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CHAPTER ONE

INTRODUCTION TO 21ST CENTURY SKILLS AND EDUCATION

CAHIT ERDEM

Characteristics of the 21st Century

The 21st century has brought about changes in every walk of life, particularly in economic order. With respect to production and economy, the 21st century is a mark of the transition from the industrial age to the knowledge age. While the value chain in the industrial age goes through extracting, manufacturing, assembly, marketing, and distribution, to products, the chain in the knowledge age is through data, information, knowledge, expertise, and marketing, to services, respectively (Thrilling & Fadel 2009). Noss (2012) refers to this transition as the shift from material labour to immaterial, weightless, production, for which process-oriented skills, such as teamwork or problem solving, are needed. This change in the economic order has required many new skills, or has altered existing skills that individuals need to possess. Modern workplaces need staff who can solve non-routine problems, perform complex communication, and have social skills (Koenig 2011).

Though economic order is the major area of change, the changes brought along with the new century are not limited to it. Beside the requirements of workplaces, intensive and easy interaction with digital media tools and platforms such as smartphones and social media requires informed decision making which is possible by acquiring new knowledge and skills that are essential, rather than desirable (Hobbs 2010). Individuals are living a life in which they are bombarded with an overabundance of information, through technological tools like televisions or computers. It is a fact that information available via media tools is not always reliable; anyone can upload contents to the internet, the results of internet searches may be outdated or irrelevant, and accessing information may require research skills and critical thinking, which means individuals

need to be information-literate (Breivik 2005). The ubiquitous use of technology has brought forth a new lifestyle for people, which is highly different from the previous century.

Given the characteristics of the new century, students need a new set of skills to make their way in a complex and constantly evolving future (Craig 2012). These skills are mostly referred to as 21st century skills. A rich literature on the categorization, definition, and application of these skills has been generated. The literature on 21st century skills is based on the assumption that the new century requires different skills for individuals to function effectively in every walk of life (Ananiadou & Claro 2009). For centuries, only a small number of people needed to have skills such as creativity, critical thinking, and problem solving, yet in the new century, every citizen needs to have these skills to survive (Akgündüz & Ertepinar 2015). One reason for the difference between the skills of the 20th century and those of the 21st century is the huge advancement in information and communication technologies, as these types of work are in a process of shift, in parallel (Dede 2009).

It is well discussed that technological changes have been rapid, changing life in an unprecedented way. Yet, Noss (2012) argues that the i-pad/smartphone paradigm is quite different from previous paradigms, in that, with this new paradigm, the institutional aspect of technology has moved to a personalized technology, which is ubiquitous in the home, the pocket, and elsewhere. However, more importantly, Noss (2012) maintains that the students themselves are digital natives. They know how to use these technologies without training. Nevertheless, when it comes to deeply engaging with technology, they are digital immigrants. Therefore, it should not be taken for granted that the new generation is a fluent and conscious user of technology. The new tools and platforms offered by new technologies present a lot of challenges to them. Yet, animosity towards technology does not help either, since it is now an indispensable part of people's lives. What is important is how, and for what purposes, we are using technology.

It is now taken for granted in the new century that people need to possess a set of skills, some of which are peculiar to the new century, while some are existing skills which are needed more these days. What is challenging is getting people to acquire these skills, an urgent need for underdeveloped countries, as they have fallen behind in aligning their schools with these skills and engaging the needed manpower in return. Developed countries, such as the United States, Canada, or England, have dwelt upon new skills and generated frameworks to teach and assess 21st century skills, whereas other countries continue to teach the curriculum of

the previous century. Unless a country equips its citizens with the skills of the new century, it will only serve for developed countries by producing the products designed and marketed by those countries, and will continue to generate minimal wages, as well as polluting its own environment while providing those services. Currently, while routine works are carried out by less developed countries, creative works, such as designing smartphones, are carried out by developed countries. This division is presented in Figure 1-1, below (Thrilling & Fadel 2009, 10).

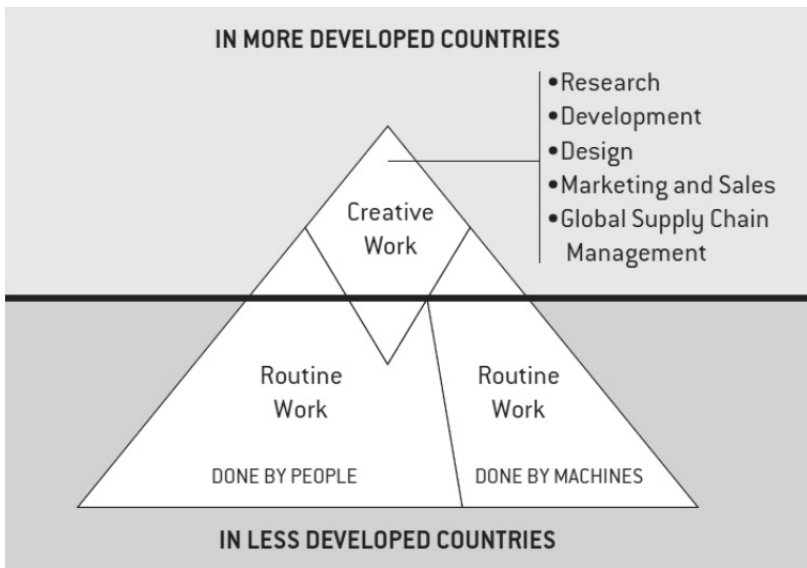


Figure 1-1. The Future of 21st Century Work

Trilling & Fadel (2009) argue that the fundamental changes in the world in the last decades have also affected the roles of learning and education in individuals' lives, to a great extent. This effect has been not only by adding new skills to be acquired by individuals, but also by changing the way the skills of previous century, such as critical thinking, are learned and practiced. Regarding the curricula in schools, and real life in the 21st century, Thrilling & Fadel (2009) highlight that: working life requires teamwork to solve problems and create new things; children are surrounded with technology in their daily lives; the world includes challenges and problems that are linked to each other, and so should the education be; and schools can fall behind with the creativity and

innovation that are needed for the economy. Learning in the 21st century is learning with digital technology (Noss 2012, 3). This 21st century skills movement demands reforms in education (Ananiadou & Claro 2009). The changes in the economy and society force education and the curriculum to change. Otherwise, it is impossible to train students with the skills they will need when they step out of the classroom.

Though most people argue that the new century requires new skills, they are not altogether new skills. What is new, is that the new economic order in the 21st century depends on these skills more than ever (Rotherham & Willingham 2009). The economy and work have changed a lot recently. Work requiring routine skills is already carried out by technology. The economy needs workers who can manage information, coming from a variety of sources, in high quantity, and who can make decisions and create (Silva 2009). This suggests that what is new, is not the skills themselves, but the need for them in the new economic order. Dede (2009) makes a distinction between perennial skills and contextual skills. Regarding perennial skills, he gives the example of collaboration. Collaboration has always been an important competency, however, as knowledge-based economy requires teamwork, the need for collaboration has increased a lot. Furthermore, the skill of collaboration now means a lot more. Collaboration, Dede (2009) argues, now includes communication with people one has never met face-to-face. Therefore, it can be argued that these skills are now more sophisticated. On the other hand, the new century has also brought about contextual skills, such as filtering enormous data and locating the required knowledge for making decisions, which was not present in previous centuries. Putting aside the origin of these skills, the urgent need for them, both for the economy and people, dictates that these skills should be deliberately focused on in the school, and through curricula to ensure individuals can be successful in the new century. Therefore, this chapter first presents 21st century skills, and then moves on to teaching and assessing these skills.

21st Century Skills: Skills and Frameworks

The literature on 21st century skills is quite rich, and includes a number of skills. In some studies, the skills are listed individually, while in other studies the skills are situated into frameworks. There are also various skills frameworks, and each of them highlights different 21st century skills (Lai and Viering 2012). Of these studies, some are carried out by individual researchers and some are carried out by organizations. Before moving on to what these skills are, some issues on the nature of these

skills need to be discussed. To begin with, though skills related to new technologies are present in all frameworks, they are not limited to technology. Craig (2012) tries to correct some of the misunderstandings about 21st century skills. First, 21st century skills are not all about technology. Technology is just a part of these skills. Second, 21st century skills are not all new skills imposed by high-tech companies. Most of these skills have been in demand for generations.

The second issue is one of the relationships between knowledge and skills. The 21st century skills movement is sometimes criticised for ignoring content knowledge, although some frameworks, such as Partnership for 21st Century Skills (P21), pay special attention to knowledge, since the skills in this framework are based on specific content knowledge and themes. Noss (2012) argues that the change in life caused by technology leads to a dichotomy. On the one hand, the elite needs to know real knowledge; on the other hand, people need process-oriented skills that technology demands from them. This case poses a problem. The skills should not be denuded of real knowledge. Critics of the 21st century skills movement argue that these skills cannot be taught independently, and students cannot apply these skills without appropriate factual knowledge; that's why they demand emphasis on content, and a broad liberal arts curriculum (Ananiadou and Claro 2009). Skills and knowledge are not separable. Research also reveals that learning is performed best when skills and knowledge are together (Silva 2009). However, opponents of the 21st century skills movement argue that these are not new skills, and that they are serious threats to the teaching of core content, lowering the standards and weakening the teaching. These opponents add that it is too hard to measure these skills (Silva 2009). This may prove true, if a comprehensive perspective is not taken towards 21st century skills and they merely become fads to please public opinion. What is important is to overcome the challenge of reaching improved outcomes for students by delivering content and skills effectively (Rotherham and Willingham 2009). Considering this, lists of 21st century skills and categories, or frameworks of these skills, are presented below, based on an extensive literature review.

Wagner (2008) refers to these skills as survival skills, and lists them as: critical thinking and problem solving; agility and adaptability; collaboration and leadership; initiative and entrepreneurialism; accessing and analysing information; effective oral and written communication; and curiosity and imagination. Grouping them makes it easier to see the scope of these skills. Based on 250 researchers' feedback, Kennedy, Latham and Jacinto (2016) put the skills into four main categories: ways of thinking

(creativity, critical thinking, problem-solving, decision-making and learning); ways of working (communication and collaboration); tools for working (information and communications technology [ICT] and information literacy); and skills for living in the world (citizenship, life and career, and personal and social responsibility).

Ananiadou and Claro (2009) firstly group the skills in three main categories: ICT functional skills; ICT skills for learning; and 21st century skills. They define 21st century skills as necessary in the knowledge society, but suggest they do not necessarily require the use of ICT. These skills have three dimensions: information; communication; and ethics and social impact. The information dimension deals with information in digital settings, such as accessing, organizing and evaluating information, sub-skills of information literacy certainly. The information dimension has two sub-dimensions: information as a source, and information as product. The communication dimension is about being an efficient member of society. It has two sub-dimensions: effective communication, and collaboration and virtual interaction. The ethics and social impact dimension is about ethical challenges as well as globalization in the new century. Social responsibility and social impact are two sub-dimensions of this dimension.

Finegold and Notabartolo (2008) group the skills into five main categories: analytic skills (critical thinking, problem solving, decision making, research, and inquiry); interpersonal skills (communication, collaboration, and leadership and responsibility); the ability to execute (initiative and self-direction, and productivity); information processing (information literacy, media literacy, digital citizenship, ICT operations and concepts); and capacity for change (creativity/innovation, adaptive learning/ learning to learn, and flexibility).

Thrilling and Fadel (2009, 26) suggest three categories of 21st century skills, outlined as follows: learning and innovation skills (critical thinking and problem solving, communications and collaboration, creativity and innovation); digital literacy skills (information literacy, media literacy, information and communication technologies [ICT] literacy); and career and life skills (flexibility and adaptability, initiative and self-direction, social and cross-cultural interaction, productivity and accountability, leadership and responsibility).

No matter how these skills are termed or grouped, they all have to do with dealing with complex world we are living in. They mainly focus on complex thinking, learning, and communication skills, and they are hard to teach (Saavedra and Opfer 2012). Due to their complexity, and the challenge of teaching and assessing them, some organizations have invested a lot of effort in this regard. Though there are many

organizations, such as Partnership for 21st Century Skills (P21), NCREL, the Metiri Group, OECD, and ISTE, which dwell on 21st century skills and suggest frameworks in general, or in specific areas, P21's framework is the most detailed, as well as being the most widely adopted (Dede 2009). P21 provides a comprehensive framework for learning in the 21st century. It includes content knowledge, expertise, and literacies, as well as specific skills. The framework is given in Figure 1-2 below.

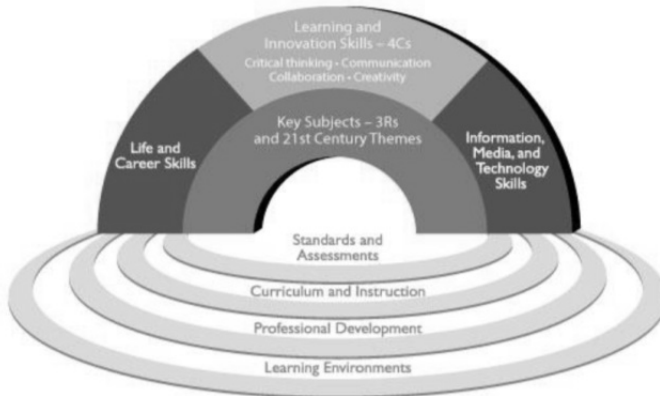


Figure 1-2. P21 Framework for 21st Century Learning (P21 2015, 1)

As the rainbow figure above shows, students are to master some key subjects (English, reading or language, world languages, arts, mathematics, economics, science, geography, history, government and civics), and interdisciplinary themes (global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy, environmental literacy). These are needed because 21st century skills are based on key academic subject knowledge. On these bases come the life and career skills, learning and innovation skills, and information, media and technology skills. Learning and innovation skills include creativity, communication, critical thinking, and collaboration. These skills are needed for adapting to complex life. In the new century, according to P21, students are expected to think creatively, work cooperatively, implement innovations, reason effectively, use systems thinking, make judgements, solve problems, communicate clearly, and collaborate with others. Information, media and technology skills are required, due to the abundant use of technology, which requires some functional and critical thinking skills. These skills are information literacy,

media literacy, and ICT literacy. Students are expected to access and evaluate information, use and manage information, analyse media, create media products, and apply technology effectively. The last category of skills is life and career skills, which are composed of flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility. Students having these life skills are supposed to adapt to change, be flexible, manage goals and time, work independently, be self-directed learners, interact effectively with others, work efficiently in diverse teams, manage projects, produce results, guide and lead others, and be responsible to others. To make it possible to equip students with these skills, P21 offers a support system. To enable the support system, standards and assessments, curriculum and instruction, professional development, and learning environments should be aligned (P21 2015, 1-9). The emphasis on the support system makes the P21 framework the most comprehensive, and it provides a clear guidance for policy makers and practitioners.

Before P21, the Metiri Group and NCREL had suggested a framework in 2003, as follows:

Digital-Age Literacy

- Basic, scientific, economic, and technological literacies
- Visual and information literacies
- Multicultural literacy and global awareness

Inventive Thinking

- Adaptability, managing complexity, and self-direction
- Curiosity, creativity, and risk taking
- Higher-order thinking and sound reasoning

Effective Communication

- Teaming, collaboration, and interpersonal skills
- Personal, social, and civic responsibility
- Interactive communication

High Productivity

- Prioritizing, planning, and managing for results
- Effective use of real-world tools
- Ability to produce relevant, high-quality products

(Dede 2009, 5-6):

The Committee on the Assessment of 21st Century Skills suggests three categories of skills: “cognitive skills (non-routine problem solving, critical

thinking, systems thinking); interpersonal skills (complex communication, social skills, teamwork, cultural sensitivity, dealing with diversity); and intrapersonal skills (self-management, time management, self-development, self-regulation, adaptability, executive functioning)” (Koenig 2011, 2).

Various frameworks of 21st century skills and individual skills are mentioned above. Given the abundance of these skills, some of them should be focused on, based on their priority. The criteria for prioritising may be a particular skill’s significance, the policies of the state or its administrators, students’ needs, or teachers’ competencies. For instance, Lai and Viering (2012) suggest that there are overlaps in various frameworks, and of these overlaps, these are the skills with an established research basis: critical thinking, collaboration, creativity, motivation, and metacognition. Based on these criteria, some skills should take priority. Otherwise, the experience of teaching 21st century skills may fail.

One other significant aspect of this process is human capital, in other words, teachers. There are many factors that have an effect on students’ learning, and among them, teachers’ abilities are particularly crucial (Darling-Hammond 2006). The qualities of teachers play an important role in the success of equipping the students with these skills. Teachers should be equipped with these skills themselves to be able to teach them, which requires professional development as well as aligning the skills with in-service teacher training. However, pre-service or in-service teacher training programmes with respect to 21st century skills are scarce, other than initiatives regarding ICT pedagogical skills (Ananiadou & Claro 2009). Professional development should be an important part of the 21st century movement. To integrate these skills, the mindsets of the stakeholders need to change. Through professional development, values, assumptions, beliefs, and cultures, of teachers, policy makers, and communities, should be unlearned to get rid of industrial-era practices in schools (Dede 2009).

İzci and Koç (2012, 102) argue that meanings and tasks attributed to teachers have always varied, depending on the age. For instance, teachers used to be defined as idealist, loyal, and hardworking officers, aiming to educate good citizens in the industrial age; however, in the 21st century, teachers are not absolute authorities transferring knowledge to students. On the contrary, they aim to connect the education system and the individual, contribute to the individual’s development, take initiative, make sound decisions, interpret contemporary values, communicate effectively, have empathy, manage information, serve as a guide for students, and continue life-long learning themselves. 21st century learning should be designed to effectively integrate these skills into curricula and

student outcomes, and this requires alignment of teacher training in the pre-service and in-service periods. In addition, administrators and policy makers are part of the human capital that needs to align.

Teaching 21st Century Skills

Integrating 21st century skills into schools requires a thorough process. The demand for schools to equip students with 21st century skills creates challenges in pedagogy and assessment (Soland, Hamilton & Stecher 2013). Therefore, this process requires careful planning. Curriculum, professional development, and assessment, are central factors that need to be taken care of for successful implementation, and they are intertwined with each other. This means that aligning the curriculum alone does not help. These three factors are discussed in this part.

Rotherham & Willingham (2009) point out the components that should be taken into account in the teaching of 21st century skills. First, the curriculum should be in harmony with respect to content and skills. Content should not be disclaimed in favour of 21st century skills, which may be a passing fad if not implemented elaborately. Second, teaching of these skills cannot be considered independent of human capital. In particular, teachers should be trained with respect to these skills. Third, including the skills in the curricula requires new and more comprehensive or elaborate assessments. They argue that unless curriculum, teacher expertise, and assessment, are in harmony, the reform of introducing 21st century skills into education would be superficial, and would have negative effects rather than expected outcomes, as was the case in many previous reform attempts.

Though it is expected that schools will foster students' skills, school curricula mostly focus on content knowledge, as opposed to skills. Though the curricula include skills, teachers mostly depend on content. One reason may be that the content is tested in large-scale assessments. Another may be the teachers are not ready for teaching 21st century skills. Craig (2012) lists six steps to implementing 21st century skills, based on the Onondaga-Cortland-Madison BOCES Instructional Support Services division, which include increasing awareness, assessing your current state, narrowing down skills to a manageable number, planning, implementation, evaluation, and continuous improvement.

According to Craig (2012), the first step includes activities, strategies and tools at team, school, or district levels, to encourage all stakeholders in an educational setting, such as teachers, students, parents, or business leaders, to adopt a vision of 21st century learning. Stakeholders should be

convinced that there is a gap between school curricula (planned and implemented) and the skills needed in the new century. Following awareness raising, the present conditions regarding the implementation of skills need to be identified, using methods such as online tools. A thorough investigation would demonstrate the need for the third step, which is narrowing skills to a manageable number. As well as the identification process, the literature highlights a great number of skills for the new century that are hard to cover. Therefore, some emergent skills should be prioritized based on the assessment data in the previous step, as well as state-wide policy. Once the key skills to concentrate on are identified, a set of common definitions needs to be developed, so that teachers can utilize them in the planning of lessons and units. Skills should be laid out in four levels, written as novice, emerging, proficient, and advanced. Teachers should plan their lessons according to these levels, based on a needs-analysis. In the implementation step, district or state-wide action steps should be followed, based on the data from previous steps. These steps may include school leadership development, professional development, curricula development, curriculum mapping, unit writing, instructional practice adjustment, revising learning environments, alignment of the evaluation, and supervision processes. In the last step, the implementation of the skills should be assessed for continuous improvement. If evaluation and revision become part of a school culture, it will surely increase student achievement and college readiness (Craig 2012).

Saavedra & Opfer (2012, 9-12) argue that the dominant teaching model in schools is still the transmission model, and it is not possible to teach 21st century skills through this model. It is more appropriate for learning information than for problem solving, practicing, or developing creativity. They propose nine strategies to teach 21st century skills. The first strategy is that curriculum should be developed which is relevant to students' lives, using generative topics in order to enable students to see the big picture. Second, students should learn the knowledge of the disciplines as well as associated skills. Third, lower-order skills and higher-order thinking skills should be developed simultaneously. The latter is not focused on in the existing curricula, since it requires in-depth teaching. The fourth strategy is that transferring learning from one discipline to another, or from school to other areas of life should be encouraged. As we are living in the information age, the fifth strategy is teaching students how to learn, which requires meta-cognitive skills. When students know how to learn, they can be life-long learners, and learn what they need in the required time. The seventh strategy is that misunderstandings are common among students

and text books do not address them; therefore, misunderstandings should be addressed directly by constructing new understandings. Eighth, technology should be used to support learning, as it provides new ways to develop 21st century skills and transfer them to different contexts. The last strategy includes fostering creativity, which is a vital skill in the new era. Characteristics of the creative process can be directly taught to students.

Alternative instruction models and techniques need to be resorted to for the effective teaching and integration of 21st century skills. Bell (2010) suggests project-based learning to this end. This encompasses learning through inquiry, collaboration, creation, communication, and problem solving. Technology, Bell argues, needs to be used in project-based learning. Regarding technology integration, Michael Horn argues that students will have different learning needs at different times of their lives, and technology can help them customize and personalize learning (Patterson 2012).

Rotterham & Willingham (2009) refer to some challenges of 21st century skills movement. Focusing on skills, particularly advanced cognitive skills, too early, may prove ineffective. The predictable path that learning follows should be considered. However, The National Mathematics Advisory Panel report (2008) suggests the opposite, arguing that there is not a set of developmental stages for gaining complex thinking skills. This is not in line with widely-held notions about stages of learning (Silva 2009). Another challenge is that the way to teach these skills is not understood by practitioners as teaching, in the way they understand the teaching of content. They try to give students more experience; however, experience does not guarantee practice, which requires feedback from more skilled people. They argue that teaching skills in the context of content knowledge should be planned.

In their study within OECD countries, Ananiadou & Claro (2009) found that most countries prefer a cross-curricular way to teach these skills, other than ICT-related skills, which are taught as separate subjects. These skills are added to curricula during curriculum reforms (Ananiadou & Claro 2009). This holds true for Turkey. In recent years, there have been some revisions in the curricula at K-12 level in Turkey. With the latest revisions in 2018, the new curricula aim to equip students with skills and values through a cross-curricular approach. The curricula involve ‘qualifications’ that are in line with European Qualifications Framework for lifelong learning. These include communication in native language, communication in foreign languages, mathematical competency, and basic competency in science/technology, digital competency, learning to learn,

social and civic qualifications, initiative and entrepreneurship, and cultural awareness and expression. There are also separate subjects, mostly optional, that are related to 21st century skills. At elementary level, there are information technologies and software, communication and presentation skills, media literacy, technology and design subjects, and at secondary level, there is the subject of computer science. Similarly, the curricula for pre-service teacher training was revised in 2018. Some new courses related to 21st century skills have been added to curricula. These include open and distance learning, critical and analytical thinking, adult education and lifelong learning, economy and entrepreneurship, human rights and democracy education, human relations and communication, career planning and development, and media literacy.

It can also be argued that there has been a change lately in the mindset of policy makers in Turkey in favour of 21st century skills. In 2017, a Teacher Strategy Paper (2017), which includes strategic planning of teacher education for the period of 2017-2023, was released. This paper highlights some of the skills such as learning to learn, problem solving, collaboration, critical thinking or ICT competency, and teachers are held responsible for teaching these skills. Therefore, the paper maintains, teachers need to develop themselves continuously, follow changes, empathize, communicate effectively, solve problems, or be leaders. In line with this, pre-service teacher training curricula have been revised, and the General Competencies for the Teaching Profession have been developed.

More recently, in late 2018, the Minister of Education announced the '2023 Education Vision'. This document includes a comprehensive reform in all areas of education, from curricula to professional development, or guidance and psychological counselling. With respect to 21st century skills, the document states that it aims to equip students with the skills of the future. It maintains that although education will aim to teach 21st century skills, which is a strategic conceptual framework exported to every corner of the world, teaching these skills without focus on values and morals is like flying with one wing. Education should focus on both skills and values. PISA is criticized for flying with one wing, by assessing only cognitive content such as critical thinking or reasoning. The document suggests some practice for 21st century skills. To this end, it is proposed that; contents will be arranged as relevant, connected, permeable, analytic and complementary for internalization of skills; design-skills workshops will be set; these workshops will be physical places for attainment of skills such as problem solving, critical thinking, productivity, team work, and multiliteracies; minor programs at graduate level will be opened for equipping teachers with 21st century skills; new digital measurement tools

supporting higher order cognitive skills will be developed in order for students to get satisfactory results at international exams such as PISA; an ecosystem will be set up for developing digital content and skills; teacher training will be carried out to develop digital skills; assessment will be based on skills-based activities as opposed to grades at elementary level; curricula will be revised with regard to skills; and training of awareness and skills will be carried out with regard to new literacies (MoNE 2018). The document provides a step-by-step path, to the year 2023. All members of society including students, teachers, administrators, and parents, are curious about the effectiveness of the new strategic plan.

Assessing 21st Century Skills

Assessment of 21st century skills poses the most challenging aspect of the issue. Developing curricula, or training teachers with the aim of equipping students with 21st century skills, will prove ineffective without investment in assessment of these skills, and currently it is not possible to argue that we are successful in this regard (Rottherham & Willingham, 2009). One of the reasons why 21st century skills are not integrated in schools is that large scale assessments are not testing these skills (Dede 2009). It is well known that students, parents, or even teachers, attach significance to what is tested for a number of reasons such as accountability or success. Ananiadou & Claro (2009) implemented a questionnaire for all OECD countries regarding the implementation and assessment of 21st century skills. Virtually all countries reported implementing these skills in school. Yet when it comes to assessment, it is vice versa. They state that there are no assessment policies for 21st century skills. Lack of proper assessment policies and measures leads to some problems. For instance, due to lack of common measures to assess these skills, there is not much research about the effects of these skills on outcomes (Finegold & Notabartolo 2008).

Though limited, there are some measures that are implemented for testing 21st century skills. The problem with these measures is two-sided. On the one hand, there are limited measures to test these skills and they have not been proved to be very efficient. On the other hand, these limited measures are being used by even fewer schools or states. Lai & Viering (2012) have reviewed the literature on the skills of critical thinking, creativity, collaboration, motivation, and metacognition, and have listed these assessment methods in the measurement of these skills: self-reports, global rating scales, standardized assessments, and observational measures. As single measures are limited, and there is not a concrete

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