

## **The Interplay of Pedagogical Competence, Digital Literacy, and Learning Facilities in Enhancing Learning Quality: A Correlational Study in Indonesian High Schools**

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**Abstract:** Learning quality is crucial for improving the overall quality of education in Indonesia. This study aims to analyze the relationship between pedagogical competence, digital literacy, and the utilization of learning facilities and learning quality in public senior high schools (SMA Negeri) in Serang Regency, Banten. A quantitative research approach was employed using Spearman correlation analysis on data collected from 294 respondents through random sampling across various public senior high schools in Serang Regency. Data were gathered through questionnaires, then analyzed using statistical methods (SPSS), data presentation, and conclusion drawing. The findings indicate that pedagogical competence, teachers' digital literacy, and the utilization of learning facilities contribute to improving learning quality. The relationship between Teachers' teacher competences (X1) and Learning Quality (Y) is 0.552. Teachers' Digital Literacy (X2) has a correlation value of 0.527, and Utilization of Learning Facilities (X3) has a correlation value of 0.460. The multiple correlation value ( $R_s$ ) is 0.652, with a coefficient of determination ( $R_s^2$ ) of 0.425. The calculated F-value ( $F_{\text{calculate}}$ ) of 71.64 is greater than the F-table value ( $F_{\text{table}}$ ) of 2.63 at a significance level of 0.05. The implications of this research highlight that the success of enhancing learning quality in public senior high schools in Serang Regency depends not only on curriculum policy but also on teachers' commitment to improving their teaching quality through enhanced competence, digital literacy skills, and consistent use of learning facilities. The novelty in this research is relevance to 21st century challenges, Focused on Indonesian public high schools, emphasis on teachers' digital literacy, measurement of learning facility utilization, and non-parametric approach with Large-Scale Likert Data. The contribution of this research is learning quality as a synergy of pedagogy, literacy, and facility use, expands quantitative non-parametric educational research, practical: supports teacher training in digital-based teaching, guides local governments to enhance learning through digital literacy and school facility optimization.

**Keywords:** Digital Literacy, Learning Facilities, Learning Quality, Pedagogical Competence

## **A. Introduction**

Indicators supporting the improvement of learning quality in the Rapor Pendidikan (Education Report) based on the National Assessment results include three main aspects: classroom management, affective support, and cognitive activation (Pusmenjar Kemdikbud, 2022). Curriculum implementation can proceed adaptively, efficiently, and in alignment with the needs of schools, thereby encouraging the achievement of better learning quality (Susanti et al., 2024). The role of educators is highly significant and must be optimized to realize quality education across various educational institutions (Lestari, 2024). Previous studies have provided a basic understanding of efforts to enhance learning quality, which is further reinforced by educators' competence in adapting instruction. Research has shown that teachers' pedagogical competence and the availability of learning facilities significantly affect learning quality in schools (Haron et al., 2021). However, these studies have not comprehensively examined the correlation among pedagogical competence, digital literacy, and the utilization of learning facilities in improving learning quality.

Other literature indicates that teachers' pedagogical competence tends to be discussed in relation to improving students' learning outcomes, rather than enhancing the overall quality of learning (Fatmawada, S et al., 2020). Moreover, another strand of research highlights that improving learning quality also requires quality management support that strengthens organizational culture as well as cooperation, honesty, and responsibility to improve educational standards (Hasbi et al., 2025). Efforts to enhance learning quality have also been carried out through teacher certification programs, which at the secondary school level include three components: professional education, general education, and specialization fields (Camara, 2024). This gap calls for research that explores challenges and opportunities in improving learning quality specifically through pedagogical competence, digital literacy, and the utilization of learning facilities in public senior high schools (SMA Negeri) in Serang Regency. The novelty of this study lies in the examination of teachers' competence in improving learning quality by integrating three key aspects pedagogical competence, digital literacy, and the utilization of learning facilities which have rarely been studied simultaneously in relation to learning quality. Most previous research has only addressed one or two variables, whereas this study offers a more comprehensive perspective.

The main objective of this research is to examine the impact of pedagogical competence, teachers' digital literacy, and the utilization of learning facilities on learning quality in SMA Negeri Serang Regency. This includes identifying key elements associated with learning quality improvement. Furthermore, the study seeks to analyze the correlations among pedagogical competence, teachers' digital literacy skills, and the utilization of learning facilities with learning quality, as well as describe their combined relationship with learning quality. Ultimately, this study provides recommendations for public senior high schools in Serang Regency to improve

learning quality, while also enhancing teachers' work discipline and pedagogical competence, which can significantly impact teacher performance, including improvements in learning quality (Afandi et al., 2023).

Using a quantitative approach, this research aims to describe the quality of learning in SMA Negeri Serang Regency in relation to pedagogical competence, digital literacy, and the utilization of learning facilities, with data obtained through questionnaires. The goal is to present data holistically, grounded in theory yet practically relevant, thereby enriching the literature on learning quality in relation to pedagogical competence, digital literacy, and the utilization of learning facilities, while also contributing to efforts to enhance learning quality in high schools more broadly.

## **B. Methods**

This study employed a quantitative approach with a correlational design. Data were collected through questionnaires distributed to respondents. The data analysis utilized Spearman's Rank correlation test to determine the strength of the relationships among variables, considering that the research data were ordinal in scale and did not meet the assumption of normal distribution.

The purpose of this research was to investigate the impact of teachers' pedagogical competence, digital literacy, and the utilization of learning facilities on learning quality in public senior high schools (SMA Negeri) in Serang Regency. The study was conducted over a six-month period, from January to June 2025, in selected SMA Negeri located in Serang Regency, Banten, Indonesia. The research population consisted of teachers from 27 SMA Negeri across the region. Respondents were chosen using a simple random sampling method, ensuring that each teacher had an equal chance of being included in the study. This approach enhanced the representativeness of the sample and minimized selection bias.

The collected data were analyzed using statistical techniques with the assistance of SPSS to determine correlations among the variables. The results indicated significant relationships between pedagogical competence, digital literacy, and the utilization of learning facilities with learning quality in SMA Negeri Serang Regency, both individually and collectively.

Instrument validity testing in this study was carried out in two stages: construct validity and statistical validity. Construct validity was examined through expert judgment to ensure that the questionnaire items aligned with the theoretical concepts and indicators being measured. Statistical validity testing was then conducted by analyzing the correlation between the score of each item and the total score using SPSS. An item was considered valid if its correlation coefficient was greater than the critical value of *r*-table at the predetermined significance level.

### C. Results and Discussion

The results of the study show that there is a relationship between pedagogical competence, digital literacy, and the utilization of learning facilities with learning quality. The correlation analysis revealed a coefficient of 0.652, indicating a very strong relationship. This finding confirms that pedagogical competence, teachers' digital literacy, and the utilization of learning facilities are significantly associated with learning quality. Based on statistical interpretation, the correlation value of 0.652 falls into the category of a very strong relationship. This implies that the higher the pedagogical competence of teachers, the better their digital literacy, and the more optimal the use of learning facilities, the higher the quality of learning achieved. These findings suggest that learning quality is not influenced by a single factor alone but rather results from the synergy of all three variables. Pedagogical competence provides teachers with the foundation to manage the learning process, digital literacy enables the effective integration of technology into instruction, and the availability and utilization of learning facilities offer both physical and digital support required in the learning environment. Together, these factors complement one another to create more effective, relevant, and student-centered learning.

The high correlation value underscores that efforts to improve learning quality in schools cannot be separated from the enhancement of teachers' competence and adequate support from learning facilities. Teachers who are pedagogically competent and digitally literate, supported by optimal facilities, are more capable of delivering interactive, meaningful instruction that enhances student learning outcomes. The summary of the correlation analysis between pedagogical competence, digital literacy, utilization of learning facilities, and learning quality is presented in Table 1 below.

**Table 1. Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,652a	,426	,420	,471

Source: SPSS version 321 output

The results of the Spearman correlation test show a positive and significant relationship between pedagogical competence and learning quality ( $r = 0.552$ ;  $p < 0.05$ ). This indicates that the higher the teacher's pedagogical competence, the better the learning quality achieved. Therefore, when teachers have a strong understanding of student characteristics, are able to select appropriate teaching strategies, and can create a conducive learning environment, the quality of learning will improve. These findings affirm that although pedagogical competence is an essential aspect of enhancing learning quality, it is not the sole determining factor. Improving learning quality requires a more comprehensive approach, particularly by strengthening teachers' pedagogical competence.

The statistical test results further reveal a significant correlation between teachers' digital literacy and learning quality ( $r = 0.527$ ;  $p < 0.05$ ). This demonstrates that the higher the teachers' digital literacy, the better the learning quality produced. This means that digital literacy plays an important role in supporting learning quality. The data suggest that as teachers' level of digital literacy increases, so does the quality of learning. Digital literacy does not only involve basic skills in using technological devices but also encompasses the ability to search, manage, evaluate, and utilize digital information to support the teaching and learning process.

These findings show that teachers with higher digital literacy are better equipped to design interactive, innovative, and relevant learning aligned with students' needs in the digital era. For instance, teachers can leverage learning management systems (LMS), educational applications, interactive media, and online learning resources to enrich teaching materials. This, in turn, enhances student engagement, broadens access to learning resources, and fosters more effective and meaningful learning experiences. The correlation values underscore the importance of digital literacy as one of the key factors in improving learning quality. Digitally literate teachers are not only able to adapt to technological advancements but can also integrate them creatively into teaching practices. However, these results also imply that digital literacy must be supported by other factors such as pedagogical competence, availability of learning facilities, and a conducive learning environment in order to optimize its impact on learning quality.

The results also show a significant correlation between the utilization of learning facilities and learning quality ( $r = 0.460$ ;  $p < 0.05$ ). This indicates that the more optimally learning facilities are utilized by teachers and students, the better the learning quality becomes. Facility utilization is therefore one of the critical factors in improving quality. The findings suggest that the more effectively learning facilities are employed by teachers, the higher the quality of learning achieved. Utilization is not limited to traditional media such as blackboards or textbooks but also includes the use of technology, interactive media, and other supporting facilities that can enhance the effectiveness of learning.

This study reinforces that learning facilities play an important role in creating more engaging, interactive, and contextual learning experiences for students. Teachers who are able to make effective use of facilities can simplify the delivery of materials, illustrate abstract concepts, and provide opportunities for students to actively engage in the learning process. Thus, the effective use of learning facilities not only supports students' understanding of the subject matter but also increases their motivation and engagement in learning. Nevertheless, although the correlation found is relatively strong, the results also show that facility utilization is not the only factor influencing learning quality. Other variables – such as teachers' pedagogical competence, digital literacy, school management support, and students' internal factors – also contribute

to the achievement of high-quality learning. The results of the regression analysis from this study are presented in Table 2.

**Table 2. Spearman Correlation Test Results**

Independent Variable	Spearman's rho	Sig. (p-value)	Remark
X1 ↔ Y (Pedagogical Competence - Learning Quality)	0.552	0.000	Significant
X2 ↔ Y (Digital Literacy - Learning Quality)	0.557	0.000	Significant
X3 ↔ Y (Learning Facilities - Learning Quality)	0.460	0.000	Significant

Source: SPSS version 21 output

## Discussion

Spearman's rho correlation analysis confirmed that Learning Quality (Y) in Public Senior High Schools (*SMA Negeri*) in Serang Regency has a positive and significant relationship with the three factors examined: Pedagogical Competence ( $X_1$ ), Digital Literacy ( $X_2$ ), and Utilization of Learning Facilities ( $X_3$ ) ( $p = 0.000$ ). Specifically, Pedagogical Competence showed a strong correlation ( $p = 0.552$ ). This finding is highly consistent with the argument by (Mallick, 2023), who defines pedagogical competence as the fundamental ability of a teacher in classroom management and mastery of instructional strategies, and reaffirms the teacher's role as an agent of development, as outlined by (Karpov, 2023). However, this finding presents an interesting phenomenon where Digital Literacy ( $X_2$ ) exhibited the highest correlation ( $p = 0.557$ ). This slightly superior correlation indicates that, within the educational context of Serang Regency, teachers' adaptation to the demands of the digital era is the most statistically crucial factor driving the improvement of learning quality – an issue increasingly dominating modern literature. Meanwhile, the Utilization of Learning Facilities ( $X_3$ ) also showed a significant, though more moderate, correlation ( $p = 0.460$ ), underscoring the vital role of school resources.

Theoretically, this result provides empirical support for models that position Teacher Competence (Pedagogical and Digital) alongside School Resources as key determinants of quality. Furthermore, this finding extends existing competence frameworks by situating Digital Literacy as a core competence that is equal to or even crucial within the contemporary educational environment. The synergy among these three factors is key: Pedagogical Competence provides the methodological foundation; Digital Literacy offers the tools for innovative instructional execution; and Learning Facilities serve as supporting resources. Maximum learning effectiveness can only be achieved through the harmonious integration of these three elements. Practically, this finding implies the necessity for balanced investment priorities by policymakers and school principals: focusing Continuous Professional Development (CPD) programs on Advanced Digital Literacy and ensuring optimal resource

allocation for facilities utilization ( $X_3$ ), while continuing to reinforce traditional pedagogical competence ( $X_1$ ). It should be noted, this interpretation is constrained by the correlational study design (which does not imply causality) and the location focus on Public Senior High Schools in Serang Regency, thus limiting the generalizability of the results.

Strong pedagogical competence, accompanied by a high level of work motivation, significantly improves teachers' performance and, in turn, enhances the quality of learning (Hanim et al., 2020). Teachers who possess pedagogical competence also demonstrate the ability to solve problems, engage in professional development, and expand relevant knowledge (Tergenbayeva & Karasholakova, 2021). Pedagogical competence combined with teacher commitment can improve performance (Siri et al., 2020) and foster students' learning achievement (Maswati, et al., 2020). This study specifically focuses on the direct influence of pedagogical competence on student learning outcomes. Furthermore, research conducted by Srijayanti, Kristiantari, and Adji (2023) on *The Relationship Between Teacher Pedagogical Competence, Career Expectations, and School Infrastructure and Learning Outcomes of Grade VI Students* revealed a significant relationship between teachers' pedagogical competence and learning quality. Their findings show that pedagogical competence is indeed significantly correlated with learning quality (Srijayanti et al., 2023). Through active participation, students are given opportunities to explore concepts and ideas more deeply (Kasi, 2022). Activating students' cognitive engagement during distance learning is supported by factors such as intrinsic motivation, problem-solving, and the connection between new information and prior knowledge (Mikheenko, 2020). Affective support in mobile-assisted language learning (MALL) can influence students' cognitive processes, performance, and engagement (Viberg et al., 2023). Such strategies aim to build emotional engagement, increase motivation, and create more meaningful and inclusive learning experiences (Teraoka et al., 2021). Collaboration among educators for school transformation involves three stages – sharing, enhancing, and disseminating – with affective support being essential for motivation and effective implementation (Nguyen & Ng, 2020).

Effective classroom management is both contextual and multidimensional, influencing learning success and emotional well-being. It involves factors such as teachers' emotional regulation, patterns of interaction, and adaptive strategies to address specific learning needs (Farkhani et al., 2022). Teachers are given the autonomy to organize classroom processes, employing quality instructional models designed hierarchically and visually to enable comprehensive learning. The primary aim of this approach is to facilitate holistic assessments of strengths and weaknesses in teaching implementation (Mejía et al., 2020). According to the Regulation of the Directorate General of Teachers and Education Personnel (Perdirjen GTK) of the Ministry of Education, Culture, Research, and Technology Number 2626/B/HK.04.01/2023 on the Teacher Competency Model, there are five levels of

pedagogical competence that describe the extent of mastery educators can achieve, as presented in the following table.

**Table 3. Levels of Pedagogical Competence**

Indicator of Competence	Level 1	Level 2	Level 3	Level 4	Level 5
1.1. Safe and Comfortable Learning Environment for Students	Understands the importance and benefits of a safe and comfortable learning environment for students	Applies strategies to create a safe and comfortable learning environment for students	Evaluates the implementation strategies of a safe and comfortable learning environment for students and designs improvements	Collaborates with colleagues regarding strategies for implementing a safe and comfortable learning environment for students	Guides colleagues in implementing strategies for creating a safe and comfortable learning environment for students
1.2. Student-Centered Effective Learning	Understands the importance and benefits of student-centered effective learning	Applies student-centered effective learning	Evaluates student-centered effective learning and designs improvements	Collaborates with colleagues on selecting and implementing strategies for student-centered effective learning	Guides colleagues in implementing strategies for student-centered effective learning
1.3. Student-Centered Assessment, Feedback, and Reporting	Understands the importance and benefits of student-centered assessment, feedback, and reporting	Conducts student-centered assessment, feedback, and reporting	Evaluates student-centered assessment, feedback, and reporting and designs improvements	Collaborates with colleagues regarding the implementation of student-centered assessment, feedback, and reporting	Guides colleagues in carrying out student-centered assessment, feedback, and reporting

Source: Appendix to the Regulation of the Directorate General of Teachers and Education Personnel (Perdirjen GTK) Number: 2626/B/HK.04.01/2023.

Evaluation of teachers' performance, which includes core tasks such as lesson planning, classroom instruction, and assessment of learning outcomes, provides a holistic picture of their dedication and effectiveness in fulfilling their roles and responsibilities within the educational environment (Siri et al., 2020). Teachers' digital literacy also contributes to the improvement of learning quality. Digital literacy refers to a person's ability and skills in reading, writing, speaking, calculating, as well as solving everyday problems. Literacy, in this sense, cannot be separated from language proficiency (Dispusip, 2019). "Digital" refers to electronic technologies that create, store, and analyze data in binary states – positive or negative (Hildawati et al., 2024). Thus, digital literacy encompasses the ability to utilize digital technologies effectively,

including skills, proficiency, and expertise. It also involves an understanding of technological tools, including their functions, applications, and potential risks (Muliyah, 2020).

Digital literacy can be understood as a “broadening of knowledge,” functioning to promote knowledge acquisition (Editorial & Board, 2016). Teachers’ digital literacy skills must be developed through integrated training and evaluation, supported by an institutional culture that strategically promotes teachers’ digital competence (Peters et al., 2022). For education, this implies that teachers need adequate digital competence and reflective practices to effectively implement digital literacy (Runge et al., 2023).

The ability to use digital learning tools provides teachers with opportunities to access digital information that supports instruction (König et al., 2020). The implementation of such learning benefits all students, including those with special needs in mainstream schools (Tenerife et al., 2022), thereby also fostering students’ creativity. Specific learning guides for students play a significant role in improving teachers’ competence in delivering quality counseling and guidance services, ultimately supporting the development of student creativity (Rahim & Hulukati, 2021).

This study is further supported by the findings of Ni Luh Putu Cahayani, Putu Diah Asrida, and Muhammad Rahmattullah (2022), who demonstrated that digital literacy and learning management jointly contribute significantly to students’ learning interest. Teachers with strong digital literacy are able to easily access current learning resources and knowledge, allowing them to adapt to the dynamic developments in education (Luh et al., 2022).

In addition, learning quality is strengthened by the utilization of learning facilities as part of educational infrastructure. Learning facilities refer to the various tools and infrastructures provided by schools to support the teaching and learning process (Nuzli, 2021). These facilities include instructional media, internet access, and financial resources needed to support independent learning (Patimah & Sumartini, 2022). Aligning and managing school facilities with the vision and mission of the institution is crucial to achieving effective, efficient, and sustainable educational goals (Abdurrohman et al., 2023). Empirical evidence indicates that learning facilities positively affect students’ motivation to learn (Purnomo et al., 2020).

Adequate facilities are essential for the effectiveness of secondary education, as they play a vital role in supporting students’ potential development, with local governments contributing significantly in providing resources and support (Fanani, 2023). Research also shows that a supportive learning environment significantly improves student motivation, thereby enhancing academic achievement (Wahyuningtyas et al., 2022). Both teaching quality and sufficient facilities have been proven to significantly affect students’ motivation to learn (Darman, 2023).

Furthermore, effective learning facilities combined with supportive family environments positively and significantly influence students' learning motivation (Mulyani et al., 2021).

A supportive learning environment, which includes access to adequate facilities and relevant technologies, enables students to become more independent, motivated, and efficient in developing the skills required throughout the learning process (Finn et al., 2024). Accessibility, as an integral part of facility improvement, ensures that every student can easily and equitably access educational resources (Tartaglia & Ahmadzai, 2024).

A positive and supportive learning environment also plays a key role in reducing negative behaviors among students, creating a safe and comfortable learning atmosphere (Tay & Zamore, 2024). To further improve learning quality and students' academic engagement, schools must undergo pedagogical paradigm reforms through specialized teams tasked with redesigning instructional approaches (Moghadasi & Keikavoosi-Arani, 2023).

Moreover, effective management of learning facilities is crucial for optimizing learning outcomes. This involves careful planning, procurement, utilization, maintenance, inventory control, decommissioning, and accountability oversight (Singgih. et al., 2022). Evidence shows that learning facilities have a significant effect on students' motivation to learn (Hasanah et al., 2023). Additionally, structured facilities positively influence both learning quality and training effectiveness (Thi Hong Thanh et al., 2023).

These findings are consistent with the study conducted by Haron et al. (2020), titled *Examining the Teachers' Pedagogical Knowledge and Learning Facilities Towards Teaching Quality*. The research examined the relationship between educational facilities and teaching quality. The results indicated a significant correlation between the two variables, in which the improvement of learning facilities positively impacts teaching quality (Haron et al., 2021).

Learning facilities should be aligned with the vision and mission of schools to achieve educational goals (Abdurrohman et al., 2023), thereby exerting a positive influence on students' learning motivation (Purnomo et al., 2020). A conducive learning environment can enhance academic achievement (Wahyuningtyas et al., 2022: 2). Both teaching quality and the adequacy of facilities have been proven to significantly affect students' learning motivation (Darman, 2023). The availability of effective learning facilities, combined with supportive family environments, has a positive and significant effect on students' learning motivation (Mulyani et al., 2021). However, limitations in the availability of laboratory equipment and audiovisual media remain a significant barrier that negatively impacts student learning outcomes (Huda, 2022).

A supportive learning environment, including access to adequate facilities and relevant technologies, enables students to become more independent, motivated, and efficient in developing the skills needed throughout the learning process (Finn et al., 2024). Accessibility, as an integral component of facility development, ensures that every student can easily and equitably benefit from educational resources (Tartaglia & Ahmadzai, 2024). Moreover, a positive and supportive learning environment plays a vital role in reducing negative behaviors and victimization among students, thereby fostering a safe and comfortable atmosphere for learning (Tay & Zamore, 2024). To enhance education quality and student academic engagement, it is essential to reform school pedagogical paradigms through dedicated teams tasked with developing innovative approaches (Moghadasli & Keikavoosi-Arani, 2023).

Furthermore, effective management of learning facilities is crucial for optimizing learning outcomes, encompassing careful planning, procurement, utilization, maintenance, inventory control, decommissioning, and accountability oversight (Singgih, et al., 2022). Empirical evidence shows that learning facilities significantly affect students' learning motivation (Hasanah et al., 2023). In addition, structured facilities positively influence both learning quality and training effectiveness (Thi Hong Thanh et al., 2023). Professional competence and teacher motivation have also been found to positively impact student learning (Husain et al., 2022), either simultaneously or partially, as seen in factors such as learning discipline, learning facilities, and peer relationships (Hutanto, 2021). The advantages of multimedia and networking, along with the exploration of English teaching models integrated with Computer-Assisted Language Learning (CALL) facilities, further contribute to the effectiveness of English language education (Bai, 2018). Overall, research indicates that student learning outcomes are significantly influenced by the combination of internal and external factors.

Despite the fact that many teachers face challenges in developing curricula and learning models, as well as dealing with phenomena that contribute to the decline of students' character (Abdurrahmansyah et al., 2022), it is therefore recommended that secondary schools optimize the utilization of learning facilities to improve their productivity. Further quantitative analysis demonstrates that teachers' pedagogical skills, supported by adequate learning facilities, have a positive effect on student learning outcomes (Sobandi A, 2020). Further quantitative analysis demonstrates that teachers' pedagogical skills, supported by adequate learning facilities, have a positive effect on student learning outcomes (Wulandari & Uwameiye, 2023).

#### **D. Conclusions**

The integration of pedagogical competence, teachers' digital literacy, and the utilization of learning facilities can foster improvements in learning quality. This study contributes to existing knowledge by providing empirical evidence that

supports theoretical foundations of learning and teacher competence, particularly in the context of Serang Regency. Future research should continue to explore broader dynamics by considering additional variables such as teaching motivation, teacher training, and the well-being of both teachers and students, in order to enrich the understanding of quality learning. Based on the findings, this research is expected to contribute to enhancing learning quality through strengthening pedagogical competence, improving teachers' digital literacy, and optimizing the use of learning facilities. These efforts are anticipated to improve the quality of learning in public senior high schools (SMA Negeri) in Serang Regency and to provide a positive contribution to the advancement of education quality in Indonesia. Nevertheless, this study has several limitations. First, it is confined to public senior high schools in Serang Regency, and thus the findings may not be fully generalizable to all Indonesian high schools. Second, the limited number of respondents (only 292) may restrict the breadth of perspectives on learning quality. Third, although instrument validation, representative data collection, and rigorous statistical analyses were conducted, respondent subjectivity may still have influenced the data.

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