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## Preparing Pre-service Teachers for 21st Century Skills Education: A Teacher Education Model

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### Abstract

This study examines the efficiency of a model aimed at teaching 21st century skills to preservice teachers at Damascus university. Two fundamental aspects were explored, firstly, promoting the teaching of 21st century skills; and, secondly, incorporating 21st century skills in the educators' pedagogical training. Quantitative data was collected from 106 student teachers, and 34 teacher educators through two survey questionnaires. Results from the teacher educator's survey data showed that the model to promote all 21st century skills in student teachers was efficient. The student teachers felt that the pedagogical training of this model was efficient in terms of promoting cognitive skills, but only average when considering information literacy and problem-solving skills and performed poorly in fostering communication skills. Thus, even though the model is efficient in promoting 21st century skills for future teachers, it lacks a training framework that places equal emphasis on applying the skills during teacher training.

**Keywords:** 21st century skills; preservice teacher; teacher education; teacher educator

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## 1. Introduction

The “Reform Movement” in education calls for a shift from traditional education, based on transforming knowledge to the learner, to a new educational pattern that cultivates learner’s skills and abilities (Ananiadou & Claro, 2009). Central to this movement emphasis on the development of critical and creative thinking skills, reflective thinking, problem-solving, reasoning, decision-making, and the ability to use digital technology to overcome unprecedented challenges (Bransford & Jossey-Bass, 2006; Osman, Tuan Soh, & Arsad, 2010; Trilling, Fadel, & Partnership for 21st Century Skills, 2009). Skills development is thus a cornerstone in the proposed educational change. It implies incorporating 21st-century skills (21st CS) into all aspects and levels of the education structure (Coutinho & Mota, 2011; Gibson, 2005; Lowther, Inan, Strahl, & Ross, 2012; Thomas, Ge, & Greene, 2011; O’Sullivan & Dallas, 2010). The shift towards adopting 21st CS is both a distinctive feature of sustainable education and an influential trend that has implications for the education system at all levels - from kindergartens to universities - including teacher education. To enact the reform, teachers need to develop, model, and assess 21st CS in their students. As such, there is a call for teacher education programmes to develop student teachers’ personal and professional development of these skills alongside their pedagogical training with a view to their later applying these skills in educational settings (Michaels, Truesdell, & Brown, 2015).

Qualified teachers play a core role in promoting 21st CS through their exemplary instructional practice, integrating a focus on these skills into their teaching activities and assessment practices. To achieve this, teachers must be equipped with the values, knowledge, and skills needed for implementing 21st-century education (Väljörvi, 2005). Hence, teacher education programmes should develop plans to prepare preservice teachers to meet the demands of 21st CS education. The nature of teacher preparation – in respect of promoting 21st CS – is thus dual-layered. It involves promoting pedagogical and personal skills and the cultivation of 21st CS skills in student teachers, while at the same time training them and giving them sufficient experience to be able to apply the skills in the classroom settings (Valli, Perkkilä, & Valli, 2014). As a consequence, preparing student teachers to teach 21st CS requires that their teachers model 21st CS in their teaching practice, so as to develop student teachers’ knowledge base concerning these skills: further, student teachers should be provided opportunities to put this new knowledge into practise in real-life situations (Häkkinen et al., 2017).

In the teacher preparation process - goals, curriculum, and training approach - teacher educators play a key role in preparing student teachers for applying 21<sup>st</sup> CS in the classroom. Besides building the student teachers’ knowledge base in respect of 21<sup>st</sup> CS, educators also use these skills in their pedagogical practice, which is an important reference for the prospective teachers (Mestrinho & Cavadas, 2018).

The literature concerning this topic raises many issues: Bransford & Jossey-Bass (2006) found that practitioner teachers perceived incorporating 21<sup>st</sup> CS into their teaching practice as a demanding process. This may explain their tendency to prefer traditional teaching methods; meanwhile, Norrena et al. (2011), in their study of Finish teacher education, further highlighted that many teacher educators do not have sufficient knowledge of 21<sup>st</sup> CS and furthermore lack the competencies to integrate 21<sup>st</sup> CS into their teaching. These issues reflect shortcomings in the design of preservice teacher training as well as in teacher educators’ knowledge base in connection with teaching 21<sup>st</sup> CS. Many aspects of the teacher preparation process have been

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the subject of a number of research articles, for example, teachers' incorporation of 21<sup>st</sup> CS into their classroom practices (Valli et al., 2014); teachers' perceptions of efforts at incorporating 21<sup>st</sup> CS in teacher education (Manik & Shareef, 2014); and the evaluation of 21<sup>st</sup> CS (Silva, 2009). The scope of the current study focuses on pedagogical preparation— an area of the overall model that deals with preparing preservice teachers to cultivate the 21<sup>st</sup> CS. Hitherto, the effectiveness of teacher preparation programmes in terms of preparing prospective teachers to teach 21<sup>st</sup> CS, has not yet been investigated in the Syrian and Arabic research context. Consequently, the current study explores the effectiveness of the Teacher Education (TE) programme in preparing preservice teachers to teach 21<sup>st</sup> CS. It fills a gap in the teacher education literature as it identifies how educators across initial TE programmes have developed 21<sup>st</sup> CS with preservice teachers in the Syrian context. It also identifies the extent to which teacher education programmes promote 21<sup>st</sup> CS to preservice teachers.

## **2. Research aims and questions**

Given the need to build 21st century skills, the current study aims to examine the effectiveness of a Syrian teacher education programme in preparing prospective teachers to teach 21st CS from both the teacher educators' and the student teachers' perspectives. Therefore, the study explores two areas: firstly, teacher educators' efforts to promote the use of 21st CS by their student teachers—this part outlines both the teaching strategies and techniques employed, and student teachers' perceptions concerning the integration of 21st CS within the overall scheme of TE. Secondly, student teachers' evaluations of their trainers' efficacy in teaching 21st CS, plus their perception of the trainers' knowledge base and relevant experiences, are explored. Accordingly, the study addresses the following questions:

- To what extent do teacher educators promote and model 21st CS in their teaching practice?
- To what extent are preservice teachers pedagogically prepared to incorporate 21st CS in their teaching practice?

## **3. Research background**

### **3.1. 21st century skills in the educational context**

Although there is no universal consensus on a certain definition of 21st CS, diverse perspectives describe a spectrum of future skills. The term 21st CS refers to a blend of knowledge, skills, and expertise that is significant in daily and professional life. These skills primarily involve thinking skills and complex cognitive processes, including skills such as critical thinking, creative thinking, problem-solving, collaboration, communication, as well as concepts such as information and communication technologies literacy (Partnership for 21st Century Skills [P21], 2015; Pellegrino & Hilton, 2012). Whereas some of these skills have been deeply immersed in education history, others have recently emerged as a result of technological advances. Thus, these skills have growing significance in teaching and learning in 21st Century education.

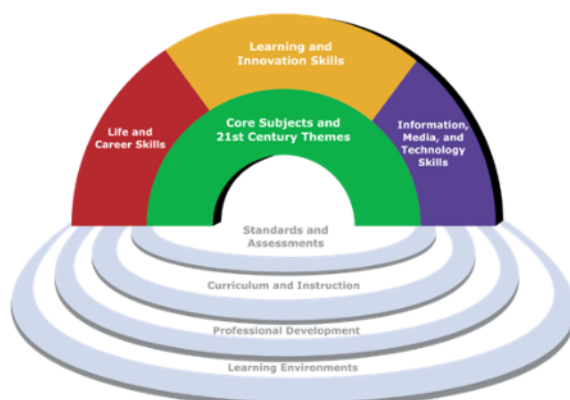
Relevant education literature indicates several frameworks that focus on skills (learning skills, literacy skills, life skills) required for 21st Century education and life. These frameworks have been developed worldwide, and include the OECD framework, the partnership of 21st Century



skills in teaching and learning, and the key competencies for lifelong learning framework proposed by the European Commission. Voogt and Roblin (2012) conducted a comparative study to analyse the necessary frameworks in the education field. They indicated that frameworks shared a consensus on the importance of competencies such as communication, cooperation, ICT, and cultural awareness, and of cognitive skills such as critical and creative thinking and problem-solving.

The framework of the partnership for 21st CS describes the skills, knowledge, and expertise students need to succeed in their education. Simultaneously, it provides teachers with guidelines for integrating skills into the teaching of core academic subjects. The framework consists of four elements: learning and innovation skills; information, media, and technology skills; life and career skills; and the core subjects and themes. The framework also includes subsystems that help teachers ensure student mastery of the skills: 21st Century Standards; Assessment of 21st Century Skills; 21st Century Curriculum and Instruction; 21st Century Professional Development; 21st Century Learning Environments (Trilling & Fadel, 2009). See Figure 1.

FIGURE 1. P21 FRAMEWORK FOR 21<sup>ST</sup> CENTURY SKILLS



Source: Trilling & Fadel, 2009

Adopting an educational policy to which integrates 21st CS into the education system requires all aspects of policy to be in a high level of cooperation and harmony. The reform policy implies changes in education goals, standards, curriculum, assessment, learning environment, and professional development to support 21st century skills (Bellanca & Brandt, 2010). Moreover, teaching 21st CS brings a change to the traditional role of teachers. Teachers in 21st century schools should take the role of facilitators and counsellors who support student development, guide students during their learning to achieve the goals, and provide them with constant feedback on their progress (Flem et al., 2004). In order to perform their role, teachers must be prepared for incorporating 21st CS. They must know their students' characteristics, plan teaching activities accordingly, and encourage them to engage in the instructional activities (Melvin, 2011; Churches, 2008). In addition to their role as facilitators and counsellors, teachers should be experts and guides who help students develop their 21st CS.

Teachers should be competent in designing and managing the classroom learning environment to support collaborative work within groups which can work independently of each other (Trilling & Fadel, 2009). Managing an active learning environment that promotes collaboration and effective communication between students demands teachers themselves to be effective

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and accessible communications (Churches, 2008). They must have skills in observation, management, monitoring students to organize learning environment (Gökçe, 2000). Moreover, teachers who provide learning experiences to their students are expected to use 21st CS in classroom activities (Burakgazi et al., 2019). This matters since, according to Sanders and Rivers (1996), teachers' competencies and skills significantly impact student learning and motivation. Using these skills in the classroom happens through several approaches; of these modelling is a prominent one. In modelling, teachers act as role models in exhibiting 21st CS in the course of their teaching. For instance, teachers use digital tools and resources to present their knowledge, skills, and experience. Further, teachers should use appropriate teaching strategies to promote student cognitive skills such as asking higher-order thinking questions. To conclude, integrating 21st CS demands a change in the traditional role of teachers. The characteristics of the required teachers can be summarised as follows:

- Being able to model the use of 21st CS in the classroom.
- Being able to assess and evaluate student progress to acquire 21st CS and provide them with constant feedback about their progress.
- Organising the learning environment to engage students in productive activities that aimed to promote 21st CS.
- Employ innovative technologies and teaching approaches that are student-centred such as inquiry-based learning and problem-based learning, which can improve learning outcomes and prepare students for the rapidly changing demands of the 21st century.
- Being a knowledgeable and long-life learner who constantly advances their professional knowledge and that of their profession.
- Has an active role in the curriculum development process.

Given the significant role of teachers in 21st century education, it is necessary to incorporate 21st CS education into the teacher preparation process. Thus, it is necessary for teacher education programmes to renew, change, and update the training model to meet 21st century education needs.

### **3.2. Teacher education for 21st century skills**

Incorporating 21st CS has profound implications for teacher training. In 21st century education, learners are at the centre of educational interest. As a result, the teaching and learning process tends to personalise educational experiences, identify individuals' learning patterns and foster novel forms of educational and teaching strategies (Schleicher A., 2012).

In this respect, teachers are expected to translate theory into reality. This means that they need to gain and develop appropriate competencies throughout their initial training in order to be able to promote 21st CS in their own classrooms. In the preparation programme, teacher educators facilitate preservice teachers' personal development of these skills at the same time as delivering pedagogical training, and teach them about the way to teach 21st CS. Preservice teachers are supposed to receive training on how to teach complex ways of thinking, educate lifelong learners, and embrace diversity with differentiated pedagogical practices (Schleicher A., 2012). Other preparation aspects might include training in the use of digital tools.

Teachers also need to practice collaboratively in designing learning environments, developing curricula, discussing the learning needs of students, and teaching with others in teaching

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approaches. An OECD (2009) comparative study summarised teachers training needs as follows:

- Teachers need to know the nature of the learning process, individual patterns of learning, student motivation, and emotions.
- Teachers need a rich knowledge base of instruction methods and assessment approaches and must use them innovatively.
- Teachers need to be knowledgeable about the subject matter of the course they teach. This will help them to use to optimise student learning by using the best teaching approaches and methods.
- Teachers need to be skilled at designing, leading, managing and planning learning environments.
- Teachers need to have opportunities for teamwork with other teachers, for a network of professional communities.
- Teachers need to use their cognitive and metacognitive skills efficiently, in order to reflect on their practices and learn from experience.
- Teachers need to be proficient in using technology as an effective teaching tool, using digital resources and platforms, and information management systems.

### **3.3. Models of preparing teachers of the 21st century.**

In order to integrate 21st CS in teacher preparation, teacher education programmes must develop or adopt a training model. The literature provides an example of visions or projects which imply that their models aim to reform the current teacher education process to integrate 21st CS.

Darling-Hammond (2000) indicated that teaching problem-solving, creative and critical thinking, and practical knowledge application requires teachers to be equipped with in-depth and flexible knowledge of subject matter and with prior knowledge base, in addition to training them to organise a productive learning process, assess student learning, and adapt instruction to different learning approaches. In their book titled *Preparing Teachers for a Changing World: What Teachers Should Learn and Be Able to Do*, Darling-Hammond and Bransford (2007) introduce a framework that recommends that teachers new to teaching 21st CS have a basic understanding of the science of learning, diversity in learning, classroom management, language acquisition, it also implies that they must use innovative assessment methods, and have the ability to use advanced technology in the classroom.

In the same context, Korthagen et al. (2006) proposed a simple yet thought-provoking vision of teacher training designed to prepare teachers to continuously strive for their students' success while at the same time embodying 21st CS. The vision is based on six principles for preservice teacher training and aims to shift the teacher's possibly traditional mindset to a more flexible perspective that suits teaching in the 21st century.

The principles are:

- Learning about teaching and learning in teacher education involves continuously conflicting and competing demands;



- Teacher training should view knowledge as a subject to be created rather than as a created subject;
- Cultivating future teachers can be enhanced through student-teacher research;
- Teacher preparation requires a meaningful relation between school, university, and preservice teachers;
- Teacher educators modelling of learning and teaching approaches advocated in the programme is important to enhance teacher preparation;
- And, promoting a student-research approach can enhance teacher education (Korthagen, Loughran, & Russell, 2006, pp. 1025–1038).

The National Institute of Education (NIE) in Singapore (2009) introduced an innovative and transformative teacher education model for the 21st century that aims to revamp the teacher education system to incorporate 21st CS, values, and professional development into teacher trajectory. The model is based on the understanding that “students’ development of 21st CS emerges as a result of competent 21st-century educators” (Durgesh, 2020, p. 64). The model identifies the intended student outcomes, which include (1) learning and innovation skills, (2) knowledge, information, media and technology literacy skills, (3) life skills, and (4) citizenship skills (NIE, 2009). Preparing teachers for these skills requires teacher education programmes focus on three areas in teacher training: knowledge of how to support learning communities that offer students opportunities to implement 21st CS in classroom settings and real-world contexts; effective instruction in 21st CS that supports innovative instruction and the use of high order thinking skills; and proficiency at the intersection of information and digital media (Durgesh, 2020).

Partnership for 21st CS and the American Association of Colleges of Teacher Education (AACTE) proposed a vision of reforming teacher education that focuses on skills and knowledge in educators’ preparation programmes. The model is informed by the need to prepare qualified teachers who are capable of teaching in the 21st century’s complex environment. Three main areas of teacher preparation identify the new model’s characters: aspects of interventions, competencies of qualified teachers, and principles that guide teacher education programmes to achieve the desired outcomes. The proposed model maintains the balance between the 21st century knowledge and skills needed for students, the ways in which educator preparation programmes can leverage those skills, as well as the desired outcomes for programme graduates. Exploring the model dimensions would give a more detailed understanding of the model’s nature. Aspects of intervention are represented by five distinct areas which together represent the foundation for teacher success at cultivating students’ skills, namely:

- Outcomes quality: programme graduates should be able to model and teach different subjects with an interdisciplinary awareness of 21st CS.
- The assessment: prospective teachers should understand and use a wide variety of assessment strategies to evaluate 21st CS.
- Curriculum and instructional methods, prospective teachers are expected to design lesson plans and curriculum and use instructional strategies that promote critical thinking, problem-solving, productive communication, and collaboration.

- Lifelong learning: prospective teachers should embrace lifelong professional learning opportunities and act as peer coaches and mentors to colleagues in an ongoing collaborative endeavour.
- Learning environment: prospective teachers should be able to create a safe environment for student learning by understanding and advocate for the varied emotional, physical, and educational needs of students (Greenhill, 2010, p. 21).

The model adopts a set of teaching competencies that are adopted from Darling-Hammond and other scholars (Darling-Hammond, 2006a, 2006b; Darling-Hammond & Baratz-Snowden, 2005; Darling-Hammond & Bransford, 2007):

- The innovative use of instructional technology to meet student learning needs implies aligning current and emerging instructional technologies with content and pedagogy, creatively using instructional technology to meet student learning needs.
- Strategically balancing direct instruction with performance-based, project-oriented learning experiences.
- Competence in using and employing a range of evaluation strategies, including formative, portfolio-based, curriculum- embedded, and summative assessments.
- Actively participating in collaborative learning communities.
- Embracing career-long learning opportunities to continually update knowledge and skills (Greenhill, 2010, p. 19)

Some 21st CS training models focus on the professional development programmes of teacher education. Such models aim to reform the existed TE programmes in order to harmonise their syllabuses with 21st CS goals. Massachusetts Department of Elementary and Secondary Education project of professional development proposes a set of standards and indicators for effective teaching practice and professional excellence which six aspects of the teaching profession:

- Skills in curriculum design, lesson planning, and assessment are required to support student's growth. This involves the teacher's ability to use research-based best practices in implementing the curriculum, knowing, and applying cognitive education.
- Skills in using a variety of assessment methods and strategies. Teachers are expected to assess students' growth using different spontaneous, formative, and summative assessment methods; analysing the results of student assessment to be employed in revising instructional plans; and providing students with regular feedback on their advance base on the assessment results.
- Skills in using multiple instructional and class management strategies. Teachers should use strategies that boost student engagement in learning activities; they should use high-quality materials adapted to learners' needs; they should be aware of students learning difficulties and misconceptions; and they should help students cope with those misconceptions and confusion.
- Skills conducive to constructing a safe and collaborative learning environment. An active learning atmosphere, where students play an active role in developing, caring relationships with fellows and adults, strengthens a sense of appropriate behaviour. Teachers should also acknowledge students' cultural backgrounds and use what they know to guide students towards dealing with and overcoming life's challenges.

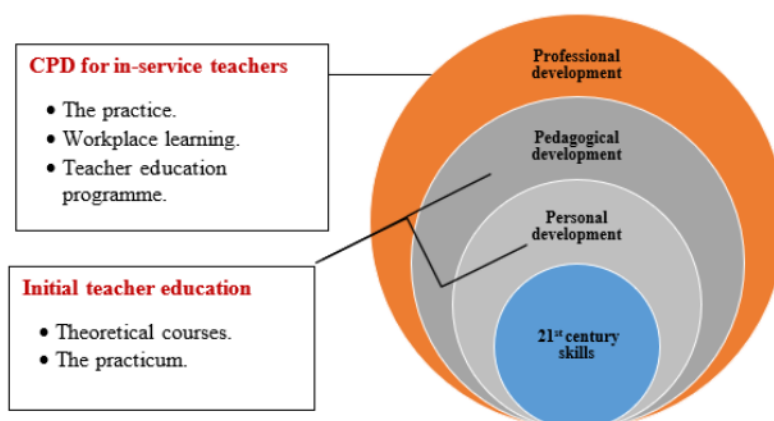


- Skills in communication and cultivating society entities that benefit and support students. These skills imply family outreach, cultural awareness, and accessing community resources. Teachers are supposed to encourage families to be engaged in students' academic life (DESE, 2011, pp. 78–82).

The previous models and related literature refer to a trajectory of three phases or dimensions in which teachers receive the needed training to teach 21st CS. The first two phases of the preparation process happen in initial teacher education for preservice teachers. In contrast, the third phase happens within the continuous professional development of the in-service teacher. Hence, Figure 2 covers:

- Personal development: in this phase, preservice teachers, through initial teacher' training, improve their capacity to understand and apply these skills in multiple contexts, not limited solely to educational settings.
- Pedagogical development: in this phase, preservice teachers receive training to build a knowledge base and acquire experiences that help them facilitate the skills development within their students. The training is through supervised teaching fieldwork (the practicum) and theoretical courses.
- Professional development: here, in-service teachers pursue their development of these skills through their practice with students, colleagues, and administrators or by enrolment in professional development programmes in teacher education.

FIGURE. 2. DIMENSIONS OF TEACHER EDUCATION MODEL FOR 21ST CENTURY SKILLS



Source: own compilation

### 3.4. Preservice teachers' knowledge base

Successful teaching requires competency in applying different forms of pedagogy and content. One of the key assumptions of teacher training is that teachers have the required knowledge and capacity to integrate 21st CS as envisaged in educational policies. Thus, developing preservice teachers' knowledge base with a view to promoting 21st CS is a crucial of teacher pedagogical training. The training framework and teacher education model guide the process of developing student teachers' knowledge base. Although there is a body of literature that deals with this issue, the need for a single unified framework for such a knowledge base is still an unmet demand in teacher education. Several frameworks have been proposed for each group of skills. Kadir (2017) introduced a framework for teacher's knowledge base of critical thinking, which implies several overlapping types of knowledge: teachers' critical thinking knowledge;

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critical thinking pedagogical knowledge; critical thinking content knowledge; and critical thinking pedagogical content knowledge. The study identified teachers' experience, knowledge domains, and understanding of critical thinking as factors influencing the construction of such a knowledge base. Mishra and Koehler (2006) proposed a framework to understand teacher knowledge in educational technology – technological pedagogical content knowledge (TPCK). The framework entails the incorporation of technology knowledge (TK) into pedagogical content knowledge (PCK) that results in a new knowledge domain called Technological Pedagogical Content Knowledge (TPCK). Approaching the topic from a different angle, Zohar studied preservice teachers' pedagogical knowledge of teaching higher-order thinking skills (HOTS), which includes creative and critical thinking. She identifies the essential elements of the knowledge base: the teacher's perception of teaching thinking; the active role of the teacher; provoking student's thinking strategies; cognitive demands of a thinking task; diagnosis of students' reasoning difficulties; and following a diagnosis of students' reasoning difficulties (Zohar, 2004; Zohar & Schwartz, 2012). Recently, Csikos & Sztányi (2020) found that, in order to teach problem-solving, teachers need to use direct– either paradigmatic or narrative-oriented – approaches when introducing simple, routine word problems to students.

The aforementioned literature presents a variety of frameworks that deals with teachers' knowledge base to promote 21st CS. However, these skills' heterogeneous nature can be conceived as an obstacle to developing a transdisciplinary knowledge base framework for teacher preparation.

### **3.5. The role of teacher educators**

Teacher education teaches student teachers about teaching the student. Accordingly, this makes the role of teacher educators more complex. They are expected to model in their practice what they teach (e.g., teaching strategies), and not only to teach a subject (e.g., a methods course) (Lunenburg & Korthagen, 2005). Therefore, teacher educators need to be aware of the concept of modelling and adopt it in their teaching practices (Swennen et al., 2008, p. 531), and consider the correspondence between their teaching practices and what they preach to students, in addition to explaining the purpose behind their modelling (Loughran & Berry, 2005). Student teachers develop their pedagogical beliefs and awareness based on teacher educators' explanation of their pedagogical choices and the way they model their pedagogy. Guilfoyle, Hamilton, and Pinnegar (1997) indicated that “in teaching future teachers, teacher educators are committed to model the work we expected from them” (p. 183). According to Fourie (2015), teacher educators should model in their teaching practice what they expect their students to do in their future classrooms; otherwise, the students would fail to fulfil their duties and roles as teachers. This is also relevant to the case of teaching 21st CS. Vygotsky (1987) pointed out that modelling the teaching of thinking skills influences the development of students' thinking. In the same context, Dewey (1997) indicated that modelling requires a high cognitive level on the part of learners, including a cognitive process of observation, inference, reasoning, and experimentation. During teacher education, student teachers will gradually internalise these processes and ways of thinking. In this respect, modelling 21st CS provides student teachers with opportunities to observe the teaching of these skills in real learning situations. The real experience gained by prospective teachers carries utmost importance because it helps them become familiar with new educational innovation methods (Griffin, 1999; Russell, 2005; Stofflett & Stoddart, 1994). Lieberman and Wood (2003) found that when teachers have

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opportunities to interact with the subject in ways they aim for their students to do, student teachers are more likely to absorb these practices and apply them in their future classroom.

On other hand, besides familiarizing student teachers with 21st CS, modelling is also essential to reshaping student teachers' beliefs about incorporating these skills into their classroom practice and enhancing their self-efficacy. Urbani, Roshandel, & Michaels (2017) meanwhile found that student teachers lack the self-efficacy necessary to teach 21st CS. Segall (2002) illustrated that unless an alteration of deeply held views occurs, prospective teachers cannot recognise and challenge their assumptions. The "folk theories" of Banner (1996) explain that any new innovation in teaching and learning that teacher educators attempt to implement, will inevitably compete with, replace, or otherwise modify such folk theories.

The efficacy of teacher modelling depends on teachers' beliefs and attitudes towards the very idea of modelling. In some cases, teachers may model something in one way without believing it fully. This inauthenticity might lead to negative implications for modelling effectiveness. According to Brookfield (1987), the ineffectiveness results from the lack of authenticity in teachers' actions. Students interact best with genuine behaviours of teachers that are authentic, and pervasive (Jane, 2015). In conclusion, modelling the practice of 21st CS is important because the explicit explanation of the pedagogical practice provides student teachers with the opportunity to experience learning and teaching situation with 21st CS integrated into activities and make judgments about its effectiveness (Loughran, 2006).

#### **4. The Syrian context**

In 2003, the National Centre of Education Development proposed a policy document called "developing education sector: from the kindergarten to the university". The document presented a reform vision of the education sector, including teacher education. One of the main goals indicated in the vision was to adopt a skills-based approach and integrate technology in education. Later on, in 2005, the association of teacher education took the policy document as a basis for reforming teacher education and adopted its goals in the standards and goals of teacher education of the leading five universities in Syria, Damascus University, Aleppo University, Tishreen University, Alfurat University, and Albaath University.

Accordingly, teacher education has two programmes: initial teacher education, and continuous professional development for in-service teachers. The initial teacher education for preschool and primary school teachers lasts four years while teachers in other specialization must have two additional years called "the special pedagogical preparation." In initial teacher education, training focuses on the personal and pedagogical development of students. The training involves seminars on instructional methods, assessment and evaluation, classroom management, the psychology of education, digital learning tools and other subjects, in addition to an intensive school practice (the practicum). Preservice teachers receive support for the questions and issues that teachers meet in their daily work. Preservice teachers work with their tutors and university teachers to determine the practice period's aims and content. The tutors are senior qualified teachers who have the necessary experience and training to guide student teachers in acquiring relevant experiences during the practice period. Student teachers should have a one-term extended agreement with a school to work with the tutor. At the beginning of the training, student teachers, with help from tutor and teacher educators, develop a teaching plan for the first month. The tutor gives daily feedback while the teacher educator sends weekly feedback.



On the other hand, in the new reform, the Continuous Professional Development programme (CPD) for in-service teachers is completed through a two-year training programme of seminars and workshops. This programme is obligatory; it targets in-service teachers according to their age and career level, and prioritizes young teachers. CPD programmes have a significant role in improving teachers' digital, communication, and life skills.

Teacher education goals are derived from the general education goals indicated in the reform vision. The goals refer to educating future citizens to think critically, compete in the age of technology and globalization, and collaborate to build the society (Musatfa Aboshahen, 2018). Thus, Teacher education programmes introduce 21st CS in different aspects. For example, Vision 2030 of education at Damascus university's teacher training programme requires teacher educators to assess students' critical thinking and ability to use digital tools. Several courses deal with components of 21st CS, such as how to teach and improve creative and critical thinking. Another course is dedicated to life skills, such as collaboration and productive communication with students. Cultural awareness is also addressed: the course Education for Equity aims to introduce student teachers to diversity in cultural traditions in diverse ethnic groups in the country and train them in how to consider this in their teaching practice, as well as how to maximize academic achievement of people from different traditions and groups. The use of digital tools is integrated into the curriculum and key requirements for students in the practicum.

Nevertheless, teacher education faces many problems. Hannoun (2016) noted that there is a gap between what preservice teachers prepare for and reality in schools. Comparatively speaking, teacher education programmes do not reflect on the reality of school in the curriculum nor in seminars. Though this gap is commonly found in education, these kinds of problems are aggravated in Syrian teacher education programmes.

## 5. Methods

In order to achieve the study aims, the study investigates Damascus university teacher educators' perceptions on their teaching practice in promoting 21st CS and the extent they model teaching of these skills in their teaching practice. On the other hand, the study examines student teachers' readiness to teach 21st CS by exploring their efficacy in teaching 21st CS. The study draws on the participants' perception of who the primary sources of the data are.

### 5.1 The participants

The study has recruited two sub-samples: the first sample has chosen from students of initial teacher education programme. It includes students from programmes of primary school education and special pedagogical preparation. The total number of students who joined the two programmes in the autumn semester of 2019 was n=137. The active status students were n=106 they were selected to be the sample of the study. Different disciplines are represented in the sample: mathematics (n=15) students; languages (n= 12) students; sciences (n= 17) students; social science (n=23) students; and primary school (n=39) student teachers (see Table 1).

TABLE 1. SAMPLE OF STUDENT TEACHERS

<b>Student teachers' discipline</b>	<b>N</b>	<b>Percentage</b>
Mathematics	15	14%
Language	12	11%

Sciences	17	16%
Social Science	23	22%
Primary School	39	37%
Total	106	100%

Source: own calculations

The second sub-sample represents educators. Of a total number of n=42 educators, n=34 teachers have been chosen as a representative sample. Teachers represent the faculties of education, primary school education, science, and human science took part in the study (see Table 2).

TABLE 2. SAMPLE OF TEACHER EDUCATORS

Teacher Educators affiliation	N	Percentage
Faculty of Education	13	38%
Sciences	6	18%
Humanities	6	18%
Primary School	9	26%
Total	34	100%

Source: own calculations

## 5.2. Data collection

Data collection took a place between November and December 2019 at Damascus university. Quantitative data was collected using an electronic survey.

## 5.3. Measurements

As the study deals with two aspects of teacher education model (the practice of teacher educators and the student teachers' readiness to teach 21st CS), but also because the two groups of study participants were expected to have different perspectives and roles in the preparation process, it was considered necessary to use an appropriate data collection instrument with each group. Consequently, the study employs two survey instruments to investigate student teachers' and teacher educators' perceptions.

The first self-report scale instrument developed by Jia et al. (2016) is used to examine preservice teachers' knowledge base and experiences relevant to cultivating 21st CS, which partially covers two aspects of the teacher education model: personal development and pedagogical development. The survey determines the extent of student teachers' efficacy in teaching 21st CS. It has the following dimensions: information literacy, collaboration, communication, innovation, creativity, problem-solving, and responsible citizenship. The scale consists of 16 items, reports student teachers' views of their efficacy in teaching 21st CS, and it has a Likert scale type of weights (1-5). The questionnaire's pilot study shows a very good level of reliability (Cronbach's alpha > 0.82). Since the questionnaire is valid, there was no need to pilot it to the sample anymore (Jia, Oh, Sibuma, LaBanca, & Lorentson, 2016). A demographic classification question (specialisation) was added to this questionnaire in order to fulfil the study goals.

The second instrument is the Survey for Measuring 21st-Century Teaching and Learning: West Virginia 21st-Century Teaching and Learning Survey [WVDE-CIS-28]. The study uses a modified version developed by Ravitz, J. (2014). The purpose of using this survey is to

investigate educator perception about their practice in the modelling of 21st CS in their teaching practice. This survey explores the personal development aspect of the teacher education model. It consists of 34 items in Likert scale type of wights (1-5) and includes the following themes of 21st CS: critical thinking skills, collaboration skills, communication skills, and creativity, and innovation skills. The questionnaire shows a particularly appropriate level of reliability, extremely reliable overall measures for each skill (standardized alpha > .90, inter-item correlations > .58). Since the questionnaire is valid and reliable, there was no need to pilot it to the sample anymore.

#### 5.4. Data analysis

The quantitative data (descriptive statistics) obtained has analysed using the statistical package SPSS (V21) for Windows. Namely, total score and mean value were employed to analyse the teacher educators' responses to determine the level of the practices that prompt 21st CS. The same statistics were applied to the student teachers' responses to the questionnaire to measure student teachers' confidence in teaching students about 21st CS.

## 6. Findings

### 6.1. Findings from the survey of teacher educator

The quantitative data (descriptive statistics) obtained were analysed using the statistical package SPSS (V21) for Windows. This means that total score and mean value were employed to analyse the teacher educators' responses to determine the level of the practices that prompt 21st CS. The same statistics are applied to the student teachers' responses to the questionnaire to measure student teachers' confidence in teaching students about 21st CS.

TABLE 4. LEVELS OF TEACHER EDUCATORS' PRACTICE OF 21<sup>ST</sup> CS

Themes of 21st-century	S. N <sup>1</sup>	Mean	Std. Deviation	M. R	The level
Critical thinking and problem-solving	9	32.38	1.51	3.60	high
collaboration	9	32.59	1.24	3.62	high
communication	8	24.18	1.01	3.02	average
Innovation and creativity	8	33.62	1.41	4.20	high
Total	34	122.76	2.21	3.61	high

<sup>1</sup> S. N= number of statements in the dimension  
Mean of response (M.R) = Mean ÷ S.N  
Source: own calculations

As shown in Table 4, teacher practices that promote students' critical thinking problem-solving are at a high level (M=32.38, MR=3.6, SD= 1.51), for collaboration skills (M=32.59, MR=3.62, SD=1.24), and innovation and creativity skills (M =33.62, MR=4.2, SD=1.4). while communication skills were at an average level (M =24.18, MR=3.02, SD=1.4). The total perception of teacher practices is at a high level (M = 122.76, MR=3.61, SD=2.2).

### Findings from the survey of student teachers

In this subsection, the second research question is answered: To what extent are student teachers pedagogically prepared to incorporate 21<sup>st</sup> CS in their teaching practice? Table 4 resents the



means and standard deviation values of student teachers' responses of their pedagogical preparedness to teach each skill of the 21<sup>st</sup> CS.

TABLE 5. LEVELS OF STUDENT TEACHERS' PERCEPTION OF THEIR EFFICACY

Themes of 21st-century	S. N <sup>1</sup>	Mean	Std. Deviation	M.R	The level
Information literacy	2	6.55	1.58	3.28	average
Collaboration	2	6.04	1.08	3.02	average
Communication	3	6.72	1.31	2.24	low
Innovation and creativity	2	6.83	1.30	3.42	high
Solving problem	3	7.86	1.52	2.62	average
Responsible citizenship	4	12.4	2.48	3.10	average
Total	16	46.44	2.98	2.90	

<sup>2</sup> S. N= number of statements in the dimension.  
Mean of response (M.R) = Mean ÷ S.N.  
Source: own calculations

The data in table 5 show that student teachers perceive the efficacy of their pedagogical training for information literacy skills to be at an average level (M =6.55, MR=3.28, SD=1.5), and view it as being of the same level for collaboration skills (M =6.04, MR=3.02, SD=1.08), solving problems (M =7.86, MR=2.62, SD=1.5), and responsible citizenship (M =12.4, MR=2.48, SD=2.48). However, the efficacy of communication skills training is perceived to be at a low level (M =6.73, MR=2.24, SD=1.31), but that for innovation and creativity skills is perceived to be at a high level (M = 6.83, MR=3.4, SD=1.3). The overall perception of the pedagogical training and its efficacy stands at an average level (M =46.44, MR=2.9, SD=2.98).

## 7. Discussion

### 7.1 Teacher educator

The findings show that teacher educators express a high level of exemplary practice to model 21st CS through their teaching practice. Existing studies on teacher educators found some supportive findings. Andin (2014) found that teacher educators model the teaching of thinking skills implicitly and explicitly. Hannoun (2016) reported comparable results from science teacher educators of using instructional practices to promote critical and creative thinking. Teacher educators' perceptions of their role in cultivating 21st CS in their students is supported by many factors. Vision 2030 explicitly refers to critical and creative thinking as a goal of education, and recommended teamwork activities to build these thinking skills. Furthermore, teaching in teacher education demands educators to apply collaborative learning approach towards achieving different tasks such as planning and executing micro-teaching and seminar activity. In addition, training preservice teacher to use technology requires teacher educators to model that for students. Teacher education requires teacher educators to design and conduct learning programmes which facilitate teamwork and collaboration with peers, which can have a powerful impact on educators' confidence, capacity for professional growth, and willingness to share their practices with others (Clark, 2001). However, the low level at which communication skills is perceived receives less attention from teacher educators; this result corroborates AlMaalouf (2018) suggestion that due to the large number of students enrolled in teacher education and higher education, teacher educators pay little attention to improving student teachers' communication skills. Moreover, teacher educators lack awareness of the importance of allowing their students to scaffold their presentation skills (AlMaalouf, 2018).

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## 7.2 Student teachers

On the basis of the research results, we conclude that student teachers perceive their efficacy and capacity to teach 21st CS to be at a mid-level. The existing studies on student teachers' capacity to teach 21st CS found some supportive and some contradictory results. Goksun and Kurt (2017) found that preservice teachers perform some 21st CS and their knowledge of teaching the skills was above mid-level. Valtonen et al. (2017) found that preservice teacher perceived themselves to be skilled in terms of teaching methods used in 21st CS. Besides, they exhibited this capacity in collaboration, group work, and presenting their teamwork using digital platforms, which are 21st CS. Nuangchalem (2017) indicated that preservice teachers perform and possess high levels of 21st CS. Contrastingly (and contrary to the current study findings), Putri et al. (2017) found that student teachers perceive their capacity for teaching 21st CS to be at a low level. The contradictory finding can be attributed to the programme which was investigated and context (such as the country of the study).

Preservice teachers' capacity for teaching for 21st CS implies their ability to implement their pedagogical knowledge and the experiences they gain during the personal development and pedagogical development phases of teacher education model, in addition to the 21st CS they acquire through personal development. However, the results from teacher educators show that teacher educators reported efficient efforts to promote 21st CS through modelling and the direct teaching of these skills. Consequently, student teachers develop their 21st CS as a result of personal development training.

This conclusion is supported by the study of Abdelkarim (2018) whose doctoral study at Damascus University found that student teachers show creative practices in the projects they conducted and high ability in solving problems. Zaidan (2017) meanwhile found that senior student teachers possess a good level of critical thinking and problem-solving skills. This confirms the efficiency of the training programme in building capacities of preservice teachers in terms of 21st CS. Therefore, the mid and low levels of preservice teachers' perceptions relating to their ability to teach 21st CS might be attributed to difficulties or deficiencies in the pedagogical development phase of teacher education. This can result in a deficient knowledge base or a lack of experiences to apply their knowledge base. However, in many courses, student teachers study the nature of thinking skills and problem-solving and teaching methods of cognitive skills. For example, in the course titled "Teaching and Learning Higher-Order Cognitive Skills," students study theories, teaching and assessment methods of thinking skills. They also receive training on digital education, during which they are expected to use different digital sources to prepare essays or other requirements of the course. In a course such as Teaching for Equity, student learn about the value of multiculturalism and diversity in society. Moreover, student teachers develop their skills collaboration and communication skills in small groups, in various courses, and for various purposes. For instance, developing lesson plans for a case study student; communicating with administrators, and other school personnel, and using technology to present their work to the class. The practicum phase of teacher education contributes to preservice teachers' experiences. However, although educators emphasize incorporating 21st CS in the practicum plan, they do not observe the application of this plan. In addition, student teachers gain much of their experiences by observing tutors in real classroom settings. Therefore, if tutors do not teach for these skills or do not discuss the teaching these skills with the preservice teachers, it is likely that these student teachers would not acquire the experience necessary to incorporate them in their own teaching.

## 8. Conclusion

The study presents a mid-level of harmonization between personal development and the pedagogical development phases of preservice teachers for teaching 21st CS. While teacher educators promote and cultivate student teachers' capacities for 21st CS to a high level, student teachers' preparedness to teach these skills stays at mid-level. The successful role of teacher educators can be attributed to the educational policy that emphasizes on 21st CS in higher education. The study concluded that difficulties related to the pedagogical development of student teachers hinder them from acquiring the necessary experience. The unique and complex nature of teacher preparation, and its multiple aspects and layers of training for 21st CS contribute to student difficulties in developing the competencies necessary to teach 21st CS. Identifying the exact difficulties can be a subject of further research. The results of the study support the importance of adopting a training framework and training model to incorporate 21st CS in teacher education to avoid ill-prepared graduates.

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