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Assessing Prospective Teachers' Readiness: An Integrative Study of Teaching Methods and the Achievement of 21st Century Competencies in the Primary Teacher Education Department

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Abstract

The transformation of education in the 21st century requires prospective teachers to have competencies that are adaptive to the changing times, such as critical thinking, creativity, collaboration, communication, and digital literacy. This study aims to 1) analyze the relationship between the teaching methods applied in the primary teacher education Department at Universitas Negeri Makassar (UNM) and the achievement of prospective teacher students' competencies in 21st-century skills; 2) identify the dominant learning paradigm and its impact on 21st-century skills; 3) map the level of student competency achievement in 21st-century skills and identify the factors that support and hinder the achievement of 21st-century skills. The research method used was a combination of quantitative and qualitative research (mixed method), with data collection using surveys and interviews, selected and implemented with consistency and accuracy. Quantitative data were analyzed using statistical techniques, while qualitative data were analyzed using thematic analysis. The research sample consisted of 250 students and 35 lecturers. The results of this study reveal that: the majority of the students teacher are at an intermediate level of competence in 21st-century skills; only a small proportion have reached an advanced level, and almost none have reached an expert level; there are variations in achievement between indicators; teaching methods and learning paradigms play a significant role in supporting or limiting these achievements; emotional support, self-reflection, and technology *integration are aspects that need to be strengthened.*

Keywords: 21st-century competencies, teaching methods, learning paradigms, PGSD students, pedagogical transformation "

1. Introduction

The 21st century is marked by major transformations in all aspects of life, including education. The development of digital technology, globalization, and the dynamics of the employment demand a shift in the learning process paradigm. Education no longer focuses solely on mastering academic material, but also emphasizes the development of complex life skills, such as creativity, critical thinking, collaboration, communication, and digital literacy (Kids, 2019; Partnership for 21st Century Learning., 2009; Skills, 2011). In this framework, teachers are required to be adaptive and innovative learning facilitators. They are not only transmit knowledge but also shape character, guide higher-order thinking skills, and equip students with essential 21st-century competencies. Teachers, as the main agents in delivering the contents, must be empowered with 21st-century skills, such as creativity, critical thinking, collaboration, and digital literacy, in order to guide students to succeed in the age of information and technology (Skills, 2011).

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The demands on 21st-century teachers make teacher education institutions (TEIs) the main foundation in preparing excellent human resources for education. This is where the Elementary School Teacher Education (ESTE) Department plays a crucial role, as it is responsible for preparing prospective teachers who will be at the forefront of basic education. However, various studies show that the changes occurring in the world of education are not yet fully reflected in teacher education practices, particularly in terms of lecture methods and learning paradigms in teacher education study programs (Abdillah & Hamami, 2021; Namsone et al., 2021; Olo et al., 2021).

The teaching methods applied in the ESTE Department should no longer be based on traditional lectures and memorization assessments, but should adopt innovative learning models such as project-based learning, blended learning, flipped classrooms, and the use of smart learning environments (SLE). The SLE concept emphasizes flexible, adaptive, and interactive learning with the support of technology, which can increase students' active participation and their reflective and collaborative skills (Spector, 2014).However, in reality, many TEIs are still lagging behind in integrating this approach into everyday learning (Darsham & Hassan, 2017).

In addition to changes in methods, the learning paradigm also needs to be adjusted. Kivunja (2014)emphasizes the importance of shifting from a content-based teaching paradigm to contextual competency-based learning. Learning should not only instill basic literacy, but also facilitate students to apply these skills in real life, including in the context of future work. Therefore, the learning paradigm must be transformative, learner-centered, and foster lifelong learning skills.

Within the framework of 21st-century teacher competencies, there are various dimensions that need to be developed. The first is the pedagogical dimension, in which teachers are required to be able to design and implement learning strategies that encourage critical thinking, creativity, collaboration, and communication. The second is the technological dimension, which includes the ability to use digital media and ICT-based learning platforms to support the teaching and learning process. Third, interpersonal and social competencies, which include the ability to build positive relationships with students and understand diversity. Fourth, character competencies, namely integrity, leadership, and empathy that teachers must possess as role models (Elayyan & Al-Shizawi, 2019; Rivalina, 2020; Santosa et al., 2022).

Previous studies have explored some aspects of this issue. Several studies highlight the importance of innovative teaching methods in shaping the competencies of prospective teachers (Ismail et al., 2021; Putri, 2023), while others emphasize the role of professional training and development in improving teacher competencies (Utari & Muadin, 2023). Similarly, studies by (Abdillah & Hamami, 2021; Bernate & Guativa, 2020; Duderstadt, 2000; Fahnert, 2019; Hafsah M. Nur & Nurul Fatonah, 2023; Kadi & Awwaliyah, 2017; Kids, 2019; Matías González & Fernández Aquino, 2017; Namsone et al., 2021; Olo et al., 2021; Priatmoko & Dzakiyyah, 2020; Scott, 2000; Susanto & Rozali, 2022)are generally still sectoral in nature and have not fully examined the relationship between teaching methods, learning paradigms, and the achievement of 21st-century teacher competencies in the specific context of PGSD study programs.

The ESTE department faces complex and unique challenges. On the one hand, the curriculum must reflect the increasingly heterogeneous and inclusive reality of basic education. Prospective teachers must be prepared to face classes that are diverse in terms of social, cultural, economic, and even learning abilities (Matías González & Fernández Aquino, 2017). On the other hand, they must also be equipped with STEM skills and digital literacy in response to technological developments and national curriculum requirements. Efforts to update the curriculum, train lecturers, and provide technology-based learning facilities are key to addressing these challenges (Granados, 2018; Shapiro & Lauritzen, 2011).

Implementation in the field still faces various obstacles, such as a lack of integration between theory and practice, limited technology training for lecturers, and weak synergy between the curriculum and the needs of the world of work. Therefore, a comprehensive and data-based evaluation is needed of


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how the current teaching methods and learning paradigms in the ESTE Department at Universitas Negeri Makassar (UNM) contribute to the achievement of 21st-century teacher competencies.

This research is theoretically, practically, and strategically relevant. Theoretically, this research provides a complete conceptual mapping of the relationship between learning paradigms, teaching methods, and 21st-century teacher competencies. Practically, the results of this study are expected to provide concrete recommendations for lecturers and study program managers in designing more relevant and effective learning strategies. Strategically, this research supports the strengthening of teacher education quality at the elementary level, which directly contributes to improving national education quality.

This study aims to examine prospective teachers' readiness to acquire 21st-century competencies by analyzing the relationship between teaching methods, learning paradigms, and competency attainment within the Primary Teacher Education Department at Universitas Negeri Makassar. The rapid transformation of education in the 21st century necessitates that future teachers possess a comprehensive set of competencies, including critical thinking, creativity, collaboration, communication, and digital literacy. Despite this demand, existing literature indicates that pedagogical practices in teacher education institutions have not fully aligned with these expectations. Addressing this gap, the present study offers a novel contribution by integrating teaching methods, learning paradigms, and competency outcomes within a unified empirical framework using a mixed-methods approach, a perspective that remains underexplored in the Indonesian context. The objectives of this study are to: 1) analyze the relationship between the teaching methods applied in the ESTE Department at UNM and the achievement of prospective teachers' competencies in 21st-century skills; 2) identify the dominant learning paradigm and its impact on 21st-century skills; 3) map the level of student competency achievement in 21st-century skills and identify the factors that support and hinder the achievement of 21st-century skills.

2. Method

This study employed a convergent parallel mixed menthod desing. Mixed methods research is a research approach that combines qualitative and quantitative elements in a single study to provide a more comprehensive understanding of a phenomenon or research question (Weyant, 2022).

The data collection instruments used were surveys and interviews, which were selected and implemented with consistency and accuracy. Quantitative data were analyzed using statistical techniques, while qualitative data were analyzed using methods such as content analysis or thematic analysis. The findings from these two analyses are then integrated to look for patterns or convergences/divergences that can provide an in-depth understanding of the phenomenon being studied. The results of this integration are then interpreted and comprehensive conclusions are drawn, providing a more complete and contextual picture. Finally, researchers reflect on this combined research process, identify the strengths and weaknesses of both approaches, and provide suggestions for further research. Thus, combined research requires careful planning to combine quantitative and qualitative data in order to obtain a more holistic understanding.

The population is a group of individuals who have the same characteristics or traits according to the criteria set by the researcher (Creswell, 2020). The target population in this study was all ESTE students spread across three campuses of the UNM, namely the Makassar, Bone, and Pare-pare campuses. Cresswell further defines a sample as a number of parts (sub-groups) of the target population that will be studied by the researcher to make generalizations about the target population. Considering the varying number of students at each campus for each level, stratified sampling will be applied. From this participants of 250 students and 35 lecturers, selected through stratified sampling across three campuses. Quantitative data were gathered a structured questionnaire comprising 40 items measured on a five-point Likert scale, encompassing eight dimensions of 21st-century competencies. The instrument demonstrated strong internal consistency, with a Cronbach's alpha coefficient of 0.87, and content validity was established through expert review. In addition, qualitative data were collected through


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semi-structured interviews designed to capture participants' experiences, perceptions of teaching practices, and factors influencing competency development. Quantitative data were analyzed using descriptive statistics, Pearson correlation, and multiple regression analysis, while qualitative data were examined thematic analysis involving coding, categorization, and theme generation.

3. Discussion

Results

Qualitative data analysis of interview results

Based on the results of interviews with students and lecturers, it can be explained that the level of student competence in 21st-century skills is mostly at an intermediate level, with some students showing progress towards proficiency in certain aspects. On the critical thinking indicator, for example, many students feel that they are just beginning to understand how to think critically in depth. As expressed by one student, "I can follow analyses from different sources, but sometimes I still have difficulty constructing my own strong arguments." Lecturers also emphasized the importance of improvement in this aspect, with one lecturer stating, "We continue to encourage students to argue logically and think critically, but it does take repeated practice to reach an advanced level."

In problem solving, students are at an intermediate stage, especially in applying a systematic approach. One student mentioned, "I can solve problems using the methods that have been taught, but to be creative, I often need guidance from friends or lecturers." Lecturers also added that although some students have begun to demonstrate good problem-solving skills, they need more practice to find creative solutions. "Creative problem solving does take time to develop, and we continue to provide opportunities for them to practice this in group projects," said a lecturer.

Effective communication skills also showed that the majority of students were at an intermediate level, with some students beginning to feel quite proficient in everyday communication in class. "I can convey my ideas in a group, but when I have to speak in front of the class, I still need more courage," said one student. A lecturer also noted that many students are not yet fully prepared to face more challenging communication situations, but there has been progress. "Their communication skills have developed quite well, especially in group discussions, but some students still need more practice to be able to speak confidently in front of many people," he explained.

In terms of collaboration, some students already feel they are at an advanced level. "I often work in teams, and we can organize tasks well. I feel that our collaboration is smooth," said one student. The lecturer considered this skill to be quite good, saying, "Our students are quite skilled at collaborating, but when they have to work with people from different backgrounds, some still experience difficulties." This shows that student collaboration still needs to be further developed to deal with more complex situations.

In terms of creativity, students generally feel they are at an intermediate level. "I can come up with new ideas, but sometimes it's difficult to develop those ideas into something truly innovative," said one student. A lecturer also acknowledged that although there are creative students, many still need to be encouraged to hone their creativity further. "Creativity does not always come naturally. We try to provide space for exploration, but not all students feel comfortable innovating," explained the lecturer.

In terms of digital literacy, some students feel that they are already proficient, especially in the use of digital tools to support their college assignments. "I can create fairly complex digital content for assignments, but when it comes to using new technology, I still need guidance," said one student. The lecturer stated that the students' digital literacy is quite good, but some still need time to get used to more sophisticated technology. "Some students are already very proficient, but there are still those who need to be encouraged further to explore new, more complex technologies," said the lecturer.

Regarding the student-centered learning approach, students feel that they are encouraged to participate actively, even though self-reflection has not been fully implemented. "I feel involved in the discussion, but sometimes it is difficult to reflect on my own," said one student. The lecturer emphasized that student-centered learning has been implemented, but there needs to be improvement in terms of

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independent reflection. "We are trying to make students more reflective, but it does take time to get used to," said the lecturer.

In terms of classroom management and emotional support, most students feel that they receive good support from lecturers. "Lecturers are always supportive and make us feel comfortable in class," said one student. However, some students still feel there are challenges in certain situations. "Sometimes when I have difficulties, I feel like I'm not being fully heard," explained one student. Lecturers also stated the importance of this emotional support for successful learning. "We strive to create a comfortable environment, even though there are situations where we also have to divide our attention among many other students," said a lecturer.

Overall, these interviews show that most students are at an intermediate level in 21st-century skills, with some aspects such as collaboration and digital literacy reaching an advanced level. Despite this progress, there is still much room for improvement for students to reach an expert level, especially in terms of creativity and effective communication.

Quantitative data analysis of survey results

The results of the percentage of student responses regarding the achievement of 21st-century teacher competencies in the context of teaching methods and new learning paradigms in the PGSD FIP UNM Makassar department are as follows:

Table 1: Survey Results

Competency	Basic	Intermediate	Advanced	Expert
Critical Thinking	0.65	61.5	37.15	0.0
Problem Solving	1.8	57.7	37.15	0.0
Effective Communication	3.8	57.7	38.5	0.0
Collaboration	0.0	61.5	38.5	0.0
Creativity	0.0	56.4	42.3	0.0
Digital Literacy	0.65	55.1	42.3	0.0
Student-Centered Learning	1.3	56.4	42.3	0.0
Classroom Management & Emotional Support	3.8	55.1	41.0	0.0

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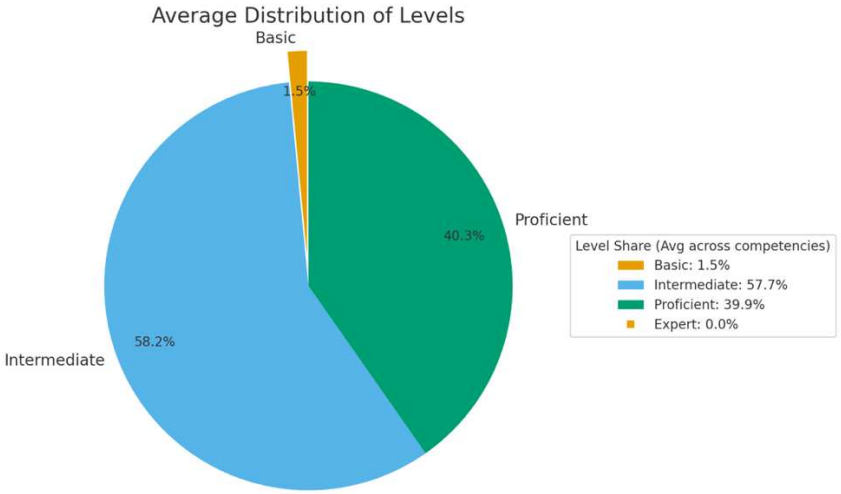

Figure 1. Distribution of Levels

a. Critical Thinking
   1) At the Basic Level: Almost no students are at the basic level (0-1.3%).
   2) Intermediate: Most students are at the intermediate level, with 61.5% for integration perspective skills and 53.8-67.9% for information analysis.
   3) Proficient: Approximately 32-42.3% of students are at the proficient level, particularly in terms of providing information and developing logical arguments.
   4) Expert: No students reached this level in critical thinking indicators.

b. Problem Solving
   1) Basic: Approximately 1-2.6% of students are at the basic level, primarily in solving simple problems.
   2) Intermediate: 50-65.4% of students are at the intermediate level, indicating that they are at the stage of using a systematic approach to problem solving.
   3) Proficient: 32-42.3% of students are at the proficient level, which includes the development of creative solutions.
   4) Expert: Almost no students reach the expert level.

c. Effective Communication
   1) Basic: 3.8% of students are at the basic level in terms of communication in challenging situations.
   2) Intermediate: 57.7% are at the intermediate level, indicating that effective communication has not yet fully developed to a higher level.
   3) Proficient: 38.5% of students reach the proficient level, but none have reported reaching the expert level.

d. Collaboration
   1) Basic: Almost no students are at the basic level (0%).
   2) Intermediate: Most students (61.5%) are at the intermediate level, especially in collaborative teams.
   3) Advanced: 38.5% of students have reached the advanced level, indicating that most students are capable of further collaboration.
   4) Expert: No students have reached the expert level.

e. Creativity
   1) Basic: Almost no students are at the basic level (0%).


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2) Intermediate: 56.4% of students are at the intermediate level, indicating that they are still in the early stages of creativity.
3) Proficient: 42.3% of students are at the proficient level for creativity, but innovation and new solutions have not been fully implemented.
4) Expert: No students reported being at the expert level.

f. Digital Literacy
1) Basic: Almost no students are at the basic level (0-1.3%).
2) Intermediate: 55.1% of students are at the intermediate level, with a focus on using technology for basic collaboration.
3) Proficient: 42.3% of students are at the proficient level, with the ability to develop more complex digital content.
4) Expert: Almost no students are at the expert level.

g. Student-Centered Learning Approach
1) Basic: 1.3% of students are at the basic level.
2) Intermediate: 56.4% of students are at the intermediate level in terms of active participation and self-reflection.
3) Proficient: 42.3% of students have reached the proficient level, showing increased engagement in the learning process.
4) Expert: Almost no students reported reaching the expert level.

h. Classroom Management and Emotional Support
1) Basic: 3.8% of students feel they are at the basic level.
2) Intermediate: 55.1% of students are at the intermediate level, indicating that emotional support is provided but not yet optimal.
3) Proficient: 41% of students feel well supported and are at the proficient level.
4) Expert: No students reported reaching the expert level.

Based on the survey data above, most students are at the intermediate level for almost all 21st-century skill indicators, with an average percentage between 55-60%. Meanwhile, some students have reached the proficient level in several aspects, such as creativity, effective communication, and digital literacy, with percentages between 32-42%. However, very few are at the basic level, and almost none have reached the expert level.

This analysis is consistent with previous qualitative results showing that student competencies are generally at an intermediate level, with some skills reaching proficient levels, but there are still many areas that need improvement to reach expert levels in 21st-century skills.

The findings reveal that the majority of students remain at an intermediate level of competency across all measured domains, with percentages ranging from 55% to 61%. A smaller proportion of students (32%–42%) achieved an advanced level, while none reached the expert level. Inferential statistical analysis indicates a statistically significant relationship between teaching methods and 21st-century competencies, with a Pearson correlation coefficient of $r = 0.62$, suggesting a moderate to strong association. Furthermore, regression analysis confirms that teaching methods significantly predict competency outcomes ($\beta = 0.58$, $p < 0.05$). The qualitative findings corroborate these results, highlighting several recurring themes, including limited depth in critical thinking, reliance on lecturer guidance, relatively strong collaborative skills accompanied by weak reflective capacity, predominantly functional rather than transformative use of technology, and the pivotal role of emotional support in fostering student confidence.

Discussion

Based on qualitative and quantitative data, most students are at an intermediate level in various 21st-century skills, such as critical thinking, problem solving, effective communication, collaboration, creativity, digital literacy, student-centered learning approaches, as well as classroom management and


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emotional support. Some students show progress toward proficiency in certain aspects, such as digital literacy and collaboration, but almost none have reached expert level in all aspects measured.

The results of this study are in line with several previous studies that also found that most students, including prospective teachers, are at an intermediate level of competency development in 21st-century skills. For example, research by Voogt et al. (2013)highlights that worldwide, skills such as critical thinking and problem solving are not yet fully mastered by students at the higher education level. They suggest that critical thinking and problem solving require repeated practice integrated into various subjects, not just in special classes that focus on these competencies. Furthermore, research by Redhana et al. (2020)also confirms that students who are accustomed to traditional learning methods tend to have difficulty developing creativity and complex communication skills. This is relevant to the findings of this study, which show that the majority of the students are at an intermediate level in creativity and communication.

These findings are also in line with a study by Costa et al. (2010),which shows that in teacher education, 21st-century skills such as collaboration and digital literacy are generally more developed than critical thinking and problem-solving skills, which require a more in-depth analytical approach. This reflects that digital literacy and collaboration may be easier for students to learn because they are closely related to technology and group activities, while critical thinking requires a deep understanding that often takes longer to master.

This study provides an additional contribution by identifying more detailed gaps in the development of 21st-century skills among the students, particularly in the context of universities in Indonesia. Although students' digital literacy is quite high (around 42.3% are at an advanced level), their critical thinking, creativity, and communication skills still need to be improved. 's findings highlight the difference in development between technology-based skills and more complex cognitive skills. This gap is important to note, because good digital literacy does not necessarily go hand in hand with strong critical or creative thinking skills, even though all three are part of 21st-century skills that support each other in a professional context.

Another significant finding is that emotional support from lecturers has proven to be important in helping students develop effective communication skills. Most students feel that the emotional support they receive is at a moderate level (around 55.1%), which indicates that students feel safe to express their opinions, but they still experience difficulties when faced with more challenging communication situations. This is consistent with the theory by Zins and (Zins & Elias, 2007)which states that emotional support in education can increase students' confidence, especially in communication skills.

In addition, this study found that the student-centered learning approach has been sufficiently implemented in the department, but student self-reflection is still not optimal. This indicates that even though lecturers encourage active participation, students' reflective skills have not developed sufficiently. A study by Brookfield (2017)states that reflective learning requires an environment that encourages introspection and opportunities for students to evaluate their understanding independently. Thus, these findings indicate the need for additional support for students to develop more in-depth self-reflection skills.

Based on the results and relevance of these findings, several practical implications and recommendations can be proposed to improve ESTE students' competencies in 21st-century skills: first, improving Critical Thinking and Creativity Exercises: To address the gap in critical thinking and creativity, lecturers can implement project-based learning and case studies that involve in-depth analysis and creative problem solving. This will provide opportunities for students to practice critical thinking skills and find innovative solutions in real-world contexts. Research by Boud & Feletti (1997)shows that problem-based learning can improve students' analytical and critical thinking skills, especially when integrated with discussion and reflection. Second, improving emotional support and an inclusive learning environment: Emotional support from lecturers and an inclusive classroom environment can help students feel more confident in communicating. Increasing emotional


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engagement by providing constructive feedback and listening to their difficulties directly can help students feel more supported. This is in line with the theory by Aburumman et al. (2022),which emphasizes the importance of care and emotional support in the learning process to improve students' interpersonal skills; third, developing Advanced Digital Literacy Training Programs: Although students' digital literacy is quite high, many still need to learn to use more complex technologies. Providing advanced technology training, such as courses in graphic design, data analysis, or digital media management, can help them master relevant skills in the digital age. The Partnership for 21st Century Skills (P21) reveals that technological skills not only include the use of basic software, but also the ability to adapt to new technologies in different contexts; fourth, encouraging Reflection-Based Learning: Lecturers can increase students' self-reflection by providing space or time for self-evaluation after completing a project or assignment. Cattaneo & Motta (2021)state that reflection-in-action is key to professional learning, as it helps individuals understand their learning processes and improve their shortcomings. Students need to be encouraged to reflect on their learning process through journals, discussions, or feedback sessions from lecturers; fifth, integrating More Complex Collaboration Skills: Although students' collaboration skills have developed quite well, cross-disciplinary collaboration integration is needed to deal with more complex situations. Lecturers can encourage collaboration with students from other majors or backgrounds to improve adaptability and cross-cultural collaborative skills. According to Johnson et al. (1998),cross-disciplinary collaboration can help students develop a broader understanding and prepare them for increasingly diverse work environments.

The discussion of these findings suggests that the predominance of intermediate competency levels is not merely descriptive but reflects underlying structural and pedagogical constraints. In particular, teaching practices remain partially rooted in traditional approaches, with insufficient emphasis on higher-order thinking and reflective learning. One of the most salient findings of this study is the observed imbalance between digital literacy and higher-order cognitive skills. While students demonstrate adequate proficiency in utilizing digital tools, this capability does not translate into equally strong critical or creative thinking skills. This finding underscores the notion that technological competence alone is insufficient to foster deeper cognitive development. Additionally, the study reveals that emotional support from lecturers plays a significant role in enhancing students' confidence in communication, although its impact on creativity appears to be indirect and limited.

From a theoretical perspective, this study contributes to the literature by proposing an integrative model that links teaching methods, learning experiences, and competency outcomes. This model extends existing frameworks by empirically demonstrating how pedagogical practices and learning environments interact to shape competency development. From a practical standpoint, the findings highlight the need for pedagogical transformation in teacher education, particularly through the implementation of project-based learning, the strengthening of reflective practices, and the integration of cross-disciplinary collaboration. Such approaches are essential to creating learning environments that not only support technological proficiency but also promote sustained development of higher-order thinking skills.

4. Conclusion

Overall, this study provides important insights into the level of development of 21st-century skills among ESTE students, where the majority are still at an intermediate level and need further improvement to reach an expert level. These findings are consistent with previous studies showing that critical thinking, creativity, and communication skills remain challenges in higher education. New findings in this study, namely the differences in the level of development of technology-based and cognitive skills, as well as the importance of emotional support, contribute to a deeper understanding of educational needs in the global era. Recommendations to implement project-based learning, provide advanced technology training, and support reflective learning can help students achieve more holistic and relevant 21st-century skills.

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