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4Cs Model in Initial Teacher Education: Fostering and Developing 4Cs Competencies in Higher Education Teaching

Džejla Idrizović[1] & Emina Dedić Bukvić[2]
University of Sarajevo –Sarajevo, Bosnia and Herzegovina

Abstract: This study examines the key competencies required of teachers in contemporary education and their role in preparing future generations. These competencies are widely recognized as foundational to societal development across multiple domains. In this context, the 4Cs model in initial teacher education was developed to establish conceptual and pedagogical preconditions for integrating critical thinking, creativity, collaboration, and communication competencies into teacher education programs. The study investigated the perceptions of students enrolled in teacher education programs at the University of Sarajevo regarding instructional activities through which university teachers foster and develop 4Cs competencies in higher education teaching. The findings indicate that, from the students' perspective, instructional activities most strongly support the development of communication competency, followed by critical thinking and collaboration, whereas creativity is the least consistently fostered. This finding suggests that the integration of 4Cs competencies in higher education remains predominantly declarative rather than transformative, revealing a gap between curricular expectations and pedagogical practice. Furthermore, the results indicate a highly significant correlation between instructional activities fostering critical thinking and creativity. Significant correlations were also observed among the other competency scales, indicating that these competencies are interrelated and mutually reinforcing rather than developed in isolation. These findings highlight practical implications for teacher education programs.

Keywords: 4Cs competencies, critical thinking, creativity, communication, collaboration

New trends in twenty-first-century education place new demands on policymakers. These changes reflect rapid economic, technological, and structural shifts in a globalized world. Educational systems worldwide strive to identify and classify the key competencies required of every individual in everyday life and professional practice. The goal is to help people respond adequately to the demands placed upon them. One key aim of contemporary education is the teaching and learning of critical thinking, problem-solving, creativity, innovation, communication, and collaboration (Ananiadou & Claro, 2009; Organization for Economic Co-

[1] University of Sarajevo – Faculty of Science, Sarajevo, B&H. E-mail; dz_idrizovic@pmf.unsa.ba
[2] Corresponding Author: Associate Professor at the Department of Pedagogy, University of Sarajevo – Faculty of Philosophy, B&H. E-mail; emina.dedic.bukvic@ff.unsa.ba

operation and Development [OECD], 2005, 2019, 2023; Partnership for 21st Century Skills [P21], 2009, 2015).

Through research and the development of the Framework for 21st Century Skills, P21 identified these four competencies as the 4Cs of 21st Century Skills: critical thinking, creativity, communication, and collaboration. They are the most significant competencies of the era and serve as core skills of deeper learning. The 4Cs competencies complement, but do not replace other skills currently taught in schools (National Education Association [NEA], 2010; P21, 2009, 2015). In addition to strategic documents, case studies, and research produced by P21, the understanding of 4Cs competencies as a key construct is further supported by many scholars (Alharbi, 2024; Alismail & McGuire, 2015; Birru, 2024; Chiruguru, 2020; Germaine et al., 2016; Haryani et al., 2021; Herlinawati et al., 2024; Kivunja, 2014, 2015; Thornhill-Miller et al., 2023). These competencies reflect a shift from traditional, reproductive learning toward active knowledge construction, innovation, and problem-solving. This aligns with policies and strategic documents that define the priorities of twenty-first-century education across Europe, North America, and Asia (OECD, 2019, 2023; P21, 2015, 2019). Despite frequent references to the importance of 4Cs competencies in strategic documents in Bosnia and Herzegovina and more broadly in Southeast Europe, few empirical studies systematically examine whether and how initial teacher education programs develop these competencies. Review studies confirm that, in contemporary literature, 4Cs competencies are increasingly understood as an interconnected construct. They should be integrated into curriculum, teaching, and assessment, rather than being treated as isolated learning outcomes (Thornhill-Miller et al., 2023). These studies also highlight the need to modernize curricula to adequately support the development of critical thinking, creativity, communication, and collaboration (Birru, 2024; Esteves, 2017). Empirical studies in education indicate that successful integration of 4Cs competencies depends on the coherent alignment of curricula, instructional planning, teachers' professional development, and institutional support for their implementation in practice (Alharbi, 2024; Herlinawati et al., 2024). Together, these findings support understanding 4Cs competencies as a conceptual foundation for contemporary educational reforms, rather than as additional pedagogical elements. Many educational systems across Europe and worldwide face various challenges in integrating twenty-first-century competencies into initial teacher education. The depth and coherence of 4Cs competency implementation vary considerably across institutions and national contexts. Students and teachers frequently encounter a lack of training, pedagogical guidelines, and institutional support for the effective implementation of 4Cs competencies in instructional practice, representing a common challenge across diverse educational settings (Alharbi, 2024). Existing research predominantly conceptualizes 4Cs competencies at the theoretical or educational policy level, with limited attention to how university teachers operationalize and integrate them through concrete instructional activities. Furthermore, little is known about how students enrolled in teacher education programs perceive 4Cs competencies within the context of university teaching. This study addresses the gap by examining students' perspectives at the University of Sarajevo.

Recent studies point to a persistent gap between declared curricular intentions and actual instructional practice. Higher education institutions often lack systematic approaches to implementing 4Cs competencies within learning processes (Herlinawati et al., 2024; Le & Nguyen, 2025). This research gap matters because students in teacher education programs will soon assume professional roles. If they copy traditional teaching, it may undermine reform processes based on twenty-first-century learning. Focusing on these competencies is important for preparing future teachers. Their role is to educate and prepare the next generation to meet the challenges of modern society (Idrizović & Dedić Bukvić, 2024). Practical experience in higher education can further shape and enhance these competencies by enabling the application and integration of knowledge in authentic contexts, thereby fostering the development of higher-order cognitive processes and reflective skills (Anderson & Krathwohl, 2001; Voogt et

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al., 2013). Given this gap and the central role of 4Cs competencies, this study aims to examine how teacher education programs foster the development of critical thinking, creativity, communication, and collaboration. It also aims to provide insight into the approaches and challenges shaping how future teachers acquire these competencies. Although the theoretical framework draws on international education policies and strategic documents (e.g., OECD; P21), the interpretation of the results in this study is situated within the context of empirical research in teacher education. The findings align with previous studies that point to a persistent gap between the declarative endorsement of twenty-first-century competencies and actual instructional practices in higher teacher education programs (Buchberger & Hasel, 2024; Thornhill-Miller et al., 2023).

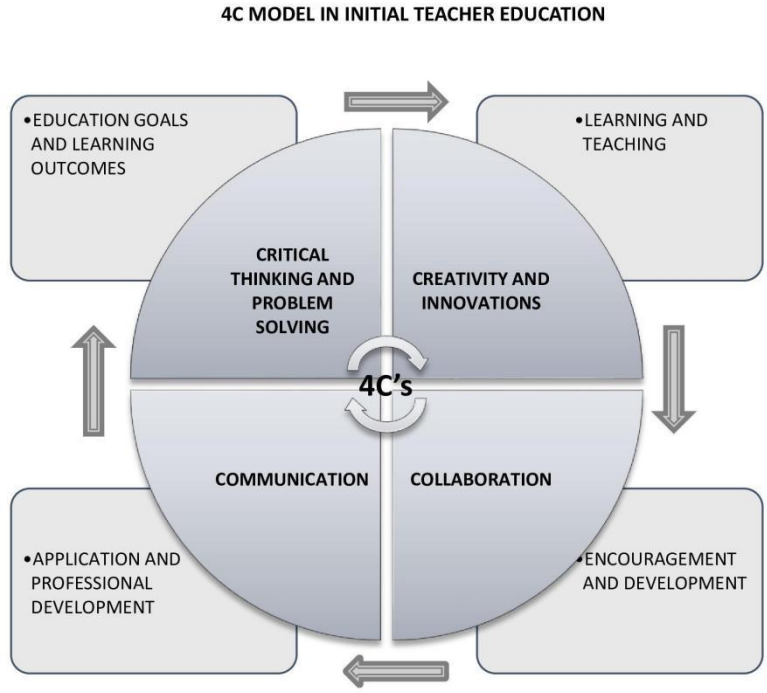
Theoretical Conceptual Framework

The 4Cs Model in Initial Teacher Education

The development of 4Cs competencies represents a central requirement of contemporary educational reforms, and their meaning and pedagogical implications have been elaborated in detail within numerous theoretical frameworks. One of the most influential among them is the P21 Framework for 21st Century Skills, which defines the 4Cs competencies (critical thinking, creativity, communication, and collaboration) as fundamental capacities required for successful work, learning, and civic engagement in the twenty-first century. The P21 Framework for 21st Century Skills emphasizes that these competencies are not isolated but are interconnected and integrated into complex processes of problem-solving, decision-making, and collaborative knowledge construction. Within the literature on twenty-first-century education, the 4Cs competencies are recognized as key cognitive, social, and metacognitive capacities that enable learners to navigate dynamic and uncertain learning contexts (Binkley et al., 2010). Voogt and Roblin (2012) further emphasize that the 4Cs competencies are at the core of nearly all international frameworks for twenty-first-century education, including P21, and highlight the need to transform educational practice toward problem-based and collaborative learning. Fullan et al. (2016, 2018) describe the 4Cs competencies as skills that foster active participation and innovation, with creativity and collaboration acting as drivers of change in schools. According to research conducted in Indonesia, the competencies of critical thinking, communication, collaboration, and creativity became prominent educational objectives with the introduction of Curriculum 2013, and teachers were encouraged to create learning environments that emphasize the development of these skills among students (Dafit et al., 2024; Danial et al., 2026). This body of research suggests that the 4Cs framework serves as a flexible, contextually adaptable concept that can be applied across diverse educational systems. Although it was initially developed with a focus on primary and secondary education, this framework increasingly shapes discussions and practices in higher education, particularly in initial teacher education. Rather than functioning as a universally standardized curricular model, the 4Cs framework primarily serves as a conceptual guideline for curriculum design, pedagogy, and learning outcomes (Binkley et al., 2010; P21, 2019).

Reflecting on the value of 4Cs competencies in preparing young people for successful life and work in the twenty-first century and drawing on the elements outlined in the Framework for 21st Century Skills (P21, 2009), the idea and need emerged to develop a 4Cs model suitable for application in initial teacher education (Figure 1).

Figure 1
4Cs Model in Initial Teacher Education



This model adapts the P21 Framework for 21st Century Skills by adopting its central components: the four key competencies (critical thinking, communication, collaboration, and creativity). However, unlike the P21 model, which is primarily oriented toward student development and encompasses a broad range of domains (twenty-first-century themes, digital skills, and life and career skills), positioning the 4Cs competencies as foundational learning outcomes for the twenty-first century, this model focuses exclusively on the initial education of future teachers. In this version, the four competencies serve as the core of a cyclical, holistic process of teacher formation that encompasses the definition of educational goals, teaching and learning processes, professional encouragement, and application in practice.

In this way, the model operationalizes the P21 approach by translating universal twenty-first-century competencies into specific pedagogical and professional requirements necessary for the development of contemporary teachers, rather than treating them as additional or isolated learning outcomes. Integrating the 4Cs model into initial teacher education requires clearly defined prerequisites for successful implementation. One of the fundamental prerequisites for applying this model is more precise planning and definition of 4Cs competencies through educational goals and learning outcomes within higher education, drawing on various strategic documents as well as international frameworks that promote the implementation of the knowledge, skills, and abilities required for the development and attainment of 4Cs competencies. Given such clearly defined educational goals and learning outcomes, initial teacher education programs should specify as many objectives and learning outcomes as necessary to ensure comprehensive coverage of the 4Cs competencies. A second prerequisite concerns the teaching and learning of 4Cs competencies through diverse course content and instructional activities. This process requires collaboration between teachers and students, necessitating a more thorough understanding of the definitions and conceptual foundations of the 4Cs competencies, as well as a greater variety of activities that actively incorporate them.

Successful implementation of the model requires purposeful planning of teaching and learning strategies. This includes the use of innovative approaches, methods, techniques, and

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instructional formats. The didactic–methodical organization of teaching and learning processes must serve the achievement of defined educational goals and intended learning outcomes, which can be accomplished through careful planning and the application of various contemporary and innovative strategies, methods, techniques, and work forms. Exploring and implementing innovative strategies to develop, stimulate, and strengthen 4Cs competencies is a challenge for both students and university teachers, requiring continuous professional development and ongoing enhancement of their own competencies. The goal of teaching 4Cs competencies in initial teacher education is to enable their practical application within the educational process, ensuring balanced development of critical thinking, creativity, communication, and collaboration. Successfully fostering these competencies among pre-service and in-service teachers can enhance professional development and improve educational practice at all levels. Implementing the 4Cs model in higher education supports active student engagement and positions these competencies at the center of the curriculum, preparing students for the challenges of contemporary society.

The proposed 4Cs model of initial teacher education presented in this study serves a conceptual and normative function. Rather than constituting an empirically validated model, it functions as a theoretical framework intended to systematize and interpret instructional practices aimed at fostering 4Cs competencies. Accordingly, the empirical component of the study does not assess the validity of the model itself but instead examines students' perceptions of the presence of learning activities that the literature associates with the development of critical thinking, creativity, communication, and collaboration. The contribution of this model lies in its contextual operationalization of the 4Cs framework within initial teacher education, rather than in proposing a novel theoretical construct.

Research Methodology

A quantitative methodological approach was applied in this study, enabling the collection of responses and opinions from students enrolled in initial teacher education programs regarding instructional practices that foster the development of 4Cs competencies.

Research Aim and Research Questions

This study aimed to examine how students enrolled in initial teacher education programs at the University of Sarajevo perceive various activities through which university teachers foster and develop 4Cs competencies (critical thinking, creativity, communication, and collaboration) in higher education teaching.

Based on this aim, the following research questions were formulated:

1. In what ways, and through which types of instructional activities, do university teachers foster the development of critical thinking, creativity, communication, and collaboration in higher education teaching from the students' perspective?
2. Which 4Cs competencies, according to students' perceptions, are fostered and developed to the greatest extent, and which to the least extent, through university teachers' instructional activities?
3. Is there a significant correlation among the 4Cs competencies, and how is this interrelationship reflected in the implementation of 4Cs competencies within the educational process?

Methods and Instruments

The survey method was applied in this study as one of the most appropriate approaches for examining opinions, attitudes, perspectives, and observations related to the stated research aim. The survey approach was selected because it enables the collection of comparable data from a larger number of respondents, thereby facilitating the identification of patterns and trends in instructional practices related to critical thinking, creativity, communication, and collaboration (Creswell & Creswell, 2022).

For this study, an anonymous online questionnaire was administered to students enrolled in teacher education programs at the University of Sarajevo. Ethical approval was obtained from the Ethics Committee of the University of Sarajevo prior to data collection. Formal IRB approval was not required under institutional regulations. Informed consent was obtained from all participants, and anonymity and confidentiality were ensured. The instrument was constructed in Bosnian/Croatian/Serbian, the official languages of Bosnia and Herzegovina, and was based on an analysis of recent and relevant pedagogical literature, as well as the studies focusing on these four competencies.

The questionnaire consisted of four scales corresponding to each of the 4Cs competencies:

(a) Critical thinking competency scale
(b) Creativity competency scale
(c) Communication competency scale
(d) Collaboration competency scale

The scales consist of a series of items describing specific activities of university teachers within the instructional process. Each item identifies specific aspects of teachers' practices that foster 4Cs competencies among students enrolled in teacher education programs and simultaneously serves as an indicator of each competency. The items were defined based on the literature used to construct the study's theoretical conceptual framework, as well as on the defined outcomes of the 4Cs competencies within the Framework for 21st Century Skills.

Before data collection, the questionnaire underwent a pilot study with a group of 12 students to ensure linguistic clarity, conceptual coherence, and cultural appropriateness of the items. Based on feedback from the pilot participants, minor semantic adjustments were made. Content validity of the instrument was established through expert evaluation. Three university professors specializing in pedagogy and didactic–methodical fields independently evaluated the items to determine whether they adequately represented the conceptual domains of the four competencies. Their feedback guided refinements in item formulation and thematic alignment.

To reduce the number of items and identify thematically related clusters of instructional practices, an exploratory factor analysis using Principal Component Analysis (PCA) was conducted separately for each competency of the 4Cs model. The analysis focused on empirically grouping instructional activities associated with each 4Cs competency rather than on testing latent psychological constructs. The number of components retained was determined through a combination of the Kaiser criterion (eigenvalues greater than 1) and an examination of factor loadings, with particular emphasis on the dominance and interpretability of the first component. To facilitate the interpretability of the component structure, Varimax rotation with Kaiser normalization was applied. The results showed that the dimensions of critical thinking, creativity, and communication were predominantly unidimensional, with the first component accounting for the largest proportion of variance and encompassing most items with high factor loadings and clear conceptual coherence. Additional components exhibited weak factorial structure and insufficient theoretical justification and were therefore excluded from further consideration.

Accordingly, only items with substantial loadings on the first component were retained and used to construct unidimensional composite scales representing instructional practices

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aimed at fostering the respective 4Cs competencies. The collaboration dimension displayed a weaker and less stable factorial structure and was therefore analyzed with methodological caution. Only items showing satisfactory loadings on the primary component and referring to concrete forms of group work organization and the facilitation of collaborative student interactions were retained for the final scale.

All composite scales were measured using a five-point Likert-type response format ranging from 5 (Strongly agree) to 1 (Strongly disagree). Participants were instructed to select the response option that, in their judgment, most accurately reflected their experience with the instructional practices under consideration. This measurement approach enabled the quantitative assessment of students' perceptions, with higher scores indicating more favorable evaluations and a higher perceived presence of instructional activities targeting the development of individual 4Cs competencies.

Overall, this analytical strategy allowed the study to remain focused on the operational level of instructional activities, without engaging in the theoretical modeling of latent constructs, which is consistent with the study's aims, the design of the instrument, and contemporary empirical approaches in educational research.

Research Sample

The research sample comprised 93 students enrolled in initial teacher education programs across nine faculties of the University of Sarajevo. The study included final year students selected through convenience sampling, as they represent a population that is about to enter the teaching profession and are therefore considered the most competent to assess how university teaching supports the development of 4Cs competencies. The questionnaire was distributed to 101 potential participants, resulting in a response rate of 92.1%.

The number of valid responses varied across scales due to partially completed questionnaires (critical thinking: N = 93; creativity: N = 87; communication: N = 87; collaboration: N = 84). Missing data were not imputed; instead, they were handled using listwise deletion, retaining only respondents with complete data for the variables included in each analysis.

Data Collection and Data Analysis

Data were collected via an online survey questionnaire developed on the Lime Survey platform, enabling standardized data collection from a larger number of participants.

The aim of the study was not to examine latent competency structures, but rather to describe the extent to which instructional activities fostered the development of each of the 4Cs competencies and to examine the relationships among them. Accordingly, the data were analyzed using descriptive statistics (arithmetic means and standard deviations) and Pearson correlation coefficients, which provide a clear overview of the prevalence of activities and the interrelationships among competencies without the need for complex latent variable modeling. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS, version 26).

Descriptive values of the items, such as the arithmetic mean or mean value (M), as well as the standard deviation (s), are presented in tables in the results section.

To determine the reliability of the scales, Cronbach's alpha was computed to assess whether the items within the scales yield consistent results. The alpha coefficient ranges from 0 to 1, with higher values (closer to 1) indicating greater internal consistency of the items within the measurement instrument.

To examine the relationships among the four competencies, Pearson correlation coefficients were calculated. The threshold for statistical significance was set at $p < .01$ to reduce the likelihood of Type I error from multiple comparisons. Correlation analysis enabled the identification of relationships between fostering individual competencies, providing insight into whether a greater prevalence of activities aimed at one competency was associated with a higher level of fostering of the others, thereby offering indicators of the coherence of instructional approaches to the development of 4Cs competencies.

The observed correlations should not be interpreted as evidence of causal or developmental relationships between competencies, instead, they reflect their simultaneous presence within instructional activities, as perceived by students.

Research Results and Discussion

Given that the fundamental characteristics, approaches, and challenges related to the development of 4Cs competencies in initial teacher education are similar across all parts of Bosnia and Herzegovina, the results of this study may be considered relevant to the broader national context. They provide insight into educational practices and challenges that shape the acquisition of these key competencies within a decentralized educational system. Such insights may inform future curricular and pedagogical interventions not only in Bosnia and Herzegovina but also in comparable educational systems worldwide.

To examine how teachers develop, foster and strengthen the 4Cs competencies through specific instructional activities, as perceived by students, four Scales of Fostering and Developing Competencies were constructed. Each scale comprises a set of items describing teachers' activities within the instructional process.

The internal consistency of the scales was assessed using Cronbach's alpha. The Cronbach's alpha coefficient for the Scale of Fostering and Developing Critical Thinking Competency was $\alpha = .95$, as was the coefficient for the Scale of Fostering and Developing Creativity Competency. The Scale of Fostering and Developing Communication Competency also demonstrated excellent reliability ($\alpha = .94$). In contrast, the Cronbach's alpha coefficient for the Scale of Fostering and Developing Collaboration Competency was lower ($\alpha = .76$) than that of the remaining scales, which showed exceptionally high reliability ($\alpha > .90$).

Very high Cronbach's alpha values may reflect not only strong internal consistency but also a degree of semantic overlap among items. This finding may be attributed to the deliberate focus on a homogeneous set of instructional activities within each competency. Nevertheless, future revisions of the instrument should consider reducing the number of items to minimize potential redundancy.

Although the Cronbach's alpha coefficient for the Scale of Fostering and Developing Collaboration Competency was lower than those of the other scales ($\alpha > .90$), it can still be considered acceptable and sufficiently reliable. As noted by Novak (2020), some researchers have reported lower alpha values (e.g., $\alpha = .65$) as acceptable, citing the influence of the number of items on the coefficient.

The research results are organized into six sections: interpretations of the results with the highest mean scores for each scale, descriptive statistics for the scales measuring the fostering and development of 4Cs competencies, and their interrelationships and correlations.

Mean scores clustered around the midpoint of the scale suggest moderately heterogeneous student perceptions, rather than clearly established pedagogical patterns. Thus, the findings suggest ambivalence and inconsistency in instructional practices rather than a strong or systematic implementation of the 4Cs competencies.

Statistical data are presented in tabular form, while only the most significant indicators of fostering 4Cs competencies, those with the highest mean values, are highlighted and described narratively.

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Fostering and Developing Critical Thinking Competency

To gain insight into how teachers foster, develop, and strengthen critical thinking competency in their instructional practice from students' perspectives, the Scale for Fostering and Developing Critical Thinking Competency was developed, comprising a series of items describing specific teaching activities within the instructional process. Each item highlights aspects of teachers' practices that foster students' critical thinking skills and encourage problem-solving abilities.

Table 1
Scale for Fostering and Developing Critical Thinking Competency

Items	*M*	*SD*	*n*
Teachers require students to connect acquired knowledge with examples from everyday life situations	3.75	0.928	93
Teachers connect course content with students' prior knowledge	3.74	0.908	93
Teachers encourage students to express their opinions and ask questions freely	3.67	0.925	93
Teachers ask questions based on factual knowledge and procedures	3.65	0.803	93
Teachers ask questions based on explanation and justification	3.61	0.860	93
Teachers ask questions based on the application of knowledge and understanding	3.59	0.947	93

Note. *M* = mean; *SD* = standard deviation; *n* = number of respondents.

The results indicate that, from the students' perspective, teachers use instructional activities to encourage students to relate acquired knowledge to everyday life examples and to integrate course content with students' prior knowledge.

This suggests that activities aimed at fostering critical thinking primarily emphasize the repetition of acquired content and the integration of new material with students' previous experiences. In addition, teachers encourage students to express their opinions and ask questions freely. Among the most prominent activities through which teachers develop and foster critical thinking competency are those in which they pose questions based on factual knowledge and procedures, explanations and justifications, and the application of knowledge and understanding. Although such strategies contribute to cognitive engagement, they largely activate lower levels of the revised Bloom's taxonomy. Moore and Parker (2009) argue that fostering and developing critical thinking skills requires engagement with higher levels of the revised Bloom's taxonomy, namely analysis, evaluation, and creation, and they propose teaching student's metacognitive strategies as an effective way to develop critical thinking. These findings are consistent with research in literature courses, where critical thinking has been defined as students' expression of their personal viewpoints, both descriptive and interpretive, regarding texts, and their evaluative judgments of content (Chi, 2022; Yaki, 2022). Such perspectives suggest that critical thinking development relies not only on recalling factual knowledge but also on interpreting, evaluating, and justifying ideas, which aligns with the call for higher-order cognitive engagement described in Bloom's revised taxonomy.

The limited presence of activities that require hypothesis formulation, independent inquiry, and the generation of alternative solutions suggests that students are not consistently exposed to cognitively demanding tasks. This pattern aligns with broader didactic tendencies

identified in contemporary research, which indicates that higher education institutions often rhetorically promote critical thinking while classroom practices remain predominantly reproductive (Buchberger & Hasel, 2024). As a result, critical thinking may be conceptually acknowledged but not sufficiently operationalized within instructional design.

Although teachers predominantly use effective methods, the findings indicate opportunities for further pedagogical development.

Fostering and Developing Communication Competency

The Scale for Fostering and Developing Creativity Competency comprises a series of items designed to gather information on how students assess teachers' efforts to stimulate their creativity, as well as the ways and activities through which teachers support the achievement of these goals in instructional practice. Table 2 presents an overview of the descriptive statistics for each listed item.

Table 2
Scale for Fostering and Developing Creativity Competency

Items	*M*	*SD*	*n*
Teachers require students to read textbooks or supplementary literature	3.89	0.945	87
Teachers require students to write definitions or short written assignments	3.74	1.005	87
Teachers ask open-ended questions during the teaching process	3.60	0.908	87
Teachers require students to identify one or multiple applications of the covered content	3.56	0.845	87
Teachers ask closed ended (yes/no) questions	3.55	0.937	87
Teachers encourage originality and inventiveness in students' work	3.51	0.963	87

Note. M = mean; SD = standard deviation; n = number of respondents.

According to students' assessments, instructional activities often require students to read textbooks or supplementary literature and to write definitions or complete short written assignments. This result suggests that reading core and supplementary materials constitutes an important part of the teaching process, which is positive as it encourages students to engage in independent inquiry and expand their knowledge. This practice may help students focus on understanding key concepts and increase their engagement in the learning process.

Furthermore, from the students' perspective, activities include asking open-ended questions and requiring students to identify one or more applications of the covered content, followed by closed-ended (yes/no) questions. Instructional activities aimed at encouraging creative thinking, the generation of new and valuable ideas, originality, and inventiveness are somewhat less frequently represented. This finding indicates that instructional activities foster students' originality and inventiveness to a moderate extent. The limited emphasis on divergent and generative activities may reflect variations in teacher quality, as higher teacher competence, knowledge, and experience have been shown to enhance the teaching of creativity (Yusriadi, 2021; Kiguwa, 2023). Although such activities are considered important for the development of creativity and innovation, students do not perceive them as sufficiently prevalent.

The results reveal a notable pedagogical tension, as activities associated with creativity remain predominantly reproductive, such as reading textbooks, writing definitions, and responding to closed-ended questions, rather than with generativity or divergence. Creativity is

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thus perceived as an extension of traditional academic tasks rather than as a process involving divergent thinking and original idea generation. Recent studies indicate that when creativity is reduced to literacy-based tasks, students struggle to engage in authentic problem-solving and innovative thinking (Kaufman et al., 2022).

Therefore, although creativity is recognized as a key twenty-first-century competency, university teaching appears to prioritize conformity and correctness over exploration and experimentation. The findings suggest a need to re-examine how instructional activities foster creativity. Most activities are limited to reading literature, defining concepts, and responding to closed-ended questions, with minimal emphasis on divergent thinking and original creation. The fact that instructional activities such as reading textbooks and writing definitions are predominantly associated with creativity in students' perceptions points to a conceptual ambiguity in the operationalization of this competency in higher education practice.

Nevertheless, these results may serve as a basis for further research and for improving instructional activities that promote deeper and more creative understanding of course content.

Fostering and Developing Communication Competency

To examine students' attitudes toward the activities and ways in which teachers contribute to the development, fostering, and strengthening of communication competency within the teaching process, the Scale for Fostering and Developing Communication Competency was developed.

Table 3
Scale for Fostering and Developing Communication Competency

Items	*M*	*SD*	*n*
Non-verbal communication is equally important in conversation as verbal communication	4.17	0.770	86
Teachers encourage reading professional literature in the mother tongue and foreign languages	3.85	0.847	86
Teachers encourage students to use media and various technologies	3.85	0.819	86
Teachers encourage students to use various forms of communication (verbal, nonverbal, written, etc.).	3.81	0.914	86
Teachers encourage students to assess the effectiveness and impact of media and different technologies	3.74	0.897	86
Teachers require students to share their observations and discuss problems	3.71	0.906	86
Teachers encourage students to use communication for different purposes (informing, teaching, motivating, persuading)	3.71	0.852	86

Note. M = mean; *SD* = standard deviation; *n* = number of respondents.

According to students' assessments, non-verbal communication in conversation is considered equally important as verbal communication. Non-verbal communication (gestures, facial expressions, posture) often plays a crucial role in conveying messages; therefore, teachers need to recognize and encourage students to use it effectively. This result may reflect a strong awareness among students of the importance of non-verbal elements in communication, which can be utilized to enhance instructional practice, particularly in lectures, seminars, and public presentations.

From the students' perspective, teachers foster the communication competency by encouraging the reading of professional literature in both the native language and foreign languages. This result reflects a positive instructional approach, as reading professional literature supports the development of critical thinking and enriches students' academic vocabulary. Nevertheless, there is potential to strengthen further the focus on the use of professional literature in foreign languages, particularly in disciplines that require internationally recognized research and sources. Based on these results, it can be concluded that teachers employ a wide range of strategies to foster various forms of communication, including verbal and non-verbal, as well as the use of technology and media in teaching. Students generally recognize these practices, and teachers appear to be successful in encouraging student engagement and critical thinking. However, the results also indicate variability in students' perceptions of the frequency of these practices, suggesting a need for further alignment and potential improvements to instructional approaches. Increasing the focus on the effectiveness and impact of media, as well as further developing students' abilities to evaluate media sources, may additionally enhance the teaching process.

Teaching itself is a communicative process in which teachers and students work together to achieve its goals and objectives. Without effective communication, no aspect of the educational process can be successfully realized. As Freire (2002) argues, without dialogue there is no communication, and without communication there is no genuine education. Communication emerges as the most consistently supported competency, particularly through oral and written production, multimedia communication, and the use of digital tools. Nevertheless, elements of argumentation, dialogue, and meaning negotiation remain insufficiently present. High mean values for communication related activities indicate that communication is the most systematically cultivated competency in higher education teaching. The emphasis on multimodal communication, including reading professional literature, using digital media, and engaging in oral expression, aligns with contemporary expectations for teachers to facilitate interactive learning environments. However, despite these strengths, the data also indicate a lack of explicit metacommunicative practices, such as feedback negotiation, argumentation, and dialogical reasoning.

Without these elements, communication may remain largely functional rather than transformative, thereby limiting its potential to support critical and collaborative knowledge construction (Mercer, 2019).

Fostering and Developing Collaboration Competency

Given that collaborative skills are gaining increasing importance in contemporary education and are classified within the Framework for 21st Century Skills as one of the four most important learning and innovation skills, one of the objectives of this study was to examine students' attitudes toward instructional activities and teachers' practices related to the fostering, development, and strengthening of collaboration skills. For this purpose, the Scale for Fostering and Developing Collaboration Competency was developed (Table 4).

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Table 4
Scale for Fostering and Developing Collaboration Competency

Items	*M*	*SD*	*n*
Teachers most frequently use frontal teaching during the instructional process	3.85	0.885	84
Teachers encourage respect for diversity, multiculturalism, empathy, and human values	3.83	0.980	84
The instructional process emphasizes individual work	3.61	0.932	84
Teachers encourage group dynamics based on heterogeneous socialization	3.60	0.893	84
Groups consist of up to four students	3.55	0.962	84
Teachers assign tasks to be completed in pairs	3.50	0.871	84

Note. *M* = mean; *SD* = standard deviation; *n* = number of respondents.

The results indicate that teachers use a range of teaching methods, however, teacher centered whole class instruction and individual work are reported most frequently, whereas small group work and pair-based tasks are less prevalent. An examination of the descriptive statistics in Table 4 suggests that, from the students' perspective, teachers most frequently use a frontal form of instruction.

Frontal teaching is a common practice in traditional educational systems and can be effective for transmitting basic facts or concepts to large groups of students (Bakir & Banikhalaf, 2025). This result indicates that frontal instruction remains dominant in many educational practices, which may be helpful but can also limit students' engagement in more active forms of learning. At the same time, instructional activities encourage students to respect diversity, multiculturalism, empathy, and humaneness, while also placing particular emphasis on individual work. The results indicate that teachers incorporate practices that support the development of students' social competencies, which may contribute to their overall development. However, there is room for improvement in the implementation of group and pair-based tasks, which could strengthen students' teamwork skills and enhance collaboration. According to students' perceptions, teachers encourage group dynamics through heterogeneous socialization and assign tasks to be completed in groups, most often with up to four students, or in pairs.

Although collaboration appears to be nominally embedded in instructional practice, the dominance of frontal teaching methods and individual work reflects a structural resistance to shared responsibility and collective knowledge construction. The limited use of cooperative learning strategies suggests that collaboration is neither systematically planned nor intentionally structured. Group work is often implemented without clearly defined role distribution, shared accountability, or deliberate development of interpersonal skills. International studies consistently warn that placing students in groups without explicit instruction in interpersonal and group processing skills does not result in meaningful collaboration (Evans, 2020).

Thus, although the university context may recognize the importance of collaboration, its implementation appears superficial and insufficiently grounded in established pedagogical frameworks.

Descriptive Values of the Scales for Fostering and Developing 4Cs Competencies

Descriptive statistics for all four dimensions show similar mean values among students, suggesting that overall differences are small (Table 5).

Table 5
Descriptive Statistics of the 4Cs Competency Scales

4Cs Competency Scales	*n*	*Min.*	*Max.*	*M*	*SD*
Critical thinking-activities	93	1.87	5.00	3.53	0.760
Creativity-activities	87	1.00	5.00	3.47	0.755
Communication-activities	87	1.93	5.00	3.72	0.675
Collaboration-activities	84	2.09	4.82	3.50	0.513

Note. M = mean; *SD* = standard deviation; *n* = number of respondents.

According to students' assessments, university teachers most frequently foster communication competency through various instructional activities, followed by critical thinking competency, while activities aimed at developing collaboration and creativity are less common. Although collaboration and creativity are statistically significantly developed, the overall findings indicate that the greatest emphasis in instructional practice is placed on the development of communication skills, whereas creativity is perceived by students as the least represented and largely neglected. This pattern aligns with previous research indicating the dominant focus of higher education instruction on transmissive and communicative aspects of learning and highlights the need for a more balanced application of teaching strategies that support the comprehensive development of the 4Cs competencies.

Guided by the assumption that practical experience can shape or further develop competencies that are essential for professional and academic success in higher education (Anderson & Krathwohl, 2001; Voogt et al., 2013), we examined whether differences exist in the perceptions of students with prior teaching experience compared to those without such experience. Two groups of students were created: students with work experience and students without work experience. This grouping reflects a conceptual distinction between students with varying levels of exposure to real world professional environments. To test the statistical significance of differences between the groups, a one-way ANOVA was conducted for each dimension of the 4Cs competencies, with the results presented in Table 6.

Table 6
ANOVA Results for Students' Attitudes by Work Experience and Effect Sizes (η^2)

4Cs Competency	*F (df)*	*p*	η^2	Interpretation
Critical thinking-activities	F (1, 91) = 1.31	.255	0.014	Negligible effect
Creativity-activities	F (1, 85) = 4.14	.045	0.046	Small to medium effect
Communication-activities	F (1, 85) = 2.87	.094	0.033	Small effect
Collaboration-activities	F(1, 82) = 10.58	.002	0.114	Medium to large effect

Note. F = F statistic; *df* = degrees of freedom; *p* = significance value; η^2 = eta squared (effect size).

The results of the one-way ANOVA (Table 6) indicate that there were no statistically significant differences between the student groups in their perceptions of the prevalence of

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communication and critical thinking competencies in instructional activities ($p > .05$). In contrast, statistically significant differences were observed for collaboration and creativity competencies ($p < .05$).

To further interpret the practical significance of these differences, eta-squared values (η^2) were calculated as measures of effect size, given that a simple one-way ANOVA with two independent groups was used. Although partial eta-squared is often recommended for more complex models (Cohen, 1988; Field, 2018), η^2 provides an adequate and transparent estimate of the proportion of total variance explained by group membership in this context.

The results show that critical thinking did not differ significantly between groups ($F(1, 91) = 1.31$, $p = .255$, $\eta^2 = 0.014$), indicating a negligible effect of work experience. Similarly, differences in communication were not statistically significant ($F(1, 85) = 2.87$, $p = .094$, $\eta^2 = 0.033$), with a small effect. In contrast, a statistically significant difference between groups was found for creativity ($F(1, 85) = 4.14$, $p = .045$, $\eta^2 = 0.046$), with the effect size suggesting a small to medium practical significance. The most pronounced difference was observed in the collaboration dimension, where students with work experience reported significantly higher levels of activities promoting teamwork ($F(1, 82) = 10.58$, $p = .002$), with a medium to large effect ($\eta^2 = 0.114$).

These findings suggest that work experience may have a meaningful practical impact on certain dimensions of the 4Cs competencies, particularly collaboration, whereas its effects on critical thinking and communication are minimal. The small to medium effect observed for creativity further suggests that work experience may contribute to more flexible and innovative approaches to problem-solving, although this influence remains limited compared to collaboration. Conversely, the absence of significant differences in critical thinking and communication implies that these competencies are primarily developed within the formal educational process, through structured instructional activities and academic discourse, independent of prior work experience.

This indicates that the effects of work experience are not universal but selective and competency specific, thereby justifying the conceptual differentiation of groups as a relevant theoretical construct for future research on competency development in higher education. These results align with theoretical expectations that work experience fosters competencies related to teamwork and creative problem-solving, whereas academic cognitive skills are developed through formal education (Biggs & Tang, 2011; Voogt et al., 2013).

Interrelationships among Scales of Activities Promoting 4Cs Competencies

In the subsequent analysis, we aimed to determine whether there are interrelationships among the activities designed to foster the development of the 4Cs competencies. To this end, a correlation matrix was constructed to examine the relationships between the scales of activities promoting the development of 4Cs competencies. Correlations can be positive or negative and range from −1 to +1. A correlation coefficient of +1 indicates a perfect positive relationship, −1 indicates a perfect negative relationship, while 0 indicates no relationship. It is important to note that the magnitude of the correlation coefficient reflects the degree of association between instructional activities in practice. Therefore, the observed correlations do not imply causal or developmental relationships between competencies, rather they indicate their simultaneous presence in instructional practices as perceived by students.

Table 7 presents the Pearson correlations among the different activities promoting the four key competencies. All correlations were statistically significant at the .01 level, indicating that the relationships between activities fostering 4Cs competencies are strong and reliable.

Table 7

Interrelationships among Scales of Activities Promoting 4Cs Competencies

Variable	1	2	3	4
1.Critical thinking–activities	—	.796**	.688**	.483**
2.Creativity–activities	.796**	—	.691**	.510**
3.Communication–activities	.688**	.691**	—	.595**
4.Collaboration–activities	.483**	.510**	.595**	—

The results indicate significant positive correlations among activities promoting the 4Cs competencies. The strongest association was found between activities fostering critical thinking and creativity (r (87) = .796, $p < .01$), as well as between creativity and communication (r (87) = .691, $p < .01$), suggesting that these competencies are frequently developed simultaneously in instructional practice. Additionally, moderate, statistically significant positive correlations were observed between activities promoting critical thinking and communication ($r(87) = .688$, $p < .01$), critical thinking and collaboration ($r(84) = .483$, $p < .01$), creativity and collaboration ($r(84) = .510$, $p < .01$), and communication and collaboration ($r(84) = .595$, $p < .01$). Although these relationships were weaker than those involving creativity and communication, they indicate meaningful associations among the competencies.

Overall, the findings support an integrated educational approach in which activities designed to foster one competency also contribute to the development of others, highlighting the complementary nature of critical thinking, creativity, communication, and collaboration. The interrelatedness of the competencies of critical thinking, creativity, communication, and collaboration is also emphasized by the P21 organization through its *Framework for 21st Century Skills*. According to NEA (2010), problem-solving in the twenty-first century involves teamwork, collaboration, and the ability to work efficiently with computers, large amounts of information, ambiguous situations, and diverse individuals. Creativity is closely intertwined with other competencies, requiring adaptability, leadership, teamwork, and interpersonal skills. Collaborative learning stimulates cognitive abilities and develops creative potential, enhancing both the quantity and quality of ideas. Paul and Elder (2006) argue that critical thinking and creativity are inseparable: critical thinking without creativity leads to scepticism, while creativity without critical thinking leads to mere novelty. Both should therefore be integrated throughout the teaching process. Critical thinking also relies on communication and information literacy, as dialogue and clear articulation of ideas stimulate thoughtful engagement (Freire, 2002). Communication, in turn, is essential for effective collaboration, which involves teamwork, shared goals, and collective responsibility (P21, 2015).

The findings also highlight the interrelated nature of these competencies. Strong correlations among activities promoting 4Cs competencies, particularly critical thinking and creativity, suggest that they do not develop in isolation but rather reinforce one another. Specifically, the relationship between activities fostering critical thinking and creativity supports theoretical assumptions that the generation of new ideas requires both evaluative judgment and divergent reasoning. Taken together, these findings also suggest that imbalances in instructional practice, such as prioritizing communication over creativity, may inhibit the holistic development of 4Cs competencies. In other words, strengthening one competency without adequately supporting the others may undermine the integrative purpose of the 4Cs framework (Fullan, 2021).

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Conclusion

The ability to pose and respond to important questions, critically reflect on others' perspectives, identify and solve problems, and engage in communication and collaboration during learning and the creation of new knowledge and innovations that contribute to a better world has long been central to learning and innovation. These capacities, therefore, place these competencies at the top of the hierarchy of key twenty-first-century competencies (Trilling & Fadel, 2009).

The 4Cs are widely recognized as key competencies of the contemporary era that all students should develop by the end of their education, particularly those preparing for future careers in the teaching profession. In this context, the present study examines how the 4Cs are implemented in the initial education of future teachers from the perspective of students enrolled in teacher education programs. Based on the proposed 4Cs model in initial teacher education, which entails the creation of specific preconditions for its successful application in higher education, this study aimed to examine how university teachers within initial teacher education programs foster and develop the 4Cs competencies through instructional activities.

The theoretical framework emphasizes that the successful implementation of the 4Cs model in initial teacher education requires the planning and application of innovative strategies, methods, techniques, and instructional formats that deliberately develop 4Cs competencies. This implies didactic–methodical structuring of teaching and learning processes in accordance with defined educational goals and learning outcomes. However, the findings indicate that, from the students' perspective, the existing instructional activities do not sufficiently foster these competencies, suggesting that current instructional approaches often lack a strong focus on the development of critical thinking, creativity, communication, and collaboration. Based on the analysis of student reported data, several distinct patterns in the development of the 4Cs competencies were identified:

Critical Thinking: Conceptual Engagement with Limited Higher-Order Cognitive Activation

Although teachers encourage students to connect new content with prior knowledge, pose questions, and justify their answers, these activities predominantly activate the lower levels of the revised Bloom's taxonomy. Higher-order cognitive processes, such as evaluation, synthesis, and problem formulation, receive considerably less emphasis within current instructional activities. The underuse of metacognitive strategies further constrains students' ability to monitor their thinking processes, which is essential for autonomous and reflective pedagogical practice. This finding is consistent with research indicating that, in many teacher education contexts, critical thinking remains an ideational construct instead of a functional learning outcome (Buchberger & Hasel, 2024).

Creativity: The Least Developed Competency

The data indicate that creativity is approached primarily through literacy-based tasks, such as reading textbooks and writing definitions, rather than through divergent thinking, risk-taking, experimentation, or generating original ideas. These findings reflect contemporary literature suggesting that higher education institutions often reduce creativity to content reproduction and convergent thinking, thereby inhibiting innovative potential and neglecting the complexity of creative processes (Beghetto, 2010; Kaufman & Beghetto, 2009). Given that future teachers will be responsible for fostering creative thinking in school settings, the absence of authentic creative engagement at the university level represents a systemic limitation.

Communication: The Most Systematically Supported Competency

Communication emerges as the most robustly developed competency, supported by diverse media, presentation-based tasks, and exposure to resources in foreign languages. This focus aligns with recent research that positions communication as the foundation of interaction rich learning environments (Mercer, 2019). However, the absence of dialogical reasoning, argumentation, and negotiated meaning making indicates that communication often remains functional instead of transformative. Without these elements, students may become proficient transmitters of information but fail to develop into reflective interlocutors capable of facilitating inquiry-based or problem-oriented learning.

Collaboration: Structurally Present, Pedagogically Absent

Despite the global emphasis on collaboration as a foundational twenty-first-century skill, the predominant reliance on frontal instruction and individual work limits opportunities for shared decision-making, group problem-solving, and collective knowledge construction. This aligns with findings from the broader literature, which caution that merely organizing students into groups does not constitute collaborative learning (Evans, 2020). For collaboration to be meaningfully developed, students require explicit guidance on interpersonal communication, collective responsibility, and conflict resolution, elements largely absent from current instructional practice.

Interrelationships Among the Scales of 4Cs Competencies

The correlations among the scales of activities fostering the development of 4Cs competencies particularly between critical thinking and creativity, support theoretical perspectives that conceptualize these competencies as mutually reinforcing rather than as independent constructs. The imbalance identified in this study, characterized by a dominant emphasis on communication and a comparatively weaker focus on creativity, suggests that fragmented instructional approaches may undermine the coherence of the 4Cs framework. Contemporary educational research consistently argues that the development of twenty-first-century competencies requires integrated pedagogical design rather than isolated interventions (Voogt & Roblin, 2012; OECD, 2023). Furthermore, the observed correlations among the scales of activities promoting the development of 4Cs competencies imply that fragmented instructional practices reduce both the coherence and the overall effectiveness of competency development. Without integrated pedagogical design, the developmental potential of the 4Cs competencies may remain underutilized.

Theoretical and Practical Implications

The results of this study are not relevant only to Bosnia and Herzegovina but also carry broader implications for international systems of initial teacher education undergoing curricular reforms. Countries such as the United States, Japan, Indonesia and member states of the European Union are increasingly adopting competency-based frameworks, and the challenges identified in this study may inform educational policies by encouraging policymakers to recognize and embrace these frameworks as strong foundations for transforming higher education teaching practice. This study thus contributes to the global discourse on preparing teachers for the twenty-first century by providing empirical evidence from a context that has historically been underrepresented in the literature.

To align initial teacher education with the demands of contemporary education, it is necessary to move beyond the symbolic integration of competencies and toward intentional

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curriculum planning, explicit modeling of pedagogical approaches grounded in the 4Cs competencies, and professional development that equips teachers with the methodical repertoire required for their effective implementation in practice (Le & Nguyen, 2025). This discrepancy between theory and practice points to the need for systematic improvement of instructional practices. Specifically, innovations are required in the planning and implementation of didactic–methodical modalities that ensure active student engagement in the learning process, stimulate creativity, foster critical thinking, and support the development of communication and collaboration skills. At the same time, a key challenge lies in teachers' continuous professional development, enabling them to apply contemporary, effective learning strategies that promote the development of 4Cs competencies among students.

The study offers several practical implications for educational policy, curriculum development, and instructional practice:

Creating learning environments oriented toward the development of 4Cs competencies: Through diverse educational strategies, it is essential to highlight the importance of these competencies in preparing young people for life and work in the twenty-first-century and to promote them as one of the key goals underpinning education at all educational levels, particularly within initial teacher education. A significant prerequisite in this regard is the creation of opportunities for implementing the 4Cs model in initial teacher education, as developed through this research. The need for curriculum redesign: Initial teacher education programs should explicitly embed 4Cs competencies into course objectives, learning outcomes, and assessment criteria, rather than treating them as supplementary or aspirational elements.

Appropriate application of teaching and learning strategies: Creativity must be reconceptualized and methodologically supported. Instructional practices should shift from reproductive, literacy-based tasks toward activities that promote divergent thinking, innovation, and constructive risk-taking. Collaboration requires structured guidance, merely assigning group tasks is insufficient. Programs must include explicit instruction in interpersonal skills, collective responsibility, and conflict resolution to ensure more meaningful collaboration.

Integrated instructional approaches yield stronger outcomes: Given the interdependence of these competencies, instructional design should foster their integrated development rather than treating them as isolated elements, ensuring that communication does not overshadow creativity and that critical thinking maintains evaluative rigor. A deeper understanding of the values underpinning the 4Cs competencies, combined with their balanced representation and application, may contribute to improved educational practice across all levels of education.

Professional development of university teachers is essential: University teachers require systematic training in metacognitive, dialogical, and collaborative approaches to effectively model the competencies expected of future teachers. Overall, the findings highlight the necessity of a systemic curriculum redesign, targeted professional development for university instructors, and the intentional incorporation of metacognitive and dialogic pedagogical approaches.

Limitations

This study provides empirical evidence from a region where research on the 4Cs competencies remains limited, offering insight into the challenges of implementing competency-based teacher education. The findings indicate that, although students recognize the importance of the 4Cs competencies (Idrizović & Dedić Bukvić, 2024), university instruction does not fully support their balanced development. However, the study relies on students' self-reported perceptions, which may be subject to bias. Therefore, future research should incorporate analyses of program objectives and learning outcomes, direct classroom observations, and interviews with instructors to triangulate the findings. The instrument used

in this study is of a preliminary nature. Accordingly, future research should consider further refinement and item reduction to minimize potential redundancy and to enhance the instrument's psychometric robustness. Given the limitations of the study, particularly the reliance on student self-reports and the descriptive nature of the research design, the findings cannot be generalized as indicators of the actual level of 4Cs competency development. Rather, they should be interpreted as insights into students' perceptions of instructional practices within the examined context.

Authors' Contributions

Both authors contributed equally to all aspects of this study.

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Ethics Statement

Ethical approval was obtained from the Ethics Committee of the University of Sarajevo prior to data collection.

Data Availability Statement

The data supporting the findings of this study are available from the authors upon reasonable request.

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Conflicts of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Notes on Contributors

Džejla Idrizović, PhD, currently works at the University of Sarajevo - Faculty of Science. She is an independent researcher and holds a doctoral degree in social sciences/humanities - field of education and pedagogy. Her research interests include the study of teacher roles and competencies, adult education, educational policy, comparative international research, the axiological foundations of education, as well as family pedagogy. She is a practitioner expert in the preparation, organization and implementation of pedagogical

practice at the University of Sarajevo – Faculty of Education and the author and co-author of several scientific and professional papers.

Emina Dedić Bukvić, PhD, is an Associate Professor at the Department of Pedagogy, Faculty of Philosophy, University of Sarajevo. Her research interests include intercultural education, teacher education and professional development, micro-pedagogical relations, the pedagogical implications of multimedia environments, and the study of educational systems. She is a member of the Peace Education Hub at the University of Sarajevo and the author and co-author of several scholarly and professional publications, including the university textbook Teachers as Digital Mentors: Supporting Work with Children and Youth in Digital Environments.

ORCID

Džejla Idrizović, http://orcid.org/0009-0007-8749-5673
Emina Dedić Bukvić, http://orcid.org/0000-0001-9920-0253