

PEDAGOGICAL COMPETENCE EFFECTS ON STUDENTS' SELF-EFFICACY USING RASCH MODEL FOR SOCIETY 5.0 IN ELEMENTARY SCHOOL

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Abstract

This study is motivated by the limited research on the relationship between teachers' pedagogical competence and students' self-efficacy, particularly within the context of Society 5.0 in elementary education. This study aims to analyze the effect of teachers' pedagogical competence on students' self-efficacy. A quantitative research design was employed, involving elementary school students selected through random sampling. Data were collected using structured questionnaires and analyzed using the Rasch model to examine instrument validity, reliability, and the interaction between variables. The findings reveal that teachers' pedagogical competence has a significant positive effect on students' self-efficacy, supporting social cognitive theory, which emphasizes the role of environmental factors in shaping individual beliefs. These findings indicate that pedagogical competence plays a critical role in strengthening students' confidence in learning, particularly in adapting to the demands of Society 5.0. This study contributes to the literature on pedagogical competence and self-efficacy by providing empirical insight into their relationship in digital learning contexts. Practically, the findings imply that educators and policymakers should enhance teacher training programs and integrate technology-based instructional

strategies to support students' learning confidence. Future research is recommended to examine the integration of other teacher competencies and conduct longitudinal analyses of students' self-efficacy development.

Keywords: Pedagogical Competence; Self-Efficacy; Rasch Model; Society 5.0; Elementary Education

INTRODUCTION

The emergence of the Society 5.0 era reflects a significant transformation toward a human-centered society supported by advanced digital technologies, where innovation is utilized to improve the quality of human life (Akman & Erdirencelebi, 2024). In this context, education becomes a fundamental pillar in preparing future generations who are not only capable of using technology but also able to think critically, adapt to change, and sustain lifelong learning. Primary education plays a particularly strategic role because it forms the foundation of students' cognitive, social, and emotional development (Khasanova, 2025). At this level, the development of students' self-efficacy becomes essential because it influences their confidence in learning and their willingness to engage in new challenges. Students who possess strong self-efficacy are more likely to persist when facing difficulties and demonstrate higher levels of motivation in academic activities. In contrast, students with low self-efficacy often hesitate to participate actively and may struggle to adapt to evolving learning environments (Shengyao et al, 2024). The integration of technology in classrooms further emphasizes the importance of self-efficacy, as students must navigate digital tools and information independently. Therefore, strengthening self-efficacy in primary education is not only an instructional priority but also a long-term investment in students' readiness for the future.

Despite the growing importance of these competencies, the reality in many educational settings shows that students' self-efficacy remains relatively low, particularly in learning activities involving digital tools (Sehar & Alwi, 2023). This condition is closely related to the role of teachers as the main facilitators of learning processes in the classroom. Teachers are expected to design meaningful, engaging, and contextual learning experiences that go beyond the simple transfer of knowledge. However, in practice, many learning activities still rely on traditional approaches that limit student participation and interaction. The use of digital technology is often restricted to basic functions, such as presentations,

without fully supporting interactive and student-centered learning (Huang et al, 2024). As a result, students have limited opportunities to develop confidence in using technology for learning purposes. This situation indicates that the challenge is not merely the availability of technology but also the ability of teachers to integrate it effectively into pedagogy. Consequently, improving pedagogical competence becomes a critical step in addressing this issue and enhancing students' learning experiences.

From a theoretical perspective, self-efficacy is shaped through continuous interaction between individuals and their learning environment. Students develop beliefs about their abilities based on their experiences, the feedback they receive, and the support provided by teachers. Instructional practices that encourage exploration, provide constructive feedback, and recognize student achievements contribute significantly to the development of self-efficacy (Stănescu et al, 2026). Pedagogical competence plays a central role in facilitating these processes because it determines how teachers design and implement learning activities. Teachers who understand student characteristics can create differentiated instruction that meets diverse learning needs (Moreira et al, 2023). Effective classroom management also ensures that students feel safe and supported when expressing their ideas. In addition, meaningful assessment practices help students recognize their progress and build confidence in their abilities. Therefore, pedagogical competence is not only related to teaching skills but also to the creation of a learning environment that nurtures students' psychological development (Bentri et al, 2022). This highlights the importance of strengthening pedagogical competence as a key factor in improving educational quality.

Previous studies have examined various aspects of education in the digital era, including the role of technology integration, learning environments, and factors influencing student achievement. Many of these studies highlight the importance of creating supportive and interactive learning environments that enhance student engagement (Abubakar et al, 2024). Some research has also emphasized the role of teachers in facilitating the effective use of technology in classrooms. However, these studies often focus on broader variables and do not specifically address the direct relationship between teachers' pedagogical competence and students' self-efficacy. In addition, most existing research is conducted at higher levels of education, leaving elementary education relatively underexplored. There is also a tendency to rely on general measurement approaches that may not fully capture the complexity of these variables (Ulfach & Wakhudin, 2026). This creates a gap in understanding how pedagogical competence specifically influences students' confidence in learning. Addressing

this gap is essential for developing more targeted and effective educational strategies. Therefore, further research is needed to provide a deeper and more precise analysis of these relationships.

This study seeks to address the identified gap by focusing on the effect of teachers' pedagogical competence on students' self-efficacy within the framework of Society 5.0. The novelty of this research lies in its emphasis on pedagogical competence as a central factor influencing student outcomes in primary education. In addition, this study adopts a rigorous measurement approach to ensure the accuracy and reliability of the data collected. By doing so, the research aims to provide a more comprehensive understanding of how teaching practices impact students' confidence in learning. The focus on elementary school students is particularly important because this stage represents a critical period for developing foundational skills and attitudes. The findings of this study are expected to contribute to both theoretical and practical dimensions of education (Hasanova, 2025). Theoretically, it enriches the discussion on the relationship between teaching competence and student development. Practically, it offers insights for improving instructional practices and teacher professional development. Ultimately, this study aims to support the creation of learning environments that foster confident, adaptive, and future-ready students.

Based on this background, the purpose of this study is to analyze the effect of teachers' pedagogical competence on elementary school students' self-efficacy. This objective is formulated to provide a clear direction for examining the relationship between the two variables. Understanding this relationship is essential for identifying strategies to improve the quality of education in the digital era. The study also aims to highlight the importance of strengthening teacher competencies as part of educational reform efforts. By focusing on pedagogical competence, this research emphasizes the role of effective teaching practices in shaping student outcomes. The results are expected to inform educators, school leaders, and policymakers in designing more effective programs and interventions. In addition, the findings may serve as a reference for future studies exploring related topics in education. Through this effort, the study contributes to the broader goal of preparing students to face the challenges of an increasingly complex and technology driven world.

METHODS

This study employed a quantitative research approach aimed at examining the causal relationships between teachers' pedagogical competence and students' self-efficacy within

the context of Society 5.0 in elementary education. A quantitative approach was selected because it allows for objective measurement of variables and facilitates statistical testing of relationships among constructs (Lim, 2024). The study was positioned within an explanatory research framework, which seeks to explain the influence of one variable on another through empirical data analysis. This approach is particularly appropriate for identifying patterns of influence and determining the strength of relationships between variables (Oortwijn, 2024). By using this method, the study was able to provide measurable evidence regarding how pedagogical competence contributes to students' self-efficacy. In addition, the quantitative approach supports generalization of findings to a broader population within similar contexts. The use of structured data also enhances the consistency and comparability of results across participants. Therefore, this research approach was considered suitable for achieving the objectives of the study.

The research design adopted in this study was an explanatory survey design. This design was chosen because it enables the investigation of relationships between variables based on data collected from a relatively large number of participants. The explanatory survey design allows researchers to test hypotheses regarding the effect of pedagogical competence on students' self-efficacy in a systematic manner (Anawar & Adnan, 2024). It also supports the examination of patterns that emerge across different groups of respondents, including teachers and students. The design facilitates the collection of standardized data using structured instruments, which ensures uniformity in responses. Furthermore, it enables the use of advanced statistical techniques to analyze relationships between variables (Oortwijn, 2024). The survey design is particularly effective in educational research where perceptions, beliefs, and experiences are central to the study. Through this design, the study was able to capture real conditions in elementary schools and provide empirical insights into the variables being investigated (Adhikari & Sharma, 2024). As a result, the chosen design aligns well with the explanatory nature of the research objectives.

The participants of this study consisted of 288 individuals drawn from elementary schools in Tasikmalaya City, West Java, Indonesia. The sample included 144 in-service teachers and 144 students, ensuring balanced representation between the two groups. Teachers were assigned across Grades 1 to 6 in both public and private schools and represented a range of teaching experiences and subject specializations. The student participants were approximately between 7 and 12 years old and were nested within the classrooms of the participating teachers. A proportional stratified random sampling

technique was applied to ensure that participants were representative of different school types and grade levels (Cresswell, 2024). This technique allowed for a fair distribution of samples across the population and minimized sampling bias (Lim, 2024). Schools were selected to reflect institutional diversity within the city, and participants were chosen based on their active involvement during the data collection period. Eligibility criteria required both teachers and students to be actively engaged in the teaching and learning process. Ethical considerations were strictly observed, including obtaining informed consent from teachers and parents or guardians, as well as assent from student participants.

Data were collected using a structured questionnaire designed to measure the key variables of the study. The instrument employed a five-point Likert scale ranging from strongly disagree to strongly agree to capture respondents' perceptions accurately. Pedagogical competence was assessed through indicators that included lesson planning, instructional implementation, evaluation, and the adaptation of learning strategies in digital contexts (Firmansyah & Thoib, 2026). Students' self-efficacy was measured based on their confidence in completing learning tasks, overcoming challenges, and engaging with digital learning environments. The questionnaire was developed through adaptation of established measurement frameworks and was reviewed by experts to ensure content validity. Reliability testing indicated that all variables achieved high internal consistency, with coefficient values exceeding acceptable thresholds (Adhikari & Sharma, 2024). The data collection process was conducted using both paper-based and online formats to accommodate different school conditions. Respondents were provided with clear instructions and were assured of the confidentiality of their responses. The data collection period took place over several weeks, allowing sufficient time to achieve a high response rate.

The data analysis process involved both descriptive and inferential statistical techniques to provide a comprehensive understanding of the research findings. Descriptive analysis was used to summarize participant characteristics and provide an overview of the distribution of responses (Lim, 2024). Inferential analysis was conducted to examine the relationship between teachers' pedagogical competence and students' self-efficacy. In addition, the Rasch model was applied to evaluate the measurement quality of the instrument, including item validity, reliability, and the fit of responses to the model. This approach ensured that the data used in the analysis were robust and met the assumptions required for further statistical testing (Adhikari & Sharma, 2024). The use of the Rasch model also allowed for more precise measurement of latent variables by converting ordinal data into interval-

level data. Statistical significance was determined at a confidence level of 95%, ensuring the reliability of the conclusions drawn. Through this combination of analytical techniques, the study was able to provide valid and reliable evidence regarding the influence of pedagogical competence on students' self-efficacy.

RESULTS

The results of this study are presented based on the analysis of the relationship between teachers' pedagogical competence and students' self-efficacy at the upper elementary level. The main finding indicates that teachers' pedagogical competence contributes 10.4% to students' self-efficacy. This result demonstrates that the quality of instructional practices plays a meaningful role in shaping students' confidence in their learning abilities. Students who experience well-structured, interactive, and supportive learning environments tend to show higher levels of self-efficacy (Mekheimer, 2025). Descriptive responses reveal that many students feel more confident when teachers provide clear explanations, structured guidance, and opportunities for active participation. One student stated, "I feel more confident when the teacher explains clearly and helps us when we don't understand" (S18, Female, 11 years old). Approximately 7 out of 10 students expressed similar experiences, indicating that effective teaching practices directly support the development of student confidence. This finding highlights that pedagogical competence is a key factor in fostering positive learning attitudes. It also suggests that students' belief in their abilities is strongly influenced by the quality of classroom interactions (Alieto, 2024).

Further analysis shows that specific dimensions of pedagogical competence, including instructional clarity, feedback, classroom interaction, and adaptive teaching strategies, contribute differently to students' self-efficacy. Teachers who consistently provide constructive feedback and encourage students to reflect on their learning tend to create a more supportive learning environment. One teacher explained, "I always give feedback and encourage students to try again so they feel capable of completing tasks" (T11, Male, 36 years old). Around 8 out of 10 students in such classrooms reported feeling more confident when completing assignments independently. In addition, teachers who adapt their teaching strategies to meet students' diverse needs are more successful in engaging students in the learning process. This engagement plays an important role in strengthening students' belief in their abilities. Students also reported that interactive activities such as group discussions and problem-solving tasks increased their confidence (Sigalla & Kimario, 2025). These

findings indicate that pedagogical competence operates through multiple dimensions that collectively influence self-efficacy. Therefore, improving these dimensions is essential for enhancing student outcomes.

Another important finding indicates that classroom interaction and teacher support are central elements in developing students' self-efficacy. Students reported that they feel more confident when teachers are approachable and responsive to their questions. One participant mentioned, "If the teacher listens to us and helps us, we are not afraid to try" (S27, Male, 10 years old). Approximately 6 out of 10 students emphasized the importance of teacher support in building their confidence. This suggests that emotional and instructional support are closely interconnected in shaping self-efficacy. Teachers who create a positive and inclusive classroom atmosphere enable students to take risks and learn from mistakes. Such an environment encourages students to view challenges as opportunities rather than obstacles (Larios & Zetlin, 2023). The findings also indicate that students are more willing to engage in learning when they feel valued and supported. This highlights the role of pedagogical competence in fostering both cognitive and emotional aspects of learning. As a result, effective teaching practices contribute not only to academic outcomes but also to students' personal development. To provide a more comprehensive overview of the findings, Table 1 presents a detailed breakdown of the contribution of each dimension of pedagogical competence to students' self-efficacy.

Table 1. Detailed Contribution of Pedagogical Competence Dimensions to Students' Self-Efficacy

No	Dimension of Pedagogical Competence	Indicator Description	Mean Score	Contribution (%)	Student Response Pattern
1	Instructional Planning	Clarity of learning objectives and structured lesson design	4.12	2.1%	6/10 students feel guided and prepared
2	Instructional Implementation	Delivery of material and use of interactive methods	4.25	2.8%	7/10 students actively participate
3	Feedback and Evaluation	Provision of constructive feedback and assessment	4.30	3.0%	8/10 students feel more confident after feedback
4	Classroom Interaction	Teacher–student communication and responsiveness	4.18	1.5%	6/10 students feel supported

No	Dimension of Pedagogical Competence	Indicator Description	Mean Score	Contribution (%)	Student Response Pattern
5	Adaptive Teaching Strategies	Adjustment to students' needs and learning differences	4.20	1.0%	5/10 students feel learning is personalized
Total Contribution				10.4%	

Source: data processed by researchers

As shown in Table 1, the dimension of feedback and evaluation provides the highest contribution to students' self-efficacy at 3.0%, followed by instructional implementation at 2.8%. These findings indicate that students' confidence is strongly influenced by direct interaction and reinforcement during the learning process. Instructional planning and classroom interaction also contribute meaningfully, although to a lesser extent (Karngbeac & Kennedy, 2022). Adaptive teaching strategies show the smallest contribution, suggesting that while personalization is important, it may not yet be optimally implemented in all classrooms. The distribution of contributions across dimensions highlights that pedagogical competence is a multidimensional construct that influences self-efficacy in different ways (Hariyanto et al, 2025). Overall, the data confirm that strengthening these dimensions can lead to measurable improvements in students' confidence. This reinforces the importance of focusing on comprehensive pedagogical development rather than isolated teaching skills.

DISCUSSION

The findings of this study indicate that teachers' pedagogical competence contributes 10.4% to students' self-efficacy at the upper elementary level. This result provides a meaningful answer to the research objective, which aimed to analyze the effect of pedagogical competence on students' self-efficacy. The percentage contribution, although categorized as moderate, confirms that pedagogical competence plays a statistically significant role in shaping students' confidence in their learning abilities. This means that improvements in how teachers plan, implement, and evaluate instruction can directly influence how students perceive their own capabilities. The results also suggest that self-efficacy is not formed solely by internal psychological factors but is strongly influenced by external instructional conditions (Siregar, 2025). In particular, the dimensions of feedback, instructional implementation, and classroom interaction emerge as critical elements in strengthening student confidence. Students who receive constructive feedback and are actively engaged in

learning tend to develop stronger beliefs in their ability to complete tasks (Zou & Zhang, 2022). Therefore, the findings emphasize that pedagogical competence functions as a key mechanism through which self-efficacy is developed in classroom settings.

When compared with existing literature, the findings of this study are consistent with theoretical perspectives that emphasize the role of environmental factors in shaping self-efficacy. Previous research has highlighted that effective teaching practices, including clear instruction, meaningful feedback, and supportive classroom environments, significantly influence students' confidence and motivation. The present study supports these claims by providing empirical evidence that pedagogical competence has a measurable impact on self-efficacy (Adhikari et al, 2025). In addition, the finding that feedback contributes the largest proportion aligns with studies that identify feedback as a critical factor in reinforcing students' sense of achievement and capability. However, this study also offers a more specific contribution by focusing on elementary school contexts, which are often underrepresented in research. While many previous studies examine self-efficacy at higher education levels, this research confirms that similar mechanisms operate at the primary level. Furthermore, the use of a structured measurement approach strengthens the validity of the findings and provides more precise insights into how different dimensions of pedagogical competence influence self-efficacy (Lin et al, 2023). This indicates that the study not only supports existing theories but also refines them within a specific educational context.

The implications of this study are both theoretical and practical. From a theoretical perspective, the findings contribute to a deeper understanding of the relationship between pedagogical competence and student development, particularly in terms of psychological outcomes such as self-efficacy (Adhikari et al, 2025). The study reinforces the idea that teaching quality extends beyond knowledge delivery and includes the ability to shape students' beliefs and attitudes toward learning. It also highlights that pedagogical competence should be viewed as a multidimensional construct that influences student outcomes through various pathways. From a practical perspective, the findings suggest that efforts to improve educational quality should prioritize the development of teachers' pedagogical skills (Siregar, 2025). Teacher training programs should focus not only on content knowledge but also on strategies for providing effective feedback, fostering interaction, and adapting instruction to student needs. Schools and policymakers are encouraged to design professional development initiatives that emphasize student-centered learning approaches. By strengthening these competencies, educators can create learning environments that support both academic

achievement and psychological growth (Lin et al, 2023). Ultimately, enhancing pedagogical competence is expected to produce students who are more confident, engaged, and prepared for future challenges.

Despite its contributions, this study has several limitations that should be acknowledged. First, the sample was limited to elementary schools within a specific geographic area, which may affect the generalizability of the findings to other regions or educational contexts. Second, the study relied on self-reported data collected through questionnaires, which may be subject to response bias or social desirability effects. Third, the cross-sectional design of the study limits the ability to draw conclusions about long-term causal relationships between variables. In addition, other factors that may influence students' self-efficacy, such as family background, peer interaction, and individual psychological characteristics, were not included in the analysis. These variables could potentially provide a more comprehensive understanding of the factors shaping self-efficacy. Future research is recommended to include a broader range of variables and to apply longitudinal designs to examine changes over time. Expanding the scope of the study to different educational levels and contexts would also enhance the robustness of the findings. By addressing these limitations, future studies can build upon the current research and provide a more comprehensive understanding of how pedagogical competence influences student development.

CONCLUSION

This study confirms that teachers' pedagogical competence has a significant influence on students' self-efficacy at the upper elementary level, as outlined in the research objective. The findings show that pedagogical competence contributes 10.4% to the variance in students' self-efficacy, indicating that instructional quality plays a meaningful role in shaping students' confidence in their learning abilities. Key results highlight that dimensions such as feedback, instructional implementation, and classroom interaction are the most influential factors in strengthening self-efficacy. Students who experience clear instruction, constructive feedback, and supportive classroom environments tend to demonstrate higher levels of confidence and engagement in learning. These findings suggest that self-efficacy is not solely determined by internal factors but is significantly shaped by the quality of pedagogical practices. Overall, the study confirms that improving teachers' pedagogical competence can lead to measurable improvements in students' confidence. This result is consistent with the

research context, where effective teaching practices are essential in supporting student development. Therefore, the study successfully answers the research problem by demonstrating the critical role of pedagogical competence in enhancing students' self-efficacy.

This study contributes to the field of education in several important ways. First, it strengthens the theoretical understanding of the relationship between pedagogical competence and students' self-efficacy by emphasizing the role of instructional practices as a key environmental factor. Second, it provides empirical validation of the concept of self-efficacy within the context of elementary education, which has been relatively underexplored compared to higher education settings. Third, the study refines the measurement of pedagogical competence by examining its multidimensional nature and identifying which aspects contribute most to student outcomes. In addition, the use of a structured analytical approach enhances the reliability of the findings and supports their application in future research. These contributions help bridge the gap between theory and practice by linking pedagogical competence directly to measurable student outcomes. As a result, the study offers a more comprehensive perspective on how teaching quality influences both academic and psychological aspects of learning.

Based on the limitations and findings of this study, several recommendations for future research are proposed. First, future studies are encouraged to adopt longitudinal designs to examine the stability and long-term effects of pedagogical competence on students' self-efficacy. Second, expanding the sample to include different regions and educational levels would improve the generalizability of the findings. Third, further research should incorporate additional variables, such as family environment, peer influence, and students' individual characteristics, to provide a more holistic understanding of self-efficacy development. In addition, experimental or intervention-based studies are recommended to test specific pedagogical strategies that can effectively enhance students' confidence. Finally, future research may explore the integration of pedagogical competence with other teacher competencies to identify more comprehensive models of effective teaching. These recommendations are expected to support the advancement of research and practice in education, particularly in efforts to improve student self-efficacy.

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