Formation of key skills of the XXI century in the educational practice of a teacher

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ABSTRACT

This study addresses the pressing need to develop key XXI century skills among teachers to effectively navigate the contemporary educational challenges that they are facing. Through interviews with 86 educators from Kazakh pedagogical universities, we identified several essential competencies, including digital literacy, critical thinking and collaboration, as being fundamental for successful teaching in modern contexts. The research proposes a multifaceted approach, employing innovative strategies such as active learning, project-based learning, and collaborative techniques, to seamlessly integrate these skills into the curriculum. The findings indicate that these methods not only enhance students' practical experiences but also foster a supportive learning environment conducive to creativity and effective problem-solving. The study concludes by emphasizing the vital role of continuous professional development for teachers, ensuring they can adapt their pedagogical practices in response to the rapidly evolving demands of education today.

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1. INTRODUCTION

In light of the accelerated pace of technological advancement and the evolving social and cultural landscape, it is imperative to identify the competencies that educators must cultivate to adequately prepare their students for the contemporary challenges they will inevitably face. Key skills of the XXI century, such as critical thinking, communication, collaboration, digital literacy and creative thinking, are becoming increasingly in demand by both students and teachers. Teachers, in turn, must be prepared not only to transmit information but also to develop these important skills in students.

Li *et al.* [1] highlight the importance of professional ideology among those working in higher education, demonstrating how educational values influence the teaching landscape. In another study, Rutten *et al.* [2] investigate the integration of technology and teacher competency, demonstrating its pivotal function in XXI century English as a foreign language classroom. Namsone *et al.* [3] concentrate on a framework for the management of teacher competence, providing practical instruments for the resolution of deficiencies in the competencies of teachers that are essential for the teaching of modern skills. Taggart and Roulston [4] discuss the digital competencies of teachers in Northern Ireland, suggesting that educators must navigate a "Goldilocks zone" of technology use – neither too much nor too little. Lastly,

Demirbilek [5] examines the fostering of intercultural competence in online classrooms, highlighting tools and strategies that promote effective education in diverse settings. These competencies are of vital importance for students' successful adaptation in a rapidly changing world, ensuring that educational practices are aligned with the modern requirements of the XXI century. The definition and classification are ambiguous of key XXI century skills, although there is a broad consensus on the need to develop critical thinking, communication, collaboration and digital literacy skills in teachers, their specific definition and composition vary depending on the context of the educational environment.

Sulaiman and Ismail [6] emphasized that teacher's communication skills play an important role in shaping the teacher's thought structure in the context of the XXI century. Waychunas [7], in turn, noted the problems associated with the formation of teacher competencies in the context of digitalization, especially in the context of Kazakh education. Syurmen and Mirzoyeva [8] emphasized the need for continuous professional development of teachers to adapt the educational process to the changing needs and demands of students. However, in addition to these aspects, it is necessary to delve into the analysis of what specific skills and tools are needed to work effectively in a digital learning environment.

Maor *et al.* [9] highlighted the important role of combining metacognition, creativity and critical thinking in the context of preparing students for the requirements of modern education. Franco *et al.* [10] pointed to the relevance and ongoing efforts of universities around the world to integrate critical thinking into their curricula. Hargreaves [11] conducted a study on the methods of collaboration available to teachers and the factors that influence the effectiveness of this collaboration. However, in addition to the studies already conducted, there is a need for further research into the effectiveness of methods of introducing critical thinking into university curricula, as well as an assessment of their impact on student's academic success.

The study of the necessary skills of the XXI century in the educational practice of teachers was conducted by Bardelli [12], who found that teachers have a positive attitude towards integrating digital literacy into the educational process. However, obstacles such as a lack of available technology, limited student experience, and time and budget constraints hinder the successful implementation of digital tools. The results of the study by Çetin [13] showed significant differences in the level of digital literacy among future teachers. Potyrała and Tomczyk [14] highlighted the need for teachers to receive additional support and education to develop digital literacy skills. Jay [15] emphasized the need to adapt the modern education system to the use of digital technologies and to develop digital pedagogy to improve digital literacy at different levels of education.

2.   METHOD

The study analyzed the peculiarities of the influence of the student environment in the formation and development of skills necessary for successful adaptation to modern challenges of education and life. A purposive sampling method was utilized to ensure a diverse representation of educators. The study summarized the use of a variety of methods and strategies, such as problem-based tasks and projects, collaborative learning, integration of modern technologies, project-based learning, as well as reflection and feedback, as tools that contribute to the effective formation and development of key XXI century skills in teacher education students. A qualitative research approach was employed, utilizing semi-structured interviews with 86 educators to collect data on their experiences and practices. The data were subjected to thematic analysis using NVivo software, thereby facilitating the identification of recurrent themes about the development of key competencies.

As part of this research, interviews were conducted with professors of higher education institutions in Astana, the Republic of Kazakhstan. The interviews were conducted to collect empirical data on their views on the formation of key skills in the educational practice of teachers. The interview data was collected between 08.05.24 and 14.05.24. The study involved 86 teachers representing different age groups. Among them were 58 women (aged 24 to 75) and 28 men (aged 25 to 77). To collect information, specially designed questions were used to identify the opinions of respondents on the peculiarities of the formation of key skills in the educational practice of teachers.

The sample size was determined through the use of a purposive sampling method, which ensured the inclusion of educators representing a diverse range of age groups and teaching experiences. As posited by Aslan [16], a sample size of 30-100 participants is deemed sufficient for qualitative research, furnishing a robust framework for data saturation and thematic analysis. The interview questions were developed by a comprehensive literature review and expert consultations, thereby ensuring content validity. The reliability of the instrument was established through a pilot study involving five educators, during which feedback was incorporated to enhance clarity and relevance. The final instrument exhibited a Cronbach's alpha coefficient of 0.85, indicative of a high degree of internal consistency.

The interview questions included:
- What key skills of the XXI century do you consider to be the most important for the successful adaptation of teachers to modern life?
- How do you integrate the development of key XXI century skills into your educational practice?
- What methods and strategies do you use to stimulate the development of critical thinking in future teachers?
- How do you develop cooperation and teamwork skills among students in the classroom?
- How do you teach students digital literacy skills and the effective use of modern technologies in the learning process?
- How do you promote creative thinking and innovative thinking among your students?
- How do you help students develop problem-solving and decision-making skills in non-standard situations?
- How do you evaluate the effectiveness of developing key XXI century skills in your students?
- What challenges do you face when working on developing key skills for the XXI century, and how do you overcome them?
- What additional resources or support would be useful for you to better integrate key XXI century skills into your teaching practice?

The data obtained from the interviews were transcribed in their entirety and subsequently subjected to a thematic analysis. This process entailed the application of a coding system to identify recurrent themes related to the formation of key skills. The NVivo software was employed to assist in the organization of the data and the facilitation of the coding process. The analysis concentrated on educators' views on effective teaching methods and the difficulties they experience in fostering key skills in their students. The evidence is constituted by qualitative data derived from interviews with educators, which elucidate their strategies, challenges, and perceptions regarding the integration of key competencies into the educational curriculum.

After completing the data collection from the interviews aimed at identifying opinions on the formation of key skills of the XXI century in the educational practice of teachers, the results were analyzed. The data obtained provided details of the prospects and concepts of forming key competencies of the XXI century among teachers. The analysis of the results identified the main problems and challenges faced by teachers in the process of introducing and developing these skills. The principal discovery is that a plethora of pioneering pedagogical techniques, including problem-based tasks and collaborative learning, markedly facilitate the cultivation of indispensable XXI century competencies among prospective educators. It was also used to identify successful practices and strategies that can be used to improve the educational process. All procedures performed in the study were by the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments.

3.   RESULTS

The development of key skills in the educational practice of a teacher is important to ensure the quality of education and prepare students for a successful professional and social life in the future. The findings indicated that critical thinking, communication, collaboration, digital literacy, and creative thinking are essential skills identified by educators. Teachers play a key role in this process, so they must have not only knowledge of their subject area but also the skills to develop key competencies in their students. Students at pedagogical universities, whose training is aimed at future professional activities in the field of education, need a diverse set of key skills to successfully adapt to the modern world. These skills need to be not only technical but also social, cultural and creative, considering the diversity of situations and requirements they will face in their professional lives, as shown in Figure 1.

Communication skills are one of the key elements of a successful professional career in education [16], [17]. Students of pedagogical universities, and future teachers, must have a high degree of communication skills, as their work is inextricably linked to interaction with different groups of people: students, colleagues, administration and parents [18]. Active listening skills, empathy and the ability to adapt communication to the individual needs of each student allow a teacher to interact effectively with a variety of audiences [19]. The exchange of experience, joint lesson planning, discussion of methodological approaches and joint problem solving contribute to improving the quality of the educational process and the professional development of the teaching community [20]. In general, the development of communication skills is an important aspect of the professional training of future teachers. Mastery of these skills allows teachers to effectively interact with various stakeholders in the educational process and provide quality education and upbringing for their students.
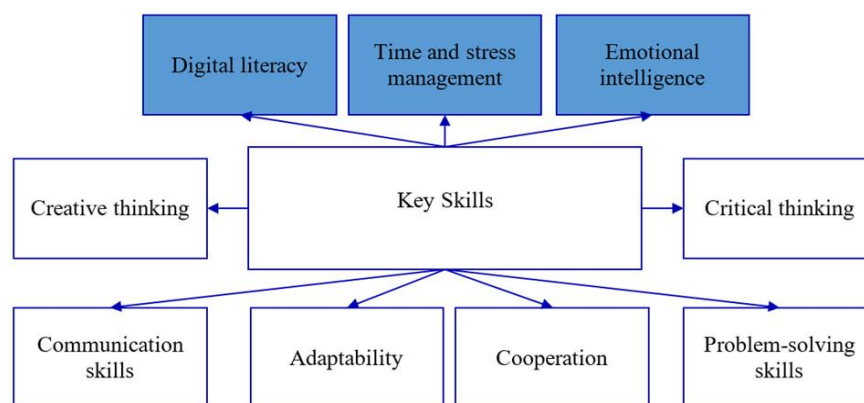
Figure 1. Key skills for successful adaptation of future teachers in the modern world

Critical thinking in pedagogy is a fundamental competence necessary for effective teaching and preparing students for the modern challenges of education and life [21], [22]. This skill includes the ability to analyze, evaluate and interpret information, as well as to apply the knowledge and skills gained in practice. One of the most important aspects of critical thinking for teachers is the ability to analyze different sources of information. Teachers should be able to critically evaluate teaching materials, teaching methods and research in the field of education [23]. This can be used to choose the most effective and appropriate teaching methods for students, as well as make informed decisions in the learning process. Teachers must be able to adequately assess their student's knowledge and skills and help them develop and improve their skills. This requires the ability to objectively evaluate the achievements of each student and offer them recommendations for further education and self-development. Critical thinking is an integral part of teachers' professional competence and plays an important role in improving the quality of education and preparing students for the modern world [24]. This competence allows teachers to effectively adapt to changing educational requirements and ensure the successful learning and development of each student. Problem-solving is a key component of teacher education students' success in both academic and professional contexts [25].

In a professional context, student teachers also face several challenges related to the organization of the educational process, interaction with students, parents and colleagues, and conflict resolution. For example, they may encounter unruly students, difficulties in planning lessons and teaching materials, and problems in dealing with parents or school administrators. To successfully address these challenges, students must be able to adapt to different situations, apply the knowledge and skills they have acquired during their studies, and be prepared to find alternative solutions and take responsibility for their actions. It is necessary to note that the development of problem-solving skills is an ongoing process that requires students to constantly improve themselves and grow professionally. This includes awareness of personal strengths and weaknesses, the ability to seek help and advice from colleagues and mentors, and the constant updating of knowledge and skills in line with the changing requirements and challenges of the educational environment. Cooperation is an integral part of a teacher's professional activity and plays an important role in ensuring the effectiveness of the educational process [26].

Previous studies [27], [28] showed that successful collaboration in the educational environment is associated with improved learning outcomes, increased professional development, and higher job satisfaction. Therefore, the development of cooperation skills should be an important aspect of the professional training of teacher education students. They must learn to interact effectively with colleagues, build fruitful relationships and apply joint efforts to achieve common goals in education. In the era of digitalization of society and the active use of information technology in various spheres of life, teachers must have the skills to work with modern digital technologies and be able to effectively integrate them into the educational process [29], [30].

Digital literacy means not only the ability to use computers and the internet, but also the ability to critically evaluate information, use digital tools for learning and professional development, and protect oneself and students from digital threats and dangers [31], [32]. Teachers need to be able to select appropriate digital tools and integrate them into the learning process, considering learning objectives, learner needs and the characteristics of the learning group [33]. In addition, the digital literacy of teachers includes the ability to effectively use digital resources for their professional development. However, the digital literacy of educators also includes an understanding of the ethical and legal aspects of using digital technologies in education, as well as the protection of student's data and copyright when creating and using digital educational resources.

Educators should be willing to protect educational information from unauthorized access and use and to teach students the basics of digital security and ethical behavior on the internet.

One of these important competencies is creative thinking, which is of particular importance in modern education [34], [35]. In the modern educational context, creative thinking is becoming increasingly relevant due to the need to find unconventional and innovative solutions to problems. Stimulating the creative thinking of students at pedagogical universities contributes to the development of innovative approaches to teaching and upbringing, which in turn contributes to improving the quality of education and its compliance with modern requirements. The development of creative thinking among students at pedagogical universities can be carried out through various educational practices, such as the use of interactive teaching methods, creative workshops and project work, as well as stimulating the independent search for solutions to problem situations. An important aspect of developing creative thinking is also the creation of a suitable educational environment that promotes creativity, self-realization and innovative thinking.

Modern society is characterized by rapid change and dynamic development, and teachers must be able to quickly adapt to new conditions, technologies and requirements to maintain their effectiveness. Rapid changes in technology, educational methods, training and education requirements create the need to constantly update knowledge and skills, as well as adapt to new working conditions. Highly adaptable teachers can effectively adapt to different situations, find adequate solutions to problems, manage the educational process flexibly and successfully implement innovative educational approaches. The development of adaptability in teacher education students can be carried out through various educational practices, such as learning under uncertainty, training in flexible thinking and decision-making, and encouraging independent search for solutions to problem situations.

Time and stress management is an important component of a teacher's professional competence in modern education [36]. The complexity and dynamism of the educational process require teachers to allocate time efficiently, manage tasks and use available resources effectively to achieve their goals. Teachers must be able not only to plan personal efforts but also to adapt to changing circumstances, respond flexibly to new challenges and maintain high professional performance. Key aspects of time management include the ability to set priorities, break tasks into smaller steps, optimize workflows and effectively use planning tools and techniques. Teachers should have self-regulation skills, the ability to effectively cope with stressful situations and maintain emotional stability. For this purpose, it is necessary to develop relaxation strategies, breathing exercises, meditation practices and other techniques that help relieve tension and restore psycho-emotional balance. Emotional intelligence encompasses a wide range of skills and abilities that allow educators to effectively interact with students, understand their needs and emotional state, and create a supportive and inspiring learning environment [37].

An important component of emotional intelligence is the ability to communicate effectively and manage your emotions in different situations. Teachers with these skills can resolve conflicts constructively, build open and trusting relationships with students, and motivate them to succeed. This helps to create a positive educational atmosphere and stimulates the academic progress and personal development of students. The development of emotional intelligence is an important aspect of the professional training of students of pedagogical universities. Teachers with a high level of emotional intelligence can successfully adapt to various situations in educational practice, interact effectively with students and create favorable conditions for their learning and development.

In this research, teachers at pedagogical universities in Kazakhstan were interviewed. According to the results of the interviews, the most important skills for a teacher are critical thinking, communication, collaboration, digital literacy, and creative thinking, as well as the ability to solve problems and make decisions in non-standard situations. According to teachers, these skills are the basis for students' successful adaptation to modern life, helping them to cope with the challenges of change and function effectively in a variety of fields. According to the interviews, most teachers integrate the development of key XXI century skills through a variety of teaching methods and strategies, including project work, group discussions, problem-solving, interactive technologies and modern educational resources, which allows students to gain practical experience and apply their knowledge in practice. Interviews revealed educators employ diverse active learning methods to develop students' critical skills. These include text analysis, debates, case studies, and project creation to enhance analytical thinking. Collaborative tasks like group projects and interactive exercises foster teamwork and cooperation. Problem-based learning encourages students to engage with real-world scenarios, promoting critical thinking and personal responsibility. Digital literacy is developed through interactive lessons and online resources, while creative workshops stimulate innovative problem-solving. To improve decision-making skills, teachers use situational simulations, cause-and-effect analyses, and strategic discussions, helping students navigate complex challenges effectively.

Methods to evaluate key XXI century skills include testing, project assessments, portfolios, and peer feedback, enabling continuous improvement of learning objectives. Teachers face the challenge of constantly updating educational content and methods to match rapidly evolving global requirements. To address this,

educators proactively monitor educational innovations, collaborate with colleagues, and pursue additional training. The student environment is critical for developing future teachers' key skills. Through collaborative learning, discussions, and teamwork, students acquire essential competencies like communication, critical thinking, and problem-solving. This environment stimulates creativity, encourages innovative approaches, and prepares students to adapt to rapidly changing professional landscapes.

Effective development of key skills in the educational practice of a teacher requires the use of various methods and strategies aimed at stimulating the development of these competencies in students, as seen in Table 1. Methods and strategies explained in Table 1 used in educational practice contribute to the comprehensive development of key skills of students in pedagogical universities. It also prepare the students for successful adaptation to the modern world.

Table 1. Methods and strategies for developing key competencies in students

Aspect	Description
Problem-oriented tasks and projects	Creating learning situations that require students to analyze, think critically and find solutions to real-world problems helps to develop key XXI century skills
Collaborative learning	Working in groups or teams allows students to develop skills in cooperation, communication, conflict resolution and collective decision-making
Use of technology	Integration of modern educational technologies and online resources helps to develop digital literacy, technical skills and the ability to effectively use information from various sources
Project-based learning	Conducting long-term projects involving research, practical application of knowledge and presentation of results helps to develop creative thinking, problem-solving and the ability to work on multi-component tasks

4. DISCUSSION

The study highlights various methods for developing skills among pedagogical students. Problem-based tasks and collaborative learning enable critical thinking, communication, and teamwork. Modern educational technologies foster digital literacy and information skills. Project-based learning promotes creative problem-solving through long-term, research-oriented projects. Continuous reflection and instructor feedback help students recognize and learn from their experiences, supporting holistic skill development. Compared with the results of Hasanah and Malik [38], it is worth noting the effectiveness of the blended learning model in improving students' critical thinking and communication skills at university. This confirms that the use of a variety of methods is an effective way to develop key XXI century skills in students. Thus, the results of this study confirm the relevance and effectiveness of methods and strategies for the formation of key skills of the XXI century in the educational practice of teachers and correspond to the findings of other studies in this area.

Critical thinking is emphasized in the design and implementation of educational programmers, as well as in adapting them to the individual needs and abilities of each student [39]. Another study, conducted by Alsaleh [40], also emphasizes the importance of critical thinking, noting it as one of the most important thinking skills and indicators of student learning. Another study presented by Bellaera et al. [41] also highlights critical thinking as one of the main learning outcomes in higher education and emphasizes its presence in university curricula. They emphasize the importance of integrating this skill into the curriculum at all levels of education and its role in preparing successful professionals. Furthermore, the incorporation of critical thinking into academic programmers encourages the development of a culture of enquiry, prompting students to challenge established assumptions and explore alternative perspectives.

In turn, comparing with the results of the study by Muckenthaler et al. [42], it is worth noting the confirmation of the importance of teacher collaboration for the successful development of schools, as, according to the scientist, it reveals that the benefits associated with collaboration are closely related to the successful characteristics of the school, which emphasizes the particular importance of this factor in the educational process. Bush and Grotjohann [43] also note different forms of cooperation, such as exchange, division of labor and collaboration. Comparative analysis of the results of the study by Li and Yu [44] emphasizes the need for adequate digital literacy of teachers to successfully respond to the new needs of the modern educational model. Researchers also point to a significant correlation between the level of digital literacy of teachers and their career satisfaction and professional role. The study by Falloon [45] notes the fact that over time, various methods and courses have been developed to improve the digital literacy of teachers, helping them to develop students' skills in using the latest technologies in education.

In light of recent literature, Amsal et al. [46] emphasize the role of prospective teachers' competencies, particularly highlighting the need for self-awareness and adaptability among educators in the XXI century. The authors posit that such competencies not only enhance teaching efficacy but also foster a supportive learning environment conducive to student growth. Similarly, Almazroa and Alotaibi [47] identify

the challenges faced in the development of proactive teacher education programmers to embed XXI century skills into curricula. The findings of the aforementioned study align with those of our own, indicating that a comprehensive understanding of these challenges is essential for the effective preparation of teachers. Moreover, Widiastuti *et al.* [48] illustrate the beneficial influence of novel learning methodologies on the cultivation of entrepreneurial abilities, which constitutes a pivotal component of the comprehensive skill set demanded in contemporary educational contexts.

The results of this study confirm that the development of communication skills plays a fundamental role in the educational practice of teachers. Communication facilitates effective interaction between different participants in the educational process, which creates a supportive learning environment and stimulates motivation to learn. Methods and strategies used to develop key XXI century skills include working with problem-based tasks and projects, collaborative learning, the use of modern educational technologies and project-based learning. These approaches contribute to the development of not only communication but also other important skills, such as digital literacy, critical thinking and creative thinking. In addition, research conducted by other scholars confirms the importance of critical thinking in pedagogy. Critical thinking involves analyzing, evaluating and interpreting information, which is essential for successful teaching and preparing students for the challenges of modern education and life. Thus, the results of this study emphasize the importance and effectiveness of methods and strategies for developing key skills of the XXI century in the educational practice of teachers.

5.   CONCLUSION

The study emphasizes the significance of XXI century skills like digital literacy, critical thinking, and creativity in preparing students for modern societal challenges. It underscores the need for continuous professional development and innovative pedagogical approaches in teacher education. Educators in Kazakh pedagogical universities are actively integrating these skills through methods such as active learning and project work, creating an environment that develops students' practical competencies and prepares them for professional complexity. The implications of these findings extend beyond the immediate context of teacher education. By underscoring the importance of integrating XXI century skills into pedagogical practices, this research underscores the necessity for educational institutions to adapt curricula and teaching methods to better prepare future educators. Such adaptability is of the utmost importance not only for the enhancement of teaching efficacy but also for the fostering of a generation of learners capable of thriving in an increasingly complex and dynamic world. The study suggests three key research directions: examining long-term impacts of pedagogical approaches on XXI century competencies in diverse educational contexts, investigating digital tools' effectiveness in teacher education skill development, and identifying optimal strategies for creating collaborative learning environments that enhance critical thinking and problem-solving skills for both students and teachers.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization		I : **I**nvestigation		Vi : **Vi**sualization		
M : **M**ethodology		R : **R**esources		Su : **Su**pervision		
So : **So**ftware		D : **D**ata Curation		P : **P**roject administration		
Va : **Va**lidation		O : Writing - **O**riginal Draft		Fu : **Fu**nding acquisition		
Fo : **Fo**rmal analysis		E : Writing - Review & **E**diting				

CONFLICT OF INTEREST STATEMENT
Authors state no conflict of interest.

INFORMED CONSENT
We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL
The research related to human use has been complied with all the relevant national regulations and institutional policies in accordance with the tenets of the Helsinki Declaration and has been approved by the authors' institutional review board or equivalent committee.

DATA AVAILABILITY
The data that support the findings of this study are available from the corresponding author [SB], upon reasonable request.

REFERENCES

[1]   X. Li, M. M. Islam, S. Islam, X. Gao, and Z. Rong, "Examining professional ideology through the perspectives of higher education professionals," *Teaching and Teacher Education*, vol. 152, p. 104774, Dec. 2024, doi: 10.1016/j.tate.2024.104774.

[2]   L. Rutten, D. Butville, and B. Dvir, "Leaning into Difficult Topics: Inquiry Communities as Teacher Professional Learning for Turbulent Times," *Journal of Teacher Education*, vol. 75, no. 3, pp. 292–304, May 2024, doi: 10.1177/00224871241231543.

[3]   D. Namsone *et al.*, "The design and operationalization of the teacher competence management framework: The method and practical tools to identify and close teacher competence gaps for the teaching of 21st century skills," *International Journal of Education and Practice*, vol. 12, no. 3, pp. 684–706, May 2024, doi: 10.18488/61.v12i3.3748.

[4]   S. Taggart and S. Roulston, "Educational technologies in schools in Northern Ireland: Teachers' digital competences in the Goldilocks zone," *Journal of Digital Learning in Teacher Education*, vol. 40, no. 4, pp. 188–206, Oct. 2024, doi: 10.1080/21532974.2024.2393575.

[5]   M. Demirbilek, "Fostering Intercultural Competence and Neighbourliness in Multicultural Online Classrooms: Tools, Strategies, and Implications for 21st Century Education," in *Handbook of Research on Critical Issues and Global Trends in International Education*, M. R. Barker, R. C. Hansen, and L. Hammer, Eds., Hershey, PA: IGI Global Scientific Publishing, 2024, pp. 400–420, doi: 10.4018/978-1-6684-8795-2.ch016.

[6]   J. Sulaiman and S. N. Ismail, "Teacher Competence and 21st Century Skills in Transformation Schools 2025 (TS25)," *Universal Journal of Educational Research*, vol. 8, no. 8, pp. 3536–3544, Aug. 2020, doi: 10.13189/ujer.2020.080829.

[7]   W. Waychunas, "Using Simulations or Rehearsals in Teacher Preparation Coursework: Learning from Preservice Social Studies Teacher Experiences to Inform Future Practice," *The Teacher Educator*, vol. 60, no. 1, pp. 37–58, Jan. 2025, doi: 10.1080/08878730.2024.2357090.

[8]   O. V. Syurmen and L. Y. Mirzoyeva, "Teachers' Continuous Professional Development and Education Quality Improvement," *Bulletin Series of Pedagogical Sciences*, vol. 67, no. 3, pp. 34–40, Sep. 2020, doi: 10.51889/2020-3.1728-5496.04.

[9]   R. Maor *et al.*, "Relationships between metacognition, creativity, and critical thinking in self-reported teaching performances in project-based learning settings," *Thinking Skills and Creativity*, vol. 50, p. 101425, Dec. 2023, doi: 10.1016/j.tsc.2023.101425.

[10]   A. Franco, R. M. Vieira, C. Saiz, and S. F. Rivas, "Bringing Pedagogical Innovation into the University Campus: Promoting students' Critical Thinking and Teachers' Practices," in *Sustainable Pedagogical Research in Higher Education*, C. Guerra, A. Franco, and M. Seabra, Eds., Routledge, 2020, pp. 67–78, doi: 10.4324/9781003004585-8.

[11]   A. Hargreaves, "Teacher collaboration: 30 years of research on its nature, forms, limitations and effects," in *Policy, Teacher Education and the Quality of Teachers and Teaching*, London: Routledge, 2021, pp. 103–121, doi: 10.4324/9781003141907-8.

[12]   E. Bardelli, M. Ronfeldt, and J. P. Papay, "Teacher Preparation Programs and Graduates' Growth in Instructional Effectiveness," *American Educational Research Journal*, vol. 60, no. 1, pp. 183–216, Feb. 2023, doi: 10.3102/00028312221137798.

[13]   E. Çetin, "Digital storytelling in teacher education and its effect on the digital literacy of pre-service teachers," *Thinking Skills and Creativity*, vol. 39, p. 100760, Mar. 2021, doi: 10.1016/j.tsc.2020.100760.

[14]   K. Potyrała and Ł. Tomczyk, "Teachers in the lifelong learning process: examples of digital literacy," *Journal of Education for Teaching*, vol. 47, no. 2, pp. 255–273, Mar. 2021, doi: 10.1080/02607476.2021.1876499.

[15]   L. P. Jay, "A framework for approximations of practice: Variations in purpose, approach, and opportunities for learning," *Teaching and Teacher Education*, vol. 152, p. 104795, Dec. 2024, doi: 10.1016/j.tate.2024.104795.

[16]   A. Aslan, "Problem- based learning in live online classes: Learning achievement, problem-solving skill, communication skill, and interaction," *Computers & Education*, vol. 171, p. 104237, Oct. 2021, doi: 10.1016/j.compedu.2021.104237.

[17]   S. Crisianita and B. Mandasari, "The Use of Small-Group Discussion to Improve Students' Speaking Skill," *Journal of English Language Teaching and Learning*, vol. 3, no. 1, pp. 61–66, Jul. 2022, doi: 10.33365/jeltl.v3i1.1680.

[18]   V. S. Ponomarenko, "State Order for the Training of Specialists With Higher Education and Optimisation of the Higher Education Network," *Journal of Higher Education Theory and Practice*, vol. 22, no. 18, p. 128, Dec. 2022, doi: 10.33423/jhetp.v22i18.5705.

[19]   P. Lewinski *et al.*, "The World Color Survey: Data Analysis and Simulations," in *Complexity Applications in Language and Communication Sciences*, A. Massip-Bonet, G. Bel-Enguix, and A. Bastardas-Boada, Eds., Cham: Springer International Publishing, 2019, pp. 289–311, doi: 10.1007/978-3-030-04598-2_16.

[20]   T. Zhumasheva, A. Alimbekova, Z. Saira, A. Ussenova, D. Nurgaliyeva, and M. Hamiti, "Evaluation of University Students' Views on the Gamified Classroom Model," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 17, no. 16, pp. 21–32, Aug. 2022, doi: 10.3991/ijet.v17i16.32189.

[21] D. Oner and Y. G. Aggul, "Critical Thinking for Teachers," in *Integrated Education and Learning*, N. Rezaei, Ed., Cham: Springer, 2022, pp. 319–336, doi: 10.1007/978-3-031-15963-3_18.

[22] A. D. Saputro, S. Atun, I. Wilujeng, A. Ariyanto, and S. Arifin, "Enhancing Pre-Service Elementary Teachers' Self-Efficacy and Critical Thinking using Problem-Based Learning," *European Journal of Educational Research*, vol. 9, no. 2, pp. 765–773, Apr. 2020, doi: 10.12973/eu-jer.9.2.765.

[23] T. Balykbayev, E. Bidaibekov, V. Grinshkun, and N. Kurmangaliyeva, "The Influence of Interdisciplinary Integration of Information Technologies on the Effectiveness of It Training of Future Teachers," *Journal of Theoretical and Applied Information Technology*, vol. 100, no. 5, pp. 1265–1274, 2022.

[24] P. Lewinski, "Commentary: Extensional Versus Intuitive Reasoning: The Conjunction Fallacy in Probability Judgment," *Frontiers in Psychology*, vol. 6, p. 1832, Nov. 2015, doi: 10.3389/fpsyg.2015.01832.

[25] A. Fadli and I. Irwanto, "The Effect of Local Wisdom-Based ELSII Learning Model on the Problem Solving and Communication Skills of Pre-Service Islamic Teachers," *International Journal of Instruction*, vol. 13, no. 1, pp. 731–746, Jan. 2020, doi: 10.29333/iji.2020.13147a.

[26] E. Haryani, W. W. Coben, B. A.-S. Pleasants, and M. K. Fetters, "Analysis of Teachers' Resources for Integrating the Skills of Creativity and Innovation, Critical Thinking and Problem Solving, Collaboration, and Communication in Science Classrooms," *Jurnal Pendidikan IPA Indonesia*, vol. 10, no. 1, pp. 92–102, Mar. 2021, doi: 10.15294/jpii.v10i1.27084.

[27] D. Nguyen and D. Ng, "Teacher collaboration for change: sharing, improving, and spreading," *Professional Development in Education*, vol. 46, no. 4, pp. 638–651, Aug. 2020, doi: 10.1080/19415257.2020.1787206.

[28] J. Koh, "Critical digital pedagogy a collaborative teaching approach," in *Innovative Pedagogical Practices for Higher Education 4.0*, M. M. Asad, P. P. Churi, F. Sherwani, and R. bin Hassan, Eds., Boca Raton, FL: CRC Press, 2024, pp. 320–331, doi: 10.1201/9781003400691-20.

[29] A. Sakhipov, T. Baidildinov, M. Yermaganbetova, and N. Ualiyev, "Design of an Educational Platform for Professional Development of Teachers with Elements of Blockchain Technology," *International Journal of Advanced Computer Science and Applications*, vol. 14, no. 7, pp. 519–527, 2023, doi: 10.14569/IJACSA.2023.0140757.

[30] Z. Altynbekova, B. Bostanov, S. Kenesbayev, M. Ongarbayeva, and Z. Sadirmekova, "Methodology of teaching future computer science teachers to create and use open educational resources," *Scientific Herald of Uzhhorod University Series Physics*, vol. 2024, no. 55, pp. 2337–2347, Feb. 2024, doi: 10.54919/physics/55.2024.233cu7.

[31] V. Ponomarenko, O. Rayevnyeva, V. Yermachenko, I. Aksonova, and O. Brovko, "Digitalization as a development factor of innovative-active university," *Problems and Perspectives in Management*, vol. 19, no. 4, pp. 213–231, Nov. 2021, doi: 10.21511/ppm.19(4).2021.18.

[32] S. M. Kenesbayev, A. K. Oralbekova, N. T. Sartayeva, and M. K. Zhailauova, "Programme and summary of research work on ICT competence development for future elementary school teachers in the conditions of inclusive education," *Espacios*, vol. 38, no. 25, p. 10, 2017.

[33] C. Sánchez-Cruzado, R. S. Campión, and M. T. Sánchez-Compaña, "Teacher Digital Literacy: The Indisputable Challenge after COVID-19," *Sustainability*, vol. 13, no. 4, p. 1858, Feb. 2021, doi: 10.3390/su13041858.

[34] Y. Suchyadi and H. Suharyati, "The Use of Multimedia as An Effort to Improve the Understanding Ability of Basic School Teachers 'Creative Thinking in The Era 'Freedom of Learning'," in *Freedom to Learn*, F. D. Mobo *et al.* Eds., Yogyakarta: Zahir Publishing, 2021, pp. 42–53.

[35] A. Yilmaz, "The Effect of Technology Integration in Education on Prospective Teachers' Critical and Creative Thinking, Multidimensional 21st Century Skills and Academic Achievements," *Participatory Educational Research*, vol. 8, no. 2, pp. 163–199, Apr. 2021, doi: 10.17275/per.21.35.8.2.

[36] B. M. Ansley, D. E. Houchins, K. Varjas, A. Roach, D. Patterson, and R. Hendrick, "The impact of an online stress intervention on burnout and teacher efficacy," *Teaching and Teacher Education*, vol. 98, p. 103251, Feb. 2021, doi: 10.1016/j.tate.2020.103251.

[37] S. Valente, A. Veiga-Branco, H. Rebelo, A. A. Lourenço, and A. M. Cristóvão, "The Relationship between Emotional Intelligence Ability and Teacher Efficacy," *Universal Journal of Educational Research*, vol. 8, no. 3, pp. 916–923, Mar. 2020, doi: 10.13189/ujer.2020.080324.

[38] H. Hasanah and M. N. Malik, "Blended learning in improving students' critical thinking and communication skills at University," *Cypriot Journal of Educational Sciences*, vol. 15, no. 5, pp. 1295–1306, Oct. 2020, doi: 10.18844/cjes.v15i5.5168.

[39] O. L. Kanybekovna, K. A. Nuralievna, G. V. Valerevich, B. Y. Yklasovich, K. G. Nuralievna, and Z. Bissenbayeva, "Development of Electronic Resources on the Formation of Personal Qualities of Schoolchildren," *Journal of Intellectual Disability - Diagnosis and Treatment*, vol. 8, no. 4, pp. 777–783, Dec. 2020, doi: 10.6000/2292-2598.2020.08.04.21.

[40] N. J. Alsaleh, "Teaching Critical Thinking Skills: Literature Review," *The Turkish Online Journal of Educational Technology*, vol. 19, no. 1, pp. 21–39, 2020.

[41] L. Bellaera, Y. Weinstein-Jones, S. Ilie, and S. T. Baker, "Critical thinking in practice: The priorities and practices of instructors teaching in higher education," *Thinking Skills and Creativity*, vol. 41, p. 100856, Sep. 2021, doi: 10.1016/j.tsc.2021.100856.

[42] M. Muckenthaler, T. Tillmann, S. Weiß, and E. Kiel, "Teacher collaboration as a core objective of school development," *School Effectiveness and School Improvement*, vol. 31, no. 3, pp. 486–504, Jul. 2020, doi: 10.1080/09243453.2020.1747501.

[43] A. Bush and N. Grotjohann, "Collaboration in teacher education: A cross-sectional study on future teachers' attitudes towards collaboration, their intentions to collaborate and their performance of collaboration," *Teaching and Teacher Education*, vol. 88, p. 102968, Feb. 2020, doi: 10.1016/j.tate.2019.102968.

[44] M. Li and Z. Yu, "Teachers' Satisfaction, Role, and Digital Literacy during the COVID-19 Pandemic," *Sustainability*, vol. 14, no. 3, p. 1121, Jan. 2022, doi: 10.3390/su14031121.

[45] G. Falloon, "From digital literacy to digital competence: the teacher digital competency (TDC) framework," *Educational Technology Research and Development*, vol. 68, no. 5, pp. 2449–2472, Oct. 2020, doi: 10.1007/s11423-020-09767-4.

[46] M. F. Amsal, Munir, Rusman, and D. D. Sagita, "21st century teacher: An overview of prospective teachers' personal competencies," in *AIP Conference Proceedings* 2023, p. 090036, doi: 10.1063/5.0161697.

[47] H. Almazroa and W. Alotaibi, "Teaching 21st Century Skills: Understanding the Depth and Width of the Challenges to Shape Proactive Teacher Education Programmes," *Sustainability*, vol. 15, no. 9, p. 7365, Apr. 2023, doi: 10.3390/su15097365.

[48] A. Widiastuti, N. Supriatna, Disman, and K. S. Nurbayani, "Development of Learning Models to Increase Entrepreneurship Competency," *Malaysian Online Journal of Educational Management*, vol. 11, no. 2, pp. 1–17, 2023.
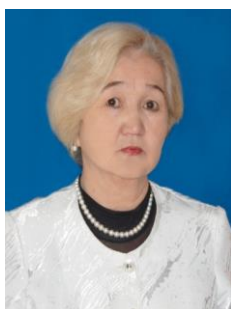
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