Research Article

American Journal of Science Education Research

The Importance of The Teacher and His Training in Changing Reality of the 21st Century

SABAG Ziva[1] iD **and Dr. COHEN Shirly Ester[2*]** iD

[1]UBB, Babeș-Bolyai University, Cluj.
[2]Talpiot College, Israel.

*****Corresponding author:** Dr. COHEN Shirly Ester, Talpiot College, Israel. Email(s): shirlyc570@gmail.com (CSE) zivasab@ gmail.com (SZ)

Abstract

The 21st century is characterized by many accelerated changes resulting from immigration, globalization, technological development, and changes in the knowledge and labor market making us face a new and changing reality. It seems that in a few years, some of the professions currently known will completely change, others will disappear, and new professions will come. The changes will be based on the human capital component, entrepreneurship, and technological innovation, which will be characterized by high cognitive abilities, and developed personal and interpersonal skills. Due to these changes, the Ministry of Education prepares the education system for the present and future challenges, and the expectations from the system and the demands from its graduates are redesigned. Therefore, there is a need to adjust the learning, education, and training patterns to the changes – acquiring skills updated to the new labor market that helps the graduates to quickly integrate into the labor market and the expected life challenges.

In this article, we will discuss the characteristics of future teaching and its importance in assimilating the skills required to assist the future generation to successfully cope with the quickly changing world in the 21st century. In addition, findings from the research literature concerning the new demands of the students will be presented and we will also examine the basic components required to assimilate these skills.

Introduction

Accelerated technological developments that have changed the labor market characterized the last decade and increased the current uncertainty regarding the new future labor market characteristics [1,2]. Currently, technology is an integral part of many employees' occupations, and it seems that the rate of jobs that change their nature and demand using different skills than those that were required in the past has increased. Therefore, employees are facing new challenges and must constantly adjust their skills to the changing needs to stay relevant in their field [2].

The development of artificial intelligence, learning machines, information, and communication are already duplicating human perception and the complex judgment that were so far the advantage of human employees. Research conducted in the USA examined the chances for survival or disappearance of 702 professions according to their creativity and consideration level compared to the repetitiveness and routine level of required tasks and found that 47% of the examined professions were at high risk of being influenced by the technological acceleration in the next 20 years, and may even disappear. The professions at high risk are those with a repetitive nature that include low social intelligence compared to professions that require highly creative and social intelligence that were found to have low risk [3]. Similar trends were found in Israel: research that examined about a million employees ages 25-64 in Israel found that about 40% of the employees who have participated in the research, work in a profession at high risk for computerization compared to 41% who are at low risk. Other professions were found at

medium risk. Additional research found that 65% of the jobs the Z generation will be employed in do not exist yet. It seems that future technology will replace routine tasks (cognitive and manual), and future jobs will require the employee to engage in non-routine tasks and more satisfying roles. Such jobs will require learning skills such as teamwork, communication ability, creativity, expression, mental flexibility, and learning skills. In addition, autodidactic will be a major quality of the future employee due to the accelerated dynamics work will not depend anymore on what a person already knows but on what he may, will, or can learn [4].

Skill is defined as "general ability acquired through learning and training, which supports and guides thinking, learning, and development regardless of the type of knowledge in question, can be transferred between disciplines and allows effective and appropriate use of knowledge, experience, and values, in a wide variety of contexts" [5]. The need to impart basic skills the future generation will need in his life to guarantee their integration into the future labor market [6], is the education system's responsibility. In 2010, a recommendation report was published by the Organization for Economic Cooperation and Development (OECD) emphasizing the importance of quality teaching and calling for the education system to develop 21st century skills to assist the system's graduates in integrating quickly and effectively into the labor market and future life challenges [7]. Additional recommendations were written in 2018 regarding future education and the skills required for 2030. The main points of the report indicate what should be already taught in schools, how existing knowledge and new knowledge

should be evaluated and criticized, solve complex problems, offer solutions to economic, social, and cultural dilemmas, and make the student into a change agent who influences his environment and predicts long-term expected results [8].

The pedagogical basis the school provides to its graduates is adapted to the needs that existed during the Industrial Revolution [...] The knowledge and skills required to perform them were defined and fixed. Today, in the 21st century, completely different skills are needed. The education system is therefore required to no longer focus on memory-based knowledge available today at the button click or a search engine but to develop the deep thinking required in the changing technological world [9].

In this article, we will refer the future teaching characteristics and their importance in assimilating the skills required to assist the future generation in successfully coping with the quickly changing world in the 21st century, we will examine the basic components required to assimilate these skills, discuss the challenges that the teaching staff are facing in assimilating this program and emphasize the importance of adapting teacher professional development process in response to these challenges.

The 21st century skills – what skills should be learned in the education system to adapt to the future labor market?
The 21st century skills are perceived as the current main challenge both on the national aspect and the international aspect of the Israeli education system. In the 1990s there were already various pedagogic reforms that strove to change and included imparting 21st century skills [10]. Most of the reforms focused on improving thinking skills to encourage high-level thinking, establish knowledge in various disciplines, and develop basic skills the students will need in their future lives [1].

Comprehensive research analyzed about 75 articles and academic books written in the years 2000-2016 found that 12 main skills are required in the 21st century: Deep thinking skills – are skills in which people have an advantage over machines and include critical thinking, creativity, and ability to solve problems; Technologic skills – skills related to knowledge of technology and technologic innovation that are necessary for digital environments and information technology-based environment. These skills include the ability to manage information and digital technological skills; Life skills – a group of emotional and social skills required for personal and interpersonal conduct in a changing world. These skills include cooperation, communication, self-direction, lifelong learning, ethical awareness, cultural awareness, and flexibility [9].

In accordance, the OECD developed a "learning compass" that defines the building blocks aimed to guide the learners toward their future and to provide them with a stable foundation that will help them integrate into the future society while maintaining their cultural and personal identity [8]. The Ministry of Education defined the "adult image" in education 2030 that is derived from this learning compass and provides a comprehensive description of a "toolbox" that is aimed to promote education in Israel and increase in-depth learning situations that combine knowledge, skills, and values. In this framework, four main skills fields were defined: cognitive and met-cognitive skills; social and emotional skills; physical and practical skills, attitudes, and values. These skills are

intertwined during the learning process because acquiring knowledge and skills in school is based on combining social and emotional skills with values. It was also found that developing physical and practical skills significantly contributes to promoting cognitive and social-emotional skills [5].

About the skills' meaning and how they can be applied in our classrooms.
Cognitive and meta-cognitive skills: deep thinking skills
Cognitive skills are a set of thinking strategies that enable the use of language, numbers, reasoning, and acquired knowledge. They include verbal and non-verbal skills and higher-order thinking skills. Meta-cognitive skills include skills of learning how to learn and self-ability to identify the learner's knowledge, skills, attitudes, and values. The cognitive and meta-cognitive skills include the building blocks of critical thinking skills, creativity, problem-solving, learning how to learn, and self-regulation [5].

Critical thinking
Critical thinking is a way of thinking in which a person aspires to strictly analyze his arguments, look for evidence, and intelligently select attitudes and values and thus conclude well-founded conclusions. A person who uses critical thinking to undermine his point of view also exercises strong thinking, developing this type of thinking helps to build profound and meaningful knowledge [11].

Critical thinking includes knowledge and sources evaluation - identifying relevant and updated information sources, distinguishing and evaluating the reading text's reliability, identifying distinctions concerning the writer's identity and motives, and identifying different opinions, positions, and beliefs. Claim - formulation, and justification of a claim through information, identifying the differences between arguments and claims and evaluating the connection between the arguments (do the arguments support/not support the claim), identifying logical fallacies in the argument such as relying on unwarranted assumptions, forming quick generalizations, etc. Decision making - analyzing an issue from various perspectives, comparing problem solution alternatives, neutralizing prejudices and biases, identifying expertise areas, and using information wisely.

An article examining the challenge of developing critical thinking among students in Libya [12] establishes the definition made by Browne & Keeley (2007) [13], who have defined critical thinking as a complex of characteristics and abilities that include: 1. Awareness of a set of interrelated critical questions; 2. Ability to ask and answer critical questions at suitable times; 3. Desire to actively use critical questions. They have recommended training students to ask the right questions to develop their ability to react critically to written articles, internet websites, claims, and arguments. This skill will promote their ability to judge the quality of lectures and classes, formulate their claims, write critical essays, and participate in classes.

Doubting - independent thinking of sources and their justification, asking undermining questions, and avoiding taking a position until clarifying the justifications and finding convincing reasons [5].

Critical thinking may be applied in various disciplines in class through some principles: the teacher has to encourage his students to present in class various opinions that are based on

various perspectives of the studied knowledge while looking for clear expressions of hypothesis and evaluating its reliability, looking for information sources that support/contradict the statement and justifying or supporting the statement. In addition, inviting a guest of exceptional opinions or having a critical debate regarding an opinion or an article. The student must be encouraged to ask stimulating and criticizing questions (What are the author's arguments based on? Do the claims contradict each other or complement each other? What is the author's point of view? Why is one claim better than another?) while presenting learning contents that develop critical thinking in the studied discipline. It should be noted that to develop student's critical thinking and make them ask stimulating and critical questions, the teacher himself is responsible for teaching in a manner that presents a variety of opinions and encourages critical thinking [13,14].

Creative thinking
Creative thinking is the ability to think about familiar subjects in different and new ways, to find alternative solutions, and to connect between disciplines while producing original, relevant, and valuable products. This thinking is thinking that complements critical thinking [15]. Creative thinking consists of four main parameters: flexibility (the ability to approach a problem in various strategies, examine the solutions, and create new problems), fluency (the multitude of ideas, the products, and the number of ways to solve them), originality (the ability to present an innovative and unexpected solution or raise a new question following a given one) and expansion and detailing given problems (developing the ability to generalize and prove beyond what the specific problem calls for and even beyond what is required according to the curriculum).

Creative thinking includes: curiosity and originality - being open to new ideas, asking research questions while finding unexpected directions, finding answers in unusual places. Mental flexibility- thinking outside of fixed patterns and examining explanations and phenomena from different perspectives, the ability to imagine abstract situations and ideas, proposing multiple ways to describe a problem and its solution, and free-thinking without judgment. Courage and perseverance - defending ideas in stressful situations and social conventions, dealing with uncertainty, challenges, and frustration, the ability to dare and cope with new situations and learn, and not be afraid of failures. Creating new connections - identifying relations and connections between ideas, actions, and results, using existing knowledge to create new knowledge, merging ideas and information details, and providing alternative explanations. Implementation - producing operative insights and conclusions and translating conclusions into concrete actions and products [16].

Problem solving
The ability to solve problems in an environment where there may be uncertainty caused by reality in which "machines take over human skills" [17], not only works that require low proficiency. It is about the takeover of automation, robotics, and artificial intelligence alongside multiple research documenting a huge number of jobs that are at risk. Such a reality requires the problem solver to combine the three thinking skills through branching thinking and convergent thinking. The problem solving process (presented in Figure 1) will be done by starting with one challenge point, the search for a solution will be expressed by expanding the search in different directions which creates new, many, varied, and original possibilities (branching thinking) on the one hand, and on the other hand, will group all the possibilities raised, examine, criticize, judge and evaluate towards finding the solution to the problem (convergent thinking).
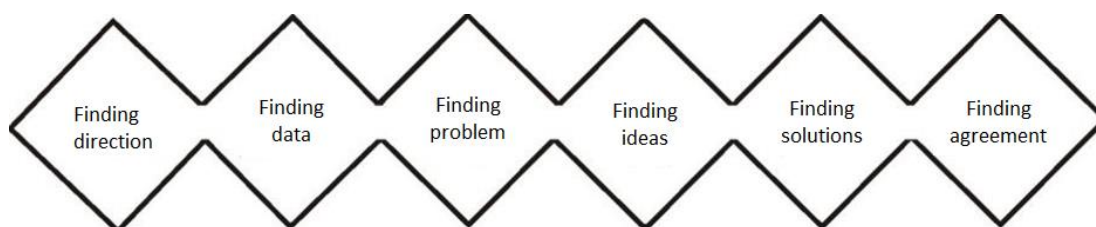

Figure 1: Creative solution problem process (The Ministry of Education, 2016).

One of the main foundations of deep thinking depends on understanding the studied term and subjects. There are three main perceptions of understanding: Understanding as a location - understanding the term in the context of other relevant terms- the larger the person's term network concerning the "new" term, the better and deeper his understanding of the term. Understanding as an application - the ability to implement a term in new contexts different from those it is learned. Understanding as a performance - is the ability to perform thought processes with the studied term [18]. The three understanding perceptions are linked (location, application, and performance) because understanding as a location (understanding in context) allows application (applying the term in new contexts) and performance (ability to perform thinking processes with the newly acquired term). A person thinks well when he understands 1) the subject he is thinking about and its field; 2) the thinking itself - the factors that help good thinking and the factors that sabotage it [18].

In addition, about 18 main understanding performances were found, which if a person can perform them for a newly acquired term, it can be said that the term has been understood in a performance manner (see Table 1).

Table 1: Understanding performance [18].

Present knowledge	Act by knowledge and with knowledge	Criticize and create knowledge
Express knowledge in your words	disassemble knowledge (analysis) and assemble knowledge (synthesis)	Justify and explain knowledge
Explain knowledge	Give example	Find out tensions in knowledge
Exhaust knowledge	generalize from knowledge items	Ask questions about knowledge
Describe different perspectives on knowledge	Predict knowledge results or consequences	Expose basic assumptions of knowledge
Represent knowledge in various ways	Place knowledge in context	Formulate knowledge that contradicts knowledge
Invent an interpretation of knowledge	Implement knowledge in new contexts	Create knowledge based on knowledge

In summary, to motivate the students it is important to plan the curriculum for them and know their prior knowledge, their skills, positions, and values. The learning subjects should be challenging and allow deep thinking, therefore, to guarantee quality learning, only a small number of subjects should be taught in each class. The teaching has to be in a logical sequence and combine various subjects to create effective learning that is based on logic and prioritize knowledge, skills, positions, and values that were studied in another context. In addition, the students must be offered various opportunities, subjects, and projects, and also allow them to offer their subjects and projects with the teacher supporting and guiding the students to educated selection. It is also important to note that new evaluation methods should be developed for such learning styles [8].

Social and emotional skills

Social and emotional skills differ from cognitive skills by engaging in the individual and himself and his environment. In a world of changing reality, nurturing social-emotional skills is an integral part of a positive educational-social functioning learning process studied by imparting and acquiring social abilities, adjusting to complex situations, adaptability, nurturing high cognitive abilities (such as high verbal ability, use of foreign languages), ability to manage time, effective task division, group cooperation and interpersonal communication can contribute to the success of the learners' personal social and occupational functioning in the future [9]. Social and emotional skills may be divided into two types: intrapersonal skills and interpersonal skills.

Intrapersonal skills - refer to the way an individual deals with himself. This set of skills includes Self-awareness - the individual's awareness of his characteristics and traits, his values, strengths, and weaknesses. Understanding how skills, tendencies, and personal characteristics are expressed in different life situations or different fields. Identifying emotions - the ability to accurately identify one's own emotions and to distinguish between different types of emotions, to relate emotions, and to understand how a certain emotion may affect behavior. In addition, the ability to understand the environment affects the emotion type and to know the situations that cause us to behave not the way we would like. A sense of competence - the ability to deal with different situations in life while believing in the ability to successfully deal with tasks and overcome challenges. The ability to develop an adaptive strategy to deal with failure situations, the ability to develop and invest time and

effort in conducting a task, and knowing the person's ability to influence his environment [16].

An article, dealing with methodological aspects of creating interpersonal relation culture among elementary school students, indicates the importance of the teacher-student communication quality as the basis of strengthening the student's skills and self-confidence. "...The teacher must pay special attention to honesty in the communication process with the student. He must be able to work effectively with children, follow the rules of speech, use a variety of positive methods in conversation (encouragement and empowering positive feedback), and communicate with children throughout the entire educational process" [19].

Interpersonal skills - refers to the way a person understands others, identifies social situations, and behaves in a way that allows optimal interaction with others and with groups in various contexts. This set of skills includes: Understanding the other person - knowing various perspectives and the other's behavior. It is the ability to see the other's perspective and understand how he thinks and feels and how his behavior is affected. The ability to identify and understand verbal and non-verbal environmental messages understand the effect of actions on the individual, and the consequences of behaviors on the experiences and feelings of others. Identifying social situations - identifying social norms, identifying the set of tools, values, positions, and beliefs and their influence on society. Identifying distress situations of others - identifying harming the other and the opportunity to assist, help, and be attended to his needs. Identifying thinking processes and making group decisions. Social sensitivity - the ability to be aware of the cultural similarities and differences between people from different cultures, to know stereotypes and prejudices about feelings, perceptions, and behavior understand the reasons for this stereotypical thinking, identify when it occurs, and know how it influences the environment. Respectfully appreciate different perspectives and diverse worldviews, ask questions to understand others, show empathy towards others, and acknowledge their feelings. The ability to repeat the meaning of the message and reflect the feelings arising from it. The ability to express yourself sensitively, honestly openly, and clearly express thoughts. Conflict management - listening and having a conversation in conflict, expressing and accepting disagreement and finding optimal solutions while understanding the other's desires and interests, and maintaining a positive attitude that

avoids defensive and offensive behavior. <u>Teamwork</u> - sharing knowledge and making joint decisions about knowledge, performing joint tasks in cooperation and compromises. <u>Having interpersonal relations</u> - maintaining healthy and satisfying relationships that include positive components such as reciprocity, honesty, and appreciation, initiating and creating and taking part in interpersonal interactions, and behaving respectfully and fairly [16].

Physical and practical skills:

These skills support the ability to use physical tools like technology, information and communication, play musical instruments, make art, play sports, and life skills. Practical skills are skills that are aimed to use and operate materials, tools, equipment, and objects to get a specific result [16].

An example of improving physical skills and especially gross motor skills of elementary school students is a method known as "BRAINball". The method was developed in Poland and was successfully applied in hundreds of pre-schools and elementary schools. The BRAINball is used as a didactic aid in teaching. Currently, the method is applied in Germany, Portugal, Finland, Greece, the USA, Singapore and Taiwan. It is an interdisciplinary method that combines physical education and academic learning and develops and improves children's motor and academic performance through movement, games, and pleasure. The balls (in 5 colors, letters, numbers, and mathematical symbols) allow teachers to integrate physical education and various contents of imparting language, mathematics, history, geography, and biology while playing and moving. Research performed in Vietnam in 2019-2020 examined whether the method improves student gross skills and found that using BRAINball improved student motoric performance [20].

The entrance of new technology to the employment market and daily life causes professions that require low cognitive skills to disappear and make a significant change in a person's way of life in general and as an employee in particular. Currently, technology plays a large part in spreading information, and interpersonal communication and technology are even used for leisure time entertainment. The ability to find information online, use digital databases and online information sources, use technological tools (like making presentations, etc.), analyze data and merge it, and create digital content became a necessary and fundamental condition in the employment market. Therefore, it is essential to impart to the students in school the required tools and skills that will help them acquire the expected technological skills in the future labor market [21].

Some claim that computer sciences and programming skills must be considered as basic knowledge that has to be imparted to students in elementary schools. An article published by Bahromova Muhayyo in Uzbekistan [22] emphasizes the importance and the objective necessity of teaching elementary school students computer science and programming in the context of digital economy development. The article notes that development in knowledge society depends on people's ability to initiate, show creativity, and develop the individual's intellectual abilities and personal skills. Therefore, the informatization of the education system is essential. Using modern pedagogical technologies through computers may significantly increase student cognitive activity. Therefore, computer sciences should be considered a basic science (while being implemented in various disciplines) that supports creating universal abilities for students.

The expert committee of the Israeli Educational Academy of Science has published a comprehensive report for 2020 that discusses the adjustment of curricula and learning materials to the 21st century. It was written in this report that the digital technology required in the future world demands the student to have many skill complexes that are divided into six main components:

(1) skills of information and data literacy - these skills include the ability to identify and define problems that require information, locate the required information, evaluate it, merge it from different information sources, present it and distribute it. This kind of literacy is important for student's lifelong learning, and it deals with the considerations of using digital materials to promote autonomous learning.

(2) communication and cooperation skills in a digital environment - these skills include the ability to learn and develop social norms for using digital technology. These are social skulls that allow effective use of technology that promotes interaction and cooperation between people - in this part we will find cooperative learning, peer learning, using social networks, multi-participant conversations etc.

(3) Digital content creation skills - these skills include the ability to know the limitation of copyright and usage licenses, create digital contents that allow self-expression, creation and sharing new ideas by writing a Facebook post, starting a blog or video blog, creating a YouTube video, developing apps and games, combining digital programming with physical materials etc.

(4) Citizenship skills and digital ethics - these skills include the ability to actively participate in a democratic society and include the accessibility to civil and social services, communication with civil and social bodies, social involvement and playing active part in society while maintaining ethics rules online (avoiding bullying and violence, avoiding incitement, spreading false information, maintaining copyrights, maintaining the privacy of others etc.).

(5) Well-being and security skills in a digital environment - these skills include the ability to use digital tools and information (such as protection against online attacks and shared data security), as well as maintaining psychological health and well-being - preventing online bullying and the ability to cope with it.

(6) skills of problem-solving and decision-making in a digital environment - these skills include the ability to identify and solve technical and fundamental problems. It includes the user's digital expertise to find solutions while understanding his digital disability. The student must develop this kind of thinking skills that will allow him to identify his options and critical thinking that will allow him to exclude non-applicable options [9].

The perceptual framework for 2030 education (see Figure 1) integrates the variety of skills a student needs that are interacted with. The additional skill stage is combining all skills in a routine layout. A young person who tends to persist in many relationships is much more likely to succeed than a person who has acquired techniques and is unable to put them together.
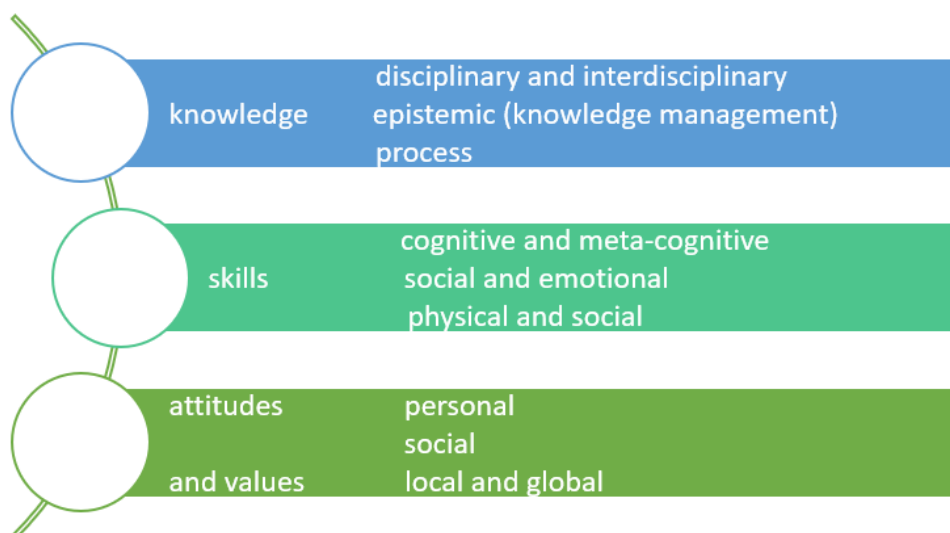
Figure 2: Perceptual framework for 2030 education (principals conference, 2019)

Challenges the teaching staff are facing in implementing the 2030 education framework

In the 2014-2015 study year, the education system began to implement the national program "meaningful learning" which was aimed to promote meaningful learning that encourages research, deepening, teamwork, and training the learner to cope with the 21st century challenges. The Israeli National Authority for Measurement and Evaluation in Education (RAMA) conducted accompanying research that examined the implementation of the changes leading to this learning. The research examined 261 schools where about 189 school principals, 1037 teachers, and 6,133 students filled out questionnaires and about 44 officials involved in promoting meaningful learning in their district within their role from all districts were interviewed in in-depth interviews [23].

The research findings have indicated that the main challenges observed in the implementation were in the implementation process. The program demanded teachers change their teaching method perception by acquiring new teaching methods, learning high-order thinking, and properly guiding the students in independent, critical, and creative research and learning. It seemed that teachers and principals (especially experienced senior teachers and principals), who were used to teaching in the old-fashioned method perception, objected to the change. There was also a contradiction between the change principles and existing patterns and routines in the school - some of the school principals feared that the program would harm the percentage of eligibility for matriculation diploma and there was a contradiction between the time required to carry out deep and meaningful teaching and the requirements for preparing the students to the matriculation exams (The coordinating supervisors did not reduce the material scope in the curriculum, which forced the teachers to reduce their teaching time in the meaningful teaching method). In addition, there was a lack of proper training and professional development in the reform implementation - there was a lack of instructors and training hours and a lack of proficiency of the guides in assisting the program implementation [23].

Additional research performed in Israel by Eisenberg & Selivansky Eden (2019) [9] confirmed these statements and summarizes it in two main barriers:

• <u>Barriers resulting from the difficulty in adjusting the education system and its employees to learning that suits the 21st century skills</u>: The teachers and school principals do not control the 21st century skills and the education system focuses on exams and numerical achievements, and it seems that there is not enough school-level autonomy to maintain learning that is defined as process learning. In addition, it was found that the knowledge and skills students are required to have in the matriculation exams and the higher education institutions' acceptance requirements, do not sufficiently reflect the necessary skills to cope with the 21st century challenges. It was also found that teacher training institutions do not adapt themselves to innovative teaching methods [9].

Research about teacher digital skills examined digital learning in schools in Germany, how often teachers implement digital technology in teaching, and what learning activities are initiated by the teachers. The research indicated that it is required to shift the focus from equipping software and equipment to training teachers to use technologies effectively. The research shows that teachers' basic digital skills are much more important both in using technology and the teacher's ability to use and develop activities for students that involve digital technologies [24].

Additional research examined the attitudes of teaching students in Slovenia towards using digital technologies in education. These research conclusions were that students have positive attitudes towards using digital technologies in education and they support using technology to support teaching processes, student guiding, and self-regulated learning, but the students see themselves as low-level users. Student attitudes were proven as an important predictor of their proficiency level in digital technologies; therefore, it indicates that future teachers have difficulties both in using advanced technology that allows for designing educational content and in their ability to cooperate and build shared educational processes. Therefore, the research recommends integrating theoretical knowledge and practical use of digital technologies in the teacher training programs, not only for initial use but also to gain skill in content development to a level that allows active use of technology [25].

• <u>Barriers resulting from the education system's nature and make it difficult to lead significant reforms</u>: The great heterogeneity of the population in Israel makes it difficult to uniformly assimilate the program in the entire system. Frequent

change of Ministers of Education in a short time makes it difficult to promote goals that require a long-term process. These political moves often result in budget suspension by the new political entity that has just come to power. It seems that the Ministry of Education "suffers" from excessive complexity, lack of uniformity, and centralization which make it difficult to lead significant and long-term processes [9].

Discussion and conclusions

This article emphasizes the importance of the Israeli education system in the 21st century. Compared to the excelling countries, Israel emphasizes centralization and standardization along with traditional pedagogy (imparting and memorization). To become a leading country in education Israel has to move to a system that allows schools and the learning system independence and pluralism developing skills and expertise that enable the development of each student according to his needs and abilities. Striving to improve these indicators will improve the quality of learning and the education system and contribute to national resilience.

To realize this, teaching quality needs to be improved, since teaching quality has proven to be more related to student learning than to schools' structural aspects in both the West and developing countries [26]. The main challenge is understanding teaching practices and how teachers and their professional development are supported. Namely, the teacher's skills must be improved to help the students acquire 21st century skills.

One approach considers teachers as learners and emphasizes that the learning process we want to see for students should be applied to teachers too.

Extensive qualitative research that was conducted in Norway in 2020 examined what science teachers consider professional development useful to promote 21st century skills (due to the new requirements for educational reform in this country). The research results indicate that teachers emphasized the importance of easy access to teaching resources and practical materials. In addition, teachers have noted that detailed explanation of teaching materials helps them to organize classes. The teachers were willing to change their attitudes or behavior because the new educational contents that were presented in the research caused higher student involvement, the students managed to learn more than expected, were consistent in learning the subject, and understood the importance of the terms. It seems that when learning strategies were organized in the teaching materials context the teachers reported they felt they received the necessary keys to improve their science teaching. When the teachers looked at practices from a meta perspective they indicated greater awareness of 21st century skills such as student-centered learning, which allows students to be involved and increase motivation in learning.

This research shows that teachers are very practical and through professional development they want specific resources that are easy to implement and do not take too long. Therefore, they will cooperate with and evaluate ready materials. It is important to give the teachers not only knowledge and skills but also materials that enable easier implementation. Lack of good sources delays research based learning. Lack of time is also known from previous research as a teacher learning limiting factor. The intrapersonal field and its focus on motivation and meta-cognition are essential for building the teacher's ability and the ability to evaluate motivation, and allowing an in-depth

reflection is as important for teacher learning as they are for student learning [27].

Because transferring knowledge to students through a transfer process (lecture or dictation) is still dominant in Israel (as well as in many other countries), there is a need to change teacher pedagogy, since 21st century skills require much more than memorization.

Survey research examined the literature dealing with teacher training (18 pieces of research) to 21st century skills and technology integration in the context of the fourth revolution implications and found that dealing with digital skills led in all research. The research shows two main disparities in teacher training: 1- misunderstanding and lack of developing frameworks and evaluations that reflect and refer to the Fourth Revolution so that teachers can be effectively prepared for the Fourth Revolution reality. 2- misunderstanding the ways teachers can be engaged with advanced technologies (for example, virtual reality, augmented reality, artificial intelligence) sustainably and innovatively [28].

It is important to see teachers as guides for an individual's learning experience. The student's learning and development rely on the daily interactions and experiences in class. Therefore, the teacher's activity in class is important (Burns & Lawrie, 2015). It is also important to strengthen dynamic learning processes for the teachers and develop their thinking skills, critical thinking, and data analysis. The key to promoting 21st century students is developing teacher skills.

A research that aimed to design and develop innovation in learning to improve "high order thinking" skills for middle school students in Thailand, examined which innovation in learning components meant to improve "high order thinking" skills for students in Thailand; Is there a student improvement "high order thinking" skills after experiencing innovation in learning? What are student opinions about innovation in learning to promote "higher order thinking" skills? The research shows that science teachers do not promote "problem solving" abilities. Most of them focus on lectures because they are afraid the students will not understand. The students were passive in the educational process and waited to get knowledge from the teacher. As a result, they lacked "analytic thinking", critical thinking, creative thinking, and problem solving skills. Moreover, teachers did not have tools to encourage students to add knowledge and apply it in daily life. Therefore, it was critical to design and develop innovation in learning that will strengthen students' higher order thinking skills by developing new content and imparting it to teachers. After implementing the program, it was found that innovation in learning was useful to students with some notable highlights: 1) students who experienced innovation in learning have higher average grades. 2) the students value the content, multimedia, and design of learning that help to improve high order thinking. Using multimedia can explain and help students better understand scientific processes. Using videos as a learning resource can better illustrate a scientific process and improve communication skills and cooperation in problem solving [29].

The OECD has also engaged with this issue [30] and notes that changes in demand for future skills have significant implications on the skills teachers need to acquire to effectively teach 21st century skills. While in the past teachers could assume that the material they teach would be valid for their students' entire lives,

teaching a fixed syllabus was in the middle of most curricula in the world. Currently, when everyone can access content in search engines, and knowledge is digitized and accessible to all, teachers have to train the students how to be "lifelong learners" and manage complex thinking. The past relied on "wisdom passed from generation to generation", the current challenge is to nurture wisdom that is dynamically created by the users. In the past different students were taught similarly, nowadays teachers have to use diverse practices adjusted to the student variety. While the past goal was standardization and conformity, now the personal adjustment of educational experiences is emphasized. While in the past the focus was on the curricula, the present puts the learner at the center. The meaning is that the education systems should identify how people study and nurture new educational approaches to help individuals achieve effective learning.

Therefore, teachers should be "knowledge employees" who constantly promote their professional knowledge. They have to be innovation agents and prepare their students for the labor market's changing demands [7].

Research performed in Catalonia examined the professional skills of 21st century teachers and was aimed to determine, on one hand, whether teachers have the required skills and on the other hand offer training strategies that may contribute to achieving them. The research is based on quantitative and qualitative methods through a survey of 281 school principals and interviews of 29 principals. The results show that today's schools need teachers who can constantly acquire new skills, show social-emotional abilities, and know how to properly manage class. The research indicates a large group of abilities that perceive the teacher's professional career as a learning sequence. It is almost impossible to pre-train teachers in all the required skills, which means that during the training period, teachers must be nurtured to acquire the necessary skills for their professional careers, namely, to "learn how to learn" in this manner the future teacher will have "sufficient abilities to acquire the necessary skills" [31].

The second research notes two skill types necessary for teachers: personal social-emotional skills and the ability to run a class. The research recommends teacher training programs to emphasize these skills in three directions: first, improving the English language skills, which is currently essential more than ever; second, innovation and research, considering that teachers have to be innovation agents; and third, the need to improve training In terms of classroom management and working with children (mainly practice of intervention in learning and training, experience with children in informal activities and remedial teaching). According to the research, there is a need to increase social capital through the joint work of universities and schools and a constant dialogue between them.

The question is what is the best training program for training the 21st century's teachers? Although there is no consensus on how such a program's success should be measured, a comparative review conducted by the OECD in 2005 indicated that there is a consensus on what a 21st century adapted learning environment should provide:

1. Centralize learning, encourage involvement, and be where students understand themselves as learners.
2. Guarantee that learning is social and cooperative.

3. To be aimed at the student motives and the importance of their emotions.
4. To be sensitive to individual differences, including previous knowledge.
5. To be demanding towards the students without burdening them.
6. To use formative feedback evaluation.
7. Promote connections between activities and subjects inside and outside school [7].

Opinion article that examined the education challenges in imparting 21st century skills indicates that: A. Today students have a digital language and therefore they learn in different ways. B. Systems are currently ready to invest less in education, so the ways to use the children's natural curiosity have to be found, so they learn more by themselves. C. Most of today's students will not have one constant lifelong career; they will go on a course of several careers. D. Students should learn how to work in cross-disciplinary teams in several ways to gain knowledge. E. The greatest challenge is how to encourage higher education institutions to become learning institutions. The article reviews possibilities for informal and formal learning through social negotiation and offers a major transition in education - towards creating platforms for lifelong learning. A transition from pushing knowledge to demand for learning. The demand approach places the students in a rich learning community (sometimes virtual) built on exercising. Passion-based learning is motivation to be part of an exercising community or a desire to learn, create, or perform something. Learning will usually be informal, through a reflective practice managed by a social environment supported by physical and virtual presence, and through the amateur and professional trainee (learner). The article offers a hybrid learning model based on niche communities a person can participate in even outside of the regular school frameworks [32].

The question is what are the learning environments that can respond to this dynamic need variety? A review of 21st century learning environments examines this term that implies a certain place of specific space where learning occurs - school, classroom, library. Although most of the learning happens in a physical place, in the current connected technological world, the learning environment can be virtual, online, or distant. Namely, it is not necessarily a specific place. Maybe the best way to think about the 21st century learning environments is as "systems that organize situations in which people can learn", environments that support student needs for effective learning. The learning environment is the buildings, tools, and communities that inspire learning and in which educators achieve the knowledge and skills the 21st century demands from everyone. Experts say that learning must occur in a context that "promotes interaction and a sense of community that enables formal and informal learning". The article calls for change in strict school education perception. The current reality demands a new perception of education - one that breaks school barriers that are separate from the real world, where educators learn from each other, and policymakers communicate with the communities they serve. The modern world demands learning environments that embrace the people of the world, places, and ideas and that are flexible in organizing the space, time, technology, and support among students, educators, families, and communities, who serve lifelong learning and connect the learners all over the world while responding global challenges and opportunities [33].

A model for designing a classroom learning environment in the 21st century tries to define what a learning environment that is well-equipped with computer hardware, software, electronic boards, and online digital learning resources looks like. Environments that enable interactive learning, higher level thinking skills, and student involvement. These environments provide cooperation opportunities and access to relevant content. Therefore, teacher training is required not only for learning how to use technology but also for learning how to integrate technology into the curricula. Developing and making rich digital content accessible and supporting IT is part of the main components required for the necessary change in schools. The model describes not just the core components of class but also refers to learning management systems; integrating comprehensive professional development; technology trainers/integration experts; access to online courses; opportunities to share learning with other communities; teaching support resources; formative assessments; online assessments; performance appraisals; digital content, virtual learning, etc. [34].

This environment also defines teachers' professional framework. In addition to developing their skills, teachers have to be able and have opportunities to cooperate with others, respond to the learning needs of specific student groups, and professionally develop and teach with others in a team approach.

A comparative review conducted by the OECD regarding innovative learning environments notes 8 principles for teacher skills in the 21st century:

1. Teachers should know the subjects they teach and be skilled in using different methods and if necessary change their approaches to optimize the learning processes. This includes using strategies and methods for learning content. Teacher knowledge of higher order thinking skills is the key to successful education. Research conducted in Indonesia examined teacher knowledge of higher order thinking skills and learning strategies that promote these skills indicating that teachers have only a little knowledge of "higher order thinking skills", a low ability to improve "higher order thinking skills", solve problems based on "higher order thinking skills" and measure student ability in "higher order thinking skills". Teachers do not distinguish between "higher order thinking skills" and abilities, skills, learning methods, learning models (problem-based learning; project-based learning; exploratory learning; cooperative learning), or learning activities. Teacher knowledge in this subject is low also because they have a low ability in problem solving. However, it seems that the teachers understand the importance of "higher order thinking skills" and teaching "higher order thinking skills" by using innovative teaching models. The research recommends investing in teachers pedagogical knowledge and training them in this subject as well as expanding access to learning resources like books, access to electronic media, and other sources [35].

2. Teachers should have a rich teaching strategies repertoire, the ability to combine knowledge and approaches and know how and when to use a certain strategy. An opinion article that deals with class management in the 21st century emphasizes that class management has nothing to do with managing children but with creating a safe and connected environment - with the required guidance and interactive patterns - that counts on student self-management. The basis for teacher success is in their ability to make a positive, encouraging, and healthy connection with the children. The article emphasizes the teacher's role in creating an emotionally safe climate where there is a lower tendency for negative and anti-social behaviors [36].

3. Strategies should include direct teaching in a group, guided discovery, group work, and guidance for study and personal discovery. They should also include tailored personal feedback. Research that examined the correlation between elementary school teacher perceptions of their skills' suitability to the 21st century and their perceptions regarding the management of constructive learning environments, found that the 21st century skills had positive correlations with teacher perception of constructive learning environments. These results indicate that when teachers have strong perceptions about problem solving, critical thinking, cooperation, communication, and creativity, they will provide their students with learning environments that are more open to student research and contribute to student positive approaches to learning adjusted to 21st century skills [37].

4. Teachers should have a profound understanding of how teaching happens in general, and in individual students, and what are the students' motivations, feelings, and lives outside the classroom. Nazarova & Daminova (2018) [38] note three motivation types in the class management context: motivation for goals (when the teacher helps the student be active and stimulated); motivation supported by incentives (grades, money, medals, diplomas); motivation caused by the student's expectations. This motivation may be caused by internal and external factors when the external motivation is weaker (due to addiction and dependence). However, positive feedback may increase self-definition and strengthen internal motivation. Another research, which found a significant correlation between class management style and student motivation and achievement in the state of Kwara in Ethiopia, recommends integrated classroom management courses in the teacher training curriculum [39].

5. Teachers should be able to cooperate with other teachers, professionals in the organization, or people in other organizations as well as in professional communities' networks.

6. Teachers should acquire good skills in using technology as a teaching tool optimize the methods for using digital resources in their teaching and use knowledge management systems to monitor student learning. Digital competence is one of the key skills for lifelong learning developed by the European Commission and is a necessary condition for personal fulfillment and development, active citizenship, social inclusion, and employment in a knowledge society. To accompany young learners in skill development, and guarantee optimal application of information and communication technologies (ICT), teachers should also have digital skills.

Research conducted in Spain shows that most of the teaching students who have participated in the research perceived their digital competence level as low, especially in the fields of creating content and problem solving, indices that are strongly related to information technologies that may change teaching processes [40].

Research that analyzed the research literature dealing with professional development programs for science teachers that support the use of information and communication technologies found that many professional development programs for teachers still use inappropriate strategies to make the necessary changes in introducing digital innovation in learning [41].

Research that tried to answer the question of how to develop teachers' digital skills included a training program for developing future teachers' digital skills. After the training, the participants' opinions were reviewed on digital ability development, how they planned to use the digital competence skills and knowledge they acquired in the training program for their future professional careers, and what are the training's advantages and disadvantages. The results indicated that teachers should be trained in information and data literacy, communication and cooperation, creating digital content, safety, and problem solving. In addition, they should be trained for digital competence that will include knowledge and exercising of professional involvement, digital resources, teaching and learning, evaluation, and empowerment of learners. The research indicated that there is a need for effective implementation of training to acquire digital competence in which future teachers cooperate in digital subjects regardless of their previous experiences [42].

7. Teachers should develop the ability to help design, lead, manage, and plan learning environments in cooperation with others.
8. Teachers must reflect on their practices to learn from their experience.

It is agreed that there is no single method for developing teacher skills, but innovative learning environments are characterized by balancing personal discovery and investigation and systematic guidance while considering individual differences in abilities, needs, and motivation of students.

Making teaching into a high-tech profession should be based on four main sources: science-inspired innovation and knowledge (research and evaluation), company-inspired innovation (entrepreneurial development of new products and services), Practitioner-inspired innovation and knowledge (teachers, and school principals), and user-inspired innovation (students, parents and communities).

In conclusion, a report published by the State Comptroller (2021) recommends strengthening the link between the education system and training institutions "In such a way that the institutions can adapt the study programs to the system requirements, to the education system policy, goals, and objectives and to the field needs". The report also recommends referring to the required training subjects in the training program, considering significantly increasing the practical training component defining active participation in training as an obligatory component, and forming a mandatory outline to examine the teaching candidate's elements in all institutions. The Council for Higher Education, the Ministry of Education, and the training institutions should guarantee the required balance between academic freedom, which is so important to the higher education institutions, and the national education policy and the education system needs, and lead a regular dialogue and work mechanism to enable this. Therefore, we recommend some initial operations in the short term including: Forming an assessment tool to measure the skills the system wants to impart and determining a strategy for dealing with them; Improving the quality of the teaching and management teams in the schools through training bodies and advanced training; Setting a long-term policy through a dedicated platform such as a National Council for Education that will be in charge of designing the education policy, strategy, and goals; Budgeting and nurturing all educational frameworks (not only in the formal framework of the schools); Promoting the reform in the education system differentially according to the population variance.

Bibliography

1. State Comptroller. (2021). *Readiness for the changing labor market The Ministry of Education's preparation for the changing labor market*. Annual audit report 71 b.
2. Somech, S. & Kadri, K. (2017). *The future of the world of work review of key trends*, Myers Joint Brookdale.
3. Brands E. & Strauss E., (Eds.) (2013). *Education for a society of culture and knowledge: 21st century transformations and their consequences - recommendations for adapting the education system in Israel to the 21st century*. The initiative for applied research in education, the Israel National Academy of Sciences.
4. Menela, M. (May 21, 2017). *Research: 65% of the jobs that Generation Z members will do don't exist yet*. Calcalist
5. *The 2030 education system - the graduate document skills* (2020). Ministry of Education.
6. Dondi, M., Klier, J., Panier, F., & Schubert, (2021). Defining the skills citizens will need in the future world of work. McKinsey & Company.
7. OECD. (2011). *Towards an OECD skills strategy*.
8. OECD. (2020), *Strengthening the Governance of Skills Systems: Lessons from Six OECD Countries*. OECD Skills Studies.
9. Eisenberg, E. & Selivansky Eden, O. (2019). *Adapting Israel's education system to the 21st century*. The Israel democracy institute
10. Shalem, M. & Lebenthal Andreson, M. (2020). *Education 2030 - a road map for education and learning in Israel*. Shat Razon Lachiuch.
11. Branko Weiss. (2015). *What is critical thinking - an introductory essay*.
12. Saleh, S. (2019). Critical thinking as a 21st century skill: conceptions, implementation and challenges in the EFL classroom. *European Journal of Foreign Language Teaching, 4*(1).
13. Browne, M. N., & Keeley, S. M. (2007). Asking the right questions a guide to critical thinking (eighth). Pearson Prentice Hall.
14. Harpaz, Y. (1996). *Education for critical thinking*. Magnes Publishing House Branko Weiss Institute.
15. The educational catalog. (2016). *Creativity, innovation and design*. Ministry of Education
16. Teaching staff portal, teaching aids. (n.d.). *Skill development*. Ministry of Education. הכוונה למקור הזה באזכורים של משרד החינוך 2021?
17. Rainie, L. & Anderson, J. (2017). The Future of Jobs and jobs training. *Pew Research Center*.
18. Harpaz Y. (2016). *To understand understanding to teach to understand - concepts and actions.* Beit Berl College.
19. Nuriddinova, D. (2022). Some methodological aspects of the formation of a culture of interpersonal relationships in primary school students. *Galaxy International Interdisciplinary Research Journal, 10*(3), 803–806.

20. Pham, V. H., Wawrzyniak, S., Cichy, I., Bronikowski, M., & Rokita, A. (2021). BRAINballs Program Improves the Gross Motor Skills of Primary School Pupils in Vietnam. *International Journal of Environmental Research and Public Health*, *18*(3), 1290.

21. The pedagogical administration. (2018). *Assimilation of 21st century skills in secondary education*. Ministry of Education.

22. Bahromova, M. M. (2021). The importance and necessity of teaching computer science and programming to primary school students. *Asian Journal of Multidimensional Research*, *10*(9), 162–166.

23. RAMA. (2018). *"Meaningful learning": perceptions of students, teachers and administrators in the years 1974 - 1977* [research report]. Ministry of Education.

24. Sailer, M., Murböck, J. & Fischer, F. (2021). Digital learning in schools: What does it take beyond digital technology? *Teaching and Teacher Education, 103*, 103346.

25. Štemberger, T., & Čotar Konrad, S. (2021). Attitudes Towards using Digital Technologies in Education as an Important Factor in Developing Digital Competence: The Case of Slovenian Student Teachers. *International Journal of Emerging Technologies in Learning (IJET)*, *16*(14), 83.

26. Kim, S., Raza, M., & Seidman, E. (2019). Improving 21st-century teaching skills: The key to effective 21st-century learners. *Research in Comparative and International Education, 14(*1), 99–117.

27. Haug, B. S., & Mork, S. M. (2021). Taking 21st century skills from vision to classroom: What teachers highlight as supportive professional development in the light of new demands from educational reforms. *Teaching and Teacher Education*, *100*, 103286.

28. Teo, T., Unwin, S., Scherer, R., & Gardiner, V. (2021). Initial teacher training for twenty-first century skills in the Fourth Industrial Revolution (IR 4.0): A scoping review. *Computers &Amp; Education*, *170*, 104223.

29. Kwangmuang, P., Jarutkamolpong, S., Sangboonraung, W., & Daungtod, S. (2021). The development of learning innovation to enhance higher order thinking skills for students in Thailand junior high schools. *Heliyon*, *7*(6), e07309.

30. Schleicher, A. (Ed.) (2012). *Preparing Teachers and Developing School Leaders for the 21st Century: Lessons from around the World*. OECD Publishing.

31. Zaragoza, M. C., Díaz-Gibson, J., Caparrós, A. F., & Solé, S. L. (2019). The teacher of the 21st century: professional competencies in Catalonia today. *Educational Studies*, *47*(2), 217–237.

32. Brown, J. S. (2006). *New Learning Environments for the 21st Century*.

33. *21st Century Learning Environment Models*. (n.d.). State Educational Technology Directors Association.

34. *21st century learning environments*. (n.d.).

35. Retnawati, H., Djidu, H., Kartianom, K., Apino, E., & Anazifa, R. D. (2018). Teachers' knowledge about higher-order thinking skills and its learning strategy. *Problems of Education in the 21st Century*, *76*(2), 215–230.

36. Bluestein, J. (2014). *Managing 21st Century Classrooms: How do I avoid ineffective classroom management practices?* ASCD Arias.

37. Anagün, E. S. (2018). Teachers' Perceptions about the Relationship between 21st Century Skills and Managing Constructivist Learning Environments. *International Journal of Instruction*, *11*(4), 825–840.

38. Nazarova G. U. & Daminova G. O. (2018). The importance of motivation in education. *Achievements of science and education, 16* (38), 33-35.

39. Adedigba, O., & Sulaiman, F. R. (2020). Influence of Teachers' Classroom Management Style on Pupils' Motivation for Learning and Academic Achievement in Kwara State. *International Journal of Educational Methodology*, *6*(2), 471–480.

40. Napal Fraile, M., Peñalva-Vélez, A., & Mendióroz Lacambra, A. (2018). Development of Digital Competence in Secondary Education Teachers' Training. *Education Sciences*, *8*(3), 104.

41. Fernandes, G. W. R., Rodrigues, A. M., & Ferreira, C. A. (2018). Professional Development and Use of Digital Technologies by Science Teachers: a Review of Theoretical Frameworks. *Research in Science Education*, *50*(2), 673–708.

42. Reisoğlu, L., & Çebi, A. (2020). How can the digital competences of pre-service teachers be developed? Examining a case study through the lens of DigComp and DigCompEdu. *Computers & Education*, *156*, 103940.

43. Bruns, B. (2011, April 13–16). *Building better teachers in the Caribbean*. World Bank Regional Learning Event: Improving Teaching and Learning Outcomes in the English-speaking Caribbean Countries with ICT, Bridgetown, Barbados.

44. *Executive Conference*. (2019, January 14). Amal group.