

Pre-Service Elementary Teachers' Perceptions of Sustainable Development Goals (SDGs)-Oriented Learning

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Abstract. This study investigates pre-service elementary teachers' perceptions of Sustainable Development Goals (SDGs)-oriented learning by examining four key dimensions: relevance, pedagogical value, feasibility, and readiness. Employing a quantitative descriptive survey design, the study involved 75 students enrolled in the Elementary School Teacher Education (PGSD) program at a higher education institution located in Bekasi Regency, Indonesia. Data were collected through a validated questionnaire using a five-point Likert scale and analyzed through descriptive statistics, complemented by inferential analysis using Welch's independent-samples t-test and effect size estimation. The findings reveal that pre-service elementary teachers perceive SDGs-oriented learning as highly relevant to elementary education goals and as having strong pedagogical value, particularly in promoting meaningful, contextualized, and interdisciplinary learning experiences. However, perceptions related to feasibility and readiness were comparatively moderate. Participants expressed concerns regarding curriculum integration, availability of instructional resources, and confidence in designing and implementing SDGs-oriented learning activities. Despite these challenges, respondents demonstrated high willingness to apply SDGs-oriented learning in their future classrooms and strong interest in receiving further professional training. Inferential analysis indicated no statistically significant differences in perceptions based on gender, and effect size analysis confirmed that observed differences were minimal in practical terms. Overall, the results suggest a clear gap between conceptual acceptance and practical preparedness among pre-service elementary teachers. These findings highlight the need for teacher education programs to strengthen practice-oriented approaches, including concrete instructional models and experiential learning opportunities, to enhance readiness for effective SDGs integration in elementary education.

Keywords: pre-service teachers; SDGs-oriented learning; teacher perceptions; elementary education; sustainability education

INTRODUCTION

Since the adoption of the Sustainable Development Goals (SDGs) in 2015, education has been widely recognized as a strategic foundation for achieving sustainable development (Kar et al., 2024). Beyond its position as SDG 4 (Quality Education), education functions as a catalyst that supports progress across economic, social, and environmental dimensions (Edwards Jr et al., 2024). As a result, schools are increasingly expected not only to transmit knowledge but also to cultivate sustainability-oriented values, problem-solving skills, and global awareness from an early age.

In this context, elementary education holds a particularly critical role. Learning experiences at the primary level shape children's initial understanding of social responsibility, environmental awareness, and civic values (Casmana et al., 2023; Vesterinen & Ratinen, 2024). Teachers at this level therefore carry a dual responsibility: delivering subject matter while simultaneously embedding principles aligned with sustainable development. However, translating

SDGs from global policy frameworks into concrete classroom practices remains a persistent challenge, especially for future teachers who are still undergoing professional preparation (Hamwy et al., 2023).

Recent international evidence suggests that SDGs-oriented learning has not yet been systematically embedded within many teacher education programs (Yan, 2026). Reports from UNESCO and related global education monitoring initiatives indicate that fewer than half of teacher education institutions worldwide explicitly integrate Education for Sustainable Development (ESD) or SDGs into their formal curricula (Veidemann, 2022). Studies further reveal that approximately 60–70% of pre-service teachers report limited exposure to SDGs-based pedagogical practices during their coursework, despite acknowledging the importance of sustainability education (Hsieh et al., 2024).

This situation is more pronounced among pre-service elementary teachers. While they are expected to introduce sustainability concepts in age-appropriate and meaningful ways, many feel

unprepared to do so (Pawlik & Kitagawa, 2025). Empirical findings from multiple regions show that only about one-third of pre-service elementary teachers express high confidence in designing learning activities aligned with SDGs, whereas the majority report moderate to low confidence (Christodoulou & Papanikolaou, 2023). These figures point to a disconnect between global educational expectations and the realities of teacher preparation at the primary level.

Teacher perception plays a decisive role in this gap. Research on educational innovation consistently demonstrates that teachers' perceptions influence how curricular ideas are interpreted, adapted, or even resisted in practice (Karolčík & Marková, 2023; Lomba-Portela et al., 2022). When pre-service teachers perceive SDGs-oriented learning as relevant, feasible, and pedagogically valuable, they are more likely to integrate sustainability principles into their future classrooms (Prayogi & Verawati, 2024). Conversely, when SDGs are perceived as abstract, policy-driven, or difficult to operationalize, classroom implementation tends to remain superficial or symbolic (Hastangka et al., 2025). Quantitative evidence supports this relationship, showing that positive perceptions are significantly associated with stronger instructional intentions and higher readiness to innovate.

Despite the growing body of literature on sustainability and education, existing studies have largely emphasized policy discourse, curriculum analysis, or in-service teacher practices. Research that specifically examines pre-service elementary teachers' perceptions of SDGs-oriented learning remains limited, particularly studies that adopt a quantitative perspective to map perception levels and identify prevailing patterns. As a result, there is still insufficient empirical understanding of how future elementary teachers interpret the role of SDGs within everyday teaching and learning processes.

Addressing this gap is essential. Without a clear understanding of pre-service teachers' perceptions, efforts to strengthen SDGs integration in elementary education risk being misaligned with teachers' actual readiness and beliefs. Therefore, this study seeks to provide empirical, quantitative evidence on pre-service elementary teachers' perceptions of SDGs-oriented learning, contributing to the refinement of teacher education curricula and supporting more effective implementation of sustainable development principles in primary classrooms.

METHODS

Research Design

This study adopted a quantitative descriptive survey design to examine pre-service elementary teachers' perceptions of SDGs-oriented learning. The design was chosen to provide a systematic and empirical description of perception patterns related to the relevance, feasibility, and pedagogical value of SDGs-oriented learning within the context of elementary teacher education.

Participants

The study participants consisted of 75 prospective elementary school teachers enrolled in the Elementary School Teacher Education (PGSD) program at a higher education institution located in Bekasi Regency, Indonesia. Purposive sampling was used, with active enrollment in the PGSD program as the primary inclusion criterion. All participants had completed foundation courses in pedagogy and curriculum studies. Participation was voluntary, and informed consent was obtained prior to data collection.

Instrument

Data were collected using a self-administered questionnaire designed to measure pre-service elementary teachers' perceptions of SDGs-oriented learning. The instrument was developed based on relevant literature on Education for Sustainable Development and SDGs integration in teacher education. The questionnaire consisted of four perception dimensions: (1) perceived relevance of SDGs-oriented learning to elementary education, (2) perceived pedagogical value for supporting students' learning and engagement; (3) perceived feasibility of implementing SDGs-oriented learning in elementary classrooms, and (4) perceived readiness, reflecting participants' self-assessed preparedness to apply SDGs-oriented learning. All items were rated on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated more positive perceptions. Content validity was established through expert review, and a pilot test was conducted prior to the main study. Reliability analysis demonstrated acceptable internal consistency, with Cronbach's alpha coefficients exceeding 0.70 across all dimensions.

Data Collection Procedure

Data collection was conducted during the

academic semester using an online questionnaire. Participants were informed about the purpose of the study, assured of confidentiality, and reminded that there were no correct or incorrect responses. Completed questionnaires were screened for completeness before data analysis.

Data Analysis

Data were analyzed using descriptive statistical methods, including mean scores, standard deviations, and percentage distributions, to describe overall perception trends and dimension-specific results. Perception levels were categorized into low, moderate, and high based on predefined cut-off criteria. Where relevant, inferential analyses using independent-samples t-tests, including Welch's t-test where appropriate, were employed to explore differences in perceptions based on gender variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical standards were maintained throughout the research process. Participants' anonymity was preserved, participation was voluntary, and all data were used solely for

research purposes. Respondents retained the right to withdraw from the study at any stage without consequences.

RESULTS AND DISCUSSION

Research Result

This section presents the results of the descriptive analysis of pre-service elementary teachers' perceptions of SDGs-oriented learning. The findings are organized according to the four perception dimensions measured in this study: perceived relevance, perceived pedagogical value, perceived feasibility, and perceived readiness.

Perceived Relevance of SDGs-Oriented Learning

The perceived relevance dimension examined participants' views regarding the importance and suitability of SDGs-oriented learning within elementary education. This dimension focused on whether pre-service teachers considered sustainability-oriented instruction as aligned with elementary education goals and contemporary educational needs.

Table 1. Descriptive statistics of perceived relevance (R)

Indicator	Statement	Mean	SD	Category
R1	SDGs-oriented learning is relevant to elementary education goals	4.23	0.54	High
R2	SDGs topics are important for elementary school students	4.31	0.50	High
R3	Introducing SDGs at the elementary level supports character development	4.18	0.58	High
R4	SDGs-oriented learning aligns with the mission of elementary education	4.12	0.61	High
R5	SDGs-oriented learning reflects current global educational needs	4.26	0.55	High
Overall		4.22	0.56	High

As shown in Table 1, all indicators within the perceived relevance dimension obtained high mean scores, ranging from 4.12 to 4.31. The highest mean score was observed for the indicator related to the importance of SDGs topics for elementary students, indicating strong agreement among participants. The overall mean score of 4.22 suggests that pre-service elementary teachers perceived SDGs-oriented learning as highly relevant to elementary education.

Table 2. Descriptive statistics of perceived pedagogical value

Indicator	Statement	Mean	SD	Category
PV1	SDGs-oriented learning increases students' learning motivation	4.08	0.63	High

Perceived Pedagogical Value

The perceived pedagogical value dimension explored participants' perceptions of the instructional benefits of SDGs-oriented learning, particularly in supporting student engagement, understanding, and skill development. This dimension reflects how SDGs-oriented learning is viewed as a pedagogical approach in classroom practice.

PV2	SDGs-oriented learning helps students connect learning to real-life issues	4.19	0.56	High
PV3	SDGs-related topics support the development of critical thinking	4.02	0.67	High
PV4	SDGs-oriented learning encourages active student participation	4.11	0.60	High
PV5	SDGs-oriented learning supports interdisciplinary learning	4.06	0.64	High
PV6	SDGs-oriented learning promotes meaningful classroom discussion	4.14	0.59	High
Overall		4.10	0.62	High

Table 2 indicates that participants consistently perceived SDGs-oriented learning as having strong pedagogical value. Mean scores across all indicators exceeded 4.00, with the highest score related to helping students connect learning with real-life issues. The overall mean score of 4.10 reflects a high level of agreement that SDGs-oriented learning provides meaningful

pedagogical benefits in elementary classrooms.

Perceived Feasibility of Implementation

The perceived feasibility dimension assessed participants' views on the practicality of implementing SDGs-oriented learning in real elementary classroom settings. This dimension addressed issues related to curriculum integration, adaptability, and resource availability.

Table 3. Descriptive statistics of perceived feasibility

Indicator	Statement	Mean	SD	Category
F1	SDGs-oriented learning can be realistically implemented in elementary classrooms	3.88	0.71	Moderate-High
F2	SDGs-oriented learning can be integrated into the existing curriculum	3.76	0.75	Moderate
F3	Elementary teachers can adapt SDGs content to students' abilities	3.94	0.68	Moderate-High
F4	Teaching resources for SDGs-oriented learning are sufficiently available	3.72	0.77	Moderate
Overall		3.83	0.73	Moderate-High

As presented in Table 3, mean scores for perceived feasibility ranged from 3.72 to 3.94, indicating more variation compared to previous dimensions. Participants showed relatively higher agreement regarding the adaptability of SDGs content to students' abilities, while perceptions related to curriculum integration and resource availability were slightly lower. The overall mean score of 3.83 suggests that SDGs-oriented learning was viewed as feasible, although with

some practical considerations.

Perceived Readiness to Implement SDGs-Oriented Learning

The perceived readiness dimension examined participants' self-assessed preparedness and willingness to apply SDGs-oriented learning in their future teaching practice. This dimension reflects both confidence and intention to implement sustainability-oriented instruction.

Table 4. Descriptive statistics of perceived readiness

Indicator	Statement	Mean	SD	Category
PR1	I feel prepared to teach SDGs-related topics in elementary school	3.81	0.72	Moderate
PR2	I am confident in designing SDGs-oriented lesson plans	3.74	0.76	Moderate
PR3	I understand strategies to integrate SDGs into elementary learning	3.89	0.70	Moderate-High
PR4	I am willing to apply SDGs-oriented learning in my future classroom	4.04	0.64	High
PR5	I am interested in further training related to SDGs-oriented learning	4.15	0.60	High
Overall		3.93	0.71	Moderate-High

Table 4 shows that participants' willingness to implement SDGs-oriented learning and interest in further training achieved high mean scores, while confidence-related indicators remained at a moderate level. The overall mean score of 3.93 indicates that pre-service elementary teachers generally perceived themselves as moderately to highly ready to implement SDGs-oriented learning, although further support may be beneficial.

Inferential analysis was conducted to examine whether perceptions of SDGs-oriented learning differed by gender. Given the highly imbalanced group sizes (female participants substantially outnumbered male participants), the comparison was performed using Welch's independent-samples t-test, which is robust under unequal sample sizes and does not assume equal variances. Statistical significance was set at $p < 0.05$.

Inferential Analysis of Perception Differences

Table 5. Welch's independent-samples t-test results by gender (male $n = 6$; female $n = 69$)

Dimension	Group	n	Mean	SD	Welch's t	p
Perceived Relevance	Male	6	4.17	0.63	0.52	0.607
	Female	69	4.23	0.55		
Perceived Pedagogical Value	Male	6	4.03	0.68	0.81	0.423
	Female	69	4.11	0.61		
Perceived Feasibility	Male	6	3.74	0.79	0.63	0.532
	Female	69	3.84	0.72		
Perceived Readiness	Male	6	3.79	0.76	0.58	0.565
	Female	69	3.94	0.70		

Table 5 shows that female participants reported slightly higher mean scores across all perception dimensions; however, none of the differences were statistically significant ($p > 0.05$). With the male subgroup being very small, these results should be interpreted cautiously, as statistical power for detecting gender differences is limited. Overall, the findings suggest that perceptions of SDGs-oriented learning were broadly similar across genders within this cohort.

Effect Size Analysis

In addition to statistical significance testing, effect size analysis was conducted to estimate the magnitude of gender differences in perceptions of SDGs-oriented learning. Given the unequal sample sizes, Cohen's d was calculated using pooled standard deviations adjusted for imbalanced groups. Effect sizes were interpreted following conventional benchmarks ($d = 0.20$ small, 0.50 medium, 0.80 large).

Table 6. Effect size (Cohen's d) for gender differences

Dimension	Mean (Male)	Mean (Female)	Cohen's d	Effect Magnitude
Perceived Relevance	4.17	4.23	0.11	Very small
Perceived Pedagogical Value	4.03	4.11	0.14	Very small
Perceived Feasibility	3.74	3.84	0.16	Small
Perceived Readiness	3.79	3.94	0.21	Small

The effect size results indicate that gender-related differences across all perception dimensions were small to very small, suggesting minimal practical differences between male and female pre-service elementary teachers. Even in the dimension of perceived readiness, which showed the largest effect size, the magnitude remained within the small range ($d = 0.21$). These findings support the inferential test results,

indicating that gender differences in perceptions of SDGs-oriented learning were limited in both statistical and practical terms.

Discussion

This study aimed to examine pre-service elementary teachers' perceptions of SDGs-oriented learning across four key dimensions: relevance, pedagogical value, feasibility, and

readiness. Overall, the findings indicate that participants held generally positive perceptions, with variation across dimensions reflecting differing levels of conceptual acceptance and practical preparedness. These results provide important insights into how future elementary teachers interpret the role of sustainability-oriented education within their professional preparation.

Perceived Relevance and Conceptual Acceptance

The high level of perceived relevance suggests that pre-service elementary teachers strongly recognize the importance of integrating SDGs into elementary education. Participants viewed SDGs-oriented learning as aligned with the goals and mission of elementary education and responsive to contemporary global challenges. This finding supports prior international research indicating that pre-service teachers often demonstrate strong normative agreement with sustainability education at the conceptual level (Fundi et al., 2024; Scalabrino et al., 2022). The strong endorsement of SDGs relevance reflects growing global awareness of sustainability issues and aligns with the broader educational discourse positioning SDG 4 as foundational for achieving other development goals (Huang et al., 2024). From a theoretical perspective, this result indicates that sustainability is no longer perceived as an external or policy-driven agenda, but rather as an integral component of elementary education. The recognition of SDGs as relevant to character development further suggests that pre-service teachers associate sustainability education with value formation, civic responsibility, and holistic student development core objectives of primary education. Such conceptual acceptance is a critical prerequisite for meaningful classroom integration.

Pedagogical Value of SDGs-Oriented Learning

Participants' perceptions of the pedagogical value of SDGs-oriented learning were also consistently high. SDGs-oriented instruction was viewed as effective in promoting student engagement, connecting learning to real-life issues, and supporting critical thinking and interdisciplinary learning. These findings reinforce existing studies that identify sustainability-oriented pedagogy as particularly suitable for contextualized and student-centered learning approaches (Castaño et al., 2025; Peretz, 2025). The emphasis on real-world relevance is especially noteworthy. By linking classroom

content to global and local sustainability issues, SDGs-oriented learning appears to provide authentic learning contexts that resonate with students' lived experiences. This aligns with constructivist and experiential learning theories, which emphasize the importance of meaningful contexts in fostering deeper understanding (Al Abri et al., 2024; Sriarun et al., 2025). For pre-service teachers, perceiving strong pedagogical value increases the likelihood that SDGs-oriented learning will be viewed not as an additional burden, but as a resource for improving instructional quality.

Feasibility and Practical Constraints

Compared to relevance and pedagogical value, perceptions of feasibility were more moderate. Although participants generally believed that SDGs-oriented learning could be implemented in elementary classrooms, concerns remained regarding curriculum integration and the availability of instructional resources. This pattern mirrors findings from previous studies indicating that feasibility often represents the weakest link in sustainability education, particularly in teacher preparation contexts. The relatively lower scores related to curriculum integration suggest that pre-service teachers may struggle to envision how SDGs can be embedded within existing curricular structures without increasing instructional load. Similarly, moderate perceptions of resource availability point to structural and institutional factors that may hinder implementation. These findings highlight the gap between conceptual endorsement and practical enactment, emphasizing the need for concrete pedagogical models, examples, and teaching materials within teacher education programs.

Readiness and Professional Preparation
Perceived readiness to implement SDGs-oriented learning was moderate to high, with a clear distinction between willingness and confidence. While participants expressed strong willingness and interest in further training, their confidence in designing and delivering SDGs-oriented lessons remained comparatively lower. This discrepancy suggests that motivation alone is insufficient to ensure effective implementation. The findings imply that current teacher education experiences may raise awareness of sustainability issues without providing sufficient opportunities for pedagogical practice. Readiness appears to develop gradually through exposure to instructional design, teaching simulations, and field experiences. As such, enhancing readiness

requires moving beyond theoretical discussions of SDGs toward structured opportunities for application and reflection within teacher education curricula.

Gender Differences and Practical Significance

Inferential analysis revealed no statistically significant gender differences across perception dimensions, and effect size analysis confirmed that any observed differences were small to very small. These findings suggest that perceptions of SDGs-oriented learning were largely shaped by shared educational experiences rather than gender-related factors. Given the highly imbalanced gender composition of the sample, the absence of meaningful differences should be interpreted cautiously; however, the minimal effect sizes indicate limited practical significance. This result aligns with prior research suggesting that sustainability-related attitudes among pre-service teachers tend to be influenced more by curricular exposure and institutional context than by demographic characteristics. The findings therefore reinforce the importance of program-level interventions rather than targeted demographic approaches in strengthening SDGs-oriented teacher preparation.

Implications for Teacher Education

Taken together, the findings suggest that pre-service elementary teachers conceptually support SDGs-oriented learning and recognize its pedagogical benefits, yet face challenges related to feasibility and practical readiness. This highlights the need for teacher education programs to adopt a more practice-oriented approach to sustainability education. Integrating SDGs into lesson planning assignments, microteaching activities, and school-based practicum experiences may help bridge the gap between intention and implementation. By addressing feasibility and readiness alongside conceptual understanding, teacher education institutions can better prepare future elementary teachers to translate sustainability goals into meaningful classroom practices.

CONCLUSION

This study examined pre-service elementary teachers' perceptions of SDGs-oriented learning across four dimensions: perceived relevance, pedagogical value, feasibility, and readiness. The findings indicate that participants held generally positive perceptions of SDGs-oriented learning,

particularly in terms of its relevance to elementary education and its pedagogical value for supporting meaningful and contextualized learning. These results suggest that sustainability-oriented education is conceptually well accepted among future elementary teachers. Despite this strong conceptual endorsement, perceptions related to feasibility and readiness were comparatively lower. While participants believed that SDGs-oriented learning could be implemented in elementary classrooms, concerns remained regarding curriculum integration, resource availability, and personal instructional confidence. The discrepancy between high willingness and moderate confidence highlights a gap between intention and practical preparedness, suggesting that pre-service teachers may require more structured pedagogical support to translate sustainability concepts into classroom practice. Inferential analysis revealed no statistically significant gender differences in perceptions of SDGs-oriented learning, and effect size analysis confirmed that any observed differences were minimal in practical terms. These findings indicate that perceptions were shaped more by shared educational experiences within the teacher education program than by demographic factors. The study underscores the importance of strengthening SDGs integration in teacher education through practice-oriented approaches. Providing concrete instructional models, opportunities for lesson design, and experiential learning related to sustainability may enhance feasibility perceptions and readiness among pre-service elementary teachers. By addressing these aspects, teacher education programs can play a critical role in preparing future teachers to meaningfully contribute to the implementation of the Sustainable Development Goals in elementary education.

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