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PREPARING PRE-SERVICE TEACHERS TO FOSTER AND APPLY THE FOUR CS IN AND BEYOND THE CLASSROOM FOR HOLISTIC 21 ST-CENTURY READINESS

Abstract

This study examines how pre-service teachers can be prepared to foster and apply the four essential skills – critical thinking, communication, collaboration, and creativity (Four Cs) - within and beyond the classroom for holistic 21st century readiness. Situated in the Kazakhstani policy context, the research employed a qualitative design comprising two focus-group discussions with final-year pre-service teachers (n =15) and semi-structured interviews with teacher educators (n = Cs10). Thematic analysis of transcripts identified three cross-cutting domains: (1) benefits of integrating Four Cs, including enhanced student engagement, higher-order problem solving, creative expression, and workplace relevance; (2) challenges to implementing Four Cs, including curricular overload, limited time and resources, uneven student readiness, and hesitancy toward pedagogical change, compounded by gaps in technological and pedagogical training; and (3) strengths and opportunities for improvement Four Cs, including project-based and inquiry-based learning, flipped classrooms, purposeful technology use, and cultures of peer mentoring and reflective practice. Findings point to the need for institutional commitment and a whole-system approach: flexible curricula, sustained professional development, access to digital tools, and mentorship structures that build teacher confidence. The study offers actionable recommendations for teacher-education programs to embed the Four Cs systematically, aligning policy aspirations with classroom realities and better preparing pre-service teachers to lead student-centered, innovation-driven learning.

Keywords: 21st century skills, Four Cs, communication, collaboration, critical thinking, creativity, pre-service teachers.

Introduction. In the 21st century, the role of teacher educators extends beyond traditional teaching methods, requiring them to cultivate essential skills that prepare pre-service teachers for an increasingly complex and interconnected world. Among these, the Four Cs are widely recognized as fundamental for academic success, career readiness, and lifelong learning. Therefore, preparing pre-service teachers to integrate the Four Cs into their teaching practices is essential to ensure high-quality education that meets the demands of modern society.

The development of these competencies requires innovative approaches in teacher education. As the Law of the Republic of Kazakhstan on Education states, one of the primary goals of the education system is to create conditions that support personal and professional development based on national and universal human values, scientific and practical advancements, new teaching methods, technology integration, and access to global communication networks [1]. To achieve this, teacher educators must move beyond traditional pedagogical frameworks and actively seek new strategies, innovative practices, and continuous professional growth. This shift is essential for equipping pre-service teachers with the skills necessary to adapt to the evolving demands of the profession and effectively support student learning.

Similarly, the State Program for the Development of Education also emphasizes the importance of fostering creativity, collaboration, and critical thinking among students, requiring teacher educators to implement student-centered approaches and interactive learning methods. In addition, Article 7 of the Law "On the Status of a Teacher" highlights the necessity for teacher educators to engage in creative initiatives, develop and apply original teaching methods, and integrate modern pedagogical strategies [2]. The above-mentioned legislation framework demonstrates that teacher education programs play a crucial role in enhancing "Four Cs" of pre-service teachers, including critical thinking, collaboration, communication and creativity. In addition, it aims to ensure that pre-service teachers are prepared to effectively address the real-world challenges in the educational field.

This national priority is consistent with the ideas expressed by Kassym-Jomart Tokayev in his 2020 State of the Nation Address to the People of Kazakhstan. In his address, he emphasized the need for new and innovative approaches to education and highlighted the importance of using international experience in implementing educational reforms [3]. This national vision reinforces the urgency of modernizing teacher education programs to align with global standards and effectively prepare pre-service teachers for the demands of 21st century classrooms.

Despite the recognition of 21st century competencies in educational policies, many teacher preparation programs still struggle to effectively integrate these skills into practice. Research indicates that gaps remain between curriculum intentions and actual implementation, particularly in developing critical thinking, creativity, and problem-solving abilities among pre-service teachers [4]. Twenty-first century education can be understood as an approach that prepares learners to adapt to rapidly changing social, technological, and global conditions. In this context, educational systems are expected to promote not only academic knowledge but also competencies such as collaboration, innovation, responsibility, and independent thinking, which enable students to respond effectively to real-life challenges and future professional demands.

Recent research conducted in Kazakhstan highlights persistent challenges in embedding higher-order thinking skills within teacher education programs. Kabysheva found that although critical thinking is recognized as an important educational objective, it is only partially reflected in the intended learning outcomes of initial teacher education curricula. The study suggests that higher-order cognitive skills require more systematic integration into teacher preparation programs. These findings indicate that strengthening critical thinking, together with other 21st-century competencies such as communication, collaboration, and creativity, remains an important priority for teacher education in Kazakhstan [5]. Similarly, Myrzatayeva et al. demonstrated that fragmented and episodic approaches to critical thinking development are insufficient for preparing future teachers. Their findings suggest that professional readiness is strengthened when prospective teachers develop their own critical thinking skills while simultaneously learning practical strategies for fostering these competencies in school settings. These findings support the argument that the effective integration of the Four Cs requires systematic and practice-oriented teacher education rather than isolated instructional interventions [6]. Furthermore, Iskakova et al. found that specially designed educational interventions contributed to significant improvements in prospective teachers' intellectual competencies, including critical and creative thinking. The authors concluded that systematic integration of innovative teaching approaches and critical thinking methods into teacher education programs enhances future teachers' professional readiness and supports the development of competencies required in contemporary educational settings [7].

Kussametova and Tokzhanova argue that contemporary pedagogical practice requires educators to possess a combination of communication, adaptability, emotional intelligence, and creative problem-solving skills. Their findings emphasize that the systematic development of these competencies contributes to teachers' professional growth and enhances the quality of the educational process. The authors further recommend integrating soft skills development into teacher preparation and professional development programs, reflecting the increasing importance of competencies closely related to the Four Cs framework [8]. The transformation of teacher education in Kazakhstan has also been influenced by the growing emphasis on competency-based learning. Ismukhanova and Sansyzbayeva argue that modern higher education should move beyond knowledge transmission and focus on the development of professional and transferable competencies. According to the authors, employers increasingly value communication, teamwork, adaptability, and problem-solving skills alongside disciplinary knowledge. This competency-based perspective aligns with current educational reforms in Kazakhstan and reinforces the importance of integrating competencies associated with the Four Cs framework into teacher preparation programs [9].

Twenty-first-century skills, such as communication, critical thinking, collaboration, and creativity are an integral part of the modern education system. These skills are recognized as essential part for preparing students to function successfully and thrive in complex social and professional environments characterized by rapid technological advancement, globalization, and constant change.

According to the concept proposed by Voogt and Roblin [10], international educational frameworks consistently emphasize the importance of these competencies in aligning curricula with the demand of modern society. Meanwhile, according to Van Laar et al. [11], twenty-first-century skills, particularly digital and cognitive competencies, are essential for successful participation in the modern workforce.

While numerous studies emphasize the importance of 21st century skills in education, there remains a gap in research on how teacher education programs can systematically integrate these skills into their curricula. In Kazakhstan, despite educational reforms promoting innovation, many pre-service teachers still lack sufficient training and support in applying the Four Cs in their teaching practices. It aims to address the gap in exploring effective strategies for integrating “Four Cs” skills into pre-service teacher education programs and identifying the challenges teacher educators face in implementing these skills both in the learning process and beyond the classroom.

The scientific novelty of this study lies in examining the integration of the Four Cs (critical thinking, communication, collaboration, and creativity) within pre-service teacher education in Kazakhstan from the perspectives of both pre-service teachers and teacher educators. The study contributes to the existing literature by identifying perceived benefits, implementation challenges, and opportunities for strengthening the Four Cs within and beyond the classroom. In addition, it highlights context-specific barriers, including curriculum overload, limited resources, uneven student preparedness, and the need for enhanced professional support. The findings provide empirical evidence that can inform the development of teacher education programs and support the more systematic integration of 21st-century competencies in the Kazakhstani educational context.

The aim of this study is to explore pre-service teachers’ and teacher educators’ perceptions of the integration of the Four Cs (critical thinking, communication, collaboration, and creativity) in teacher education programs in Kazakhstan, with particular attention to effective pedagogical strategies, implementation challenges, and opportunities for strengthening their development within and beyond the classroom.

Research Questions

1. How do pre-service teachers and teacher educators perceive the benefits of integrating the Four Cs (critical thinking, communication, collaboration, and creativity) into teacher education and classroom practice?
2. What challenges and barriers do pre-service teachers and teacher educators encounter when fostering and applying the Four Cs within and beyond the classroom?
3. What practices, strategies, and recommendations can support the effective integration of the Four Cs in pre-service teacher education programs in Kazakhstan?

To effectively prepare students for 21st century challenges, teacher education programs must equip pre-service teachers with the knowledge, strategies, and practical experiences necessary to integrate critical thinking, communication, collaboration, and creativity (the Four Cs) both in and beyond the classroom. This study explores pedagogical approaches, real-world applications, and challenges in fostering these skills, ultimately offering recommendations for holistic 21st century teacher readiness.

The Four Cs framework is grounded in widely recognized international models of 21st-century skills, which conceptualize critical thinking, communication, collaboration, and creativity as core competencies essential for preparing learners to succeed in a rapidly changing, knowledge-based and innovation-driven society [12]. This framework categorises these skills into four main dimensions: creativity and innovation, critical thinking and problem-solving, communication skills, and collaboration skills. Each dimension has specific operational definitions. Critical thinking and problem-solving skills refer to students' ability to process information and make evidence-based decisions. Collaboration is defined as the ability to work together and share responsibilities with others. Communication encompasses the ability to convey and receive information effectively. Creativity refers to the capacity to generate innovative ideas and solutions. These Four Cs are interconnected and systematically influence one another. The concept of the Four Cs (communication, collaboration, creativity, and critical thinking), as emphasized by the Partnership

for 21st Century Learning (P21), highlights their importance as core competencies in modern education. These skills are widely recognized as essential for preparing graduates to succeed in a rapidly changing and complex global workforce. The P21 framework further emphasizes that effective development of these competencies requires alignment among curriculum design, teaching practices, and assessment systems [13].

Indeed, educational systems worldwide have shifted their primary objectives toward aligning school curricula with the demands of 21st century learning. Developing key competencies such as critical thinking, creativity, communication, and collaboration has thus become an educational necessity rather than an optional enhancement [14].

Although researchers have proposed various frameworks for 21st century skills, there remains limited consensus on precise definitions [15, 16]. Nevertheless, the Four Cs have consistently been identified as core components of 21st century competence [17]. Each of these skills reflects a unique yet interconnected dimension of cognitive and social development.

Critical thinking represents a foundational cognitive process essential for enhancing students' decision-making, analytical reasoning, and reflective judgment, playing a key role in the development of 21st century competencies among pre-service teachers [18]. It transcends disciplinary boundaries and encourages learners to make connections across diverse domains of knowledge [19]. Creativity, on the other hand, involves generating original ideas, solutions, or expressions. As Yang and Cheng note, creativity is a multifaceted process that integrates imagination, knowledge, and skill, making it one of the most comprehensive and adaptive competencies in education [20].

Communication is equally vital, as it enables students to express ideas clearly, engage in meaningful dialogue, and collaborate effectively across disciplines and cultures. Effective communication skills enhance students' capacity to solve problems collaboratively and to construct and share knowledge more productively. Finally, collaboration involves working effectively within teams to achieve shared goals. It requires individuals to integrate their abilities, expertise, and perspectives, thereby fostering collective intelligence and mutual learning [21].

Taken together, the Four Cs form the cornerstone of 21st century education, promoting intellectual flexibility, innovation, and lifelong learning. Developing these skills among pre-service teachers is therefore fundamental to equipping pre-service teachers with the ability to model and nurture these competencies in their own students.

Methods and Materials. Participants. The study involved two groups of participants.

Pre-service teachers. A total of 15 pre-service teachers (aged 20-22) in their final year of study from the Bachelor of Education program at Kazakh Women's Teacher Training University participated in the study. They were selected using purposive sampling based on their teaching practicum experience in focus group discussions.

Teacher educators. Semi-structured interviews were conducted with 10 teacher educators specializing in pedagogy and curriculum development.

Data collection methods

Focus group discussions: Two focus group sessions were conducted with pre-service teachers, each lasting approximately 50 minutes. Participants were asked open-ended questions regarding their perceptions of the integration of Four Cs skills (critical thinking, creativity, collaboration, communication) into classroom activities and their teacher training program. All sessions were audio-recorded with prior consent.

1. Benefits of Integrating the Four Cs skills

– What do you think are the key benefits of integrating these 21st century skills (critical thinking, communication, collaboration, creativity) into classroom activities?

– How do you think these skills can prepare students for future academic and professional success?

– What advantages do you see for teachers when they effectively integrate these Four Cs into their lesson plans and teaching strategies?

– Can you share any experiences from your training sessions where integrating these skills resulted in successful outcomes?

2. Difficulties in embedding the Four Cs

- What kind of difficulties do you face when trying to apply the “Four Cs” into your future classroom?

- Do you encounter any challenges when trying to implement skills such as communication, collaboration, creativity, and critical thinking during your pedagogical practice at school?

- What kind of factors like limited resources, time constraints, curriculum requirements or classroom environment might make it difficult to apply these skills in your pedagogical practice at school?

- What misunderstanding or challenges do you think students might face in using these skills?

2. Strengths of integrating the Four Cs skills?

- In your opinion what strengths can come from focusing on these Four Cs (critical thinking, communication, creativity, and collaboration) in a classroom setting?

- How can collaboration and creative activities enhance your classroom culture and interactions with students?

- What do you think are the strengths of encouraging critical thinking and communication in a learning environment?

- Do you believe these skills create opportunities for more student-centered learning experience?

Semi-structured interviews: Individual interviews were held with teacher educators to explore their perspectives on the challenges and opportunities in integrating Four Cs skills within teacher training programs. Interviews were 45-60 minutes long and followed a semi-structured format with flexible probing questions.

1. Benefits:

- How do the Four Cs contribute to preparing students for the demands of the 21st century?

- What are the observed advantages of integrating these skills into teacher training programs?

2. Challenges:

- What obstacles exist in embedding the Four Cs in teacher preparation program?

- What innovative resources, psychological support or individual support do you think are necessary to overcome these challenges?

3. Good sides and possibilities of “Four Cs”

- What successful examples and best practices did you observe in implementing “Four Cs” during the lesson?

- How can teacher training programs be improved through the integration of these skills?

Data analysis:

All focus group discussions and semi-structured interviews were audio-recorded and transcribed verbatim. The data were analyzed using thematic analysis. First, the transcripts were read several times to ensure familiarity with the data. Second, meaningful segments of participants’ responses were identified and assigned initial codes. Third, similar codes were grouped into broader categories based on recurring patterns and ideas. Fourth, these categories were reviewed and refined to develop overarching themes that reflected participants’ perceptions and experiences. Finally, the themes were interpreted and reported using representative quotations to illustrate key findings. The analysis was conducted manually, and themes were developed inductively from the data. The resulting themes focused on the perceived benefits of the Four Cs, challenges to their implementation, and opportunities for strengthening their integration within teacher education programs.

Results and their Discussions. The results of focus group discussions indicate that vital and meaningful information has been obtained on how pre-service teachers perceive the integration of Four Cs in teacher education, and the benefits of implementing critical thinking, creativity, communication and collaboration in this regard are outlined in Table 1.

Table 1. Benefits of integrating Four Cs

Theme	Code	Description	Examples from discussions
Critical thinking	think critically about the issues, analyze ideas critically	Participants connected critical thinking with solving problems, making decisions, and thinking critically during classroom activities and discussions.	“They help students solve the problems, decisions” “Critical thinking helps the students to see the problem from the other side and solve the problem.” “Analyze ideas critically”
Creativity	create new ideas; innovative thinking; draw posters; creative solutions	Participants described creativity as generating new ideas, completing creative projects, and finding solutions in classroom tasks.	“Creativity inspires innovative thinking.” “They also draw the posters.” “Create new ideas.”
Communication	communicate effectively; speaking skills; express things they thought; share ideas	Communication was related to speaking activities, sharing ideas, and expressing thoughts during classroom interaction.	“Communicate effectively.” “Role-playing really helps to solve speaking problem.” “Students build confidence and express things they thought.”
Collaboration	work together; teamwork; group work; communicate with each other	Participants associated collaboration with teamwork, peer interaction, and group activities during lessons.	“They work together and decide this problem.” “Working collaboratively enhances teamwork.” “Pupils socialize and communicate with each other.”
Real-world relevance	real life; professional success; workplace skills; future things	Participants believed that 4Cs skills help students prepare for future life, workplace situations, and professional success.	“Prepare students for real life.” “These skills are essential for academic and professional success.” “They can also use in real life.”
Student-centered learning	active participation; student engagement; personalized learning; active learning	Participants explained that integrating 4Cs skills makes lessons more interactive, engaging, and focused on students’ active participation.	“Keep students engaged and motivated.” “Fostering active participation and learning process.” “Create opportunities for more student-centered learning.”

Source: compiled by the author

According to the data in Table 1 above, an important finding is that participants perceived the Four Cs not as isolated competencies but as interconnected skills that support holistic teacher development. While communication and collaboration were frequently associated with classroom interaction and teamwork, critical thinking and creativity were linked to problem-solving and innovation. This suggests that pre-service teachers view the Four Cs as practical competencies directly applicable to both academic and professional contexts rather than as abstract educational concepts. The challenges and barriers to implementing Four Cs are presented in Table 2.

Table 2. Challenges and barriers to implementing Four Cs

Theme	Code	Description	Examples from discussion
Time constraints	limited class time; strict curriculum; time management	Participants of the discussion explained that in most cases teachers do not have time to apply “Four Cs” because of the curriculum requirements or lesson planning.	“Teachers sometimes may not have enough time to teach and practice the skills because of strict curriculum requirements.”
Lack of resources	lack of technology; classroom tools; limited materials	Some participants say that they have limited access to technology such as Interactive board, Wi-Fi	“Not all classrooms have the tools or space needed for

		and others, small classrooms also reduce collaborative and creative activities.	collaboration or creative activity.” “Lack of resource such as access to technology or tools for collaboration.”
Traditional teaching methods	traditional learning; open-ended tasks; student resistance	Students also mentioned that they used traditional learning methods like just doing exercises from textbook that is why they struggle with creative classroom activities.	“Students may find open-ended creative task difficult or confusing.” “Critical thinking and creative works for them is right now more new things.”
Mixed skill levels	mixed ability classes; student engagement; classroom management	It is hard to organize and manage collaborative activities because students’ levels and engagement are different.	“Differences in skill levels and engagement among students can make it harder to manage collaborative activities.” “Mixed ability classes make it difficult to combine them in one task.”
Student anxiety and shyness	shyness; anxiety; lack of confidence; language barriers	Learners’ language barriers and shyness also can be problems to participate in classroom activities.	“Some students hesitate to participate because of shyness or anxiety and lack of confidence or language barriers.”
Limited teacher training	teacher experience; implementation difficulties; professional challenges	In some cases, teachers may feel unprepared to apply “Four Cs” productively especially in creative or collaborative activities.	“Some teachers may feel unprepared to handle creativity-driven or collaboration activities.”

Source: compiled by the author

As shown in Table 2, the findings reveal that barriers to Four Cs implementation operate at multiple levels. Some challenges are structural in nature, including curriculum overload, limited instructional time, and insufficient resources. Others are learner-related, such as anxiety, low confidence, and varying levels of preparedness. This indicates that effective integration of the Four Cs requires addressing both institutional constraints and individual learner needs simultaneously. The strengths and opportunities for improvement related to Four Cs integration are summarized in Table 3.

Table 3. Strengths and areas for improvement

Theme	Code	Description	Examples from discussion
Student engagement	Active learning, classroom interaction	4Cs make learning more dynamic, leading to higher student interest and motivation	“Students are more interested when lessons require critical thinking, creativity and collaboration”
Empowering students	Independence, responsibility	Encourages students to take control on their learning and build confidence	“4Cs empower students to become independent learners and responsible decision-makers”
Real-world problem solving	Inquiry-based learning, debates, open-ended questions	Helps students develop skills applicable beyond the classroom	“Using real -world problems in discussions and debates fosters critical thinking”
Teacher effectiveness	Innovative teaching strategies, classroom management	Encourages teachers to implement engaging and effective instructional methods	“Lessons become more dynamic and impactful with collaboration and engaging activities”
Recommendations for improvement	Practical implementation strategies	Suggested techniques include peer communication, real-world problem-solving, and creativity-enhancing tasks	“Use debates, presentations, and group projects to develop communication and collaboration skills”

Source: compiled by the author

A notable finding is that participants consistently linked the successful development of the Four Cs with active and student-centered pedagogies. Approaches such as debates, inquiry-based activities, group projects, and real-world problem-solving were perceived not only as instructional techniques but also as mechanisms for fostering learner autonomy and engagement. This highlights the importance of moving beyond traditional teacher-centered instruction toward more participatory learning environments.

Thus, the results of the focus group clearly demonstrated evident recognition of the importance of the "Four Cs," as well as the discrepancy between theoretical understanding and practical implementation. Although pre-service teachers possess a propensity for student-centered learning, their ability to consistently apply these competencies is still hampered by contextual limitations. This is a structured pedagogical support and coherence of curricula, which indicates the need to update them in accordance with modern requirements. A thematic analysis of interviews with teacher educators is presented in the following Table 4.

Table 4. Thematic Analysis of Teacher Educators’ Perspectives on Integrating the Four Cs into Teacher Education Programs

Theme	Sub-themes/key insights	Thematic Codes
Importance of the Four Cs	<ul style="list-style-type: none"> -Critical thinking: Analysis, problem-solving, informed decision-making -Creativity: innovative thinking and novel solutions -Collaboration: teamwork and diverse perspectives -Communication: expressing ideas effectively and influencing others 	<ul style="list-style-type: none"> Importance of critical thinking Creativity for innovation Collaboration skills Effective communication
Benefits of integration	<ul style="list-style-type: none"> -Enhanced teaching effectiveness and dynamic classrooms. -Stronger teacher-student relationships. -Alignment with modern educational standards. -Growth mindset development 	<ul style="list-style-type: none"> Enhanced classroom effectiveness Positive teacher-student relationship Alignment with Global Standards
Challenges of integration	<ul style="list-style-type: none"> -Curriculum overload and time constraints. Resistance to change and institutional constraints. -Lack of resources and technology. -Fear of failure and lack of confidence. 	<ul style="list-style-type: none"> Curriculum overload Resistance to change Resource limitation Educator confidence issues
Best practices	<ul style="list-style-type: none"> -Project-based learning (PBL) and Inquiry-based learning (IBL). -Flipped classroom for student responsibility -Technology-enhanced learning platforms like Google classroom. -Peer mentoring and co-teaching model 	<ul style="list-style-type: none"> Project-based learning Inquiry-based learning Flipped classrooms Technology integration Peer collaboration
Opportunities for improvement	<ul style="list-style-type: none"> -Revise teacher education curriculum to prioritize the Four Cs. -Provide ongoing professional development. -Train teachers to integrate advanced technologies. -Establish mentorship and reflective practices. 	<ul style="list-style-type: none"> Curriculum development Continuous professional development Technology training mentorship programs

Source: compiled by the author

The results of Table 4 highlight the more systemic perspective of the integration of the Four Cs, which allowed the focus group results to be extended. An important difference emerged between the perspectives of pre-service teachers and teacher educators. While pre-service teachers primarily focused on classroom-level experiences, including student engagement, time constraints, and practical implementation challenges, teacher educators emphasized broader institutional factors such as curriculum design, professional development, mentoring, and resource availability. This difference

suggests that successful integration of the Four Cs requires alignment between classroom practices and institutional support structures.

Research Question 1.

The findings indicate that both pre-service teachers and teacher educators perceive the Four Cs as essential competencies for contemporary teacher education. Participants emphasized increased student engagement, active participation, teamwork, communication, creativity, and real-world problem-solving as the main benefits of integrating the Four Cs into classroom practice. The findings further suggest that these competencies contribute to student-centered learning and support the development of skills required for academic and professional success.

Research Question 2.

The study identified several challenges associated with fostering and applying the Four Cs. The most frequently reported barriers included curriculum overload, limited instructional time, lack of technological and material resources, mixed-ability classrooms, student anxiety and lack of confidence, and limited teacher preparedness for implementing innovative pedagogical approaches.

Research Question 3.

Participants proposed several strategies for strengthening the integration of the Four Cs in teacher education programs. These included curriculum revision, project-based learning, inquiry-based learning, technology-enhanced teaching, mentoring, and continuous professional development. The findings of the present study provide direct answers to the three research questions and suggest that the successful integration of the Four Cs depends on coordinated efforts at both classroom and institutional levels. While participants acknowledged the educational value of these competencies, they also identified significant implementation barriers and emphasized the need for curriculum reform, professional development, mentoring, and technology integration to strengthen Four Cs development within teacher education programs.

The results of this study are in line with previous studies showing that successful 21st century skills adoption depends not only on teacher awareness but also on systemic support [22]. In particular, it has been found that adherence to traditional teaching and assessment practices is more flexible and limits the adoption of learner-centred approaches. In addition, the results complement the existing literature, showing how these difficulties are reflected in teacher training programs, since future teachers are expected to simultaneously master and apply innovative pedagogy. The research also identifies practical ways to address these difficulties. Both sources show the effectiveness of approaches such as project-based learning, research-based learning, and collaborative action (Tables 3 and 4). These strategies allow active participation and directly correspond to the development of Four Cs skills. However, their successful implementation depends on structured support that includes focused training, access to resources, and directional practice opportunities. Another key finding of the study is the crucial role of professional development in supporting the integration of the Four Cs. Teachers without lifelong learning, continuous training and mentoring may lack the skills and confidence needed to apply innovative learning methods before starting work. This shows that the integration of the 4Cs is not a one-off but a sustained process that requires ongoing institutional support.

The results suggest that the implementation of Four Cs skills needs to be seen as a systemic process rather than an individual pedagogical experience. Effective and productive implementation requires coordinated action at multiple levels, such as curriculum development, training strategy, evaluation practices, and institutional support. By addressing these interrelated factors, teacher training programs can move from theoretical support for Four Cs to their continued and meaningful use in classroom practice.

Conclusion. This study explored pre-service teachers' and teacher educators' perceptions of the integration of the Four Cs (critical thinking, communication, collaboration, and creativity) within teacher education programs at a pedagogical university in Kazakhstan. The findings revealed that both participant groups viewed the Four Cs as pivotal competencies for preparing pre-service teachers for contemporary educational and professional environments. Participants highlighted the contribution of these competencies to student engagement, active participation, teamwork,

communication, creativity, and real-world problem-solving, emphasizing their value for student-centered learning and professional readiness for the workplace.

The study also identified several barriers and challenges to the effective implementation of the Four Cs. The most frequently reported challenges included curriculum overload, limited instructional time, insufficient technological and material resources, mixed-ability classrooms, student anxiety, and limited teacher preparedness for innovative pedagogical practices. These findings indicate that the successful integration of the Four Cs requires both institutional support and targeted professional development. Participants also proposed a range of strategies for strengthening Four Cs integration within teacher education programs. These included curriculum revision, project-based learning, inquiry-based learning, technology-enhanced teaching, mentoring, and continuous professional development. The findings underscore that teacher education programs should provide systematic opportunities for pre-service teachers to foster and apply these competencies through both coursework and practicum experiences. The study has several practical implications. Teacher education institutions may strengthen Four Cs development by aligning curricula with 21st-century competencies, expanding opportunities for active and inquiry-based learning, supporting mentorship initiatives, and increasing access to digital learning tools. Such measures may help bridge the gap between policy expectations and classroom implementation.

Limitations. This study is subject to several limitations. The sample size was relatively small and limited to participants from a single university, which may restrict the transferability of the findings. In addition, the study relied on self-reported perceptions collected through focus groups and interviews. Future research may involve larger and more diverse samples from different teacher education institutions and employ mixed-methods approaches to further examine the implementation and impact of the Four Cs in teacher education.

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БОЛАШАҚ МҰҒАЛІМДЕРДІ СЫНИ ОЙЛАУ, КОММУНИКАЦИЯ, ЫНТЫМАҚТАСТЫҚ ЖӘНЕ ШЫҒАРМАШЫЛЫҚ DAҒДЫЛАРЫН СЫНЫП ІШІНДЕ ЖӘНЕ ОДАН ТЫС ОРТАДА ДАМУҒА ӘРІ ҚОЛДАНУҒА ДАЯРЛАУ: XXI ҒАСЫР ТАЛАПТАРЫНА КЕШЕНДІ ДАЙЫНДЫҚ

Аңдатпа

Бұл зерттеу болашақ мұғалімдерді XXI ғасыр талаптарына жан-жақты даярлау мақсатында сыни ойлау, коммуникация, ынтымақтастық және шығармашылық сияқты төрт негізгі дағдыны сынып ішінде және одан тыс ортада дамытуға әрі қолдануға қалай даярлауға болатынын қарастырады. Зерттеу Қазақстанның білім беру саясаты аясында жүргізіліп, сапалық зерттеу әдісіне негізделді. Зерттеу барысында соңғы курс студенттері болып табылатын болашақ мұғалімдермен (n = 15) екі фокус-топтық талқылау және педагогикалық жоғары оқу орны оқытушыларымен (n = 10) жартылай құрылымданған сұхбаттар өткізілді.

Транскриптерді тақырыптық талдау нәтижесінде (Төрт С) дағдыларын педагогикалық білім беру үдерісіне енгізуге қатысты үш негізгі бағыт анықталды: (1) аталмыш дағдылардың артықшылықтары, яғни білім алушылардың белсенділігінің артуы, жоғары деңгейлі проблемаларды шешу дағдыларының дамуы, шығармашылық қабілеттің көрінісі және еңбек нарығы талаптарына сәйкестік; (2) дағдыларды қолдану барысындағы қиындықтары: оқу бағдарламасының шамадан тыс жүктелуі, уақыт пен ресурстардың шектеулілігі, білім алушылардың даярлық деңгейінің әркелкілігі, педагогикалық өзгерістерге сенімсіздік, сондай-ақ технологиялық және әдістемелік даярлықтағы олқылықтар; (3) Төрт С дағдының күшті жақтары мен мүмкіндіктері: жобалық және зерттеуге негізделген оқыту, аударылған сынып тәсілі, технологияларды мақсатты пайдалану, тәлімгерлік пен рефлексивті тәжірибе мәдениеті.

Зерттеу нәтижелері институционалдық қолдау мен жүйелі тәсілдің қажеттілігін көрсетті: икемді оқу бағдарламалары, тұрақты кәсіби даму, цифрлық құралдарға қолжетімділік және мұғалімдердің сенімділігін арттыратын тәлімгерлік құрылымдар. Зерттеу педагогикалық білім беру бағдарламаларына сыни ойлау, коммуникация, ынтымақтастық және шығармашылық дағдыларын жүйелі енгізуге бағытталған практикалық тұрғыдан ұсыныстарды көрсетті.

Түйінді сөздер: XXI ғасыр дағдылары, сыни ойлау, коммуникация, ынтымақтастық, шығармашылық, болашақ мұғалімдер.

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ПОДГОТОВКА БУДУЩИХ УЧИТЕЛЕЙ К РАЗВИТИЮ И ПРИМЕНЕНИЮ НАВЫКОВ КРИТИЧЕСКОГО МЫШЛЕНИЯ, КОММУНИКАЦИИ, СОТРУДНИЧЕСТВА И КРЕАТИВНОСТИ В УЧЕБНОЙ И ВНЕУЧЕБНОЙ СРЕДЕ: КОМПЛЕКСНАЯ ГОТОВНОСТЬ К ТРЕБОВАНИЯМ XXI ВЕКА

Аннотация

Данное исследование рассматривает, каким образом можно подготовить будущих учителей к развитию и применению четырех ключевых навыков – критического мышления, коммуникации, сотрудничества и креативности – в учебной и внеучебной среде для комплексной готовности к требованиям XXI века. Исследование проведено в контексте образовательной политики Казахстана и основано на качественном подходе. В рамках исследования были проведены две фокус-групповые дискуссии со студентами выпускного курса педагогических программ (n = 15), а также полуструктурированные интервью с преподавателями педагогического образования (n = 10).

Тематический анализ стенограмм выявил три основных направления, характеризующих интеграцию навыков 4С в педагогическое образование: (1) преимущества – повышение вовлеченности обучающихся, развитие навыков решения сложных задач, творческого самовыражения и соответствие требованиям рынка труда; (2) трудности – перегруженность учебных программ, ограниченность времени и ресурсов, неоднородный уровень подготовки обучающихся, неготовность к педагогическим изменениям, а также недостаточный уровень технологической и методической подготовки; (3) сильные стороны и возможности – проектное и исследовательское обучение, перевернутый класс, целенаправленное использование технологий, культура наставничества и рефлексивной практики.

Результаты исследования указывают на необходимость институциональной поддержки и системного подхода: гибких учебных программ, устойчивого профессионального развития, доступа к цифровым инструментам и наставнических структур, способствующих повышению уверенности учителей. Исследование предлагает практические рекомендации по системному внедрению навыков критического мышления, коммуникации, сотрудничества и креативности в программы педагогического образования.

Ключевые слова: навыки XXI века, критическое мышление, коммуникация, сотрудничество, креативность, будущие учителя.

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