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Comparative Analysis of Learning Outcomes Between Conventional and Google Classroom-Assisted Learning at Vocational High School

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Abstract

The urgency in this study lies in how student learning outcomes are influenced by the use of the digital application Google Classroom during the learning process. This study aimed to compare students' learning outcomes between conventional learning and Google Classroom–assisted learning in a Vocational High School context. A quantitative approach employing a quasi-experimental non-equivalent control group design was used. The participants consisted of 45 tenth-grade students at SMK YPT Purworejo, Central Java, Indonesia, selected through purposive sampling. One class served as the experimental group receiving instruction through Google Classroom, while the other class was taught using conventional learning methods. Students' learning outcomes were measured using a post-test achievement test. The data were analyzed using descriptive statistics, assumption testing, the Mann–Whitney U test, and effect size analysis. The results indicated that students in the Google Classroom–assisted learning group achieved higher mean scores than those in the conventional learning group. The Mann–Whitney U test revealed a marginally significant difference between the two groups (p = .050). Furthermore, the effect size analysis indicated a moderate effect (r = 0.29), suggesting meaningful practical value. Overall, the findings indicate that Google Classroom–assisted learning tends to support better learning outcomes than conventional learning in Vocational High Schools, although its effectiveness depends largely on pedagogical integration rather than technology use alone.

Keywords: *Conventional Learning, Google Classroom, Learning Outcomes*

Introduction

Vocational High Schools (VHS) play a crucial role in preparing students for employment and reducing unemployment rates by equipping them with relevant competencies required in the workforce (Ismaniati et al., 2023). Learning outcomes are central to vocational education as they reflect students' mastery of knowledge, skills, and attitudes required in specific occupational fields and serve as critical indicators of instructional effectiveness that support pedagogical decision-making through structured assessment and evaluation (Sujianti et al., 2025). In Vocational High Schools, skilled graduates are expected to be equipped with appropriate competencies before entering the labor market and to demonstrate proficiency aligned with industry demands (Nuryanto et al, 2020). Therefore, instructional strategies in vocational education must be carefully designed to ensure that students achieve the required learning outcomes necessary for successful workforce participation.

In Vocational High Schools, various instructional approaches are implemented by teachers to support students' learning needs. Despite these variations, conventional learning remains dominant in many Vocational High Schools (Basori, 2018). This instructional approach is

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typically characterized by teacher-centered practices, limited use of instructional media, and a heavy reliance on classroom interaction. Conventional learning is constrained by its dependence on physical attendance, fixed schedules, instructor-centered practices, and high costs, which collectively reduce flexibility, learner autonomy, and equitable access to education (Chakma et al., 2025). As a result, such approaches often lead to low student engagement, restricted learning flexibility, and limited opportunities for independent learning. In the context of educational digitalization, these limitations have become increasingly evident, highlighting the need for more adaptive, interactive, and technology-supported instructional models to enhance the effectiveness of vocational education.

In response to technological developments, numerous studies have explored the use of technology to support the process of teaching learning in the classroom, such as using e-learning, Zoom, and Google Classroom (Anggraini et al, 2021; Putri et al, 2022; Sukarni et al., 2021). Meanwhile, the teacher also recognizes that there are several tools to be used in assessment, such as Quizizz (Mahaswary et al., 2025) and web-based exams (Ngafif, 2018). Then, technology is also being used in teaching media to help the teacher in achieving their teaching purpose (Ngafif et al., 2024). In this article, the focus is on learning management system in educational settings namely Google Classroom. Google Classroom has been reported to support instructional organization, enhance interaction between teachers and students, and simplify access to learning resources (Iftakhar, 2016).

These features are believed to support students' learning processes and potentially improve learning outcomes. Supporting this view, (Syakur et al., 2020) concluded that Google Classroom is capable of operating effectively by assisting teachers and students in conducting learning activities in a more intensive and organized manner. From a pedagogical perspective, the effectiveness of digital platforms such as Google Classroom depends not only on the technology itself but also on how it is integrated into the teaching and learning process. This perspective is explained through the Technological Pedagogical Content Knowledge (TPACK) framework, which emphasizes the interrelationship among technological knowledge, pedagogical knowledge, and content knowledge in instructional practice (Sukarni et al., 2025).

Previous studies emphasize that effective technology integration requires teachers to align digital tools with appropriate pedagogical strategies and subject matter in order to support students' conceptual understanding and learning performance (Pratika et al., 2025). In vocational high school contexts, the application of TPACK is particularly important because teachers are required to integrate subject content with appropriate teaching strategies while utilizing technology to support both conceptual understanding and practical skill development. Without proper pedagogical integration, the use of learning technologies may not lead to meaningful improvements in students' learning outcomes.

Other studies have examined Learning Management System (LMS)-based instruction more broadly, indicating that digital platforms can promote learner autonomy, flexibility, and active participation (Azhar et al, 2018; Sudarsana et al., 2019). LMS implementation in vocational education supports structured learning, skill-based instruction, and flexible access to learning materials, which are essential for preparing students for workplace demands (Lasmanawati et al., 2021; Faradina et al., 2026). LMS-based learning environments allow students to engage with instructional content beyond classroom boundaries and encourage self-paced learning (Idham et al., 2024). Moreover, LMS platforms provide integrated learning features, including assessment and feedback tools, that support more personalized and continuous learning experiences (Munna et al., 2024). Nevertheless, some studies suggest that the effectiveness of

LMS implementation depends on factors such as instructional design, teachers' digital literacy, and students' technological readiness. Furthermore, comparative studies between conventional and digital learning environments have reported mixed findings. Several researchers found that technology-assisted learning resulted in better learning outcomes than traditional instruction (Nalini et al., 2019). In contrast, other studies reported no significant differences when digital technologies were not pedagogically integrated into the learning process (Mahendra et al., 2022).

These inconsistent findings indicate that although digital learning platforms offer potential benefits, their impact on students' learning outcomes remains inconclusive and requires further empirical investigation. Despite the growing body of research on Google Classroom and LMS-based learning, studies focusing specifically on Vocational High School contexts remain limited, but it is still open worldwide that the use of technology to support the teaching and learning process in Vocational High Schools (Salim et al, 2025). Many research has been conducted in general senior high schools or higher education institutions, where learning characteristics, instructional objectives, and curricular demands differ from those of vocational education (Lessy et al, 2024). Prior research indicates that instructional effectiveness of digital platforms may vary significantly across educational levels, particularly between general and vocational education due to differences in curriculum orientation, learning objectives, and assessment practices (Zulhaji et al., 2023). Consequently, empirical evidence regarding the effectiveness of Google Classroom in Vocational High Schools is still insufficient.

Although numerous studies have examined digital learning platforms, existing research has predominantly focused on students' perceptions, attitudes, or motivation, with limited attention given to quantitatively measured learning outcomes, particularly in the Indonesian Vocational High School context. Most prior studies were conducted in general senior high schools or higher education institutions, where learning characteristics and instructional objectives differ from those of vocational education. Therefore, this study aims to compare students' learning outcomes between conventional learning and Google Classroom–assisted learning in a Vocational High School setting. The novelty of this research lies in its controlled quantitative comparative design focusing on objectively measured learning outcomes in Indonesian vocational education, complemented by effect size analysis to highlight the practical instructional value of Google Classroom beyond statistical significance, and emphasizing the importance of pedagogical integration rather than technology use alone, as framed by the TPACK framework.

Method

This study employed a quantitative approach using a comparative quasi-experimental design. Specifically, a non-equivalent control group design was implemented to compare students' learning outcomes between two instructional approaches, namely conventional learning and learning assisted by Google Classroom. This design is commonly applied in educational research when random assignment of participants is not feasible but a comparison between groups is still required to examine the effect of instructional interventions (Cresswell, 2018). The use of this design allowed the researcher to systematically evaluate differences in learning outcomes between the experimental and control groups within a natural classroom setting.

The research was conducted at SMK YPT Purworejo, Central Java, Indonesia. The population of this study consisted of all tenth-grade students enrolled at the school during the academic year in which the research was conducted. From this population, 45 students from

two classes with relatively similar academic characteristics were selected as research samples through purposive sampling. One class was assigned as the experimental group and received instruction through Google Classroom, while the other class served as the control group and was taught using conventional classroom learning methods. Purposive sampling was employed to ensure that the selected classes had comparable learning backgrounds, grade levels, and exposure to instructional materials, thereby allowing a more valid comparison between the two groups.

The instrument used in this study was an achievement test designed to measure students' learning outcomes following the instructional treatment. The test items were developed based on the same learning objectives and instructional materials delivered to both groups to maintain content equivalence. Prior to its implementation, the instrument was examined for its validity and reliability. Content validity was established through expert judgment involving English education lecturers and experienced English teachers who evaluated the relevance, clarity, and appropriateness of the test items in relation to the learning objectives. Based on their feedback, several items were revised to improve clarity and suitability for the students' proficiency level. The reliability of the instrument was tested through a pilot test administered to students with similar characteristics to the research participants. The reliability coefficient was calculated using Cronbach's Alpha, which indicated that the instrument had an acceptable level of internal consistency.

The instrument consisted of objective test items that assessed students' understanding of the learning material. The test was administered as a post-test to both the experimental and control groups at the end of the instructional period. Using the same instrument for both groups ensured that any observed differences in learning outcomes could be attributed to the instructional method rather than differences in assessment content. Data collection was conducted through a structured instructional process over several classroom meetings. Both groups were taught the same learning materials and followed identical learning objectives throughout the instructional sessions. The control group received instruction through conventional face-to-face classroom learning, while the experimental group participated in learning activities facilitated through Google Classroom. At the end of the instructional period, both groups completed the same post-test simultaneously. The students' post-test scores constituted the primary quantitative data used in the analysis.

The collected data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics were used to summarize students' learning outcomes by calculating measures such as the mean, standard deviation, and score distribution for each group. Inferential statistical analysis was conducted to determine whether a statistically significant difference existed between the learning outcomes of the control group and the experimental group. Prior to hypothesis testing, the data were examined for normality and homogeneity of variance as prerequisite assumptions. If the data were normally distributed and the assumption of homogeneity was satisfied ($p > .05$), an independent samples t-test was employed to compare the mean scores of the two groups. However, if the normality assumption was not met ($p < .05$), a non-parametric alternative, namely the Mann–Whitney U test, was used (Goss-Sampson, 2019). In addition to statistical significance testing, effect size analysis was conducted to determine the magnitude of the difference between the two instructional methods, thereby providing information regarding the practical significance of the intervention (Maher et al., 2013).

Results

Descriptive Statistics of Students' Learning Outcomes

Descriptive statistical analysis was conducted to provide an overview of students' English learning outcomes in both groups.

Table 1. Descriptive Statistics of Students' Learning Outcomes

	N	Mean	Std. Deviation
Conventional Learning	23	70.09	11.95
Google Classroom-assisted Learning	22	75.14	9.94

Table 1 presents the descriptive statistics of students' English learning outcomes in both groups. The experimental group taught using Google Classroom–assisted learning obtained a higher mean score ($M = 75.14$, $SD = 9.94$, $n = 22$) compared to the control group taught through conventional learning ($M = 70.09$, $SD = 11.95$, $n = 23$). The score distribution ranged from 49 to 91 in the experimental group and from 49 to 97 in the control group. These findings indicate that students exposed to Google Classroom–assisted learning tended to achieve better learning outcomes than those taught using conventional methods, although further inferential testing was required to determine statistical significance.

Test of Normality

To determine whether the data met the assumption of normality, the Shapiro–Wilk test was conducted due to the relatively small sample size in each group.

Table 2. Test of Normality (Shapiro-Wilk)

		Statistics	df	Sig.
Students' English Score	Conventional Learning	.969	23	.654
	Google Classroom-assisted Learning	.864	22	.006

As shown in Table 2, the conventional learning group obtained a significance value of .654 ($p > .05$), indicating that the data were normally distributed. However, the Google Classroom–assisted learning group showed a significance value of .006 ($p < .05$), suggesting that the normality assumption was violated in this group. Since one group did not meet the normality assumption, a non-parametric statistical test was considered appropriate for hypothesis testing.

Test of Homogeneity of Variances

Before conducting hypothesis testing, Levene's Test was performed to examine the homogeneity of variances between the two groups.

Table 3. Levene's Test for Equality of Variances

	F	Sig.
Students' Learning Outcomes	.948	.336

Table 3 indicates that the significance value of Levene's Test was .336 ($p > .05$), which means that the variances between the conventional learning group and the Google Classroom–assisted learning group were homogeneous. Although the homogeneity assumption was satisfied, the violation of normality in one group required the use of a non-parametric test for further analysis.

Hypothesis Testing Using Mann-Whitney Test

Due to the violation of the normality assumption, the Mann–Whitney U test was employed to compare students' English learning outcomes between the two groups.

Table 4. Mean Ranks of Students' English Scores Based on Learning Method

		N	Mean Rank	Std. Deviation
Students' English Score	Conventional Learning	23	19.26	443
	Google Classroom-assisted Learning	22	26.91	592
	Total	45		

Table 4 shows that the Google Classroom–assisted learning group obtained a higher mean rank (26.91) compared to the conventional learning group (19.26). This result indicates that students taught using Google classroom–assisted learning generally achieved higher scores than those taught using conventional methods.

Table 5. Mann-Whitney U Test Statistics

	Students' English Score
Mann-Whitney U	167
Wilcoxon W	443
Z	-1.963
Asymp. Sig. (2-tailed)	0.050

As presented in Table 5, the Mann–Whitney U test revealed $U = 167.00$, $Z = –1.963$, with a significance value of $p = .050$ (two-tailed). This result indicates a marginally significant difference between the two instructional methods at the .05 significance level. Therefore, it can be interpreted that Google classroom–assisted learning tended to produce higher English learning outcomes compared to conventional learning.

Effect Size Analysis

To determine the magnitude of the difference between the two instructional approaches, an effect size analysis was conducted using the formula $r = |Z| / \sqrt{N}$. The calculation yielded $r = 0.29$, which falls within the moderate effect size category according to conventional interpretation criteria. This finding indicates that, beyond statistical significance, Google Classroom–assisted learning demonstrates meaningful practical value in improving students' English learning outcomes.

Discussion

Discussion of Students' Learning Outcomes between Conventional Learning and Google Classroom–Assisted Learning

This study aimed to compare students' learning outcomes between conventional learning and Google Classroom–assisted learning in a Vocational High School context. The statistical findings revealed that the Google Classroom group obtained higher mean scores and mean ranks compared to the conventional group, with a marginally significant difference ($U = 167.00$, $p = .050$). Although the significance level was at the threshold, the overall direction of the findings consistently favored Google Classroom–assisted learning, indicating a tendency toward improved learning outcomes when the platform was integrated into instructional practice.

The descriptive results suggest that Google Classroom–assisted learning may contribute positively to students' learning by supporting instructional organization, facilitating access to

learning materials, and enabling more flexible learning management. These findings are consistent with previous studies reporting that Learning Management Systems enhance accessibility and instructional efficiency (Ain et al, 2025; Sudarsana et al., 2019). However, the marginal statistical result also indicates that the improvement observed in this study was not sufficiently strong to demonstrate clear superiority over conventional learning, suggesting that technology integration alone may not automatically produce substantial learning gains.

In addition to improving access to learning resources, the use of digital platforms such as Google Classroom may also encourage greater student engagement with instructional materials. Through online platforms, students can revisit learning materials, review teacher explanations, and access assignments beyond classroom hours. This flexibility allows learners to regulate their own learning pace and provides opportunities for repeated exposure to instructional content. Such repeated engagement with learning materials may support deeper cognitive processing, which is an important factor in improving comprehension and retention in language learning. Furthermore, the integration of digital learning platforms can create a more student-centered learning environment. In conventional classrooms, learning activities are often limited by time constraints and teacher-led explanations. In contrast, online learning platforms allow teachers to distribute additional materials, provide asynchronous feedback, and facilitate extended learning activities. As a result, students may experience a more flexible learning environment where they can access materials according to their individual learning needs and preferences. This flexibility may indirectly contribute to improved academic performance, even when the statistical difference between instructional methods appears relatively modest.

Another important benefit of Google Classroom lies in its ability to support continuous communication between teachers and students. Through online announcements, assignment submissions, and feedback features, students can receive more structured guidance throughout the learning process. Such communication channels may help reduce misunderstandings related to learning tasks and ensure that students remain engaged with the instructional process. Therefore, the integration of a digital learning platform may contribute not only to academic performance but also to the overall organization and management of the learning experience.

Additionally, the use of Google Classroom may promote the development of learner autonomy and self-regulated learning. Students who engage with online learning environments are often required to manage their own learning schedules, monitor assignment deadlines, and independently access instructional resources. These learning behaviors are closely associated with self-regulated learning skills, which are widely recognized as important predictors of academic success. In the context of Vocational High School education, where students are expected to develop independent learning habits and workplace readiness, the integration of digital learning platforms may provide meaningful educational benefits beyond immediate learning outcomes.

Factors Contributing to the Marginal Statistical Difference

One possible explanation for the marginal statistical difference lies in the manner in which Google Classroom was implemented in this study. The platform primarily functioned as a Learning Management System rather than as a transformative pedagogical innovation. The instructional objectives, content coverage, and teacher roles remained comparable across both groups, which may have limited the magnitude of observable improvement. This finding aligns with previous research emphasizing that digital platforms require appropriate pedagogical integration to generate significant learning benefits (Rahman et al, 2021; Munna et al., 2024).

Another contributing factor may be the relatively short duration of the intervention. The integration of digital platforms often requires an adaptation period during which students develop self-regulated learning skills and familiarity with the technology. Several studies have reported that the impact of LMS-based learning becomes more evident when implemented over a longer period (Khikmah et al, 2021; Nalini et al., 2019). Therefore, the limited implementation time in this study may have constrained the statistical magnitude of the effect.

In addition, students' prior familiarity with digital learning platforms may also influence the effectiveness of technology-assisted instruction. When students are not accustomed to using online learning systems, a portion of the instructional time may be spent adapting to the technological environment rather than focusing fully on the learning content. This adaptation process may temporarily reduce the observable academic impact of digital learning platforms during short-term interventions.

Interpretation of Effect Size and Practical Significance

Although the Mann–Whitney U test revealed marginal statistical significance, the effect size analysis indicated a moderate effect ($r = 0.29$). In educational research, effect size is considered a crucial indicator because it reflects the magnitude of an instructional intervention beyond p-values alone (Maher et al., 2013). The moderate effect size suggests that Google Classroom–assisted learning provides meaningful practical value in improving students' English learning outcomes. This practical significance is particularly relevant in Vocational High School contexts, where instructional effectiveness is influenced by curriculum demands, time allocation, and students' readiness for independent learning. Even moderate improvements may accumulate over time and contribute to better learning management and academic performance. Therefore, the findings of this study should be interpreted not only from a statistical perspective but also from an educational impact standpoint.

Pedagogical Implications for Vocational High School Instruction

From a pedagogical perspective, the findings emphasize that the effectiveness of Google Classroom depends largely on how it is integrated into the teaching and learning process. In line with the TPACK framework discussed in the introduction, effective technology integration requires alignment among technological knowledge, pedagogical strategies, and subject content knowledge. Without such alignment, digital tools may function merely as administrative platforms rather than as instruments for enhancing conceptual understanding.

In Vocational High School settings, where instruction must balance theoretical knowledge and practical competence, Google Classroom can serve as a supportive Learning Management System that enhances instructional organization and accessibility. Teachers may utilize the platform to distribute learning materials, manage assignments, provide timely feedback, and facilitate blended learning activities that extend beyond classroom sessions. However, to maximize its potential impact, teachers should integrate interactive and student-centered learning strategies rather than relying solely on digital content distribution. Activities such as collaborative online discussions, project-based assignments, and reflective learning tasks may further enhance the educational value of digital platforms. Strategic pedagogical planning therefore remains the key determinant of successful technology-assisted instruction.

Research Limitations and Future Research Directions

This study was conducted within a single Vocational High School context with a relatively small sample size, which may limit the generalizability of the findings. In addition, the duration

of the intervention was relatively short, potentially affecting the magnitude of measurable outcomes. These factors may have contributed to the marginal statistical significance observed in this study. Future research is recommended to involve larger and more diverse samples across multiple vocational institutions to enhance external validity. Longer implementation periods and varied instructional designs may also provide deeper insight into the long-term impact of Google Classroom–assisted learning. Furthermore, future studies may consider examining additional variables such as student engagement, digital literacy, and learning motivation to better understand the mechanisms underlying technology-supported learning effectiveness in vocational education contexts.

Conclusion

This study aimed to compare students' English learning outcomes between conventional learning and Google Classroom–assisted learning in a Vocational High School context. The results indicate that students who participated in Google Classroom–assisted learning achieved higher mean scores and mean ranks compared to those who experienced conventional learning. The Mann–Whitney U test revealed a marginally significant difference between the two instructional approaches (U = 167.00, p = .050). Although the statistical significance was at the threshold level, the direction of the results consistently showed that the integration of Google Classroom tended to support better learning outcomes. Furthermore, the effect size analysis demonstrated a moderate effect (r = 0.29), suggesting that the use of Google Classroom provides meaningful practical benefits for improving students' English learning outcomes. This finding implies that the integration of digital Learning Management Systems can contribute positively to instructional organization, accessibility of learning materials, and flexibility in the learning process. However, the results also indicate that the effectiveness of technology integration depends not only on the platform itself but also on how it is pedagogically implemented in the classroom.

In conclusion, Google Classroom–assisted learning shows potential as a supportive instructional tool in Vocational High School settings, although its impact may remain limited when it is used primarily as a Learning Management System without deeper pedagogical transformation. Therefore, teachers are encouraged to integrate Google Classroom with interactive and student-centered learning strategies to maximize its educational benefits. Future research is recommended to involve larger samples, longer implementation periods, and additional variables such as student engagement and digital literacy in order to obtain a more comprehensive understanding of technology-assisted learning in vocational education.

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