Teachers' Perceptions of Sustainable Education and its Impact on the Quality of Learning and Graduate Outcomes

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Abstract
This study aims to analyze the effect of teachers' perceptions of sustainable education on the quality of learning and graduates' competence. The research uses an explanatory quantitative approach with purposive sampling techniques, involving 42 teachers in Natar District, South Lampung. Data were collected through standardized questionnaires and analyzed using correlation tests and canonical analysis to examine the relationships between variables. The research results indicate that teachers' perceptions of sustainable education have a significant effect on the quality of learning with a correlation value of $\rho = 0.548$ ($p < 0.05$). In addition, teachers' perceptions also have a strong influence on the quality of graduates with a correlation value of $\rho = 0.659$ ($p < 0.05$). Simultaneously, canonical analysis produces a canonical correlation value of 0.698, indicating a fairly strong relationship between teachers' perceptions and the quality of learning and graduates' competence. This finding confirms that the more positive the teachers' perceptions, the higher the quality of learning produced, resulting in graduates who excel both academically and non-academically. Therefore, strengthening teacher capacity through continuous training, workshops, professional mentoring, and education policies oriented towards sustainability is very necessary to ensure the effective and continuous implementation of sustainable education in schools.

INTRODUCTION

Education is the main pillar in building the nation's progress. Amid the flow of globalization and rapid technological development, education not only serves as a means of transferring knowledge but also as an important instrument in shaping a generation that is critical, adaptive, and aware of the importance of sustainable living. Global challenges encompassing environmental, social, and economic aspects demand that the education sector be able to prepare learners to think critically, act wisely, and take responsibility for the future. The concept of Education for Sustainable Development (ESD) emerges as an approach that can address these needs, emphasizing the importance of education that integrates sustainability values throughout the learning process (Damanik & Saliman, 2023).

In line with that, the concept of lifelong learning is becoming increasingly relevant in modern education systems. Continuous education is not only understood as formal learning in schools but also includes lifelong learning activities aimed at developing knowledge, skills, as well as personal, social, and professional competencies. In the school context, continuous education requires the involvement of all parties, including teachers, principals, students, parents, and the community, in order to support the quality of the teaching and learning process, which must be adaptive to changes in curriculum, teaching methods, and the needs of the workforce (Setiawan et al., 2023). Thus, ESD not only functions as a conceptual discourse but must also be practically implemented within the educational ecosystem.

Junior High Schools (SMP), as level of basic education, play a crucial role in instilling sustainability values from an early age. At this stage, students' character and mindset begin to form, making the cultivation of sustainability awareness strategic. However, in reality, perceptions of sustainable education are not uniform among educators, students, or policymakers. This affects how ESD principles are integrated into learning, ultimately impacting the quality of graduates. Previous research shows that students' involvement in sustainability-based projects can increase environmental awareness, critical thinking skills, and a sense of social responsibility (Parinduri et al., 2023). Therefore, a proper

perception of sustainable education is one of the key factors in producing excellent and competitive graduates. Furthermore, the challenges faced by education in Indonesia can be seen from the School Participation Rate (SPR) data. Based on data South Lampung Regency for the period 2019–2023, there was a decline in school participation from the elementary level 99.72%, the junior high level 93.98%, to the senior high/madrasa level 72.36%.

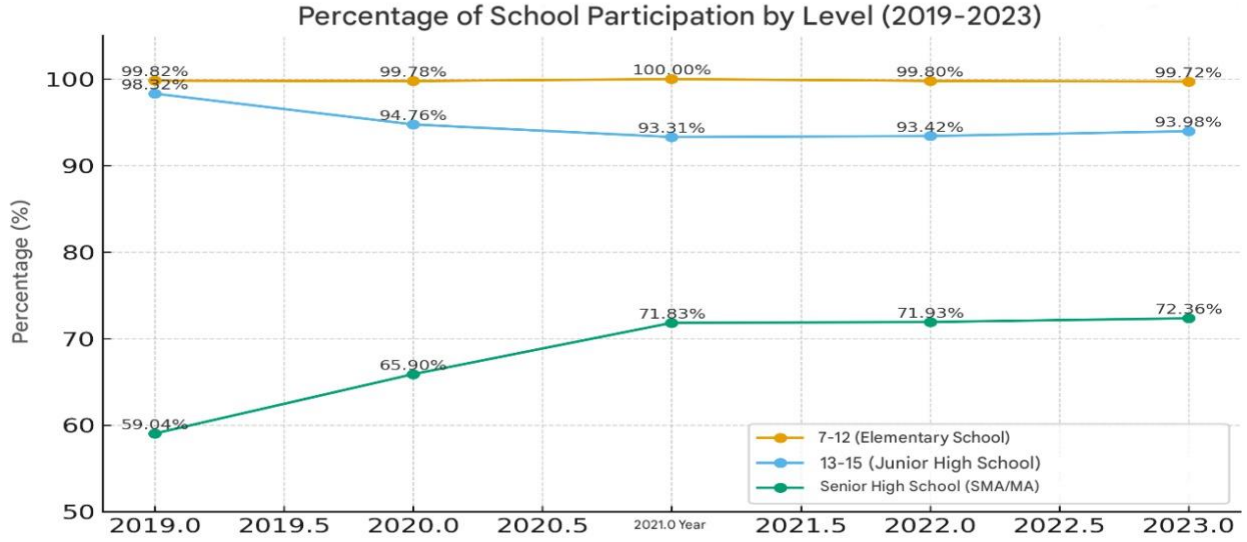

Figure 1. School Participation Percentage by Level (2019-2023)

This decline indicates the existence of fundamental issues such as low motivation and interest in learning, limited access to education, and even school cost constraints. This aligns with the findings of Napitupulu et al. (2025) that environmental literacy and sustainability among junior high school students still need to be improved so that they become more adaptive and have social as well as ecological awareness. In other words, without reinforcing sustainable education, students have the potential to become graduates who are less prepared to face the dynamics of real life.

Based on these conditions, this study aims to analyze teachers' and students' perceptions of sustainable education at the junior high school level, as well as to explore its implications for the learning process and the quality of graduates. This study is important because most research on ESD in Indonesia still focuses more on higher education or teacher professional development, while studies at the junior high school level are still very limited. The research results are expected to provide theoretical contributions to the development of sustainable education studies while also producing practical recommendations for the government, education departments, and schools. Consequently, the implementation of ESD can be carried out more effectively in improving the quality of learning and the competitiveness of graduates at the basic and secondary education levels.

Referring to the background and the novelty of the ideas that have been described, the research problem formulation in this study is as follows:

1. Is there a significant effect of perceptions of sustainable education on the quality of learning in schools?
2. Is there a significant effect of perceptions of sustainable education on the quality of school graduates?
3. Is there a significant effect of perceptions of sustainable education on both the quality of learning and the quality of school graduates?

In line with the formulation of the problem, the goal to be achieved from this research is to determine the following:

1. The influence of perceptions of sustainable education on the quality of impact in schools.
2. The influence of perceptions of sustainable education on the quality of school graduates.
3. The influence of perceptions of sustainable education on the quality of learning and the quality of school graduates.

METHOD

This study uses an analytical quantitative approach. This approach aims to examine the influence of independent variables (perceptions of continuing education) on dependent variables (learning quality and graduate quality). The population in this study consists of teachers in several schools in Natar District, South Lampung. The sampling technique uses purposive sampling, meaning samples are selected based on certain objectives or characteristics deemed relevant to the research, totaling 42 people. Primary data collection was conducted using questionnaires and analyzed using correlation tests and canonical analysis to examine the relationships between variables.

RESULTS AND DISCUSSION

A. Result

This research was conducted by distributing a questionnaire in the form of a Google Form to obtain data related to the variable Teacher Perception of Sustainable Education (X) and its effect on Learning Quality (Y1) and Graduate Competence (Y2).

Continuing Education

Data on continuing education (X1) obtained through the distribution of questionnaires to respondents are shown in the following figure.

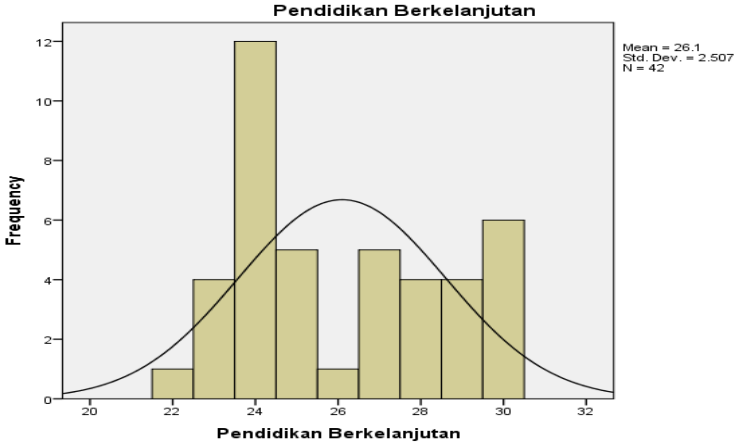

Figure 2. Frequency Distribution of Continuing Education Variable

Referring to the image, it can be seen that this distribution pattern shows a fairly diverse spread of data around the average value, or almost resembles a normal distribution. On the histogram, there is also a normal curve overlaid, indicating that the data spread pattern approaches a normal distribution, with a mean of 26.1 and a standard deviation of 2.507. In other words, most of the data are centered around the middle value, with relatively small variation among respondents. This phenomenon, as shown through this data, indicates that the majority of educators have a positive view and participation regarding the concept of sustainable education. In other words, most educators demonstrate understanding and consistent practice in integrating sustainable values into the teaching and learning process, although some educators still lack understanding. Such a pattern also reflects consistency in the application of sustainability principles in the secondary education sector in the research area. These findings are in line with the results of Fauzan's (2020) study, published in the Journal of Educational Reasoning, which indicated that students' learning outcomes, illustrated with similar histogram patterns, show maximum frequency at the central value, indicating that most participants have an intermediate level of mastery, while only a minority fall into the very low or very high categories. This pattern reflects an almost normal data distribution, where most people have fairly comparable skills or understanding.

Learning Quality (Y1)

Data on the quality of learning (Y1) was obtained through the distribution of questionnaires to 42 secondary school teachers in Natar District, South Lampung. The distribution of research data for the learning quality variable can be seen in the following figure.

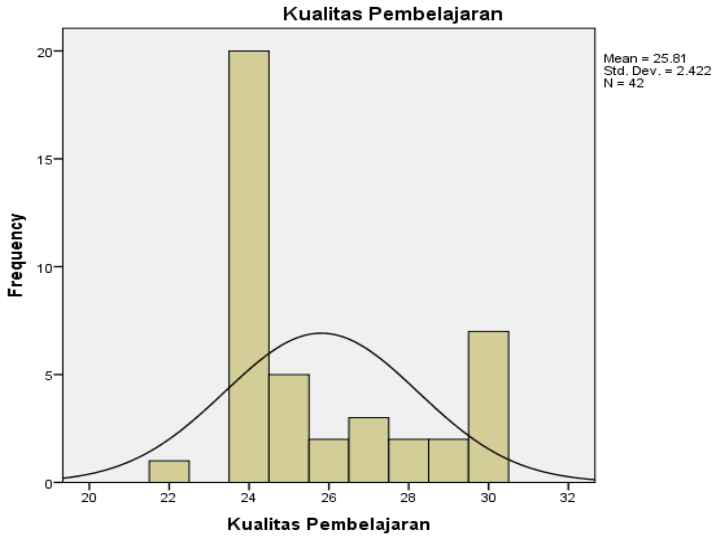

Figure 3. Frequency Distribution of Learning Quality Variable (Y1)

As depicted in the image, the data distribution pattern appears to be nearly normal, with a mean of 25.81 and a standard deviation of 2.422. This means that the learning quality values tend to be centered around the average value, with relatively small differences among respondents. This finding aligns with research conducted by Hukmi (2025) published in the Journal of Education, which indicates that tailored and organized learning methods lead to consistent and uniform learning outcomes among students. This situation suggests that the learning process has been carried out in a balanced manner, so most students have fairly even levels of understanding and skills.

Mutu Graduate (Y2)

Data on the quality of graduates (Y2) were obtained by interview to 42 secondary school teachers in the Natar District, South Lampung. The distribution of research data for the learning quality variable can be seen in the following figure.

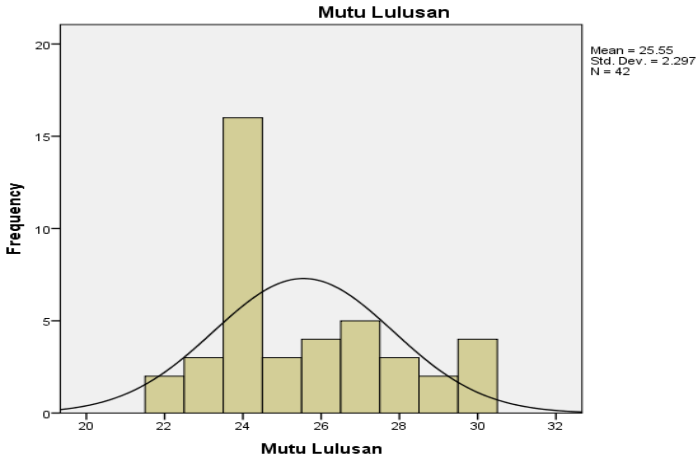

Figure 4. Frequency Distribution of Graduate Quality Variables (Y2)

Based to the image it shows that this data distribution almost resembles a normal pattern, with an average value of 25.55 and a standard deviation of 2.297. This means that the spread of values tends to be even around the average, where the variation among respondents is not too large. This finding is consistent with the frequency distribution theory described by Yulianto (2023), which states that in a normal data distribution, the central value has the highest frequency, while extreme values at the edges of the distribution appear in smaller numbers. This situation indicates the uniformity of views among

respondents regarding the quality of graduates, which is considered fairly stable and representative of the overall population of teachers studied.

Canonical Correlation Hypothesis Test (Simultaneously)

Canonical Correlation Analysis (CCA) is a statistical technique used to examine the relationship between two groups of variables simultaneously, namely independent and dependent variables. Unlike regular correlation, which only looks at the relationship between two variables, canonical analysis examines how a set of independent variables relates to a set of dependent variables simultaneously. Some aspects that are considered in this test are the canonical correlation value, eigenvalue, and Wilks' Lambda. The canonical correlation value indicates the strength of the relationship between the two groups of variables (the closer to 1, the stronger), the eigenvalue indicates how much of the data variance can be explained by that relationship, and a smaller Wilks' Lambda means that the existing relationship is more significant.

Table 4. Results of Canonical Correlation Test

	Correlation	Eigenvalue	Wilks Statistic	F	Num D.F	Denom D.F	Sig
1	698	952	512	-	-	-	-

Based on the test results, a canonical correlation value of 0.698 indicates a fairly strong relationship between the independent and dependent variables. An eigenvalue of 0.952 suggests that this canonical function can explain most of the variation in the data. Meanwhile, a Wilks' Lambda value of 0.512, which is close to zero, indicates that the relationship is significant. In other words, the independent variables (for example, teachers' perceptions of sustainable education) have been proven to have a significant simultaneous effect on the dependent variables (for example, the quality of learning and graduate outcomes).

In general, these results suggest that the better teachers perceive continuing education, the more it not only improves the quality of learning but also impacts the quality of graduates. This aligns with the research of Chyquitita (2024), which emphasizes that teachers' professional attitudes and views on the importance of continuing education significantly affect teaching quality and graduate outcomes. Teachers who have a positive outlook on continuous education are usually more prepared to accept changes, adapt to technological advancements, and constantly improve their skills through ongoing training. Thus, this canonical analysis reinforces the findings from previous correlation tests, but with a more comprehensive perspective because it examines the relationships among groups of variables simultaneously, rather than one by one.

B. Discussion

1. The Influence of Teachers' Perceptions of Sustainable Education on Learning Quality

Based on the results of the analysis that has been conducted, it was found that sustainable education has a significant impact on the quality of learning. The analysis results indicate a significant relationship between the implementation of sustainable education principles and the improvement of learning quality in schools. The statement above is proven by the analysis data results of the statistical test, which showed a correlation coefficient value of $\rho = 0.548$ with a significance value of $0.000 < 0.05$. This indicates a moderate and significant positive relationship, meaning that the better the teachers' perception of sustainable education, the better the quality of learning produced. Thus, it can be affirmed that the better the teachers' perception of sustainable education, the higher the quality of learning they create.

Based on the explanation above, it can be interpreted that continuous education has a real impact on the quality of learning. This finding is in line with the research of Ainiyah et al. (2025), which shows that a continuous teacher career development program can strengthen pedagogical skills while also enhancing adaptability to educational technology developments. This confirms that continuous education is one of the important factors that can improve the quality of learning practices in the digital era.

Research conducted by Lestari, Isnaningrum, and Hidayat (2024) also supports these findings. They found that continuous professional development programs can encourage teachers to be more creative in designing learning strategies. Furthermore, a literature review conducted by Munawir, Yani, and Az-zahra (2025) emphasized that continuing education serves as a strategic means to maintain teacher professionalism. The findings of Rachman et al. (2024) in the context of the Sekolah Penggerak implementation also provide aligned empirical evidence. They stressed that the success of quality education transformation is greatly influenced by teachers' ability to engage in continuing education.

In general, the results of interviews with several educators support these findings. Educators indeed acknowledge that their understanding of sustainable education is not yet deep, but in practice, there are efforts to integrate sustainability principles, for example, through group work, experiential learning, and extracurricular activities that foster social awareness. Research conducted by Prayoga et al. (2021) also reports consistent results. They stated that teachers not only focus on theory but have already applied the principles of sustainability and professionalism in teaching practice (for example, through group work, creative activities, and social character development). It is also emphasized that teachers' professionalism develops through reflection and practical experience, even though their theoretical understanding is not yet perfect. Methods such as collaborative and reflective learning are described as forms of implementing the values of educational sustainability in the context of improving educational quality. However, another study by Juryatina et al. (2024) stated that teachers master many aspects of knowledge and attitudes, but they lack mastery of actions and ethics in ESD. This indicates that, although they understand the importance of sustainability values, they find it difficult to apply them in real classroom life. Thus, it can be understood that teachers' perceptions of sustainable education have a significant impact on the quality of learning.

2. The Influence of Teachers' Perceptions of Sustainable Education on Graduate Quality

Based on the results of the conducted analysis, it was found that continuing education is related to improving the quality of graduates through several consistent pathways documented in national literature. This finding aligns with various studies showing that the implementation of continuing education can strengthen academic competencies, foster critical thinking skills, and enhance social and environmental awareness, thereby consistently contributing to the development of more capable and competitive graduates. This aligns with the research by Munawir et al. (2025), which shows that continuing education through the PKB program significantly affects the improvement of teachers' professional competencies, directly impacting the quality of learning and graduates' standards. This program has become a consistent pathway in the national literature to improve the quality of education through training, reflection, and continuous learning innovation. Another study that aligns with this statement is the research by Sari et al. (2023), which states that the quality of graduates is not a trivial or easy matter, but must be planned systematically through educational management processes to enhance the expected quality of graduates. In efforts to improve the quality of education in schools, a high-quality school management system capable of continuous development and improvement is required.

The above statement is supported by the correlation coefficient result $\rho = 0.659$ with a significance of $0.000 < 0.05$, which falls into the category of a strong and significant positive relationship. In social research, this figure can be interpreted to mean that teachers' perceptions have a real contribution in shaping the quality of graduates. Teachers' perceptions can be seen as a form of cognitive and affective investment: teachers who have a high awareness of the importance of continuous education will instill these values in students, so that the quality of graduates improves not only academically, but also in social and environmental dimensions.

The analysis results indicate that continuing education is related to the improvement of graduate quality through several consistent pathways documented in the national literature. First, continuing education strengthens the competencies of educators, both pedagogical and professional, making teaching methods more effective and relevant to industry/community needs (Agustina et al., 2022). When educators adopt regularly updated teaching practices, curricula and learning materials are more easily adjusted so that graduates acquire up-to-date knowledge and skills. Second, continuing education encourages the implementation of practice-based learning and institutional collaboration that supports

the development of work skills. Third, continuing education strengthens the internal quality assurance system through a continuous cycle of planning, implementation, and evaluation.

National empirical data show the consistency of this relationship. Agustina et al. (2022) reported that increasing teacher professionalism through continuous programs contributes to improved learning processes, which in turn enhances student outcomes; this is relevant when outcomes are interpreted as the quality of graduates. The implementation of PKB at the madrasah level (Nurkholis et al., 2021) confirms that continuous practice at the educational unit level transforms daily teaching patterns into a more contextual and competency-focused approach; graduates gain more practical learning experiences.

When applied in real school conditions, interviews with teachers indicate that although their understanding of sustainable education is not yet fully comprehensive, there are already learning practices that align with sustainability principles. Thus, the findings of this study confirm that teachers' perceptions of sustainable education play an important role in shaping the quality of graduates. The more positive the teachers' perceptions, the greater the likelihood of producing graduates who are not only academically excellent but also socially responsible, environmentally conscious, and equipped with life skills relevant to the challenges of the 21st century. This highlights the importance of efforts to strengthen teachers' capacities, whether through training, workshops, or educational policies, so that their perceptions of sustainable education become more mature and can be effectively implemented in the learning process.

3. The Impact of Teachers' Perceptions of Sustainable Education on the Quality of Learning and Graduate Competence

Based on the results of the analysis that has been conducted, it was found that teachers' perceptions of sustainable education collectively have a significant impact on the quality of learning and graduate standards. This emphasizes that teachers' understanding and perception of sustainable education not only shapes the way they design and implement the learning process, but also directly affect the improvement of graduates who are more adaptive, competent, and relevant to the needs of the times. This statement is also in line with what was expressed by Paridah Nur (2025), who stated that in implementing the Merdeka Curriculum in elementary schools, teachers play a strategic role as facilitators, motivators, and innovators. This role requires them to change and develop new learning strategies, especially through self-directed learning, projects, and differentiation, which align with students' needs and the demands of the times. Similar research is also revealed by Mantra et al. (2022), who explain that teachers are aware that the Independent Curriculum is different from previous curricula. As a result, they feel the need to participate in training activities related to curriculum development and implementation so that they can teach better and achieve optimal outcomes. Therefore, teachers' understanding and positive perception of training (continuous education) are very important because it provides them with the ability to implement the curriculum effectively and intensively. Ultimately, trained teachers are able to design classes and implement the curriculum properly, producing more competent and adaptive graduates in accordance with the demands of the times.

This statement is evidenced by the canonical correlation test result of 0.698, indicating a fairly strong relationship between the independent and dependent variables. An eigenvalue of 0.952 suggests that this canonical function can explain most of the variation in the data. Meanwhile, a Wilks' Lambda value of 0.512, which is close to zero, indicates that the relationship is significant. In other words, the independent variables (for example, teachers' perceptions of sustainable education) have been proven to have a significant simultaneous effect on the dependent variables (for example, the quality of learning and graduate competence).

Based on the explanation above, it can be interpreted that teachers' perceptions of sustainable education collectively have a significant impact on the quality of learning and the quality of graduates. This means that the more positive teachers' perceptions are regarding the importance of sustainable education, the higher the quality of learning they can create, which ultimately directly affects the improvement of graduate quality. This conclusion is also in line with the findings of research by Savira (2023), which states that the more positive teachers' perceptions are regarding the importance of

sustainable education and their transformative role, the more effective they are in implementing innovative and holistic learning strategies, which ultimately shapes the 2045 Golden Generation that is globally competitive and oriented towards positive values for the nation's progress. Other research by Sherly (2025) also suggests that stakeholders continue to receive training to improve teacher professionalism and ensure that teachers are able to understand and implement an appropriate curriculum. Ultimately, this will lead to an improvement in the quality of learning. This indicates that the quality of graduates is not only determined by the individual abilities of students, but is also greatly influenced by teachers' perspectives on integrating sustainability values into the learning process. Research by Safitri (2025) states that school revitalization depends on improving the professionalism of teachers and educational staff. In the era of the Industrial Revolution 4.0, teachers play an important role in ensuring that the curriculum remains relevant to the demands of business and society. Therefore, teachers who believe that sustainability values such as continuity, relevance, and adaptability are crucial for the learning process will result in a holistic learning experience. Ultimately, this process will produce graduates who not only master technical skills but also possess the ability to communicate, collaborate, and adapt to technological advancements, making them competent and ready to compete globally. Thus, it can be asserted that a teacher's positive perception of sustainable education plays a strategic role in building quality learning while producing graduates who are more competent, competitive, and oriented towards sustainable development.

The results of this study indicate that continuous education has a positive impact on the quality of learning and the competence of graduates. Empirical evidence from field studies and national reviews shows that continuous professional development (CPD) programs enhance teachers' pedagogical and professional competencies, making teaching practices more effective, reflective, and oriented towards achieving learning outcomes. For example, quantitative research in Madrasah Ibtidaiyah found a strong correlation between CPD and teachers' professional competence; the improvement in teachers' competence resulting from CPD ultimately enhances the planning, implementation, and evaluation of learning, leading to an improvement in the quality of the teaching and learning process (Sriyati, Muhdi, & Rasiman, 2023). Thus, it can be affirmed that teachers' perceptions of sustainable education play a very important and determining role in the quality of learning and the competence of graduates.

CONCLUSION AND SUGGESTIONS

A. Conclusion

Based on the results of data analysis and hypothesis testing conducted regarding the influence of Teachers' Perceptions of Sustainable Education on the Quality of Learning and Graduate Competence, the following conclusions can be drawn: 1) Continuing education has a significant impact on the quality of learning. Based on this research, it can be concluded that teachers' perceptions of continuing education have a significant effect on the quality of learning. The results of this study confirm that improving teachers' understanding of the concept of continuing education will directly affect the quality of learning, making it more contextual, meaningful, and relevant to the needs of future generations. 2) Teachers' perceptions of sustainable education have a significant impact on the quality of graduates. Based on this study, it can be concluded that teachers' perceptions of sustainable education prove to be a key factor in shaping the quality of graduates. The more positive these perceptions are, the greater the chances of creating graduates who are not only academically excellent but also adaptive, competitive, and socially and environmentally conscious. Therefore, strengthening teachers' capacity through policies and continuous training becomes an important strategy to address the challenges of 21st-century education. 3) Simultaneously, teachers' perceptions of sustainable education concerning the quality of learning and graduate outcomes. Based on this study, it can be concluded that teachers' perceptions of sustainable education have a significant impact on the quality of learning and graduate outcomes. Positive perceptions encourage the development of creative and relevant teaching strategies, thereby enhancing the learning process while producing graduates who are academically excellent, critical, ecologically aware, and ready to face global challenges.

B. Suggestion

Based on the findings, which confirm that teachers' perceptions of sustainable education (PKB) have a significant and strong influence on learning quality (ρ=0.548) and graduate quality (ρ=0.659), it is

recommended that the government implement a comprehensive intervention strategy at the policy level and school-level implementation. Specifically, the Government and the Department of Education need to prioritize the development of more systematic Sustainable Education (PKB) policies. This policy should include regular training programs and workshops that not only focus on enhancing teachers' pedagogical competencies and professionalism but also explicitly strengthen their conceptual understanding and practical implementation of the principles of Education for Sustainable Development (ESD). The goal is to ensure that teachers can transition from merely theoretical understanding to concrete and ethical actions in the classroom sustainability context. Furthermore, school management needs to build a collaborative and reflective learning ecosystem. This includes facilitating experiential and project-based learning practices that directly develop students' critical thinking skills, social responsibility, and environmental awareness. With consistent encouragement and support, teachers' positive perceptions will be optimally transformed into creative, relevant, and results-oriented teaching strategies, thereby producing graduates who are adaptive and ready to face the challenges of the 21st century.

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