Pre-service Teacher Education Programs with 21st-Century Skills: Teacher Educators' Experiences

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Article Info	ABSTRACT
	Educating pre-service teachers to meet the demands of the 21st century and integrating 21st-century skills into the programs is a long-standing debate. This phenomenological study aims to understand and discover teacher educators' experiences and perceptions leading to a pre-service teacher education program integrated with 21st-century skills. By employing transcendental phenomenology, the study describes the phenomenon through the perspectives of 12 teacher educators from various global contexts. Hence, a criterion sampling strategy was adopted, and 12 teacher educators with experiences in 21st-century skills were selected as participants. The data collected through semi-structured interviews with the teacher educators were analyzed based on the content analysis, including iterative reading and debriefing processes. The findings highlighted that a pre-service teacher education program comprising 21st-century skills in a well-designed and integrated way is vital no matter the country's context. Accordingly, this program should cover multiple literacy and skills integrated based on students and the government's needs as well as discipline. Furthermore, it should provide both on-campus and off-campus learning experiences encouraging collaboration, inquiry, and options. By approaching the whole program development process with an evolutionary perspective, it should be revised and renewed by following the advancements. In a collaborative management context, it should also be facilitated through training, time, autonomy, freedom, and resources for teacher educators.

INTRODUCTION

Knowledge and technology dissemination in the 21st century forces countries to reconstruct their education system, and they mostly result in legislative reforms, curriculum reviews, or complementary objectives in the legislation about curricula (Gordon et al., 2009). However, a persistent gap between intended policy and actual practice is frequently highlighted in the studies (Law, 2009; Young, 2003) because of the difficulty in implementing the curricular changes in real life. Unfortunately, changing education policies to meet 21st-century skills is not enough to provide students with these skills (Alan & van der Velden, 2012). Within this scope, the literature argues how to ensure that 21st-century skills are not just an aspiration but a tangible component of students' education. Tangney and others (2023) assert that the lack of qualified teachers is also an obstacle to the implementation of 21st-century skills. Eisner (1995) points out that the agenda for genuine educational reform and significant teacher preparation for the 21st century can only be achieved when teacher educators give up old habits. Similarly, Uyar (2023) underscores the crucial role of teacher educators and education faculties in helping pre-service teachers acquire 21st-century skills. However, the lack of teacher education programs aligned with 21st-century skills could prevent pre-service teachers from graduating with the skills required by today's demands and leave teacher educators unprepared to implement innovative methods (Almazroa & Alotaibi, 2023). Therefore, the argument should be directed to teacher preparation by raising questions on educating teachers for the 21st century and what kind of teacher education programs are needed. Answering these questions requires improving the quality of education and equipping pre-service teachers with the competencies needed to teach effectively in the 21st century (Gümüş, 2022). Nevertheless, the studies predominantly focus on 21st-century skills definitions (e.g., Kereluik et al., 2013; Voogt & Roblin, 2012), countries' policies and reforms regarding 21st-century teacher education (e.g., Gordon et al., 2009; Tan, 2019), and teacher candidates' 21st-century skill qualifications (e.g., Gelmez Burakgazi et al., 2019; Kirbas & Bulut, 2024; Paşa et al., 2022; Uyar, 2023; Yurt, 2023), faculty members' qualifications to teach 21st-century skills (Molla et al., 2023). The studies specifically guiding a pre-service teacher education program integrated with 21st-century skills (e.g., Domine, 2011; Häkkinen et al., 2016; Maphosa & Mashau, 2014) are also in limited numbers. Additionally, as 21st-century teaching and learning do not signify one theory or a set of agreed-upon ideas (Lourie, 2020), this study intends to guide the development of teacher education programs integrated with 21st-century skills by focusing on teacher educators' experiences in curriculum design and teaching processes by adopting a qualitative perspective through a curriculum lens.

21st-Century Skills

The skills needed for effective participation in the knowledge society are argued through the frameworks (The Council of the European Union [EU], 2018; Lemke, 2002; Organization for Economic Co-operation and Development [OECD], 2005; Partnership for 21st Century Skills [P21], 2019). Adopting competence-oriented education, the EU (2018) outlines 21st-century skills with eight competencies on basic skills (literacy, language, numeracy, digital skills), future-oriented life management, entrepreneurship, citizenship, cultural awareness, and expression. A web-based framework, The Project enGauge, defines them regarding digital literacy, inventive thinking, effective communication, high productivity, and information technology skills (Lemke, 2002). While OECD (2005) classifies the skills within three titles (use tools interactively, interact in heterogeneous groups, and act autonomously), P21 (2019) illustrates them through life and career, learning and innovation, information, media, and technology skills. Despite using different names or categorizations, the frameworks mainly propose essential skills for both students and teachers.

21st-Century Teaching Skills and Teacher Education

The changes brought by 21st-century skills to teacher education (Zeichner, 2013) require shaping the programs compatible with these skills (Almazroa & Alotaibi, 2023; Domine, 2011; Gut, 2011; Kausar

& Ajmal, 2024). Some studies attempted to integrate 21st-century skills into teacher education programs by addressing different skills (Ashton & Newman, 2016; Cretu, 2017; Häkkinen et al., 2016; Maphosa & Mashau, 2014; Shidler, 2024; Tan, 2019; Yeşilçınar & Aykan, 2022). For example, Häkkinen et al. (2016) developed an approach with collaboration and problem-solving skills. Maphosa and Mashau (2014) addressed teacher candidates' needs, such as digital skills, cultural sensitivity, and responding to diversity within such a program. While Cretu (2017) investigated 4Cs development through an empirical study, Ashton and Newman (2006) examined learning-to-learn competence with blended instruction. In summary, these studies displayed that integrating skills into the programs enhanced student-centered instruction and required a lot of effort for pedagogical practices.

However, some studies suggested integrating 21st-century skills without offering concrete models or developmental frameworks (Aslan, 2015; Greenhill, 2010; Maor et al., 2023; Yost et al., 2000). According to Aslan (2015), effective 21st-century skill development is possible by giving teacher candidates autonomy. The programs should also enhance teacher candidates' ability to design curricula to organize 21st-century skills based on their students' profiles (Greenhill, 2010). They should include critical reflection to improve teacher candidates' ability to handle problems with different perspectives and methods (from action research to constructivist ones) (Yost et al., 2000). Besides, teacher educators are other pillars of 21st-century skills integration and role models (Maphosa & Mashau, 2014). They should organize teaching processes, provide opportunities for skill development, and check teacher candidates' progress (Bozkurt, 2021; Urbani et al., 2017). Moreover, they should work collaboratively on using the skills in their lessons (Adeosun, 2014) through project-based studies (Tan & Chua, 2024), face-to-face and virtual interaction, and so on.

The successful role of teacher educators in imparting these skills can be attributed to the consistent teacher education policies (Alahmad et al., 2021). Teacher candidates must develop pedagogical approaches and technological teaching techniques during their pre-service education. They must also strive to gain experience and proficiency in these skills throughout their service period to foster 21st-century skills (Almazroa & Alotaibi, 2023). By embedding 21st-century skills into different courses, pre-service teachers not only acquire skills but also develop collaboration (Gut, 2011). Hence, curriculum integration is an effective method to develop these competencies, allowing students to engage in interdisciplinary learning that mirrors real-world problem-solving (Drake & Reid, 2018). As seen above, the literature on pre-service education argues various ways to integrate 21st-century skills; however, a holistic approach is needed in 21st century (Liu & Low, 2015). The holistic approach emphasizes not only key competence and new literacies but also disciplinary knowledge and values, ensuring a comprehensive integration of 21st-century skills into education (Doryakova et al., 2023). This perspective might also be essential in pre-service teacher education, requiring programs to equip future educators with the ability to design curricula, integrate diverse competencies, and adapt to school-specific learning contexts for effective teaching. Nevertheless, additional research, developments, and experments on the holistic approach are needed (Doryakova et al., 2023). Hence, as a research study on teacher educators' experiences across different countries, this study aims to contribute to the ongoing discourse on curriculum integration, pedagogical strategies, and policy alignment in pre-service education.

As teacher educators have a critical role in seeking and enacting new models and strategies for 21st-century teacher education (Tan, 2019), this study focuses on understanding their experiences and perceptions of a pre-service teacher education program integrated with 21st-century skills. By uncovering their insights, it aims to address the existing gaps in curriculum design and policymaking, offering actionable strategies for integrating 21st-century skills into teacher education. Given the complexity of aligning teacher education programs with rapidly evolving societal and technological demands, the study's findings could provide valuable guidance for educators, policymakers, and researchers. Therefore, this study seeks to answer the following questions:

(1)   What can be learned from teacher educators' experiences related to 21st-century skills in pre-service teacher education programs?

(2)   How do teacher educators perceive a pre-service teacher education program integrated with 21st-century skills?

METHOD

Research Design

This study employed a phenomenological research design that focuses on researching the meaning of individual experiences (Polkinghorne, 1989) and the definition and interpretation of these meanings in the ways they emerge (van Manen & Adams, 2010). Therefore, gathering several naive descriptions from the participants and regarding the researchers' self-reflections on the phenomenon (Polkinghorne, 1989), the research pursued to develop the meanings of pre-service teacher education programs integrated with 21st-century skills through teacher educators' experiences and perceptions.

Participants

In phenomenological research, all participants must experience the phenomenon studied (e.g., Moustakas, 1994; Polkinghorne, 1989); therefore, the criterion sampling strategy was employed, selecting teacher educators with experiences in 21st-century skills and curricular-related studies. The process began with a literature review using keywords such as 21st-century skills and pre-service teacher education program, resulting in a list of 71 potential participants. After debriefing discussions about the participants' expertise and the country they represent, the potential participants (n= 43) were contacted via email invitations. Participation was voluntary, and data collection continued until data saturation was achieved. Ultimately, 12 teacher educators working in teacher colleges or universities across seven countries participated in the study. Their backgrounds and expertise, which align with the study's aim of integrating 21st-century skills into pre-service teacher education, are summarized in Table 1.

Table 1. *The background information about the participants*

Participant	Country	Years of Experience as Teacher Educator	Expertise Aligning with Study's Aim
P1	Türkiye	Over 20 years	Innovative teacher education models, curriculum development, instructional designs
P2	Cyprus	Over 30 years	Inclusive education and teacher training, the integration of 21st-century competencies in diverse learning environments
P3	Türkiye	Over 20 years	Teacher education for 21st-century, curriculum development, educational sciences
P4	Türkiye	Over 30 years	Curriculum development for pre-service teachers in Türkiye, critical thinking and problem-solving skills
P5	Türkiye	Over 20 years	Curriculum development for pre-service teachers in Türkiye, problem-solving skills, multiculturalism
P6	Türkiye	Over 15 years	Critical thinking, reflective thinking, and curriculum literacy development in pre-service teacher education
P7	The Netherlands	Over 30 years	Educational technology and teacher training, focusing on digital competence and 21st-century pedagogy integration
P8	Cyprus	Over 35 years	Curriculum development for pre-service teachers in Türkiye, instructional design, teacher education
P9	The USA	Over 20 years	Innovative teaching methods in teacher education, including creativity, digital fluency, and interdisciplinary learning
P10	Romania	Over 20 years	Curriculum development in Romania, inclusive education, reflective thinking

| P11 | South Korea | Over 10 years | Curriculum development in Korea, teacher education and training in the USA, Singapore, and Korea, critical thinking |
| P12 | Austria | Over 10 years | Educational policy, inclusive education, migration |

As seen in Table 1, most of the participants were teacher educators with experience in European countries. The study sample included only one participant from each of America and East Asia. Therefore, the data of the study is limited to the phenomena of 21st-century skills and their integration into pre-service teacher education programs of teacher educators in Europe.

Instrument

Semi-structured interviews were utilized to collect data. First, an interview protocol (Creswell & Creswell, 2018) was initially prepared in Turkish, consisting of 13 questions, and reviewed by three experts. Based on their feedback, some questions were revised and modified. Then, two researchers independently translated the protocol into English, and the best-translated version was decided through debriefing. This version was subsequently reviewed by four experts specializing in English and qualitative research. After incorporating their suggestions, the final protocol was refined to include 12 questions, such as: "What comes to your mind when you hear 'a pre-service teacher education program integrated with 21st-century skills'?", "Which 21st-century skills do you include in your lectures and instructions?", and "How would you design a pre-service teacher education program that effectively integrates 21st-century skills?". These questions aimed to explore educators' professional insights, instructional approaches, and perspectives on program development. To ensure clarity, the protocol was piloted with a teacher educator in Turkish before the data collection process began. The interviews lasted approximately 45 minutes each and were conducted between April and June 2021 through online meeting platforms. Depending on the participant's preference, the interviews were managed in either Turkish or English and recorded with their consent. Furthermore, the ethical approval was obtained from the Social and Humanities Scientific Research and Publication Ethics Committee on April 12, 2021, under the approval number 128939.

Data Analysis

The study adopted transcendental phenomenology to describe the phenomenon as it appeared in the meanings and free from suppositions (Moustakas, 1994). Consequently, a content analysis was conducted. Since multiple researchers participated in the study, those with the highest similarity in coding were selected to ensure consistency. For that purpose, the transcriptions were first read and checked individually, and then two interviews were selected randomly for the analysis. Each researcher analyzed these two interviews independently, and the degree of coding similarity was then assessed through debriefing. Based on this process, the first and third researchers were chosen to conduct the data analysis collaboratively.

The data set consisted of 12 semi-structured interviews, totaling approximately 8 hours and 30 minutes of recorded discussions. The recordings were manually transcribed into a total of 146 pages, formatted in Times New Roman, 12-point font, with 1.5 line spacing. The shortest transcription was 8 pages, while the longest reached 16 pages, reflecting the depth of responses from different participants. The data analysis followed iterative reading and debriefing processes. Firstly, two researchers individually gathered textural qualities (Moustakas, 1994) about the program. Second, the initial themes and codes were refined and consolidated through debriefing discussions to achieve freedom from suppositions (Moustakas, 1994). Hence, this iterative process guided the researchers to synthesize the underlying meanings of the program. It should be noted that no program supported by AI was used in this study, and all data was manually analyzed following data collection in 2021. The manual analysis allowed for a deeper, context-sensitive exploration of teacher educators' perspectives, ensuring that the meanings and nuances in participants' responses were carefully interpreted.

Trustworthiness and the Roles of the Researchers

The study utilized multiple researchers, peer review, iterative analysis, and expert opinion strategies to obtain validity. The semi-structured interview protocol was developed based on several experts' opinions, and multiple researchers attended to collecting, analyzing, and interpreting the data procedures. The interviews were transcribed separately by the first two researchers, independent users in English. Data analysis was conducted iteratively, with peer discussions ensuring consistency in coding. Initially, intercoder reliability was assessed using Miles and Huberman's (1994) formula, with the highest similarity rate (76%) observed between the first and third researchers. As this rating fell below the commonly accepted threshold for strong intercoder reliability (typically 80% or higher), additional measures were taken to enhance coding consistency. First, the coding framing (O'Connor & Joffe, 2020) was collaboratively developed between the first and third researchers, which ensured a systematic and transparent approach to coding. Second, regular debriefing sessions were conducted where emerging themes were compared, discussed, and refined by all the researchers (Saldaña, 2013). For instance, through these discussions, consensus was reached on key themes such as program rationale, program development process, program management, and metaphors, while alternative categorizations -such as benefits of 21st-century skills, characteristics of 21st-century teacher education programs, needs for an integrated 21st-century skills program, and recommendations for curriculum development- were reconsidered and refined. By implementing these strategies, the study ensured that coding discrepancies were minimized, and the final thematic framework reflected a shared understanding among the researchers.

On the other hand, the first two researchers, English teachers, and the third one, a professor at a state university, tried to do their best to portray the participants' perceptions and experiences by reducing their suppositions and acknowledging the significance of a good teacher education program. Any experience related to the researchers was bracketed and discussed in the debriefing. Nevertheless, participant feedback was not obtained because of the participants' busy schedules due to the COVID-19 lockdown. However, the researchers took notes during the interviews and asked further questions for clarity to reach the best understanding of the participants' perceptions and experiences.

FINDINGS

The participants' experiences with the program mainly indicated three themes: the program's rationale, design process, and management. Additionally, their perceptions depicting the program were presented with the metaphors they used.

The Rationale for the Program

The participants' reflections on the shortcomings in the pre-service teacher education programs or applications and the demands of today's world indicated the rationale for such a program. Their insights collectively underscored the rationale for rethinking and redesigning pre-service teacher education programs to better align with 21st-century skills. Accordingly, the findings related to this theme are presented as follows:

The participants highlighted shortcomings in the current pre-service teacher education programs, as mentioned by P6: "I think the current programs are far from providing 21st-century skills.". Also, their critiques mainly centered on the inefficiency of these programs in equipping teacher candidates with essential skills. Accordingly, they noted that graduates often lack crucial skills such as techno-pedagogical skills, inclusive education, communication, cooperation, curriculum literacy, and critical thinking. P12 illustrated this gap by stating, "… when they (teachers) do not know anything about inclusive education, it will be really difficult to cooperate." Similarly, P1 underscored the deficiencies in critical thinking and curriculum implementations by asking, "What is the curriculum and how to apply it? … I find teachers very deficient in raising questions, preparing assignments, and projects using critical

thinking skills."

On the other hand, some participants acknowledged the inclusion of the skills in the programs, but they noted some problems. As P7 mentioned, "Most of them (programs) focus on preparing them (teacher candidates) to be good teachers for an ordinary school. And yes, 21st-century skills are present, but a little bit, it is not in the core of my discussions, definitely not.", the skills in the programs are minimal or not at central focus. Others highlighted the limitations that hinder effective implementation or skill development: "We do not have much space in our program to really run it, design and run it based on this kind of inquiry-based learning or inquiry-based teacher education." (P11). "There is an elective course on critical thinking (in the program). But when you limit it to two hours and an elective course, will this skill improve? Or offering an elective course? I mean, will we limit it to the students who take that course?" (P6)

Besides, the participants remarked on the lack of a specific vision for teacher education at faculties: "There was nothing (vision statement) at the institution. I have not heard it (such a vision) from any administrators. Neither (from) the dean nor the rector. I cannot say that I have witnessed at our university and other universities." (P3). Also, they indicated that current programs are prepared centrally and demand strict implementation, leaving no room for teacher educators to adapt their programs to today's educational needs. P11 illustrated this challenge by stating, "… It is mostly regulated by our Ministry of Education. So, the federal government has a lot of power in controlling the teacher education program because we follow their regulation. And I mean, that is how we want our teacher education and also our public schooling as well."

They also criticized traditional approaches in teaching in terms of the domination of discipline-based knowledge, teacher candidates' characteristics, instructional methods, assessment techniques, and learning levels. Discipline-based knowledge dominance in programs leads to teacher candidates' difficulty in practice, as in the following: "Teachers learn a lot of discipline-based knowledge. But I think many students, those student teachers, they want to know more about how they can actually use this kind of discipline knowledge to really teach the students. … I think that is the confusion or maybe difficulty that our students might have when they become teachers." (P11). Similarly, P4 highlighted the disconnect between theoretical instruction and meaningful learning by stating, "We (Teacher educators) are trying to teach all the accepted theories like learning theories, developmental theories, all the knowledge that found. (However) We cannot gain knowledge either." Besides, the participants noted that traditional teaching approaches and exam-oriented assessment cause teacher candidates to become passive recipients: "How do you make students expressing themselves in the primary school so silent when they come to university? We make children silent, not questioning, not asking, not researching, not expressing themselves." (P5). "(Teacher candidates) take the lecture notes, memorize them, take the exam, and pass." (P3). These insights pointed out that current programs might stifle the essential skills such as creativity, critical thinking, and problem-solving for the 21st century.

Furthermore, the participants highlighted the demands of today's society and classes:

We have classes that have children from very different backgrounds, not just traditionally different, like social class and gender and all that. We have refugees and immigrants now in our classes. We have kids that do not speak the language of the country. And so, we have a very big gap between the children. Some children are better prepared for school, and others are not. … We (Teacher educators) have to prepare them (teacher candidates) for this kind of class, a multi mix-ability class (with) different demands (and) different needs. (P2)

In addition to changing classroom demands, they pointed out the 21st century demands regarding the changing world, labour market, arguments in scientific papers, meeting students' needs, and collaboration. For example, P10 noted that teachers required to prepare the next generation for a rapid world may not teach something they do not have. Additionally, the participants mentioned the demand

of the labour market: "(In) every government, they talk about the need of creative or you know competent human capital or human resources whatsoever." (P11) and "The employers are expected this kind of skills regardless of domain. They expect the graduates have these abilities." (P10). However, they underscored teacher candidates' struggle to meet these demands. P11 highlighted this challenge by stating, "… when they become teachers, start teaching, (and) then they suddenly have this demand of promoting the students' 21st-century skills, which they do not have much knowledge or skills. So, I think that is really an issue." Furthermore, they noted that collaboration is needed to meet these demands: "Recently, schools are very competitive places. … The job (teaching) is now far too difficult for us to do it individually. … The teacher has (to) be able to negotiate and (be) willing with the parents, collaborate with colleagues, get assistance from where they can." (P2). These perspectives underscored the urgency of equipping teacher candidates with the necessary skills, knowledge, and support systems to navigate the evolving educational landscape.

The participants' reflections also suggested that such a program is essential for personal growth to become more autonomous, flexible, satisfied, and influential teachers. For instance, P11 emphasized that teacher candidates will be more autonomous, beneficial, and happy since they achieve students' happiness with the program. Besides, teacher candidates can be empowered through "caring and sharing" (P12), which contributes to the community's progress "as being a G-7 country" (P1) and globalization because "The 21st century is like a mixed soccer team demanding global teachers." (P8). Moreover, they added that the skills are crucial to life: "If you do not have these (21st-century skills), you cannot survive as a teacher." (P2), "(They are essential) to succeed in different career(s)." (P10).

The Development Process of the Program

The participants' perspectives also uncovered the key aspects of the program development, including its design, implementation, evaluation, and improvement. Accordingly, the participants mentioned the program's structure, learning outputs, content, teaching and learning process, and assessment dimensions. They explained that the program should be interdisciplinary and multidimensional and should capture the link between objectives, teaching and learning methods, and assessment as in the following: "It should be multidimensional, it should be interdisciplinary and cooperating with some other teachers." (P12). P10 also added that the link between objectives, teaching, learning, method, and assessment could capture this program.

Regarding the program's intended outcomes, the participants emphasized the need to equip teacher candidates with a diverse range of competences, including digital, language, and learning-to-learn competences alongside thinking, transformative, interpersonal, problem-solving, research, and teaching skills. As P1 highlighted, "Especially since technology has become a necessity rather than an option, digital teaching, digital programs, (and) digital teaching materials will come into our lives more and more from now on. That is why teachers need to get stronger in these techno-pedagogical field competences." (P1). Beyond technical skills, they also pointed out the importance of inclusivity and respecting others: "So, they have to respect each other's background; they have to respect each other's diversity, choices, and it is really important that they are not going to you know classify the students and classify the other people based on what they do or how they do." (P12). Besides, they stated that the program should enhance a teacher identity (P5) by fostering cognitive and affective skills in a balanced way (P4). Furthermore, P2 mentioned a competency in legislation emphasizing the importance of accessing people in critical positions in the education system. Moreover, the program should promote capability awareness as highlighted by P12, "Personally, we pay too much attention to teaching teachers how to actually help students to recognize their own competencies, capabilities." Some participants also stressed the need for multiple literacy skills, including curriculum, digital, and media literacy: "A teacher should have curriculum development skills, that is, a teacher should know how to develop and implement the curriculum, and how to evaluate it." (P5) Lastly, they expressed that the program should encourage

flexible, entrepreneurial, innovative, and creative teacher development and broaden teacher candidates' perspectives, as stated by P2, "You have to open your mind. You (have to be) open to new ideas and new experiences. You have to travel. You have to get in touch with different people and become a much richer person."

The participants also emphasized that the program's content should encompass a balanced integration of critical thinking, communication, cooperation, and creativity skills -commonly known as 4Cs-alongside disciplinary and humanistic knowledge:

> One is, of course, foundational knowledge. … The second piece is what typically people talk about in terms of the 4Cs, creativity, collaboration, critical thinking, (and) those kinds of things. … I think a third component that is our framework is sort of what we call humanistic knowledge. So, these are the values and principles that we bring to work that we do. It would be things that facilitate, would be things around understanding of the global context within which we work, you know, and so the ethical and moral. (P9)

Moreover, the participants underlined that skills should be integrated based on the discipline rather than a separate course:

> 21st-century skills can be taught in every lesson. For example, critical thinking skills and creative thinking skills should not be isolated topics, but instead they should be fostered through creative assignments, though-provoking questions, activities, and assessments. This way, students are naturally encouraged to think critically and creatively. Over time, these skills become more than just academic—they evolve into a mindset, a way of viewing and interacting with the world. (P1)

For the program's teaching and learning process, the participants implied that the program should offer project-, problem-, practice-, inquiry, and discussion-based activities providing real-life situations:

> It is necessary to give them (teacher candidates) opportunities to put these skills to work, both based on the lessons and teaching practices. Maybe, it is necessary to create different environments in schools where they can put these skills to work, even at the university, if not at school. Otherwise, I think that if we put it in the lesson and leave it, we will not get results. (P4)

Besides, the participants emphasized collaborative activities, establishing cooperation between teacher candidates from different disciplines and individuals outside the university. They also recommended that the activities, including different digital tools, should be supportive, structured, and student-centered. Moreover, they underlined that the program should provide all these activities offering options and ranging in time. The participants also underlined that the program should offer formative assessments, including portfolios, feedback, and assignments with options, open tasks, and group work. For example, P10 remarked that peer feedback is fruitful for pre-service teachers. P9 emphasized performance-based assessment: "I always talk of performance as an understanding. So, what kinds of performances of understanding as a learner are you providing? You know, a test or a quiz is one kind of performance of understanding. …But I think that more attempted project-based, concrete projects that you create something is the way that all of these things get integrated."

The participants' experiences indicated some design principles and the steps to follow when designing the program. Firstly, they mentioned that considering every detail, re-questioning everything, and being aware of a long process with an evolutionary perspective are needed. For instance, P9 shared that they (educational designers) are attacking the problem at every level; they decorously reimagine and

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re-question things while mentioning their design process. Similarly, P4 remarked on an evolutionary perspective needed in designing such a program:

> We (teacher education policymakers) tend to adopt a revolutionary approach, therefore, we propose a new program, a new thing, by destroying everything (and) ignoring past experiences. That is not appropriate for the program development process. I think that an evolutionary approach must be adopted in curriculum change instead. … It should be developed with a constant revision, I mean by renovating, monitoring, evaluating, revising (and then) going back to the starting point.

The participants' insights pointed to the necessity of a comprehensive and adaptable program that integrates multiple skills, aligns with cultural contexts, and bridges the gap between humans and technology. They also emphasized the importance of covering all learning domains, combining various skills within courses, and believing in the importance of the skills. As P12 pointed out, adapting the skills to the cultural context is crucial, "I think we use these skills, but we had to adapt them to our national context, the cultural context." Moreover, they stressed the significance of designing a well-structured program that balances theory with practice. P11 pointed to successful international examples by stating, "They (the countries with best practices) have very well-designed programs. So, I think in terms of the balance between theory and practice, they will be probably the best or maybe the ideal example." In this regard, P1 noted the importance of proper implementation by emphasizing the delivery of practicum and theory courses as required to maximize skill development. Additionally, P8 introduced the concept of connectivism in the program's design, highlighting the need to integrate human interactions with technological advancements: "We need to start with connectedness in the program model. … We need to connect humans to technology. We need to achieve this connectedness in designing (a) new program. This is called connectivism."

The participants also stated that a connection with K-12 education and a balance between the government's demands and students' needs should be established. Again, pointing to the successful international examples, P11 explained the importance of the balance between the demands and commitment to the achievement of the program: "There is some connection with this kind. They (the country with best practices) have in their national curriculum. … Managing that balance between those governments' needs and the teachers' all commitment to students think that will be important." (P11). They also remarked on a transparent and data-driven design process when designing the program: "(Once) It is (the design plan) shared with everybody. People get feedback. Then you move on" (P9), and "We were doing accompanying curricular research on pre-service teachers (at the same time) when we were developing the curriculum." (P12)

Furthermore, the participants also stressed the need for building a design team, needs analysis, vision and goal setting, creating debates, setting design principles and plans, defining outcomes and the core subjects, and piloting the program when designing the program. While P9 noted the importance of including the community in building a design team, others mentioned teachers, students, and auditors must also take place in the design team: "I think the first thing you really need to do is get community buy-in, I mean broader stakeholders. Everybody has to feel that they are part of the conversation, that this is not something that's being imposed on them." (P9) "The people with best practices on these (21st century) skills should have a role in this team. ... The teachers and administrators are critical at that school. I mean, they can define the problems best." (P3) The participants also added that a shared goal or vision should be set, and it might be achieved through creating debates: "Drawing different stakeholders' ideas about it and trying to deliberate and negotiate the different perspectives, different ideas, and come up with a certain agreement about what is really the direction that will be the plan for restructuring." (P11) "Design principles and plans should also be organized after setting the visions and goals." (P9)

Additionally, the participants highlighted defining learning outcomes with the core subjects and including the experiences in the design process: "I think basic program outcomes should be discussed at length. So, what qualifications should they be equipped with after four years?" (P1), "I would keep some of the core courses, not the same, but at least not content-wide the same but least focus the same." (P7), "They (teacher candidates) will try them on kids. Otherwise, you cannot develop those skills by saying, just 'giving here is this skill; here is that skill.'. They cannot be delivered theoretically." (P6) Lastly, P4 emphasized that piloting the program is necessary.

Regarding the practice and evaluation of the program, the participants underscored that more autonomy, good command of instruction, and an agreement for collaboration with practice schools are needed for the program implementation. "I want to be free to teach in my class the way I see fit, to place my own priorities in the courses, and teach the values that I believe important for the teachers." (P2) Also, stressing that program development is an ongoing process, they all highlighted the necessity of a constant evaluation process, periodic feedback, several meetings, and iterative revisions to ensure its effectiveness. P2 pointed out the dynamic process of program design by stating, "We make changes all the time, new ideas, new adoptions. So, it is an ongoing process." Similarly, P4 reinforced the importance of systematic revision cycles by asserting, "It needs to include cycles based on revisions. Without this process, personally I do not think that we can achieve it even if we build a good team and integrate the skills in the best way."

Management of the Program

The participants' insights also uncovered the management process for the program's sustainability, identifying key requirements at policy, faculty, and student levels. A recurring theme was the need for a systemic shift in understanding and implementation, particularly at the policy level, to ensure consistency and effectiveness across all levels of education. P2 described the challenge when facing outdated political structures by stating, "You have to battle with the education system of the ministry and the various old fashioned, I do not know, people who work there, that is the problem. They should develop as well." Similarly, P3 emphasized the limiting effects of standardized assessments, noting, "Naturally, students think that they will pass the classes by taking exams. Or a test called PPSE (Public Personnel Selection Exam) ahead. I mean, what does PPSE measure? So they just focus on them." Beyond policy constraints, the participants' reflections entailed the importance of a change in ethical and moral understanding to manage the program effectively. P1 pointed out, "We have serious problems related to values, ethics, (and) work discipline as a country now. We have conflicts, lows, and highs." Meanwhile, P9 emphasized that strong educational leadership is crucial for fostering an environment where teacher candidates feel empowered to experiment, innovate, and engage deeply in learning: "It is only educational leaders who can create those spaces where teachers can feel free to play and to try different things, possibly fail once in a while, but also engage their learners in a much better way." Acknowledging the complex and gradual nature of systemic change, participants recognized that transforming teacher education is a long-term process. P9 illustrated this reality by stating, "Can we declare victory? No way. Never. … I see us doing this work for the next ten years. ... So, I think we are at an early stage of a very complex process."

Another key concern raised by the participants is the need for improvements at school levels, particularly in terms of physical infrastructure, institutional support, and alignment with K-12 curricula to ensure the program's management. P9 highlighted the structural challenge of the schools, stating:

I think the biggest constraint is the structure of school(s) that we have. And that's sort of a lot of my work now is asking how that structure can be changed. Like, can we think of space differently? Can we think of the kind of pedagogical approaches that we have differently? Can we think of teacher training differently? But none of that is going to occur until we reimagine what redesign how schools work. Like, how schools are set up. Right? I think that is the biggest constraint in the space.

On the other hand, P2 pointed to the disconnection between pre-service teacher education programs and real-world school environments: "Then the problem is when they (teacher candidates) go to school, and they find a different world. And the teachers tell them, 'Do not listen to the university, the real world is not like that.' That is our biggest task." Additionally, the participants stressed that 21st-century skills should not be limited to higher education. However, they should be integrated into K-12 curricula to create a more seamless learning progression: "So, if they expect these skills to be part of the academic preparation and not only academic, we can talk about this also in the pre-university curriculum." (P10). Moreover, the participants emphasized the importance of system-wide consistency and long-term vision in managing the program:

I would say cohesion. ... I mean, these factors involved in deciding how the teacher training is going to be. To look for everything not to change every year (but) just to have a vision and stick with this and support. (P10)

At the faculty level, the participants noted that teacher educators need time and freedom of speech to ensure the program's management and sustainability. They raised concerns about the limited opportunities for teacher educators to engage in discussions and shape the future of teacher education. As P7 noted, "Teacher educators together are discussing and sharing with each other how they see the future of teachers and teacher education. ... So, they need to have time and maybe also help to develop ownership about that." Furthermore, participants stressed the importance of freedom of speech and greater involvement in policy decisions, arguing that faculty members should have a voice in shaping teacher education policies. P2 expressed this concern, stating, "I need to be heard by the policymakers. I need to be able to express myself freely outside the university." The participants also explained that collaboration with change agents, other scholars, and ownership are required for the management of the program. P10 emphasized the value of collective efforts, stating, "We are facing similar problems, similar challenges. And if we get united or help each other, maybe that will ease our work." The need for trust and institutional support was also underscored, with P3 asserting, "We will trust in academics. We do not have any other option." Similarly, P9 highlighted the importance of resilience in the face of setbacks, stating, "We just pick ourselves up, and we move on, and we hope we learn something from it. You know, every move." Moreover, stronger communication among faculty members was recognized as critical in fostering a collaborative and forward-thinking academic environment. P10 reflected on this need, stating, "Sometimes we do not speak enough with one another about this. This level of communication between us I think it is very important."

Finally, the participants remarked on the needed infrastructure at the faculty level through resources, classroom sizes, and educational environment: "Maybe a common database with such kinds of resources, tips, or things like these would help teacher educators not to feel alone or isolated in their world." (P10). The participants also articulated the need to raise teacher educators' qualities, underscoring the importance of mindset:

Let us say we have achieved the integration of 21st-century skills into all pre-service teacher education programs. This does not assure teacher candidates' skills development because curriculum development is a multidimensional process. Teacher educators should also need some education, and their mindset in teaching should change. (P4)

Additionally, the participants emphasized that the professional development activities for teacher educators should be continuous and include both top-down and bottom-up approaches, as illustrated by P7: "There needs to be a combination (of top-down with bottom-up approaches)." Furthermore, they advocated for the recruitment of experienced teacher educators, including senior and retired teachers, to strengthen faculty expertise:

I think the qualities of that stuff should be first and foremost… I believe that senior or retired teachers could also be highly beneficial. In fact, a dedicated faculty position could be created for them. This was something I saw in the U.S., for example. They called it "adjunct professor," referring to professionals who have extensive experience in the field or industry. (P1)

Finally, the participants noted that student preparedness also plays a crucial role in the success of teacher education programs. They stressed the need for teacher candidates to be open to innovation and equipped with digital competencies. P7 remarked on this challenge, stating, "On the side of students, there needs to be some kind of openness to innovation. … They are hesitant to start new things."

Metaphors Depicting the Program

The participants used metaphors to describe pre-service teacher education programs integrated with 21st-century skills, each reflecting a different perspective on the process and its impact. While not all participants articulated metaphors, those who did offer vivid and thought-provoking imagery that sheds light on the complexity and transformative potential of such a program. The metaphors - battle, blooming flower, powerful guidance, water, and walnut - convey insightful interpretations of the challenges, opportunities, and transformative potential of such a program.

The program as a battle

P2 employed the metaphor of battle to illustrate the struggles and challenges involved in implementing and sustaining the program. Also, the sharp tone in her voice when describing the program might be the reflection of her struggles: "Everybody is well, theoretically, so keen on this philosophy of sharing and collaboration and this and that. But this contradicts producing a perfect team. … So, it is a constant battle … sometimes we win, sometimes we lose."

The program as a blooming flower

Conversely, P11 described the program as a blooming flower, symbolizing personal and professional growth:

To me, the ideal way would be seen like a blooming flower so every student-teacher can follow their own path to bloom their own flower. You know they have their own strengths and own interests as well. And the teacher education really can provide some kind of opportunities to really boost this and let them grow as a teacher who can make (a) good impact on their students.

This metaphor can be interpreted as teacher candidates' self-actualization as it assists them in uncovering their potential, ultimately enabling them to positively impact the educational environment.

The program as powerful guidance

P1 used the powerful guidance metaphor to highlight the program's role in empowering future teachers: "The program reminds me of setting off with more powerful, more qualified guidance. Like, I imagine a teacher candidate empowered in all terms." This perspective positions the program as a guiding force that strengthens teacher candidates, equipping them with essential skills and confidence.

The program as water

P5 described the program as water, emphasizing its infinite nature, continuous learning process, and essential role in lifelong education:

It feels like infinity, like continuous learning. I can describe it as lifelong learning, especially because 21st-century learning skills play a crucial role in this ongoing process, enabling

individuals to become active members of society. I could also compare it to a resource—a single term that encapsulates access to everything, an integrated source of knowledge. Or perhaps I could call it water—because water is life.

This metaphor illustrates that the processes of learning, teaching, and feedback form a continuous, dynamic cycle, and the program as water is at the center nourishing the growth of teacher candidates and teacher educators.

The program as walnut

Finally, by emphasizing the right time in 21st-century skill development, P6 described the program as if hulling a walnut:

(The program is) like a walnut. It is tough to crack the shell. When you manage it, you may encounter worms or an infected walnut. You may have been too late for everything. However, when it is not infected, that is priceless. ... Walnut fresh from the tree. It can stain your hands when you do not hull it correctly. That is why, you need to know how to hull, how to eat, or how to crack it. Otherwise, you mess up.

This metaphor suggests that gaining 21st-century skills requires careful planning and timely intervention. Otherwise, unintended results can be obtained. Therefore, timing and careful planning in skill acquisition should be approached with precision, much like cracking a walnut at the right time - if done too late, the opportunity may be lost, and if done incorrectly, the process may become messy or ineffective.

In sum, the water metaphor refers to the vitality of 21st-century skills and the program, emphasizing their essential role in sustainable educational growth. In contrast, the battle and walnut metaphors indicate the difficulties and careful planning involved in the integration process, underscoring the need for resilience and strategic preparation. Meanwhile, the blooming flower and powerful guidance metaphors demonstrate the program's ultimate goal -empowerment and meaningful transformation- when it is achieved. Collectively, these metaphors illustrate the multifaceted nature of integrating 21st-century skills into pre-service teacher education, acknowledging both the obstacles and the transformative potential such a program holds when effectively designed and implemented.

DISCUSSION, CONCLUSION, RECOMMENDATIONS

The participants' experiences showed that the pre-service teacher education program integrated with 21st-century skills is needed in all contexts. All the participants from different countries surprisingly emphasized that the current pre-service teacher education programs are inadequate for developing the skills. Similarly, the literature argues the translations of policy initiatives and statements to educate students for the 21st century into today's classrooms (e.g., Lamb et al., 2017; Tan et al., 2017). In parallel with this argument, the study uncovered that the current teacher education programs from developing to developed countries could not achieve students operating in the 21st century. These findings are further supported by a recent meta-analysis of 32 research articles (Kausar & Ajmal, 2024), which underscores the widespread inadequacy of current teacher education programs in fostering 21st-century skills. Similarly, a systematic review of 55 studies has found that existing teacher education programs have limited actionable strategies for teaching 21st-century skills (Almazroa & Alotaibi, 2023). Research conducted in OECD countries also indicates that, although 21st-century skills are addressed in national curricula, there are minimal or no clear guidelines on how to teach them effectively (Ananiadou & Claro, 2009). Therefore, teacher education should be reconceptualized as a moral and intellectual activity rather than a form of technical rationality (Tan, 2019), as this study pinpointed the dominance of traditional teaching approaches. Nevertheless, the 21st century is demanding, considering

technological advancements, globalization, a multicultural society, and a knowledge-based economy (Maphosa & Mashau, 2014). As the study depicted, today's teachers should be equipped with various skills to meet these demands.

With a multidimensional understanding, the participants suggested that these skills should be integrated within the program rather than proposing a separate course parallel with other studies (Domine, 2011; Gut, 2011). By synthesizing and integrating the skills, the program should be based on different skills and higher-order thinking (Häkkinen et al., 2016) and the profiles of the pre-service teachers (Cretu, 2017; Greenhill, 2010). Hence, by tailoring to the students' varying needs, abilities, and learning preferences (Tan, 2019), the program should include a well-organization of skills, knowledge, and values (Maphosa & Mashau, 2014; Tan, 2019) and case-based teaching methods (Dwikristanto & Khaerudin, 2024). Furthermore, the participants indicated that the program should provide learning experiences encouraging collaboration, communication, options, and digital tools. Through both on-campus and off-campus experiences, the engagement of teacher candidates in the skills should be enhanced.

Besides, the participants emphasized including the community in the design process of the program. Similarly, Hammerness et al. (2005) note that creating a coherent program with only faculty members having no practice experience is complicated. Moreover, a qualified collaboration between stakeholders will positively affect designing the program based on 21st-century skills (Adeosun, 2014; Ferreira et al., 2024; Shidler, 2024). Nevertheless, collaboration and autonomy are critical in the program's implementation since teacher educators need autonomy rather than being told what to do in classes (Aslan, 2015). For the evaluation of the program, the study revealed that teacher educators should constantly revise and renew curricula through cooperation and communication by following advancements.

Despite the participants' experiences in different contexts, the management of the integration process requires intellectual and practical recasts at policy, faculty, school, and society levels jointly, as in the P21's (2019) study. Gordon et al. (2009) also recommend "maximize the coherence and synergy between the national formulation of key competence strategies, and more local implementation choices" (p. 236), and agencies and teacher educators should be dynamic associates in the policies for pre-service teacher education. Hence, instead of the only "heroic" (Lamb et al., 2017, p. 46) stakeholders, all the stakeholders should collaborate in curricular events for the integration process with a shared paradigm and innovative mindset.

Adeosun (2014) states that collaborative and communicative studies of teacher educators for integrating 21st-century skills are essential, as the participants claimed collaborative leadership at the faculty level. In a collaborative management context, policymakers' decisions, with the participation of others, facilitate integration initiations at the faculties. Teaching-focused personal and social networks improve 21st-century skills at the faculty level (Benbow et al., 2021). As the participants said, K-12 schools practicing 21st-century skills with the proper physical structure and curricula offer teacher candidates the opportunity to experience these skills. To apply holistic understanding in integrating the skills (Maphosa & Mashau, 2014), faculty members and K-12 workers should study cooperatively. An advanced society in all areas offers cultural support for integrating these skills in school and teacher education programs.

The participants remarked on teacher educators' need for professional development in the integration of 21st-century skills, as Gordon et al. (2009) emphasize the importance of training teacher educators. Similarly, Bozkurt (2021) revealed that the inefficacy of teacher educators hinders teacher candidates' ability to achieve 21st-century skills. Competencies such as creativity, technology, and cultural awareness can be new for teacher educators; therefore, teacher educators are required to be competent learners and users.

In fact, it was understood that the freedom of the stakeholders is a critical component of the teacher education program, as in some studies (Aslan, 2015; Cretu, 2017; Greenhill, 2010). Teacher educators demand to be free for curricular decisions compatible with the primary skills in the 21st century, such as creativity, critical thinking, and metacognition (Lamb et al., 2017; P21, 2019). Consequently, teacher educators and teacher candidates prefer to work with managers who are collaborators but not authorities.

Producing a metaphor for a teacher education program integrated with 21st-century skills was challenging for the participants. However, they explained the requirement of such a program with the metaphor of water, like the survival skills metaphor of Saavedra and Opfer (2012). The metaphor blooming flower means teacher candidates' self-actualization, which can be related to another metaphor, powerful guidance. The metaphors battle and walnut show that the participants perceive the integration as a painful process as the competence of perseverance described by Lamb et al. (2017). In sum, they believe that 21st-century skills are vital in many ways.

Limitations and Implications

While this study provides valuable insights into integrating 21st-century skills into pre-service teacher education, it has some limitations. First, the sample size is relatively small, comprising only 12 teacher educators from seven countries, which may not fully capture the diversity of experiences across different educational contexts. Second, the study only relies on self-reported data from semi-structured interviews, which are inherently subjective and may have been influenced by participants' personal biases. Also, the study did not employ other data collection tools to provide and triangulate a more comprehensive understanding of pre-service teacher education with 21st-century skills. Additionally, since data collection occurred during the COVID-19 pandemic, external factors such as remote teaching challenges may have influenced the participants' responses. Therefore, further studies are recommended to address these limitations by employing a mixed-methods approach, including larger and more diverse participant samples, as well as observational and longitudinal data collection.

From teacher educators' experience and perceptions, this study uncovered notable findings about a pre-service teacher education program integrated with 21st-century skills. First, the current programs are inadequate in preparing teachers to meet the demands of the 21st century, whatever the country's context is; therefore, it is vital to integrate the skills to achieve multiple literacy and capabilities into the programs with a good change policy and collaboration. However, for the integration to be successful, it must be well-organized, balanced, and systematically designed. A clear change policy and collaboration across stakeholders are also vital. To design such programs, the following practical steps are recommended:

- Establish a multi-stakeholder design team including teacher educators, policymakers, curriculum developers, and in-service teachers.

- Conduct a needs analysis that incorporates feedback from schools and communities to ensure contextual relevance.

- Apply backward design principles, setting clear learning outcomes aligned with 21st-century competencies such as collaboration, creativity, critical thinking, and digital literacy.

- Build curricular flexibility to adapt to future needs and technological advancements.

- Provide collaborative and inquiry-based learning opportunities, both on-campus and in real-world, off-campus settings, to allow teacher candidates to meaningfully practice these skills.

Furthermore, the study displayed that the program's success depends on the policy, faculty, and student-level requirements. Accordingly, a change in understanding and infrastructure is needed at the policy level. National and institutional frameworks that mandate the integration of 21st-century skills across teacher education curricula could be developed. This might include aligning ministries, accreditation bodies, and universities to support systemic change and investing in digital infrastructure to promote innovation in teaching and learning. Additionally, at the faculty level, the study indicated that teacher educators need time, freedom, collaboration, training, and resources, so, ongoing professional development for teacher educators on innovative pedagogies, digital tools, and inclusive practices should be provided. Also, institutions should provide time and space for collaboration, reflection, and co-creation among faculty members, enabling sustained program improvement. On the other hand, fostering an innovative mindset and effectively applying

digital skills are essential requirements for student-teachers at the individual level. This can be achieved through scaffolded learning experiences such as micro-teaching, internships, and collaborative projects. Additionally, digital skills training should be integrated into both coursework and practicum components.

For the evaluation of the program, formative assessment tools should be implemented to to evaluate both skill acquisition and program effectiveness throughout the teacher education journey. Additionally, feedback loops from graduates, mentors, and partner schools could be used to continuously revise and improve the program. Lastly, teacher educators' perceptions depicted the program's vitality and difficulty with metaphors. These metaphors can be used as reflective tools in professional development sessions to deepen faculty understanding of the emotional and practical dimensions of change.

Consequently, this program requires significant effort and collaboration from various stakeholders. However, the end result will be fruitful as it might prepare teachers to meet the demands of the 21st century. Apart from the implications for the program mentioned above, this study can offer further studies on the design, evaluation, and implementation process of the program by using the study's findings. The results might be argued with teacher educators from different contexts so that a shared paradigm for designing such a program could be developed.

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