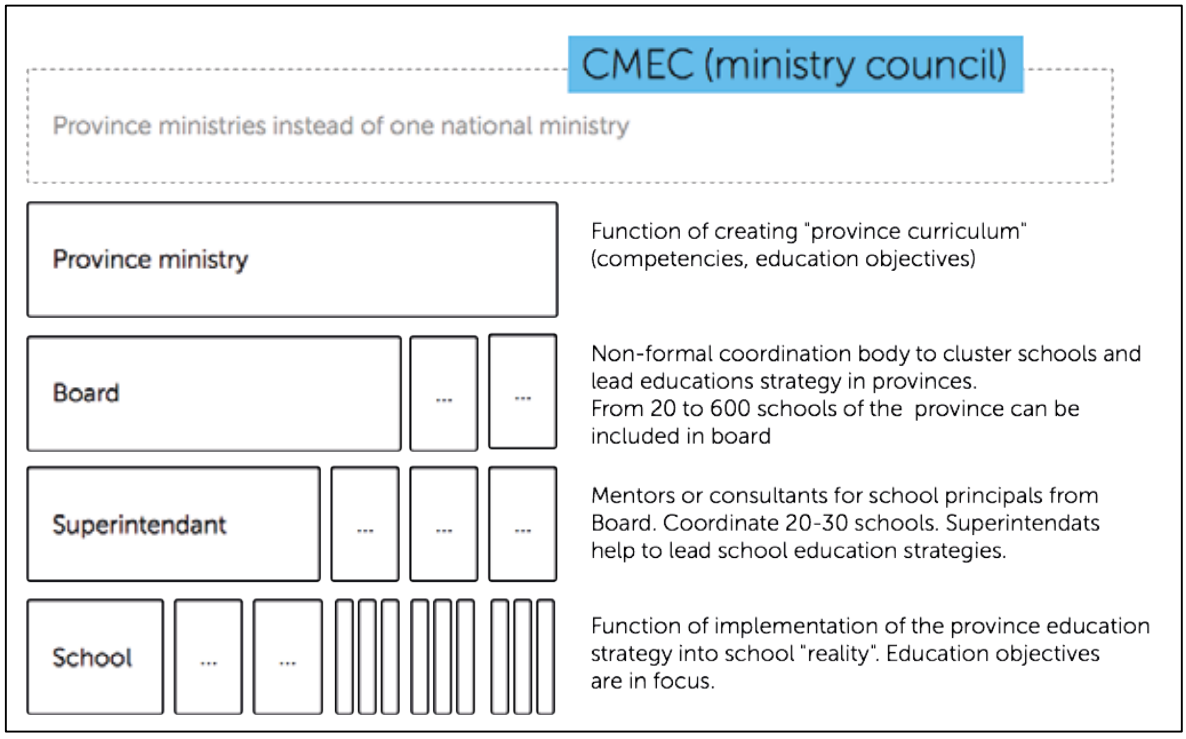
2.2. Methods of curriculum regulation

Approach 1 — Canada, Finland, Korea, USA: autonomy

The autonomous model of curriculum regulation is well represented in Ontario (Canada). On the whole, the Canadian system of education is characterized by a high degree of autonomy and freedom of the provinces, schools, and teachers. Canada is among the few countries of the world that do not have a national ministry of education. The existing Council of Ministers of Education (CMEC) rather focuses on a visionary strategic mission and represents Canada in the international education community. It does not regulate education in the provinces. The regulatory activity is performed by the provinces, each of which has its own ministry of education with a high degree of autonomy in decision-making. The idea of autonomy and distributed decision-making permeates the whole system going far beyond provincial ministries of education.

The regulatory system consists of several levels, and each is responsible for decision-making in certain areas. We shall discuss the province of Ontario, the most populated province in Canada, as an example of this approach, but the other Canadian provinces have a similar model of curriculum regulation. The overall model is described in Fig. 2.

Figure 11.2. *Administrative model of curriculum regulation in Ontario, Canada*



At the provincial level, the ministry is responsible for the most general tasks. It is the ministry that develops or chooses the framework of competences to serve as a foundation for the whole system of education. Such a framework is then integrated with the provincial curriculum. In this sense, Canada can boast of several curricula, with a curriculum for each province. The Ontario Curriculum is built around the 6Cs developed by Michael Fullan, a Canadian-based worldwide authority on education reform.

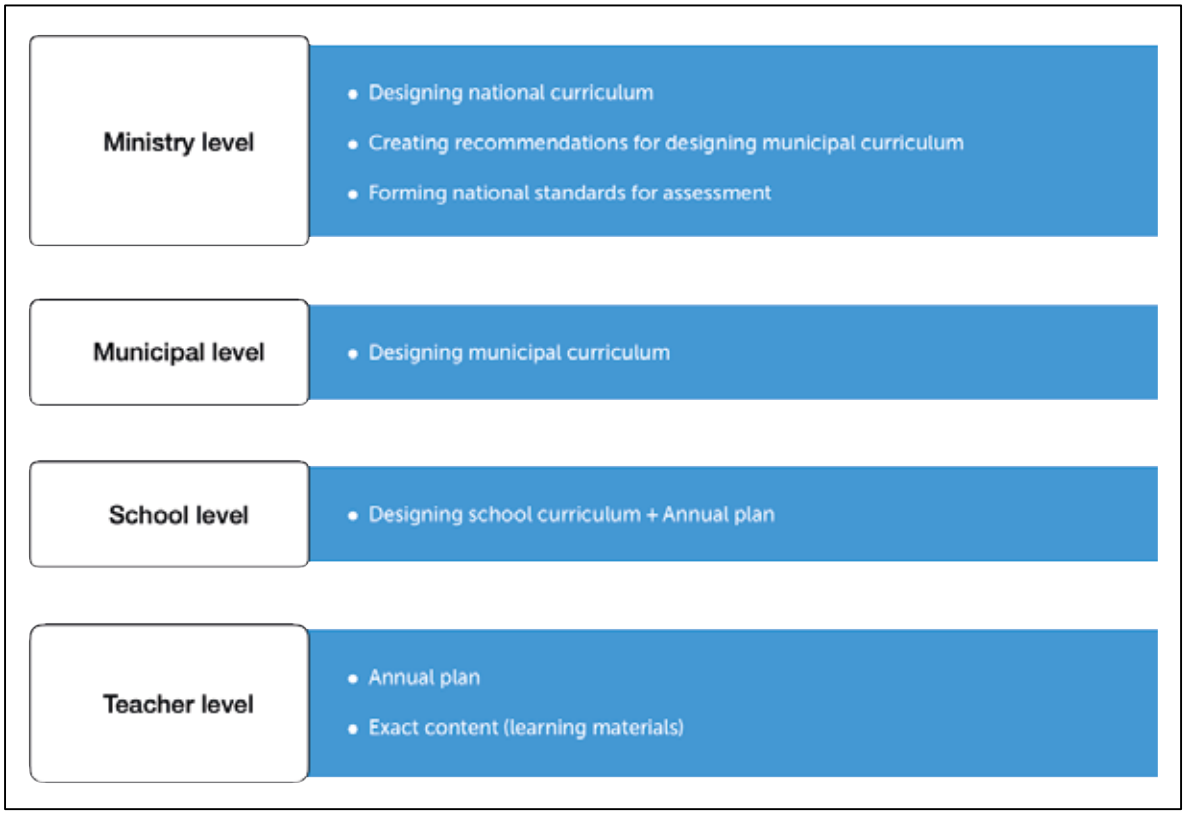
School boards, the next level of educational authority in the province on Ontario, were first established in the 1980s as a mediator communicating the ministry policy down to schools; however, since then they have become quite independent bodies, which render and adapt the curriculum, turning it into educational strategies for school clusters. Clusters may include up to 600 schools and are not only built on a territorial basis. In school boards, there is a special position of superintendant who works with a limited number of schools trying to help them develop their own curriculum. Boards and superintendants specify educational outcomes, which schools and teachers then keep in mind when selecting subject contents for their students. In such a model of regulation, the decision-making autonomy of a teacher is quite considerable.

South Korea can be viewed as an example of a decentralized model of a less explicit nature. The country has a national ministry of education and a number of documents, which

regulate curriculum implementation by schools and municipalities. However, teachers also have quite a noticeable degree of autonomy in their interpretations and ways of using the curriculum.

The national ministry of education is responsible for designing a curriculum, which is to become mandatory for the country, and also for developing guidelines for the organization and management of municipal level curricula. These guidelines are not mandatory, and municipalities develop their own curricula relying heavily on the national curriculum. Schools can also adapt the curriculum to their needs. These amendments, however, are fairly moderate, and the national curriculum can always be traced in the modified municipal and school versions. A general outline of how authority is delegated is presented in Fig. 3.

Figure 11.3. *Administrative model of curriculum regulation in South Korea*



Recently, the Korean curriculum has become more competence-oriented. The approach was developed by a number of research centres, including the Korea Institute of Curriculum and Evaluation.

Approach 2 — Russia, Poland, China: centralization

The Chinese example would be of most interest to illustrate the centralized approach. China has recently been updating its national curriculum and, in addition to subject contents, also included competences and values (in the Chinese educational framework they have a special role) in the scope of regulation. At the same time, the Chinese system of curriculum regulation has the distinct attributes of centralization.

In 2016, new curricula were issued for the main school subjects. A new framework was presented which integrates values and competences (see Chapter 4 on China for more detail). For the new curriculum to be implemented efficiently, school practices had to be changed. As they started to be changed gradually, they involved a transformation of the curriculum regulation system. For example, as learning is becoming more individualized, school authority to include their own courses in the curriculum or adapt mandatory courses to suit their needs better is expanding. This leads to an increase in teacher autonomy. The selection of contents has become more flexible in Chinese schools, teachers are now allowed to break a class into smaller groups and work with each group using different content.

3. A GENERALIZATION OF GLOBAL TRENDS IN CURRICULUM REGULATION

Competences and educational outcomes are highlighted

Despite the diversity of approaches to curriculum regulation, the competence-based model of education has become dominant. In some countries (like Finland, South Korea and China), competences or frameworks of competences are stated clearly in the national curriculum. In others competences are proclaimed at the level of the state policy (like in Ontario, Canada), or implied but not defined explicitly (England, UK), or even included into educational outcomes (like in the US Common Core or Russia). However, in one way or another, the vast majority of national curricula do mention competences.

Educational outcomes are formulated in terms of activities performed

Another global trend in the area of curriculum regulation is associated with educational outcomes. Like competences, they may come under different names — however, the outcome-based reforms initiated at the end of the 20th century have made educational outcomes an indispensible part of regulation. Moreover, educational outcomes are usually described in terms of activities a student can perform. It is not the knowledge of facts, dates, rules, and formula, but one's ability to apply them in a variety of situations. Such an activity

orientation does not deny the value of disciplinary content — on the contrary, educational outcomes embrace disciplinary contents and use it as a tool to foster children's competences and general development.

This synergy of educational activities (skills, competences) and educational contents has become more prominent in the last decade. At the turn of the 21st century, somewhat euphoric sentiments prevailed in favour of competences — there were even calls to disavow all disciplinary contents. In this respect, the US experience of the first half of the 2000s, when the country was discussing the national Common Core initiative, is quite exemplary. However, in the decade that followed the pro-competence sentiments have become more moderate, and the issue of an efficient balance between competences and content is discussed more and more often. Pro-content approaches are being introduced, though in a new attire: as a tool to foster competences (e.g. through deep learning).

Content as a tool. A shift of disciplinary boundaries

While contents' role as the core of curriculum is revisited, another trend is gaining prominence: content is increasingly presented in larger units, and not as rigid lists of topics, as before. "Big ideas" (Ontario) and "content areas" (Finland) are good illustrations of this trend. In this approach, content is described in a way which allows schools and teachers to adapt it to their needs and select materials taking into account a child's individual track and interests.

At the same time, the idea of literacy is brought forward in a broader interpretation. Although it does not appear in curricular documents systematically, it is nevertheless becoming more visible in the area of regulation and it is attracting increasingly greater attention. Some countries, for a few years already, have been trying to change the traditional structure of disciplines. Thus, in Ontario (Canada), some schools introduce subjects of rather vague disciplinary boundaries — it can be, say, a project involving contents coming from geography, biology, and the arts. The reason for such new "meta-disciplines" to appear consists in the growing gap between the traditional matrix of school subjects, on the one hand, and the professional matrix in the labour market (and also in everyday life), on the other. In other words, at school, a child usually has lessons of mathematics, their national language, physics, or biology, each with a distinct boundary. In real life, however, this boundary is much less visible and oftentimes is not discernable at all. Context-specific (or content-specific) literacy is seen as a way to overcome this gap. In this way, digital literacy would have elements of mathematics, computer science, and languages; whereas health literacy would embrace elements of physical education, biology, and even arts and physics (e.g, the recent Singaporean curriculum for physical education, among learning outcomes mentions that students will be able to state Newton's laws of motion and will be able to "apply biomechanical principles such as force, centre of gravity, summation of forces and projectile motion to analyse movement for refinement and

improvement"[7]). It is important to emphasise that the idea of literacy here is coming not from an "academic" source, but rather from the complex, non-linear nature of everyday life.

Local curricula as a mainstream. Multi-level autonomy in decision-making

Our analysis suggests that the more a national system of curriculum regulation is oriented towards competences, the more often methods of distributed management are called for. Partly, this is the reason why the traditionally centralized education systems in China and Korea are increasingly expanding school autonomy during their competence-oriented curriculum reforms. In practice, it is quite difficult to regulate the task of fostering competences if teachers do not share it. Educational outcomes and competences will remain merely declarations if schools are just to comply with the regulations and not participate in shaping their design at the local level.

The United States, England, and Poland (at its previous stage of reforms) provide good examples of how teachers' engagement can be achieved. Russia (also at a previous stage of reforms) also made a good effort and managed to involve about 100,000 teachers in discussion of the tentative core curriculum. Finland, Canada, and Australia illustrate a different approach, when local curriculum development is delegated to provinces or municipalities.

This trend (more competences mean more autonomy) also works in the reverse version: the greater a system is oriented towards regulating educational content in detail, the more it is subject to centralization. For instance, the attempt of Russian counter-reforms in 2017–2018 (the attempt by the ministry of education to redirect the focus of the national curriculum on disciplinary content) was accompanied by a series of escorting initiatives: centralization of school management systems and introduction of "a single textbook" (i.e. only one textbook for each school subject). The initiatives were not just a coincidence, but confirm the overall trend. It can be explained by the fact that prescribing educational content in every little detail significantly limits teachers' autonomy, and makes their professional activity pre-determined. In such a system, teachers perform what they are told, which, in its turn, has to be supported by an elaborate system of control over their performance.

All in all, current global trends in the area of curriculum regulation highlight competences, educational outcomes, and agents' autonomy. However, there are lots of questions still to be discussed: how are competences and disciplinary contents best linked together? Where is the point beyond which teachers' autonomy should be limited? How are competences to be assessed? — and many others. This is why it is very important to continue international

[7] Exercise and Sports Science Syllabus. Ministry of Education, Singapore. 2017. https://www.moe.gov.sg/docs/default-source/document/education/syllabuses/physical-sports-education/files/2018_olevel_exercise_and_sports_science_syllabus.pdf

research, support international cooperation and develop a common language to discuss curriculum models.

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Chapter 12

PEDAGOGICAL AND SCHOOL PRACTICES

Anything is easy if you can assimilate it to your collection of models.
…What an individual can learn, and how he learns it,
depends on what models he has available.
… the "laws of learning" must be about how intellectual structures
grow out of one another and about how, in the process,
they acquire both logical and emotional form.[1]

Seymour Papert

…not to transfer knowledge but to create environments and experiences
that bring students to discover and construct knowledge for themselves,
to make students members of communities of learners
that make discoveries and solve problems.

Robert Barr, John Tagg, 1995, p. 15

Highlights

- **The emphasis is on students and their learning (and on students owning their learning), and not on teachers' instructional activity to introduce new content.**

- **A supportive learning environment (positive emotional background and ambitious goals for each student).**

[1] Papert S. *Mindstorms: Children, Computers and Powerful Ideas*. 1980. P. vii.

- **Inquiry-based learning to activate students' curiosity and encourage them to make meaning: students (on their own and in collaboration with peers) specify the task for themselves, search relevant information and research the topic, present what they have learned, formulate criteria of success and, together with the teacher, evaluate the result.**

- **Project-based learning as mainly interdisciplinary group projects (3–15 students) lasting several days, a semester or even the whole academic year, and focusing, among other things, on challenges relevant for the local community.**

- **Personalized learning.**

- **learning tasks and situations are linked to students' real experience and are relevant for them.**

- **assessment for learning which serves as a feedback mechanism highlighting students' strengths and weaknesses, their short-term and longer-term personal learning objectives.**

1. THE FRAMEWORK: CONSEQUENCES FOR PEDAGOGICAL PRACTICES AND ASSESSMENT

The framework we present in this report (see Chapter 2), and this is true of any competence-based framework in education, cannot be implemented in schools if it is not aligned with the (1) curriculum and not supported by (2) teaching+instruction and (3) assessment. It also implies (4) professional development of teachers, and the design and development of powerful (5) learning environments.

(1) The **curriculum** is to be revised along five steps:

- Identification of *curriculum units* to be taught.

- Identification of *instructional methods* that are considered most effective for learning these units.

- Checking whether Step 2 facilitates or impedes the acquisition of domain-specific *knowledge, skills, and attitudes*,

- that are considered as constituents of *competences*.

- Analysis of everyday *life situations* that can be designed in learning environments on the basis of Steps 1–4.

(2) Generally, advanced curricula emphasize **instructional methods** that integrate the use of supportive technologies, inquiry- and problem-based approaches (e.g., model-based inquiry learning), higher-order thinking skills (e.g., analogical reasoning) and the ability to cooperate and communicate. In recent years, several instructional methods have been developed and implemented that meet the requirements of advanced curricula.

(3) Availability of valid assessment instruments is essential for a systematic development of competences. Psychologists and educational scientists have at their disposal a wide and varied pool of methods to assess knowledge, skills and attitudes (Groth-Marnat, 2003). A competence can be observable through its constituent knowledge, skills and attitudes. It is the task-dependent performance of an individual that makes an underlying competence visible (Schott & Ghanbari, 2012).

(4) "Learning 21st century skills requires 21st teaching" (Saavedra & Opfer, 2012, p. 8). Accordingly, the fourth support system of our framework refers to teachers' performance to promote 21st century skills for students and is called professional development (Arens et al., 2012). The emphasis on teachers' professional development is well rooted in educational theory and research (cf. Avalos, 2011; Guskey & Huberman, 1995). Professional development aims at cultivating teachers' abilities to identify students' particular learning styles, aptitudes and talents as well as relevant personal and motivational traits, which impact the students' strengths and weaknesses of learning. This corresponds with Hattie's (2009, 2012) approach of visible learning that can be considered the most influential momentum in current educational theory and research.

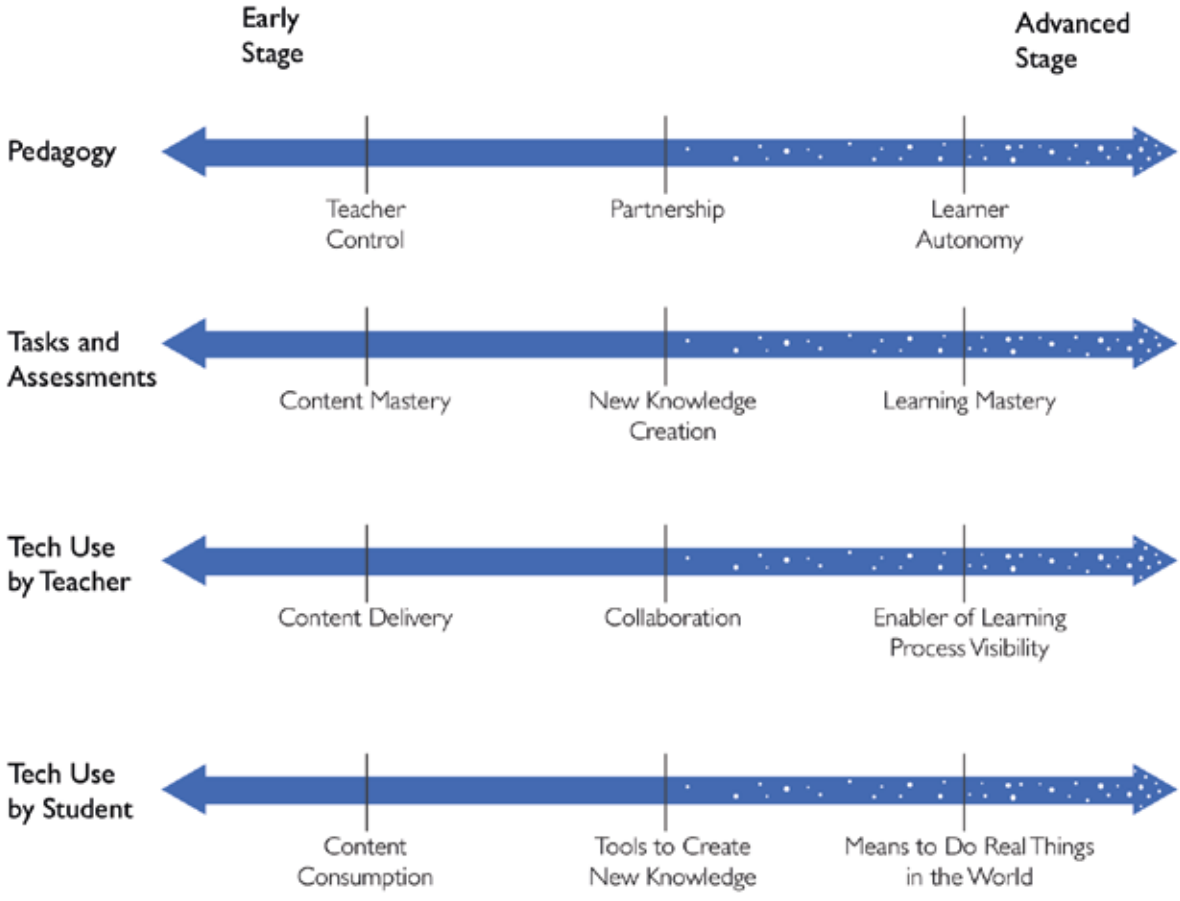
(5) As an alternative to traditional classroom teaching, the concept of learning environments has become very influential in recent years in educational psychology. However, this concept originated with Wertheimer's (1959) suggestion of designing environments in which information is provided in such a way that learners are enabled to deal effectively with new problems. Learning environments are defined as "comprehensive, integrative systems that promote engagement through student-centered activities, including guided presentations, manipulations, and explorations among interrelated learning themes" (Hannafin, 1992, p. 51). This might include the use of digital tools (e.g., Rieber, 1996) but does not necessarily do so. Well-designed learning environments are tricky to develop and sustain (cf. Seel et al., 2017), and the role of teachers is crucial (e.g. OECD 2018)[2].

[2] Paniagua, A., and D. Istance (2018), *Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies*, Education Research and Innovation, OECD Publishing, Paris. http://dx.doi.org/10.1787/9789264085374-en

Box 1. The major shift: from teaching to learning

The overarching logic in the evolution of today's school practices has been associated with the shift from the "teaching and instruction paradigm" to the "learning paradigm", with the former being embedded mainly in behaviourist theories and the latter — in constructionist theories. A concise comparison of the two paradigms was suggested in the 1990s (Barr, Tagg 1995, p. 16–17), see Chart 10.2. Originally, it was discussed in order to describe a desirable change in undergraduate education. However, we find it fully applicable to schools today, and see it as a very clear framework to reflect on school practices. The highly influential model of educational change developed by Michael Fullan further supports this shift with regard pedagogical effectiveness (see Chart 10.1). The same conceptual approach underlines the OECD principles of modern education (see Chart 10.3).

Chart 10.1. *Continuum of New Pedagogies Effectiveness*



Source: *Fullan M., Langworthy, M. (2014) A Rich Seam: How New Pedagogies Find Deep Learning, London: Pearson. P. 44. http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf*

Chart 10.2. *Comparing Educational Paradigms*

The Instruction Paradigm	The Learning Paradigm
Mission and purposes	
Provide / deliver instruction	➔ Produce learning
Transfer knowledge from faculty to students	➔ Elicit student discovery and construction of knowledge
Offer courses and programs	➔ Create powerful learning environments
Improve the quality of instruction	➔ Improve the quality of learning
Achieve access for diverse students	➔ Achieve access for diverse students
Criteria for Success	
Inputs, resources	➔ Learning and student-success outcomes
Quality of entering students	➔ Quality of exiting students
Curriculum development, expansion	➔ Learning technologies development, expansion
Quantity and quality of resources	➔ Quantity and quality of outcomes
Enrollment, revenue growth	➔ Aggregate learning growth, efficiency
Quality of faculty, instruction	➔ Quality of students, learning
Teaching / Learning Structures	
Atomistic; parts prior to whole	➔ Holistic; whole prior to parts
Time held constant, learning varies	➔ Learning held constant, time varies
50-minute lecture, 3 unit course	➔ Learning environments
Classes start / end at same time	➔ Environment ready when student is
One teacher, one classroom	➔ Whatever learning experience works
Independent disciplines, departments	➔ Cross discipline / department collaboration
Covering material	➔ Specified learning results

End-of-course assessment	➔ Pre/during/post assessment
Grading within classes by instructors	➔ External evaluations of learning
Private assessment	➔ Public assessment
Degree equals accumulated credit hours	➔ Degree equals demonstrated knowledge and skills
Learning Theory	
Knowledge exists "out there"	➔ Knowledge exists in each person's mind and is shaped by individual experience
Knowledge comes in "chunks" and "bits" delivered by instructors	➔ Knowledge is constructed, created, and "gotten"
Learning is cumulative and linear	➔ Learning is a nesting and interacting of frameworks
Fits the storehouse of knowledge metaphor	➔ Fits learning how to ride a bicycle metaphor
Learning is teacher centred and conrolled	➔ Learning is student centred and controlled
"Live" teacher, "live" students required	➔ "Active" learning required, but not "live" teacher
The classroom and learning are competitive and individualistic	➔ Learning environments and learning are cooperative, collaborative, and supportive
Talent and ability are rare	➔ Talent and ability are abundant
Nature of Roles	
Faculty are primarily lecturers	➔ Faculty are primarily designers of learning methods and environments
Faculty and students act independently and in isolation	➔ Faculty and students work in teams with each other and other staff
Teachers classify and sort students	➔ Teachers develop every student's competencies and talents
Staff serve /support faculty and the process of instruction	➔ All staff are educators who produce student learning and success
Any expert can teach	➔ Empowering learning is challenging and complex
Line governance; independent actors	➔ Shared governance; teamwork

Source: *Barr and Tagg 1995, p. 16–17.*

Chart 10.3. *Features of learner and teacher practice consistent with the OECD Principles*

Principles	Learners	Teaching
1. Learner centredness	Active learner engagement skilled at self-regulation	Learning at the centre Educators are knowledgeable and collaborative Clarity of vision quality assurance
2. Social nature of learning	Co-operative learning	Social rich pedagogy Collegial activity Flexible learning settings
3. Responsiveness to motivations and emotions	Positive challenge for every learner, low disengagement bonds of attachment and trust education of the emotions	Understanding emotions Approaches that motivate
4. Sensitivity to individual differences	Individualised approaches, louder learner voice	Rich pedagogical mix Collaborative leadership
5. Graded challenges	Formative assessment, wide and deep learning matrices, inclusive challenge	High expectations Personalised evidence Growth mind-sets
6. Assessment for learning	Shared expectations deep learning	Clarity of expectations Detailed feedback
7. Horizontal connectedness	Connectedness to the community	Connecting across subjects and topics

Source: *Paniagua, A., and D. Istance (2018), Teachers as Designers of Learning Environments: The Importance of Innovative Pedagogies, Education Research and Innovation, OECD Publishing, Paris. P. 37.* http://dx.doi.org/10.1787/9789264085374-en

Box 2. Teaching and instruction

Teaching and instruction go hand in hand, but are often confused because they are almost similar in sense and meaning.

Teaching consists of periodic patterns of instructional activities, which can be applied on various subject areas to initiate and foster students' learning (e.g. Gage & Berliner 1996; Einsiedler, 1997; Seel & Hanke, 2014). Teaching refers to the methods, techniques, and procedures used by a teacher in the classroom to help students learn successfully. A long time ago, Otto Willmann (1898) described teaching as the making of learning. It is formal when it occurs inside the classroom or informal when someone learns things outside the portals of the school.

Instruction is a fundamental aspect of teaching and refers to the way a teacher arranges the classroom environment for students to interact and learn. Teaching is more complex and includes three dimensions: structuring of intended cognitive and social learning processes; organization of instructional arrangements and methods; sequencing of learning tasks.

Teaching is *explaining* something while instruction is *telling* someone how to do something. Teaching works for overall development while instruction works for skill development.

Successful teaching needs *instructional arrangements* to motivate students and help them focus their attention, organize information for understanding and remembering, and monitor and assess learning.

***Instructional strategies* are techniques that are used to help students become independent, *strategic learners*. These strategies become learning strategies when students independently select the appropriate ones and use them effectively to accomplish tasks or solve problems.**

2. CHOOSING A TEACHING STRATEGY

Different teaching strategies are different ways of helping students learn. There are many things to consider when selecting a teaching strategy, but the most important criterion consists in evaluating *what* and *how* students should learn. A possible choice ranges from strong teacher-centred approaches, such as direct instruction and expository teaching, to student-centred approaches, such as open inquiry and exploration with minimal teacher support. Supporting the learner-centred paradigm, we have to stress that no teaching strategy is better than others for *all* intents and purposes. For example, inquiry-based learning can be quite challenging for a student (Flick & Lederman, 2004), especially for low achievers, because of their lack of prior knowledge, skills and self-discipline.

Choosing among teaching strategies should be guided by several leading questions (Killen 2016):

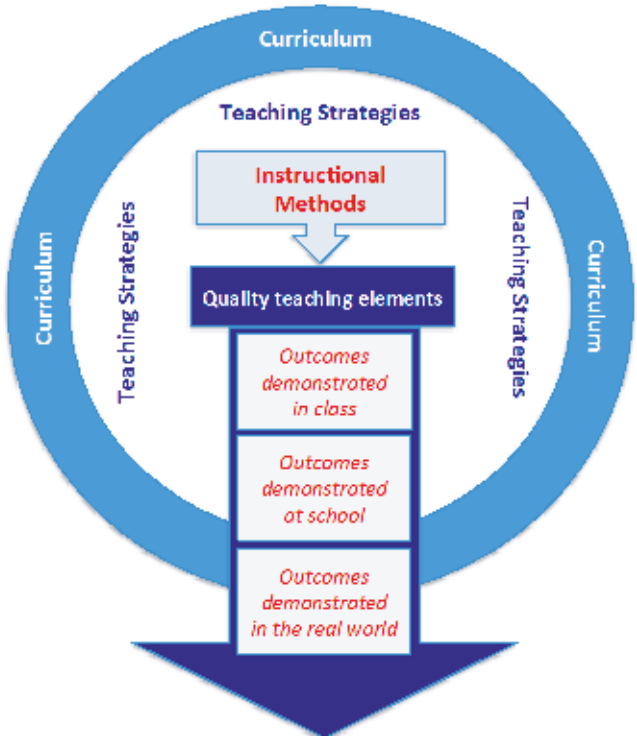
- How do people come to develop the knowledge, skills, values and attitudes that should be taught? How can "natural ways" of learning be incorporated into lessons?
- Do the learners have the necessary prior knowledge, skills and attitudes to use the teaching strategy being considered?
- How much time, space and other resources are available, and how do they constrain the choice of a teaching strategy?
- How can students be engaged in real-life experiences as they learn?
- What can be done to make learning easy for students?
- What motivational strategies can be used to foster self-confidence in learners?

The choice of a teaching strategy often depends on a particular *educational philosophy*. There are many different educational philosophies that have been developed over the years to provide students with the best education possible. For some decades of the 20th century, the teacher-centred philosophy of behaviourism focused on human learning as a reaction to external stimuli. Among the methods derived from behaviourist theory for practical classroom application are contracts, consequences, reinforcement, extinction, and behaviour modification. Alternately, student-centred approaches such as progressivism and constructivism are learner-centred educational philosophies which emphasize hands-on inquiry based on students' activities. Progressivism assumes that ideas should be tested by experimentation, and learning comes from finding answers to questions. Constructivism emphasizes (in accordance with John Dewey, Jean Piaget, and others) situated learning, which occurs when learners are actively involved in a process of meaning and knowledge construction as opposed to passively receiving information. Both progressivism and constructivism promote the interaction of students as valuable to the learning process, whereas the approach of humanism rejects the value of group-oriented education and upholds the idea of enhancing individual development.

"Good" teaching is made up of *quality teaching elements*. In the literature about teaching 21st century skills, one can find a general consensus with regard to those quality teaching elements that are considered necessary and sufficient to foster the 4Cs (critical thinking, creativity, communication and collaboration): questioning, discovery learning, scaffolding, providing feedback, small-group work and collaboration, as well as metacognition (e.g., King et al. 2013).

The interplay of teaching strategies, instructional methods, and quality teaching elements related to the curriculum, as well as learning outcomes can be displayed as in Figure 1.

Figure 12.1. *An integrated framework of teaching and instruction (adopted from Killen, 2016)*



3. UNIVERSAL QUALITY TEACHING ELEMENTS FOR 21ST CENTURY SKILLS

Although different frameworks emphasise different competences, skills and attitudes, most of them are quite consistent as far as the teaching and instruction strategies that support students' learning are concerned. It is well established that, to become successful strategic learners, students need

- step-by-step strategy instruction;
- a variety of instructional approaches and learning materials;
- appropriate support that includes modelling, guided practice and independent practice;

- opportunities to transfer skills and ideas from one situation to another;
- meaningful connections between skills and ideas, and real-life situations;
- opportunities to be independent and show what they know;
- encouragement to self-monitor and self-correct;
- tools for reflecting on and assessing own learning (Walker et al. 2002).

Questioning, discovery learning, scaffolding, feedback, metacognition, and small-group work are central elements of quality teaching aiming at enhancing higher-order thinking and communication skills that make up the core of most 21st century skills frameworks.

Asking questions is a universal mode of instruction (Henson, 1979) that is used by teachers as a central part of their teaching for many reasons. Questions stimulate the recall of prior knowledge, develop interest and motivate students to become actively involved in lessons, promote comprehension, initiate discussion, stimulate students to pursue knowledge on their own, and build critical-thinking skills (cf. Tofade et al., 2013). Teachers' classroom questioning as a means of developing students' critical thinking skills and inquiring attitudes has a long and venerable history as an instructional strategy (cf. Christenbury & Kelly, 1983; Gall et al. 1978), and often is referred to the *Socratic method* of using questions and answers to challenge assumptions, expose contradictions, and lead to new knowledge and wisdom (cf. Heckmann, 2004; Stenning et al., 2016). The Socratic method as well as the use of questioning in the realm of reciprocal teaching (e.g., Rosenshine & Meister, 1994) demonstrates that teachers might ask thought-provoking questions that require higher-order thinking to answer (cf. Saavedra & Opfer, 2012a; Schwarz & Fischer, 2006; Seel, 1983).

Teachers can continually ask probing questions to motivate students, guide the inquiry process, and stimulate curiosity and thought — but critical thinkers should also be enabled to ask themselves questions: "To become an effective problem solver, students must ask questions to deepen understanding and gain information about the problem" (Beers, 2011, p. 22). *The shift from teachers' classroom questioning to* ***teaching students to ask questions*** *is a key feature of the framework for 21st century learning*. By asking questions, students can identify their knowledge gaps and think critically about what they are learning, assess information from peers and other sources of information. Thus, the skill of formulating questions supports the 4Cs and stimulates curiosity: "A good question reflects a genuine desire to find out, a deep feeling for wanting to know more than we already do, a good question helps us think" (Barell, 2003, p. 60). Many types of questions qualify as good questions, especially if they lead to hypothetical thinking, reflection, hunches or inquiries that help students plan investigations (cf. Sternberg & Williams, 2003). Learning to generate different

types of questions for different purposes helps students learn to ask questions that lead to knowledge and understanding (cf. King, 2004). *See also the section on "Fostering communication skills" below for more techniques of questioning.*

The educational approach of ***discovery learning*** fosters the development of critical thinking skills and creativity, collaborative and autonomous work, problem solving, etc. It is guided by attempts to invoke students' interests, ideas and intellectual curiosity, to apply their intuition and imagination to discover solutions to complex problems.

Discovery learning as an instructional strategy has a long tradition in education (e.g., Dewey, 1916/1997; Piaget, 1954, 1973). Based on Dewey and Piaget, it was primarily Bruner (in the 1960s) who propelled the educational approach of guided-discovery learning (Olson, 1992).

From Bruner's perspective, discovery was not restricted to "the act of finding out something that before was unknown to mankind, but rather [included] all forms of obtaining knowledge for oneself by the use of one's own mind" (Bruner, 1961, p. 22). He further states that there are "powerful effects that come from permitting the student to put things together for himself, to be his own discoverer" (p. 22). The teacher's main task consists of guiding and motivating learners to seek solutions to problems by extending what they already know and inventing something new. Teachers should assist the learners in combining prior knowledge with new information, and encourage them to connect their knowledge to the real world. According to Bruner, learning also occurs through failure. Thus, discovery learning does not focus on finding the right end result, but rather the new things to be discovered in the process of problem solving. The teacher's main responsibility is to design instructional conditions and facilitation to guide the learning process: learners can work on their own or with others, and they learn at their own pace.

Papert (1980) argued that the role of the teacher is to create the conditions for discovery learning and invention in the classroom rather than provide ready-made knowledge. Accordingly, discovery-oriented instruction provides students with learning environments focussing on a complex problem and opportunities for inventing creative solutions to the problem (see also Edelson, Gordin & Pea, 1999).

Several instructional strategies make discovery learning more effective (e.g., Bonk & Smith, 1998; Cremin, 2015; DeHaan, 2009; Hammer, 1997; Wilson, 1995):

(1) The learning activities should be related to a challenge defined in terms of a complex task or problem.

(2) *Scaffolding* is needed to support the learner in the process of discovery. Scaffolding fades gradually so that the learner may develop a feeling of self-responsibility as problem solver.

(3) The challenge should be designed as an authentic task to make learning valuable for transfer.

(4) *Reflection* on the content and skills to be learned should occur in order to enable students to establish and apply their own heuristics for problem solving.

(5) The learners are allowed and encouraged to test possible solutions of problems against different views in different contexts.

Scaffolding is a key concept in constructivist approaches to learning. Through scaffolding, teachers guide students in their discovery of new learning by providing support in the form of questions, demonstrations, or through the generation of hypotheses for explanations (Moran, 2007). Scaffolding involves giving students support at the beginning of a lesson and then gradually turning over responsibility to the students to operate on their own (cf. Rosenshine & Meister, 1992; Slavin, 1995). Without this limited temporary support, students are unlikely to develop higher-order thinking skills; too much scaffolding, however, can be as detrimental as not enough.

Feedback is the third quality-teaching element (Marzano, Pickering & Pollock, 2001). In Hattie's (2008) list of visible learning factors, feedback belongs to the most influential factors for improving students' learning. In teaching 21st century skills, feedback allows target learning, not grading. The main purpose of feedback "is to reduce discrepancies between current understandings and performance and a goal" (Hattie & Timperley, 2007, p. 86). Feedback works at four levels: Task level (i.e., how well a learning task is understood/performed), process level (i.e., the main process needed to understand/perform tasks), self-regulation level (i.e., self-monitoring, directing, and regulating of actions), and self-level (i.e., personal evaluations and affect) (Ibid.).

A central goal of 21st century teaching consists of enabling students to act and learn autonomously (e.g., OECD, 2010), which implies advanced skills in metacognition. ***Metacognition*** refers to higher order thinking which involves active control over the cognitive processes engaged in learning (Alvarado, 2016). Metacognition is important both for critical thinking (e.g., Halpern, 1998; Ku & Ho, 2014; Magno, 2010) and creativity (e.g., Feldhusen, 1995; Hargrove & Nietfeld, 2015; Kaufman, Beghetto & Watson, 2016). Activities such as planning how to approach a given learning task, monitoring comprehension, and evaluating progress toward the completion of a task are metacognitive in nature (cf. Van Velzen, 2017). Providing students with opportunities to practice self-monitoring and thinking about the thinking strategies they are using in problem solving is an important quality-teaching element which also contributes to the creation of *scientific communities* inside the classroom because metacognition encourages students to learn about the nature and practices of scientific investigation (White and Frederiksen 2010). Creating scientific communities in classrooms is a highly challenging yet important ed-

ucational goal and presupposes collaboration and group work (cf. White, Frederiksen & Collins, 2009).

Small-group work is a highly valued quality-teaching element for fostering critical thinking, creativity, and metacognition in the classroom (Gokhale, 2012; Nelson, 1994; Styron, 2014). Putting students in group learning situations is the best way to foster critical thinking: "In properly structured cooperative learning environments, students perform more of the active, critical thinking with continuous support and feedback from other students and the teacher" (Cooper 1995, p. 8). Similarly, small-group work is also considered as a quality element for teaching creativity (e.g., Baer & Kaufman, 2012; Piirto, 2011). Furthermore, small-group work is a necessary condition for fostering communication and collaboration.

3. COMPETENCE OF THINKING

Competence of thinking results from deliberate training of higher-order thinking skills (supported by knowledge and attitudes, as described in Chapter 2). Higher-order thinking skills, including critical, logical, reflective, metacognitive, and creative thinking are activated when individuals encounter unfamiliar problems, uncertainties, questions, or dilemmas[3]. Thus, the goal of teaching is to equip students with the ability to identify and solve problems in their academic work and in life. What instructional strategies are available to promote higher-order thinking? Educational research and practice has dealt with this question for quite a while (e.g., Bereiter & Scardamalia, 1987; Costa, 1991) but it is still a challenge to build the competences into K-12 education.

Many educators believe that higher-order thinking skills need to be taught explicitly (Williams 2015), through *deliberate teaching* (Collins 2014), which includes

(1) teaching skills through real-world contexts,

(2) varying the context in which students use a newly taught skill,

(3) emphasizing the building blocks of higher-order thinking (e.g., building background knowledge, classifying things into categories, making hypotheses, drawing inferences, solving problems),

(4) encouraging students to think about the thinking strategies they are using.

[3] See e.g. King FJ, Goodson L., Faranak Rohani M.S. *Higher Order Thinking Skills: definition, teaching strategies, assessment* / Center for Advancement of Learning and Assessment. http://www.cala.fsu.edu/files/higher_order_thinking_skills.pdf

Fostering critical thinking

It is widely believed that critical thinking can be infused in lessons throughout all disciplines by utilizing in-depth questioning and evaluation of both data and sources for finding and utilizing credible information (cf. McCollister & Sayler, 2010). Indeed, the development of critical thinking skills is not only applicable to core subjects such as reading, mathematics, language arts, and science, but also to social studies, to fine arts and music education (e.g., Kokkidou, 2013).

When it comes to critical thinking in the literature of education, reference is usually made to the pioneering work of Halpern (1984, 1998) who proposed a *Four Part Model* to guide teaching and learning for critical thinking.

Halpern's Four Part Model of critical thinking

Part 1: *Explicitly teach the skills of critical learning*. **Students are provided with deliberate practice in applying critical thinking skills (Van Gelder, 2005), which generally produces the "best" learning results (cf. Halpern, 2001; Marin & Halpern, 2011).**

Part 2: *Develop the disposition for effortful thinking and learning.* **"Developing a critical thinking attitude and disposition is at least as important as developing the skills of critical thinking. The skills are useless if they are not used. The attitude of a critical thinker must be cultivated and valued" (Halpern, 2003, p. 37).**

Part 3: *Direct learning activities on structural aspects* **of problems in order to increase the probability of transcontextual transfer of critical-thinking skills. The "structural component" focuses on how to organize teaching so that critical thinking skills can be generalized.**

Part 4: *Make metacognitive monitoring explicit and overt.* **The metacognitive component includes checking for accuracy and monitoring progress toward the goal.**

Effective teaching has to take into account that critical thinking includes cognitive processes such as looking at evidence and seeking justification, selecting pertinent information, distinguishing relevant from irrelevant facts, analyzing the credibility of an information source, determining the strength of an argument, identifying relationships and alternatives, discerning examples and counterexamples, recognizing assumptions, biases, and logical fallacies, defending ideas and hypotheses, and drawing appropriate conclusions and inferences (Bonk & Smith, 1998). Much has been written about critical thinking and its psychological foundations but much less about teaching critical thinking, probably because it is presumed to be hard to do (Willingham, 2007). Some decades ago, training programs were designed to make students better thinkers (e.g., Covington et al., 1974; De Bono, 1991;

Feuerstein et al., 1980) — with lots of time and effort but only modest benefit. However, positive results were produced by the *Higher Order Thinking Skills (HOTS) programme* of Pogrow (2005), based on four kinds of thinking skills: (1) metacognition, or the ability to think about thinking; (2) making inferences; (3) transfer, or generalising ideas across contexts; and (4) synthesising information. This program is a pure thinking skills approach to assist educationally disadvantaged students in grades 4–8. Such a programme is based on the idea that there is a set of critical thinking skills that can be applied and practiced across content domains.

Despite the reported positive results of Progrow's programme, the general experience with training programs to enhance critical thinking leads to two conclusions: (a) thinking critically should be taught in the context of subject matter, and (b) critical thinking strategies should be taught explicitly and practiced (Willingham, 2007). Correspondingly, the Critical Thinking Consortium (www.tc2.ca) advocates a four-pronged approach to embedding critical thinking into teaching and learning:

- create an atmosphere for thinking by nurturing thoughtful communities that support student thinking,
- create opportunities for thinking by framing critical challenges that invite students to think critically about the subject matter,
- build capacity for thinking by developing the intellectual tools that enable students to competently think through the task at hand, and
- provide guidance about student efforts that includes assessing thinking and performance — what students have achieved and their use of the intellectual tools to support their thinking.

"If teachers purposely and persistently practice higher order thinking strategies for example, dealing in class with real-world problems, encouraging open-ended class discussions, and fostering inquiry-oriented experiments, there is a good chance for a consequent development of critical thinking capabilities" (Miri, David & Zoller, 2007, p. 353). Using dialogues, questions and discussion to develop critical thinking skills is what most authors advocate as instructional strategy (e.g., Angelo, 1995; Barnett & Francis, 2012; King, 1995; Robertson & Rane-Szostak, 1996). In a nutshell, the following characteristics of instructional activities can be considered as effective to support critical thinking in the classroom.

Instructional activities to prompt and support critical thinking:

- **Provide a less-structured learning environment that prompts students to explore what they think is important.**
- **Provide social-learning environments such as those inherent in peer-group works and small group activities to allow students to see other points of view.**
- **Provide emotionally supportive environments in the classroom encouraging re-evaluation of conclusions.**
- **Provide enough wait-time for students to reflect when responding to inquiries.**
- **Provide authentic tasks involving ill-structured data to encourage reflective thinking during learning activities.**
- **Prompt reviews of the learning situation, what is known, what is not yet known, and what has been learned.**
- **Prompt students' reflection by asking questions that seek reasons and evidence.**
- **Provide some explanations to guide students' thought processes during explorations.**
- **Provide reflective journal to write down students' positions, give reasons to support what they think, show awareness of opposing positions and the weaknesses of their own positions.**

Practice manuals to enhance critical thinking skills:

Burkhalter, N. (2016). *Critical thinking now. Practical teaching methods for classrooms around the world.* Lanham, MD: Rowman & Littlefield.

Caroselli, M. (2009). *50 activities for developing critical thinking skills*. Amherst, MA: HRD Press.

Halonen, J.D., & Gray, C. (2015). *The critical thinking companion* (3rd ed.). London: Macmillan.

Rozakis, L. (1998). *81 fresh & fun critical thinking activities*. New York: Scholastic Professional Books.

Worley, P. (2015) *40 Lessons to Get Children Thinking: Philosophical Thought Adventures Across the Curriculum*. London: Bloomsbury Education.

Fostering creative thinking

Historically, creativity and creative thinking can be traced back to ancient times (*Albert & Runco, 1999) but usually Wallas (1926) is acknowledged as having designed one of the first psychological models of the creative process. In the 1950s, Guilford (1950) pioneered creativity as a scientific approach in psychology and education. Guilford's most important contribution to conceptualising creativity consists in the distinction between convergent and divergent thinking (Guilford, 1967). Actually, divergent thinking* is sometimes used as a synonym for creativity in psychology literature.

When people speak or think of creativity, often they mistakenly think of it as having only to do with artistry. Moreover, this concept entails some myths (cf. Seel, 2013): that creative inventions are a burst of spontaneous inspiration from a lone genius; that a person working alone is always more creative than a group; or that social conventions always interfere with invention and innovation. However, all "the myths quickly fall apart when we examine the lived reality of creativity" (Sawyer, 2006, p. 259). Psychological research on creative thinking shows that usually there is not a spontaneous insight into a solution of a problem but rather creative invention is "hard work" (Sawyer, 2006) and mostly results from collaborative work.

Accordingly, the UK *National Advisory Committee on Creative and Cultural Education* (1999) suggests that the first task in teaching for creativity is "to encourage young people to believe in their creative potential, to engage their sense of possibility and to give them the confidence to try" (p. 90). Students need to be repeatedly reminded and shown how to be creative, to integrate material across subject areas, to question their own assumptions, and to imagine other viewpoints and possibilities (cf. DeHaan, 2009; Scott, Leritz & Mumford, 2004). This can be supported by creativity training programmes and learning environments.

Creativity training programmes have been developed since the 1960s. They differ with respect to domain specificity, use of substantive models, and theoretical assumptions about the nature of creative thinking (Lambert 2017; Miller et al. 2013), but most programmes share the common foundation of divergent thinking (Fasko, 2001). A meta-analysis of 70 studies demonstrated that well-designed creativity training programmes prove to be successful also in enhancing critical thinking (Scott et al. 2004). Creativity training appeared beneficial for a variety of people, not just younger or unusually gifted children. "These observations lead to a relatively unambiguous conclusion. Creativity training works" (Scott et al., 2004, p. 382). It should be emphasised that unassisted discovery does not benefit learners (Alfieri et al. 2011), whereas feedback, worked examples, scaffolding, and elicited explanations do (cf. Kirschner et al., 2007).

How Creativity Training Works: results of a meta-analysis of 70 studies (Scott et al. 2004)

- **Among various theoretical models, only the use of a cognitive approach consistently contributed to significant effect sizes.**
- **Cognitive processes linked to the generation of new ideas (problem finding, conceptual combination, and idea generation) proved to be the most powerful factors on the effectiveness of training (see also Mumford et al., 1991).**
- **In most cases, the success of creativity training could be attributed to *providing guidance* concerning the application of requisite cognitive processes. Specifically, techniques such as critical thinking, convergent thinking, constraint identification, and use of analogies, were positively related to the success of training. In contrast, less guidance such as use of open exploratory techniques (e.g., expressive activities, illumination, and imagery) were negatively related to obtained effects.**
- **Simple demonstration of heuristics or strategies may be sufficient to stimulate divergent thinking, because these strategies and heuristics are readily grasped.**

Learning environments play an important role in fostering creativity. Based on 58 studies, Davies et al. (2013) summarized several environmental factors which enhance creative skills development in children and adolescents: (1) the flexible use of space and time within a classroom, (2) the availability of appropriate materials and resources for making artefacts, (3) the flexible use of games providing learner autonomy, and (4) supportive relationships between teachers and students with the emphasis of constructive dialogue and collaborative work with others; (5) teachers' awareness of students' needs and non-prescriptive instructional planning.

We, thus, argue that students' creativity can be extended through *explicit support for enhancing curiosity, exploration and discovery*. An extensive list of ways to develop creativity in the classroom, with references both to instructional strategies and learning environments is summarised in Annex A (based on Sternberg & Willams 1996, p. 20).

It should be stressed that fostering creativity cannot be limited to direct instruction. It needs teaching aimed at mentoring, encouraging and inspiring students to think creatively. In other words, one cannot expect creative students if those who teach them are not capable of inspiring and encouraging them in this endeavour. Thus, teaching creativity presupposes creative teaching and creative teachers (cf. Gregerson, Snyder & Kaufman, 2013). Teaching is in itself a creative undertaking that requires teachers' commitment and expertise that, however, can be enhanced by using proved and tested practice manuals or even ready-to-use creativity training programs (cf. Murdock & Keller-Mathers, 2011; Salakhatdinova & Palei, 2015).

Practice manuals to enhance creative thinking skills:

Bowkett, S. (2005). *100 ideas for teaching creatively*. London: Continuum.

Caroselli, M. (2009). *50 activities for developing critical thinking skills*. Amherst, MA: HRD Press.

VanGundy, A.B. (2005). *101 ways for teaching creativity and problem solving*. San Francisco, CA: Wiley.

Worley, P. (2015) 40 Lessons to get children thinking: Philosophical thought adventures across the curriculum. London: Bloomsbury Education.

4. INTERPERSONAL COMPETENCE AND INTRAPERSONAL COMPETENCE: FOSTERING SOCIAL AND EMOTIONAL SKILLS

Educational programmes to foster social and emotional learning

In terms of educational interventions and curriculum planning, interpersonal competence and intrapersonal competence tend to go hand in hand as mutually reinforcing. The process is generally referred to as *social and emotional learning (SEL)* and aims at developing one's ability to recognize and manage emotions, set and achieve positive goals, appreciate the perspectives of others, establish and maintain positive relationships, make responsible decisions, and handle interpersonal situations constructively (Elias et al. 1997; CASEL[4]).

Several in-depth reviews (e.g., Durlak et al., 2007; Payton et al., 2008; O'Conner et al., 2017; Corcoran et al., 2018) and a comprehensive meta-analysis of over 300 studies (Durlak et al., 2011) show that training programmes designed to enhance social and emotional learning may significantly improve students' interpersonal and intrapersonal competences as well as their academic performance. Such programmes aim at assisting students in the development of skills that help them better manage their emotions and interactions with other people in educational settings to maximize their learning experiences. Intervention programs can be incorporated easily into routine classroom practices and do not require addi-

[4] https://casel.org/what-is-sel/

tional staff for effective delivery. Generally, it appears that classroom-based SEL programs are successful across all educational levels and grades.

Short-term objectives of SEL programmes include fostering students' self-awareness, self-management, social awareness and responsible decision-making skills, as well as improving their attitudes and beliefs about self, others, and school (CASEL; Durlak et al., 2011). From an intervention standpoint, attempts to foster discrete emotional skills without fostering skills of social interactions would be short-sighted. In SEL programmes, emotional abilities typically are related to social functioning in order to support coordinated social, emotional and academic learning in the classroom (cf. Beauchamp & Anderson, 2010).

SEL programmes vary in their pedagogical approaches, with some focusing on *individual-level skill development* and others emphasizing *contextual changes* designed to improve interpersonal dynamics and climate at the classroom or school level (e.g., Rivers et al., 2013). Two strategies can be distinguished to enhance school performance and youth development by addressing the cognitive, emotional, and social dimensions of learning.

- The first strategy is aimed at *educational intervention* or prevention and involves carefully designed instruction in processing, integrating and applying social and emotional skills in the realm of particular training programs. Through explicit instruction and *deliberate practice*, social and emotional skills are taught, modelled, practiced, and applied to diverse situations so that students become enabled to use them eventually as part of their daily repertoire of behaviours (O'Conner et al., 2017; Zins & Elias, 2006).

- The second strategy involves the design of comprehensive learning environments, which provide a supportive school and classroom *climate* for learning and teaching as well as a broad range of opportunities for acquiring and applying social and emotional skills in the daily routines in and out of school. This holistic approach presupposes improved classroom management and teaching practices as well as whole-school community-building activities (cf. Hawkins et al., 2004; Rivers et al., 2013; Schaps, Battistich, & Solomon, 2004; Weissberg & Greenberg, 1998).

A brief summary of school-based SEL programmes is given in Annex C.

At the same time, after-school SEL programmes turn out to be very successful. A meta-analysis of 69 after-school programmes revealed important results (Durlak & Weissberg, 2007; Durlak et al., 2010): young people who participate in after-school programmes improve significantly in three major areas -- feelings and attitudes, behavioural adjustment, and school performance. After-school programs succeeded in improving feelings of self-confidence and self-esteem, school bonding (positive attitudes toward school), positive so-

cial behaviours, and achievement test scores. They also reduced problem behaviours (e.g., aggression, noncompliance and conduct problems). Thus, after-school SEL programmes produced multiple benefits that pertain to adolescents' personal, social and academic life. Especially, programmes that used evidence-based skill training approaches were consistently successful in producing multiple benefits for participants[5]. Linking school and afterschool through SEL has become top of the educational agenda (cf. Devaney & Moroney, 2015).

Learning environments to support fostering social and emotional skills

Educational programmes to support SEL enable students of different ages to manage their emotions and social interactions in the realm of educational settings (Elias, Kress, & Hunter, 2006), but it is no less important that SEL programs also help teachers to develop their own social and emotional skills and to incorporate SEL techniques in a schoolwide approach. Thus, the effectiveness of classroom-based SEL programmes depends, to a large extent, on improved strategies of instruction and classroom management aiming at learning environments that provide a supportive and engaging climate for students and teachers.

In our framework, learning environments are conceived as *communities of social practice* that provide opportunities for shared social and emotional learning. A community of social practice is different from both a team and a social network because it is defined by knowledge, skills and attitudes. A community of social practice produces shared practice as members engage in collective processes of social and emotional learning because participation has value to the members. A community of practice defines itself along three dimensions: (a) the joint enterprise as comprehended and continuously negotiated by its members (the "what about"), (b) the relationships of mutual engagement and participation ("how it functions"), and (c) the shared repertoire of resources and capacities that member develop over time ("what is produced") (Wenger 1998). With communities of social practice, the "what is produced" refers to shared social knowledge, attitudes, and skills. It can be argued that communities of social practice correspond with Vygotsky's (1978) idea of the *zone of proximal development* defined as an area of learning in which a learner is assisted by a teacher or peer with a skill set higher than that of the learner.

Communities of social practice support informal and incidental SEL, and thus are a necessary but not sufficient condition for enhancing SEL in the classroom. It is most efficient when combined with deliberate training in intentional SEL programmes.

[5] For more detail see, among others: Pierce, Bolt & Vandell, 2010; Shernoff, 2010; Larson & Angus, 2010; Salusky et al., 2014.

Moulding a SEL programme

From a psychological perspective, enhancement of social and emotional skills is one of the most extensively investigated areas of educational intervention and prevention. Therefore, it makes sense to rely on the large-scale experience, namely: (1) to adopt and adapt the concept of CASEL as the leading paradigm for organizing a comprehensive programme of SEL in and out of school, and (2) to adopt and adapt successful SEL programmes, such as the *Prepare Curriculum* or the *Supporting Positive Behaviour*. The *Prepare Curriculum* (Goldstein 1999) includes skill-streaming for adolescents and covers 50 social and emotional skills focusing on the reduction of aggression, stress, and prejudice. *Supporting Positive Behaviour* (McGinnis & Goldstein, 1997) aims at teaching 59 specific skills for five major skill groups: skills for classroom learning, skills for making friends, skills for dealing with feelings, alternatives to aggression, and skills for dealing with stress.

There are over a hundred of important social and emotional skills for students to learn, but they can be grouped into skill areas to make it easier to identify and determine appropriate interventions. Our operational framework focus on four groups of emotional skills (Mayer and Salovey 1997) and five groups of social skills (Riggio and Reichard 2008):

Emotional skills:

- identifying emotions
- using emotions to facilitate thinking
- understanding emotions
- managing emotions

Social skills:

- the ability to express oneself in social interactions,
- the ability to "read" and understand different social situations,
- knowledge of social roles, norms, and scripts,
- interpersonal problem-solving skills,
- social role-playing skills.

Such grouping is supported by the availability of reliable and valid instruments (like, correspondingly, the MSCEIT[6] or the SSI[7]), to measure these emotional and social skills across childhood and adolescence.

Instructional practices to foster social and emotional skills

We consider that SEL programmes are a starting point of competence development to be combined with mastery learning in order to achieve a level of *skilled performance*, which constitutes the fundamental basis of a substantial transfer of social and emotional skills into various situations of everyday life. Specific instructional practices can be applied to support skilled performance of social and emotional skills. Normally, they would focus on two explicit areas: communication and collaboration to solve problems, both domain-general and domain-specific.

A. Fostering communication skills

In the classroom, communication is mainly oral and organised as discussion, conversation and questioning between students or between students and teachers. These forms aim both at communication skills as such, but also make the reflection and thinking process more explicit.

Discussion is generally valued as a powerful tool in helping students to exchange ideas, understand new concepts, and reach a decision in ambiguous situations. Discussions in the classroom may differ in the level of their inclusiveness and structuredness. For example, we can distinguish between *brainstorming* as a process for generating creative ideas and solutions through intensive and freewheeling group discussion (Orlich et al. 2013), *tutorial discussion* with students work in groups on problems that are designed to build a conceptual understanding of a topic (cf. Turan et al., 2009), *task-directed discussion* aimed at eliciting dialogues that may be useful for vicarious learning (cf. Dineen, Mayes, & Lee, 1999), and *inquiry-centred discussion* as an engaging and insightful conversation.

D**iscussion often** is used as a synonym of **conversation**, and the distinction between discussion from debate and dialogue is also quite fuzzy. See Box 3 for a clarification of these theoretical terms.

6 Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT).

7 The Social Skills Inventory (SSI), also known as the Self-Description Inventory, was developed by R.E. Riggio and assesses 6 basic social skills that underlie social competence.

Box 3. Discussion, Conversation, Debate and Dialogue: a differentiation in the classroom

Discussion **is generally defined as the action or process of talking about something in order to reach a decision or to exchange ideas or opinions. In a** *discussion* **people are involved in an exchange of knowledge or information and respond to each other from different positions with the focus on a particular topic that is at the centre of the communication.**

In a *conversation* participants exchange knowledge, sentiments, observations, opinions, or ideas from different positions but there is no particular topic on which the exchange is concentrated. While discussion is focused on a particular topic, conversation is permitted to move into all possible directions. For instance, a conversation can be a talk between two or more people in which thoughts, feelings, and ideas are expressed, questions are asked and answered, or news is exchanged.

In a *debate* the participants pursue the intention to express a particular position and articulate it in its difference from over even in contrast to position of other participants. Debaters are not primarily motivated to learn from each other but to defend and articulate their own positions.

Participants involved in a *dialogue* are explicitly concerned about learning from each other and revising and developing their original positions. *Dialogue* **differs from discussion, conversation, and debate in some features: There is an exchange between different positions in such a way that the original positions of the participants are changed and developed on the basis of the preceding phases of the interchange. Thus, dialogue has innovative potential. More than discussion, conversation and debate, dialogue creates a common space and leads to shared experiences and insights. Thus, dialogue is a kind of** *reflective discourse* **(van Zee & Minstrell, 1997). The** *Socratic Dialogue* **is generally considered as the best example of reflective discourse.**

Source: Chesters (2012).

These forms of classroom communication share one salient property: students have to play an important role in constructing new knowledge and in acquiring new understandings about the world. The teacher thus plays the role of facilitator rather than of "transmitter" of contents. Accordingly, rather than providing step-by-step instruction designed to produce right answers or correct performance, teachers encourage students to display their ideas and thinking processes and guide them to increasingly sophisticated levels of comprehension.

Five practices to promote classroom discussion have been distinguished (Stein et al. 2008; see also Nicol, 1999):

(1) *anticipating* the students' likely answers to cognitively demanding learning tasks,

(2) *monitoring* the students' responses to the tasks during the exploratory phase,

(3) *selecting* some students to present their responses during the discussion phase,

(4) *intentionally sequencing* the students' responses, and

(5) *helping* the class to make connections between the students' different response.

Effective discussion in the classroom goes beyond question-and-answer recitations and aims at providing opportunities for ***reflective communication***, including discussion, conversation, and dialogue. The major goal of reflective communication is to challenge students' critical thinking and to extend personal responses by considering the views of others, and to share personal thoughts, feelings and experiences. Usually, the teacher initiates the discussion by asking a question that requires the students to reflect upon and interpret learning experiences. In addition to this instructive communication, reflective communication also occurs when students try to explain or refute conjectures offered by their peers (Brendefur & Frykholm, 2000). Probably the best example of reflective communication is the *Socratic Dialogue* with its particular "rules of the game" (see Box 4).

Box 4. Six rules for conducting a *Socratic Dialogue*

Content impartiality — refers to the responsibility of the facilitator (usually a teacher) to remain impartial about the question being discussed. Because the dialogue is student-centred, any substantive contribution of the facilitator would undermine the purpose of the dialogue.

Working from the concrete — practical experience is a characteristic feature of the Socratic dialogue. Thus, drawing back to a concrete example puts the dialogue into the context of a real-life experience.

Mutual understanding — emphasizes the role of the facilitator as being imperative to productive and reflective thinking. It is the facilitator's responsibility to make sure that all students understand each other.

Focussing on the current questions — the facilitator must keep the group focused on one question.

Striving for consensus — it is the role of the facilitator to demand consensus from the group.

Facilitator interventions — the facilitator is free to interrupt the dialogue in order to keep the group on track but should be free from personal contributions.

Source: Heckmann's (2004)

The Socratic dialogue has, of course, its specific rules but classroom discussions and conversations also have their regularities and usually proceed through five phases:

(1) The *challenge* — the facilitator (teacher) introduces the topic to be discussed by providing a clear purpose and engaging students to becoming involved.

(2) *Briefing* — a short instruction in which the facilitator sets the ground rules, then poses a question, raises an issue, or presents a puzzling situation.

(3) The *discussion* or *conversation* itself — the teacher keeps the discourse focused and encourages all students to participate. Asking questions, responding to students' contributions, using visual cues, etc., to keep the discussion focused. Pairing students or putting them in small groups can enhance their participation in the discussion.

(4) *Closure* — the facilitator provides a summary or asks students to summarize the content and results of the discussion.

(5) *Debriefing* — the facilitator debriefs the process of the discussion by having students examine their thinking processes and reflect on their participation.

In reflective classroom communication, the teacher focuses and moderates the discussion, but the setting is underpinned by broad and active student participation. In an atmosphere of open and reflective communication, students should feel free to express their ideas and ask questions for themselves. However, most frequently it is the teacher who initiates and organizes reflective communication by asking questions which help students to make sense of their activities, to speculate, argue about and resolve problems and to link ideas and applications. This instructional approach is referred to as ***accountable talk*** (Michaels et al. 2013) and aims at fostering the meaningful conversation, respectful debate and academic discourse needed to build the collective knowledge of its participants.

Competent and well-planned *questioning* is critical for classroom communication, and each discussion, conversation and dialogue should include a mixture of factual and thought-provoking questions in order to enhance critical and reflective thinking (cf. Cazden, 2001; Goldenberg, 1992). However, conventional classroom teaching often is characterized by a plethora of teacher questions which are not systematically planned and executed. A wide range of studies has documented the fact that the typical pattern of classroom discourse is one-sided, following a pattern of teacher question, student response, and teacher evaluation of the response (Cazden, 2001; Mehan, 1979). Certainly, teacher questions which require recall of information are necessary to support academic learning but also questions are needed that require students to think independently and critically. Carefully planned and executed questioning provides the path to critical and productive thinking (cf. Furtak et al. 2018; Mueller 2018; Boswell, 2006; Chin, 2007) — because "a mind with no questions is a mind that is not intellectually alive" (Elder & Paul, 2002, p. 3).

Questions come in many different forms and can be asked at varied cognitive levels (cf. Samson et al., 1987). However, the issue of effective classroom communication raises one simple question: *What strategies of questioning stimulate higher-order thinking?*

Besides questioning according to the Socratic Dialogue rules (e.g., Browne & Keeley, 2007; Chin, 2007; Elder & Paul, 1998; Yang, Newby & Robert, 2005), *divergent, evaluative* and *reflective questions* are usually credited for their capacity to "develop higher-order thinking — to elicit motives, make inferences, speculate on causes, consider impact, and contemplate outcomes" (Orlich et al., 2013, p. 221). A classification of questions by their fundamental essence is presented in Table 1[8]. See also a more detailed classification highlighting 17 types of questions in the McKenzie's *Questioning Toolkit* (Annex B) (McKenzie's 1997, 2005).

Table 12.1. *Taxonomy of questions in classroom teaching*

Question Type	Description
Convergent	Closed, not offering many options; converges on a single or narrow list of "best" answers; encourages focused, succinct response
Divergent	Open, having many responses; permits the exploration of diverse perspectives; encourages dialogue
Focal	Student must choose or justify a position.
Brainstorm	Questions that generate a list of ideas or viewpoints.
"Shotgun"	Questions containing several content areas with no particular link.
"Funnel"	Multiple questions starting broadly and gradually leading to more focused inquiry.

Source: *Tofade et al., 2013, p. 2.*

Teachers can develop questioning skills and strategies through a combination of knowledge and deliberate practice but pre-service and in-service teachers' questioning skills can also be trained effectively (e.g., Otto & Schuck, 1983; Pagliaro, 2011; Sitko & Slemon, 1982), in particular through microteaching (e.g., Kumar, 2016; Lakshmi & Rao, 2009; Yip, 2004).

As mentioned above, a key feature of the 21st century classroom consists of a shift from teachers' classroom questioning to *teaching students to ask questions* (e.g., Black, 2001; Bowker, 2010) aiming at a "classroom culture that supports the common core" (Harris,

[8] See also taxonomies of questions in classroom teaching, which refer to Bloom's taxonomy of educational objectives and classify questions according to their cognitive level or complexity: Collins, 2014; Hill & Flynn, 2008.

2014), including teaching students the techniques of questioning and conversation to improve cognitive and social learning.

Practice manuals to foster communication:

Garber, P.R. (2008). *50 communications activities, icebreakers, and exercises.* Amherst, MA: HRD Press.

Kerwood, R. (2005). *Essential questions and questioning strategies*. Columbia, MO: eMINTS National Center.

Koechlin, C., & Zwaan, S. (2006). *Q tasks. How to empower students to ask questions and care about answers*. Markham, Ontario: Pembroke Publ.

Fostering collaboration

A key feature of the current discussion about 21st century skills teaching is the universal emphasis on learning and problem solving in *small groups*. Different terms are used to denote small group activities. Some authors (e.g., Cooper, 1995; Lord, 2001) use the term *cooperation*, others (e.g., Laal & Ghodsi, 2012; Styron, 2014; Trilling & Fadel, 2009) prefer the term *collaboration*, and yet others speak about *teamwork* (e.g., Oakley et al., 2004).

Collaborative/cooperative learning is a process by which students interact in dyads or small groups with intent to solicit and respect the abilities and contributions of individual members. Collaborative/cooperative learning changes the dynamics of the classroom by requiring discussion among learners. Five essential features characterize effective cooperation and collaboration: positive interdependence, individual and group accountability, beneficial interactions, appropriate use of social and emotional skills, and group dynamics (Johnson and Johnson 2009). These features trigger differently depending on how learning and working groups are formed.

Formal learning groups, informal learning groups, and study teams are the most common formats for collaborative/cooperative learning (cf. Cohen, 1994; Johnson, Johnson & Holubec, 2008; Udvari-Solner, 2012).

- *Formal learning groups* consist of students learning and working together, from one class period to several weeks, to achieve shared learning goals and complete jointly specific tasks and assignments. There is sustained collaboration to accomplish the academic assignment.

- *Informal learning groups* are temporary groupings of students who work together to achieve a joint learning goal in spontaneously formed ad-hoc groups that last from a few minutes to a class period.

- *Study teams* (or *cooperative base groups*, respectively) are long-term, heterogeneous cooperative learning groups formed for the specific purpose of providing mutual support to complete course assignments. Membership is consistent and maintained across over the time period of the course. Members of these study teams in secondary and higher education settings meet regularly outside of class to study together and provide assistance or feedback to one another.

The ultimate goal of forming learning groups is to create a ***community of learners*** who share values and beliefs and who actively engage in learning from one another. A community of learners creates an environment in which students and teachers are actively and intentionally constructing knowledge together and solve problems. Learning communities are connected, cooperative, and supportive. Participants are interdependent in that they have joint responsibility for learning and share resources and points of view, while sustaining a mutually respectful and cohesive climate of learning (Mester, 2008; Seel et al., 2017). Communities of learners as well as collaborative learning in general have been related to discovery learning, critical thinking, and creativity (e.g., Brown and Campine 1994; Devi et al., 2015; Harter, 2009; Sawyer, 2008; Styron, 2014).

Research across several decades demonstrates, that group work can be an effective method to motivate students, encourage active learning, and develop skills of critical thinking, communication, and decision making. When students learn in these kinds of supportive, relational groups, they not only learn better, they also develop sociability and social skills that strengthen their interpersonal relationships. But without careful planning and facilitation, group work can frustrate the participants who then develop an averseness to collaboration and cooperation. This phenomenon is called "group-hate." Group-hate has been referred to as the dread and repulsion that many people feel about working in groups or teams (Burke, 2011; Myers & Goodboy, 2005). However, these feelings diminish among group members who have received proper instruction about working in groups. One way to overcome group-hate is to form realistic expectations of group work and **talk to students about their past experiences with group work (cf. Haggarty & Postlethwaite, 2002).** Placing students in the same room, assembling them together, and assuring them they are a group, does not mean they will cooperate or collaborate effectively. Group work must be carefully planned and organized. Basically, some recommendations can be made to contribute to successful learning and problem solving in small groups (Howard, 1999; Michaelsen & Sweet, 2008):

(1) Groups must be properly formed and managed,

(2) students must be accountable and responsible for the quality of their individual and group work,

(3) students must receive frequent and timely feedback,

(4) group assignments must promote both learning and team development,

(5) if necessary, provide (initial) guidance and scaffolds to support the progress in learning and problem solving.

Based on research and practice of collaborative group work, the Centre for Teaching Excellence of the University of Waterloo provides useful suggestions to implement groupwork successfully in the classroom (Box 5).

Box 5. Designing group activities and communities of learners

I. Preparing for group work

- **Think carefully about how students will be physically arranged in groups.**
- **Insist on professional, civil conduct between and among students.**
- **Talk to students about their past experiences with group work (this will help to overcome „grouphate".**

II. Designing the group activity

- **Identify the instructional objectives. For group learning to be effective, students need a clear sense that group work is "serving the stated learning goals and disciplinary thinking goals" of the course (Franchini 2014, p. 280).**
- **Make the task challenging but not too difficult.**
- **Assign group tasks that encourage involvement, interdependence, and a fair division of work. Specifically, allocate essential resources so that group members are required to share information (e.g., the jigsaw method)...or assign different roles to group members.**
- **Decide on group size.**
- **Decide how you will divide students into groups. To vary group composition and increase diversity within groups, randomly assign students to groups.**
- **Allow sufficient time for group work.**
- **Try to predict students' responses.**

- **Design collaborative work in multiple forms: pairs, small groups, large groups, online synchronously, online asynchronously, etc.**

III. Introducing the group activity

- **Share your rationale for using group work. Students must understand the benefits of collaborative learning.**
- **Have students form groups before you give them instructions.**
- **Facilitate some form of group cohesion.**
- **Explain the task clearly.**
- **Set ground rules for group interaction.**
- **Encourage students ask questions**

IV. Monitoring the group task

- **Monitor the groups but do not hover.**
- **Expect a lot of your students.**
- **Be slow to share what you know.**
- **Clarify your role as facilitator.**

V. Ending the group task

- **Provide closure to the group activities.**
- **Model how you want students to participate.**
- **Connect the ideas raised to course content and objectives.**
- **Don't provide too much closure.**
- **Ask students to reflect on the group work process.**

Source: https://uwaterloo.ca/centre-for-teaching-excellence/teaching-resources/teaching-tips/

Following these suggestions increases the chances that collaborative learning will facilitate thinking and makes it explicit in a non-stressful environment, while also enhancing the skills of working together in a productive and respectful way.

Practice manuals to foster collaboration:

Kane, K.O., & Harms, J. (eds). *Getting started: A guide to collaboration in the classroom.* http://www.cte.hawaii.edu/publications/Collab_web.pdf

Race, P. (2000). *500 tips on Group Learning.* London: Kogan Page.

Stewart, G. (2014). *Promoting and managing effective collaborative group work*. Belfast: Education and Library Board.

Hughes, M., & Ph.D. Shapiro (2004) *101 Ways to Teach Social and Emotional Skills*. London: Bureau for At-Risk Youth.

5. INTRAPERSONAL COMPETENCE: FOSTERING LEARNING TO LEARN — AND THINKING ABOUT THINKING

The idea of *learning how to learn* is quite old and can be traced back to the Socratic method. Since the 1970s, this idea has been incorporated under the term *metacognition* (Brown, 1978; Flavell, 1976, 1979) and is commonly referred to as "thinking about one's thinking" as well as self-regulated learning (Zimmerman, 1986). For more than 40 years, the term metacognition has dominated educational research. However, as a result of the discussion about 21st century skills, *learning to learn* has become a fashionable term, which attracts educational policy makers more than the term metacognition.

Metacognition vs Learning to learn: a clarification

Metacognition **is generally defined as thinking about one's thinking, and refers to processes of planning, monitoring, and assessing one's understanding and performance. Thus, metacognition includes a critical awareness of one's thinking and learning. It involves recognizing the limit of one's knowledge or ability and then figuring out how to expand that knowledge or extend the ability. Learning and "transfer can be improved by helping students become more aware of themselves as learners who actively monitor their learning strategies and resources and assess their readiness for particular tests and performances" (Bransford, Brown & Cocking, 2000, p. 67).**

Learning to learn **has been defined as a developmental process in which people's conceptions of learning evolve and become consciously available to one's systematic analysis and review (e.g. Candy 1990). In general, it involves the acquisition of attitudes, knowledge, and skills that allow people to become more effective, flexible, and self-organized**

learners in a great variety of contexts. Likewise, in a Finnish research project *learning to learn* has been defined as "the ability and willingness to adapt to novel tasks, activating one's commitment to thinking and the perspective of hope by means of maintaining one's cognitive and affective self-regulation in and of learning action" (Hautamäki et al., 2002, p. 39).

Most definitions of *learning to learn* that can be found in the literature (e.g., Hoskins & Fredricksson, 2008; Stringher, 2014; Veenman et al., 2006) share an emphasis on metacognitive processes and self-regulation. For Bransford et al. (2000), the pursuit of a metacognitive approach in teaching can make students take the control of their learning. Teaching students how to learn is as important as teaching them the content of a subject-matter domain.

> *"…much attention is now focused on the critical role of metacognitive competence, the capacity to understand and control one's own thinking and learning processes. This competence makes people aware of how and why they acquire, process and memorise different types of knowledge. In this way, they are in a position to choose the learning method and environment that suits them best and to continue to adapt them as necessary"* (Eurydice, 2002, p. 16).

The good news is that *metacognition and learning to learn can be taught* (Bailey, Dunlosky & Hertzog, 2010; Pellegrino et al., 2001; Teong, 2003): Teaching students metacognitive skills and learning to learn will lead them to pursue their own learning throughout their education and their life (Stringher, 2014). Students *and* teachers need to engage in active practice on metacognition and self-regulation of learning.

Learning to learn cannot be taught in a separate course but has to be embedded in regular courses. In comparison with learning to learn which is a relatively new concept, metacognition has been an area of interest to educational researchers for more than 40 years. From this research, several features of effective learning environments for teaching metacognitive skills can be deduced (cf. Ellis, Denton & Bond, 2014):

- an *engaging curriculum* (Leutwyler, 2009);
- *assessment integration* by preferably using divergent questioning (Leon-Guerrero, 2008);
- *consistent practice* a metacognitive skills, such as making predictions, visualizing, and summarizing (Scharlach, 2008);
- *explicit strategy instruction*, including direct instruction (e.g., providing explanations), as well as strategy modelling and practice combined with verbalizations.

On the whole, educational research across 40 years clearly shows that aligned teaching can develop students' metacognitive capacity by encouraging them to explicitly examine how they think. For example, teachers can reinforce students' metacognition by modelling it on a regular basis as they address an example problem and then asking students to reflect on the teachers' model. According to Ellis et al., this kind of *modeling* is the most widely used approach to metacognitive training. However, it is also important for students to develop positive mental models — combined with collaborative articulation — about how they learn, the limits of their learning, and indications of failure (Oppl, 2016; Saavedra & Opfer, 2012b). In addition to modelling, *diagrams* and concept maps have been frequently used to foster the metacognitive skills of planning, monitoring and evaluating. Further strategies to enhance metacognition are reported, including mnemonics, use of checklist, goal attainment, and learning diaries (e.g., Clipa, Ignat & Stanciu, 2012). Quite recently, *wrappers* are recommended as quick and easy tools for monitoring and evaluating metacognitive activities. A wrapper is a scaffold designed to help students enhance their thinking skills over a lesson or their test-taking skills (e.g., Greenstein, 2012; Lovett, 2013; Poorman & Mastorivich, 2016).

Example of a metacognitive wrapper

Metacognitive Reflection

Respond to the following prompts as you complete your research project.

1. *Planning*
    a. What do you know about this topic now?
    b. What do you want/need to know about this topic?
    c. What resources are you considering exploring?
    d. How did you decide where and how to begin?
    e. Where did you start? What did you do first? Why?
2. *Acting*
    a. How did you proceed? Describe your steps.
    b. What resources seem worthwile? Why? How did you evaluate them?
    c. List the resources you explored; mark those that were most useful with an asterisk (*).
    d. How did you decide which ones to mark?

e. How did you know how you were going? What did you ask yourself?

f. What problems did you run into? How did you change or adjust your process in response?

g. How did you know when you reached your goal?

3. *Evaluating*

a. What worked to produce a high-quality product?

b. Describe any new strategies you used.

c. What could you do differently if you were starting over?

d. How well did you do in relation to the requirements of the assignment?

What other thoughts do you have about your research or your metacognition?

Source: *adopted from Greenstein, 2012, p. 88.*

A wrapper is an activity that surrounds a pre-existing learning or assessment task and fosters students' metacognition. Wrappers work because metacognition practice is integrated with the task: students are self-monitoring in the context where it is needed, feedback on accuracy can be built in, and support can be gradually faded.

Comprehension shouldn't be silent (Kelley & Clausen-Grace, 2013), and thus, verbalization, and in particular, *Think Aloud* is a frequently used method for fostering metacognitive skills. *Think Aloud* means verbalizing the steps or procedures of a strategy as it is being deployed. It also involves posing questions, identifying resources, and reciting affirmations well (Kelley & Clausen-Grace, 2013). The various strategies for fostering metacognition and learning to learn accord with (a) encouraging students to examine their thinking when accomplishing a learning task or problem, (b) giving them practice in identifying confusions, (c) pushing them to recognize conceptual change, and (d) providing a forum in which students monitor their own thinking (Tanner, 2012).

In accordance with research on metacognition and educational practice, metacognitive skills are a prerequisite for self-regulation of learning, which can be paraphrased as self-created thoughts, feelings, and actions in the pursuance of learning tasks. Students who regulate their learning effectively can process learning tasks on their own initiative and with creativity, persistence, and a sense of responsibility. However, this requires high motivation to learn. Thus, models of self-regulated learning include motivational variables (e.g., goals, self-belief, and intrinsic interests) as central elements (Zimmerman, 1998). To develop positive attitudes toward learning to learn students must accommodate self-mo-

tivation for learning, willingness for personal development and changes, self-awareness and self-confidence, willingness to motivate and support others (Hofmann, 2008). Equipped with motivation to learn, positive attitudes and metacognitive skills students may develop the potential to become *expert learners* who are characterized through by their methodical approach, control, and reflection in mastering tasks, are conscious of the knowledge and skills they (do and do not) possess, and use appropriate strategies to apply or acquire them. Expert learners are capable of monitoring the own learning progress in order to make a quick decision on what to do in case a problem may arise. Shortly said, an expert learner is strategic, self-regulated, and reflective (Ertmer & Newby, 1996). However, it takes time and deliberate practice to become an expert learner (Ericsson, Krampe & Tesch-Romer, 1993).

Practice manuals to enhance learning to learn and metacognition:

Frender, G. (2014). *Learning to learn* (rev. ed.). Chicago, Il: World Book.

James, M. et al. (2006). *Learning how to learn. Tools for schools*. London: Taylor & Francis.

These manuals provide metacognitive activities to guide students in (a) identifying what they already know, (b) articulating what they have learned, (c) communicating their knowledge, skills, and abilities, (d) setting goals and monitoring their progress, (e) evaluating and revising their work, (f) identifying and implementing effective learning strategies, and (g) transferring learning from one context to another. Basically, two types of metacognition are trained: *reflection* (i.e. thinking about thinking) and *self-regulation* (i.e., learning to learn).

ANNEX A

25 ways to develop creativity

The prerequisites

1. Modeling creativity

For teachers the most powerful way to develop creativity in students is to be a role model.

2. Building self-efficacy

Teachers should help students believe in their ability to be creative.

Basic techniques

3. Questioning assumptions

Teachers shelp their students learn how to formulate good questions and how to answer them.

4. Defining and redefining problems

Teachers encourage students to define and redefine problems and projects.

5. Encouraging idea generation

The environment for generating ideas must be relatively free of criticism. Brainstorming can be used to produce ideas.

6. Cross-fertilizing ideas

Teachers stimulate creativity by helping students to think across subject matters and disciplines.

Tips for teaching

7. Allowing time for creative thinking

To think creatively needs time to do it well. Therefore, learners need time to understand a problem and to toss it around.

8. Instructing and assessing creativity

The teacher asks questions that require divergent thinking. Opportunities for creative thought should be included in assignment and tests.

9. Rewarding creative ideas and products

Students' creative efforts must be rewarded promptly.

Avoid roadblocks

10. Encouraging sensible risks

Students are encouraged to take sensible intellectual risks with courses and activities.

11. Tolerating ambiguity

A creative idea tends to come in bits and pieces and develops over time. Without the ability to tolerate ambiguity, learners may jump to a less than optimal solution.

12. Allowing mistakes

When students make mistakes, they should be asked to analyze and discuss the mistakes. Often, mistakes contain the germ of good ideas.

13. Identifying and surmounting obstacles

To help students deal with obstacles, the teacher might remind them of creative people whose ideas were initially shunned and helps them develop an inner sense of awe of the creative act.

Add complex techniques

14. Teaching self-responsibility

Teaching students how to take responsibility means teaching to understand their creative process, criticize themselves, and take pride in their creative work.

15. Promoting self-regulation

Students must learn to take control of the process. Thus, teachers provide them strategies for self-regulation.

16. Delaying gratification

Students must learn rewards are not always immediate and that there are benefits to delaying gratification.

Use role models

17. Using profiles of creative people

Introducing profiles of creative people and their experiences gives students powerful information that exists independently and complements previously stored information.

18. Encouraging creative collaboration

Collaboration can spur creativity. Teachers encourage their students to collaborate with creative people to learn by example.

19. Imagining other viewpoints

Teachers encourage students to see the importance of understanding, respecting, and responding to other people's points of view.

Explore the environment

20. Recognizing environmental fit

By building a constant appreciation of the importance of person-environment fit, teachers prepare students for choosing environments that are conducive to their creative success. Students get encouraged to examine environments to help them learn to select and match environments with their skills.

21. Finding excitement

Creative people are intrinsically motivated in their work. Teachers help students uncover their true interests, ask them to demonstrate a special talent or ability for the class.

22. Seeking stimulating environments

Teachers help their students develop the ability to choose environments that stimulate their creativity.

23. Playing to strengths

Teachers can help students play to their strengths. By helping students identify the nature of their talents, teachers create opportunities for them to express and use their talents.

The long-term perspective

24. Growing creatively

„Teachers and administrators are susceptible to becoming victims of our own expertise — to become entrenched in ways of thinking that worked in the past, but not necessarily in the future [...] Being creative means stepping outside the boxes that we — and others — have created for ourselves" (Sternberg & Williams, 1996, p. 48).

25. Proselytizing for creativity

The virtues of teaching to develop creativity in students and teachers multiply from reinforcement. Teachers should colleagues, associates, administrators, principal, school board members, and everyone else how important it is to develop creativity in students.

Source: Sternberg and Williams (1996)

ANNEX B

Questioning Toolkit

Type of Question	Description
Essential Questions	are central to our lives and touch our hearts and souls. They probe deep into issues that reflect the complexity of life. They often deal with abstractions and the "how" and "why" of people, places, and things.
Subsidiary Questions	are smaller queries that often lead to larger insights. They're sometimes combined together to ask larger questions.
Hypothetical Questions	explore possibilities and test relationships. They are useful when making decisions and solving problems. They're often "what if" questions.
Telling Questions	focus an investigation on specific evidence. Information is gathered leading to a specific target.
Planning Questions	help students organize their thinking, structure their investigation, and sequence activities.
Organizing Questions	help structure information in meaningful ways.
Probing Questions	ask students to apply logic, connect to prior knowledge, use intuition, and experiment with data to acquire useful evidence.
Sorting & Sifting Questions	focus on the relevance of information in addressing a particular need.
Clarification Questions	help students define words and concepts, examine the logic of an argument, and identify the underlying assumptions
Strategic Questions	arise during the inquiry process as students are exploring, assimilating, inferring, and reflecting.
Elaborating Questions	extend and expand findings by asking students to look for implicit (unstated) meanings.
Unanswerable Questions	explore those areas where truth may never be found. Students must understand that some problems may not be solved.
Inventive Questions	encourage the discovery of new ideas or rethinking of existing approaches.
Provocative Questions	challenge the status quo by promoting doubt and skepticism. They may explore irony, satire, and parody.
Irrelevant Questions	distract students from their original questions, but these diversions are sometimes useful in finding new, relevant directions.
Divergence Questions	explore topics adjacent to the original questions, but issues that might be connected.
Irreverent Questions	*Questions* challenge students to think outside the box. Although they may seem disrespectful or impolite to some, they may generate important discussions about key issues.

Source: *McKenzie, 1997.*

ANNEX C

An overview of Social and Emotional Leaning intervention and prevention programmes

Programme	Mission / Methods	Contents / Structure
Primary Mental Health Project (Cowen et al., 1971)	Targets children K-3. Addresses social and emotional problems that interfere with effective learning.	Objectives are • to improve learning and social skills • to reduce acting, shyness and anxious behaviours • to increase frustration tolerances
The ACCESS Program (Walker, Todis, Holmes & Horton, 1988)	Offers a complete curriculum for teaching effective social skills to students at *middle and high school* levels. The program teaches • peer-to-peer skills, • skills for relating to adults, and • self-management skills.	*ACCESS* contains • teaching scripts for 30 social skills identified by secondary teachers and students as critical for social competence; • an eight-step instructional procedure; • a student study guide containing role-play scripts, discrimination exercises, and student report forms for contracted practice; • suggestions for grouping of students • a motivational and behaviour management, and • generalization strategies.
The EQIP program (Gibbs, Potter & Goldstein (1995; DiBiase et al., 2012)	A three-part intervention method for working with antisocial or behaviour disordered adolescents.	The approach includes training in • moral judgment, • anger management/ correction of thinking errors, • and pro-social skills.
Skill-streaming the Elementary School Child (2–6) (McGinnis & Goldstein, 1997)	Skill-streaming addresses the social skill needs of students who display aggression, immaturity, withdrawal, or other problem behaviours.	The curriculum for both programs contains *60 skill lessons* and includes five skill groups: • Classroom survival skills, • Friendship-making skills,

Extension of Annex C

Programme	Mission / Methods	Contents / Structure
	The approach utilizes modelling, role playing, performance feedback, and transfer (homework). Students develop competence in dealing with interpersonal conflicts and learn to use self-control.	• Dealing with feelings, • Alternatives to aggression, • Dealing with stress.
S kill-streaming the Adolescent (7–12) (Goldstein & McGinnis, 1997)	addresses the social skill needs of adolescent students who display aggression, immaturity, withdrawal, or other problem behaviours.	
The PREPARE Curriculum (Goldstein, 1999)	Designed for use with middle school and high school students but can be adapted for use with younger students. A series of 10 course-length interventions grouped into three areas: reducing aggression, reducing stress, and reducing prejudice.	*Part I — Aggression Reduction* • Skill-streaming skills for adolescents • Situational perception training • Anger control training • Moral reasoning training *Part II — Stress Reduction* • Stress management training • Problem-solving training • Recruiting supportive models *Part III — Prejudice Reduction* • Empathy training • Cooperation training • Understanding and using Groups
PATHS: Promoting Alternative Thinking Strategies (K-6) (Kusché & Greenberg, 1997)	The PATHS program facilitates the development of self-control, positive self-esteem, emotional awareness, and interpersonal problem-solving techniques -- all skills that work to reduce classroom disruptions caused by bullying and other hostile behaviour.	The PATHS program's practical, effective strategies teach children how to label their feelings and apply self-control strategies, leading to significant improvements in coping skills, classroom behaviour, and verbal fluency. • Conceptual domains: • Self-control • Emotional understanding

Programme	Mission / Methods	Contents / Structure
		• Self-esteem • Peer relations • Problem solving
The Stop & Think Social Skills Program (Knoff, 2001)	The program provides teachers with an effective, proven way to teach their middle to late elementary students (grades 4–5) the social skills that will help them become more successful socially, academically, and behaviourally.	The *Stop and Think* program organizes skills into four areas: 1. *Survival skills* (e.g., listening, following directions, ignoring distractions, rewarding yourself) 2. *Interpersonal skills* (e.g., sharing, asking for permission, joining an activity) 3. *Problem-solving skills* (e.g., asking for help, apologizing, accepting consequences, deciding what to do) 4. *Conflict resolution skills* (e.g., dealing with teasing, accusations, peer pressure)
The RULER Feeling Words Curriculum (Maurer, Brackett & Plain, 2004; Brackett et al., 2012)	RULER is a multi-year curriculum designed to promote social, emotional, and academic learning. It aims simultaneously to enhance the social and emotional skills of adolescents and create an optimal learning environment that promotes academic, social, and personal effectiveness. Recommended for *grade 5–8* students, program engages the intellectual, emotional, and social framework of the individual to develop self- and social-awareness, acquisition of a diverse vocabulary to identify and express emotional experiences, understand the relationships between thoughts, feelings, and actions, and share and communicate thoughts and feelings with others.	Student activities include self-reflection, analysis of academic material and current events, classroom discussions, interaction with family members, artistic designs, and creating writing assignments. The program includes 6 steps: *Step 1*: Introduction of feeling words — connecting feeling words to personal anecdotes. *Step 2*: Designs and personified explanation — symbolically representing feeling words. *Step 3*: Real world associations — connecting feeling words to social and academic situations. *Step 4*: Personal/Family associations — connecting personal and family experiences to feeling words. *Step 5*: Classroom discussions — sharing real world and/or personal/ family associations.

Extension of Annex C

Programme	Mission / Methods	Contents / Structure
		Step 6: Creative writing assignment — incorporating feeling words into open-ended essays.
Head Start REDI (Bierman et al., 2008; 2017)	Head Start REDI is a randomized controlled *preschool* preventive intervention. It addresses social competence, aggressive-oppositional behaviour, learning engagement, attention problems, student-teacher closeness, and peer rejection.	The coaching process provides • explicit instruction in social skills, • structured and supportive opportunities to practice skills, • feedback that allows the student to adjust and improve skill performance, • opportunities for self-regulation to promote social awareness and sensitivity; • support to generalize social skills to „real-life" peer interactions.
Social Skills Improvement System SSIS™ (K-12) (Gresham & Elliott, 2008)	The SSIS™ (Social Skills Improvement System) Intervention Guide is designed to implement remediation strategies that are directly tied to problems identified by the SSIS Rating Scales. Because the SSIS Intervention Guide is highly coordinated with the SSIS Rating Scales, this dynamic intervention program enables to conduct meaningful pre-treatment and post-treatment assessments and be confident that the decisions are reliable. The SSIS provides optional intervention strategies and resources that support instruction, and tools to monitor program effectiveness and student progress.	Critical Social Skill Domains: • *Communication*: The act or process of imparting or interchanging thoughts, opinions, or information by speech, writing or signs. • *Cooperation*: The act or instance of working or acting together for a common purpose; more or less active assistance from a person; willingness to help or work together. • *Assertion*: A positive statement or declaration, often without support or reason; an act of sticking up for oneself or for what is right. • *Responsibility*: The ability to make moral or rational decisions on one's own, and to be answerable for one's behaviour; the quality or state of being trustworthy or dependable. • *Empathy*: Identification with or understanding of another's situation, feelings, thoughts, attitudes, or motives; the ability to imagine how another person is feeling and to understand his or her mood.

Programme	Mission / Methods	Contents / Structure
		• *Engagement*: The act of involving someone in an activity; involving oneself or becoming occupied; the act of sharing in the activities of a group. • *Self-control*: Control or restraint of oneself or one's actions or feelings; the ability to control one's emotions and remain calm even when feeling angry, afraid, excited or upset.

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