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The Influence of Information and Communication Technology (ICT) Media on the Economics Learning Outcomes of Grade XI Students at SMA Negeri Ploso

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Abstract

Although Information and Communication Technology (ICT) has become increasingly important for improving instructional quality and students' academic achievement, empirical evidence regarding its effectiveness remains necessary across diverse educational contexts. This study aims to examine the effect of ICT utilization on the learning outcomes of Grade XI students at SMA Negeri Ploso. A quantitative explanatory approach was employed, involving 101 students selected through total sampling. Data were collected through questionnaires, observations, interviews, and documentation and analyzed using simple linear regression with IBM SPSS Statistics 27. The findings demonstrate that ICT utilization has a positive and statistically significant effect on students' learning outcomes ($p < .001$), with a coefficient of determination (R^2) of .715, indicating that ICT accounts for 71.5% of the variance in learning outcomes. These results confirm that effective ICT utilization contributes substantially to improving students' academic performance. The study concludes that the sustained integration of ICT into instructional practices is essential for promoting more effective, interactive, and student-centered learning. These

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findings provide empirical support for schools and educators to strengthen ICT-based instructional strategies and optimize digital learning environments at the senior high school level.

Keywords: Academic Achievement; Digital Learning; ICT Utilization; Learning Outcomes; Senior High School Students

INTRODUCTION

The rapid advancement of digital technology has transformed educational practices, requiring schools to integrate technology into teaching and learning to equip students with competencies needed in the twenty-first century. Contemporary education no longer emphasizes only the acquisition of knowledge but also the development of critical thinking, creativity, collaboration, communication, and problem-solving skills that enable learners to respond effectively to global challenges (Diah Rusmala Dewi, 2019). Consequently, educational institutions are expected to adopt innovative learning approaches that integrate Information and Communication Technology (ICT) to create learning environments that are interactive, student-centered, and responsive to technological developments (Nursya'ban, 2024).

The integration of ICT into education has become increasingly important because digital technology provides broader access to learning resources and facilitates flexible learning experiences beyond conventional classroom settings. ICT enables students to obtain information efficiently through digital devices and internet-based platforms while supporting teachers in designing more engaging instructional activities (Ersyandi, 2023). In Indonesia, educational policies have also encouraged the implementation of technology-assisted learning to improve instructional quality and students' academic achievement (Wardani et al., 2024). Therefore, ICT is no longer viewed merely as a supporting tool but as an essential component of modern educational practice.

Among various ICT applications, Google has become one of the most widely utilized digital platforms in educational contexts. Through services such as Google Search, Google Classroom, and Google Forms, students can access diverse learning materials, communicate with teachers, submit assignments, and participate in online assessments more efficiently (Utami, 2021). The accessibility and flexibility provided by Google's digital ecosystem have

significantly expanded students' opportunities to acquire knowledge independently while supporting more collaborative learning environments (Zou et al., 2023).

Google-based learning platforms also enable students to access scientific articles, educational videos, digital books, and various credible online resources that enrich their understanding of classroom materials. Such accessibility encourages independent learning, enhances learning motivation, and broadens students' perspectives beyond textbooks provided at school (Zahra et al., 2025). Interactive digital learning environments further enable students to engage more actively in knowledge construction and information exploration throughout the learning process (Ekosantoso et al., 2025).

Despite these advantages, the implementation of ICT in education also presents several challenges. The abundance of online information requires students to possess adequate digital literacy skills to distinguish reliable sources from inaccurate or misleading information. Moreover, unrestricted internet access may expose students to distractions that reduce learning concentration and encourage excessive dependence on instant information retrieval rather than conceptual understanding (Sobandi, 2019). Consequently, the educational benefits of ICT depend largely on how technology is integrated into instructional practices and how students utilize digital resources responsibly.

Previous studies have consistently reported positive relationships between ICT utilization and educational outcomes. Technology-supported learning has been found to improve instructional effectiveness by facilitating access to diverse learning materials and encouraging more active student participation (Aliyah & Masyithoh, 2024). ICT also promotes interactive learning experiences that strengthen students' cognitive engagement and support meaningful learning processes (Iqbal, 2024). Furthermore, technology integration contributes to improved academic achievement when digital resources are aligned with instructional objectives and students' learning needs (Carstens et al., 2021).

The positive contribution of ICT to learning outcomes has also been demonstrated in various educational settings. ICT-based learning media significantly enhance students' academic performance by increasing learning effectiveness and improving conceptual understanding (Rosary & Stevanus, 2023). Similar findings indicate that digital learning media positively influence students' chemistry learning outcomes through more engaging instructional experiences (Sakhila et al., 2024). The implementation of ICT has likewise been

associated with higher learning achievement because technology supports students in obtaining learning resources more efficiently and independently (Fitriana et al., 2022).

Digital technology also encourages greater learning autonomy by enabling students to manage learning activities according to their individual needs. Students are no longer restricted to classroom instruction because information can be accessed anytime through digital platforms (Erwin et al., 2021). The use of search engines, particularly Google, further strengthens students' ability to explore information from multiple sources and enriches their learning experiences beyond printed materials (Ramadhan et al., 2023). Similarly, Google has been recognized as an effective learning resource that supports students in understanding instructional materials across different educational contexts (Reygita & Wahyuningsih, 2022).

Although numerous studies have investigated ICT in education, several research gaps remain evident. Most previous research has examined ICT as a broad educational medium without specifically focusing on Google-based software applications as a distinct ICT component supporting classroom learning (Waluyo, 2021). Existing studies have also predominantly involved elementary school students, various non-economics subjects, or online learning environments developed during the COVID-19 pandemic, limiting their applicability to face-to-face senior secondary education (Purba et al., 2023). Moreover, many studies have incorporated ICT alongside additional variables such as learning motivation or learning interest, making it difficult to determine the independent contribution of ICT to students' academic achievement (Santika et al., 2021).

Based on these limitations, empirical evidence concerning the direct influence of Google-based ICT utilization on students' learning outcomes in face-to-face economics learning at the senior high school level remains limited. Previous investigations have not sufficiently examined Google as a specific ICT software platform that independently contributes to academic achievement within regular classroom instruction. The present study addresses this gap by focusing specifically on the utilization of Google-based ICT applications—including Google Search and other Google educational services—as learning tools for Grade XI economics students at SMA Negeri Ploso. This context is particularly relevant because students increasingly rely on digital technology during learning activities, while teachers continue to seek effective strategies for integrating ICT without reducing students' conceptual understanding.

The theoretical foundation of this study is derived from ICT-based learning theory, which emphasizes that digital technology enhances learning effectiveness by expanding access to information, facilitating interactive learning experiences, and supporting independent knowledge construction (Kurniati & Wiyani, 2021). This perspective is further supported by constructivist learning theory, which argues that meaningful learning occurs when students actively construct knowledge through interaction with various learning resources and authentic learning experiences (Suryana et al., 2022). Accordingly, appropriate ICT integration is expected to strengthen students' cognitive achievement through active engagement with digital learning resources.

The novelty of this study lies in its specific examination of Google-based ICT software as a single independent variable influencing students' learning outcomes in face-to-face economics instruction at the senior high school level. Unlike previous studies that investigated ICT in broader contexts or combined it with multiple explanatory variables, this research provides more focused empirical evidence regarding the educational contribution of Google-based ICT utilization within conventional classroom learning. Based on these considerations, this study aims to examine and explain the effect of Information and Communication Technology (ICT), particularly Google-based digital learning applications, on the learning outcomes of Grade XI students at SMA Negeri Ploso. The findings are expected to enrich empirical evidence regarding ICT integration in secondary education while providing practical recommendations for teachers and schools in optimizing digital technology to improve students' academic achievement.

METHODS

This study employed a quantitative approach with an explanatory research design to examine the effect of Information and Communication Technology (ICT) on the learning outcomes of Grade XI students at SMA Negeri Ploso. A simple linear regression design was adopted to determine the influence of the independent variable, ICT utilization, on the dependent variable, students' learning outcomes. ICT was operationalized through four indicators: accessibility of learning information, the use of digital technology as a learning resource, the utilization of digital technology to enhance conceptual understanding, and the use of digital media during the learning process. Learning outcomes were measured within the cognitive domain, including understanding (C2), applying (C3), and analyzing (C4).

The study was conducted at SMA Negeri Ploso during the 2025/2026 academic year. The participants consisted of all 101 Grade XI students enrolled in Economics classes. Since the population was relatively small and accessible, total sampling (saturated sampling) was employed, allowing every member of the population to participate and ensuring comprehensive representation of the target population.

Data were collected through classroom observations, interviews with the Economics teacher, documentation, and a structured questionnaire using a five-point Likert scale. The questionnaire was developed based on the established ICT indicators and was subjected to validity and reliability testing before data collection to ensure measurement accuracy. Observations and interviews were conducted to support the quantitative findings, while documentation provided students' academic records and other relevant institutional data.

The research procedure included instrument preparation, data collection, data processing, and statistical analysis using IBM SPSS Statistics version 27. Descriptive statistics were first employed to describe the characteristics of the data, followed by prerequisite tests, including normality, before conducting simple linear regression analysis. The research hypothesis was examined using the t-test, while the coefficient of determination (R^2) was calculated to determine the proportion of variance in students' learning outcomes explained by ICT utilization. These analytical procedures enabled an objective assessment of the relationship between ICT use and students' academic achievement.

RESULTS

1. Normality Test

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		101
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	3.64571444
Most Extreme Differences	Absolute	.051
	Positive	.051
	Negative	-.048
Test Statistic		.051
Asymp. Sig. (2-tailed)[c]		.200[d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Figure 1. Normality Test Results

Figure 1. Normality Test Results shows that the significance value obtained from the One-Sample Kolmogorov–Smirnov test is 0.200, which is higher than the significance level of 0.05 (0.200 > 0.05). This finding indicates that the regression residuals are normally distributed. Therefore, the normality assumption has been satisfied, and the data are appropriate for further analysis using simple linear regression to examine the effect of Information and Communication Technology (ICT) media on students' learning outcomes.

2. Simple Linear Regression Analysis

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	15.621	4.658		3.354	.001
	Media ICT	.938	.060	.846	15.757	<.001

a. Dependent Variable: Hasil Belajar

Figure 2. Simple Linear Regression Results

Figure 2. Simple Linear Regression Results shows that the regression analysis produced a constant value of 15.621 and a regression coefficient of 0.938 for the Information and Communication Technology (ICT) media variable. Accordingly, the simple linear regression equation is Y = 15.621 + 0.938X. The positive regression coefficient indicates that each one-unit increase in the use of ICT media is associated with a 0.938-unit increase in students' learning outcomes. This finding demonstrates a positive relationship between ICT media and learning outcomes, suggesting that greater utilization of ICT media contributes to improved student achievement.

3. Hypothesis Testing (t-test)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	15.621	4.658		3.354	.001
	Media ICT	.938	.060	.846	15.757	<.001

a. Dependent Variable: Hasil Belajar

Figure 3. Hypothesis Test Results

Figure 3. Hypothesis Test Results shows that the Information and Communication Technology (ICT) media variable has a t-value of 17.757 with a significance value of < 0.001. Since the significance value is below 0.05, ICT media has a positive and statistically significant

effect on students' learning outcomes. Therefore, the alternative hypothesis (H_1) is accepted. The positive regression coefficient ($\beta = 0.938$) further indicates that greater use of ICT media is associated with higher learning outcomes.

4. Coefficient of Determination (R^2)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.846[a]	.715	.712	3.664

a. Predictors: (Constant), Media ICT

Figure 4. Coefficient of Determination Results

Figure 4. Coefficient of Determination Results shows an R Square value of 0.715, indicating that Information and Communication Technology (ICT) media explain **71.5%** of the variance in students' learning outcomes, while the remaining **28.5%** is explained by factors outside the regression model. Furthermore, the Adjusted R Square value of **0.712** confirms that the model maintains a high explanatory power after adjustment. These findings demonstrate that ICT media make a substantial contribution to students' learning outcomes.

DISCUSSION

The findings demonstrate that the use of Information and Communication Technology (ICT) has a positive and statistically significant effect on the learning outcomes of Grade XI students at SMA Negeri Ploso. The regression analysis indicates that ICT utilization contributes positively to students' academic achievement, suggesting that greater integration of digital technology into the learning process is associated with higher learning outcomes. The positive regression coefficient ($\beta = 0.938$), the significant t-test result ($t = 17.757$, $p < 0.001$), and the coefficient of determination ($R^2 = 0.715$) collectively indicate that ICT is a substantial predictor of students' performance in Economics. These results imply that ICT is not merely a complementary instructional medium but functions as an important learning resource that supports students in acquiring knowledge, understanding concepts, and completing academic tasks more effectively.

The descriptive analysis further strengthens this interpretation. Students reported a high level of ICT utilization across all indicators, with the highest mean observed for the use of digital technology as a learning resource. This finding suggests that students have become accustomed to using digital platforms to access instructional materials, search for additional

references, and reinforce classroom learning. Meanwhile, the indicator related to accessibility of learning information obtained the lowest mean, although it remained within the good category. This pattern indicates that while digital learning resources are widely utilized, challenges related to accessing information efficiently still exist for some students. Nevertheless, the consistently favorable scores across all indicators demonstrate that ICT has become an integral component of students' learning experiences.

The results are consistent with the primary objective of this study, which was to examine whether ICT utilization influences students' learning outcomes. The significant relationship observed indicates that technology enhances learning by facilitating easier access to information, providing diverse instructional resources, and supporting independent learning. Students who actively utilize ICT are more likely to engage with learning materials beyond classroom instruction, thereby strengthening conceptual understanding and improving academic performance. Consequently, ICT serves not only as a medium for information delivery but also as a catalyst for developing more active and student-centered learning processes.

These findings are consistent with previous studies cited in the thesis. Kurniati and Wiyani (2021) argue that ICT improves the efficiency and effectiveness of instructional activities by expanding students' access to learning resources. Similarly, Aliyah and Masyithoh (2024) emphasize that digital technology increases student participation and creates a more interactive learning environment, ultimately improving learning achievement. The present findings reinforce these arguments by providing empirical evidence that effective ICT implementation contributes directly to students' academic outcomes in the context of senior secondary education.

The findings also support the conclusions reported by Rosary and Stevanus (2023), who found that ICT-based learning media improve students' interaction and comprehension during classroom instruction. Likewise, Wungguli and Yahya (2020) reported that students taught using ICT-supported learning achieved better academic performance than those participating in conventional instruction. The consistency between the present study and previous research suggests that the educational benefits of ICT are relatively stable across different educational settings and learning contexts. Rather than replacing teachers, ICT strengthens instructional practices by providing flexible learning opportunities and encouraging students to become more independent learners.

From a theoretical perspective, this study contributes to the growing body of literature emphasizing the role of educational technology in improving learning outcomes. The findings support the theoretical assumption that meaningful integration of ICT promotes active learning, expands access to information, and enhances students' cognitive engagement during instruction. The high coefficient of determination indicates that ICT explains a substantial proportion of the variance in learning outcomes, highlighting its importance as one of the major factors influencing academic achievement within the studied context. At the same time, the remaining unexplained variance suggests that learning outcomes are multidimensional and may also be influenced by motivation, learning interest, family environment, prior knowledge, and other educational variables not included in this study.

Practically, these findings provide important implications for schools and teachers. Teachers should continue integrating ICT into instructional activities by selecting appropriate digital platforms and learning resources that align with students' needs and curriculum objectives. Schools should strengthen technological infrastructure and provide continuous professional development to improve teachers' digital competencies. Such institutional support is essential for maximizing the educational benefits of ICT and ensuring that technology is implemented as an effective pedagogical tool rather than merely as a technological innovation.

Methodologically, this study demonstrates that a quantitative explanatory approach combined with simple linear regression is appropriate for examining the relationship between ICT utilization and learning outcomes. The use of validated questionnaires together with objective academic achievement data enhances the credibility of the findings. Nevertheless, incorporating qualitative approaches in future research may provide richer insights into students' experiences, perceptions, and learning behaviors when using ICT in educational settings.

Despite its contributions, this study has several limitations. First, the research was conducted in a single senior high school involving only 101 Grade XI students, limiting the generalizability of the findings to broader educational contexts. Second, the study examined only one independent variable, whereas learning outcomes are influenced by multiple internal and external factors. Finally, ICT utilization was measured primarily through students' questionnaire responses, which may be subject to response bias despite the use of validated

research instruments. Future studies should involve larger and more diverse samples, include additional explanatory variables, and employ mixed-methods approaches to obtain a more comprehensive understanding of how ICT contributes to students' academic achievement.

CONCLUSION

This study aimed to examine the effect of Information and Communication Technology (ICT) on the learning outcomes of Grade XI students at SMA Negeri Ploso. The findings demonstrate that ICT has a positive and statistically significant influence on students' academic achievement. Greater utilization of ICT in the learning process is associated with improved learning outcomes, indicating that digital technology plays an essential role in supporting effective instruction through easier access to information, broader learning resources, and enhanced conceptual understanding. These findings successfully address the research objective by confirming that ICT constitutes an important factor contributing to students' academic performance.

The study contributes theoretically by strengthening empirical evidence regarding the educational value of ICT integration in secondary education. From a practical perspective, the findings provide useful guidance for teachers and schools in designing technology-supported learning environments that encourage active student engagement and improve instructional effectiveness. The significance of this study lies in its comprehensive assessment of ICT utilization, providing a clearer understanding of how digital technology contributes to learning achievement in the context of Economics education at SMA Negeri Ploso.

The implications of this research suggest that systematic and purposeful integration of ICT can improve instructional quality while fostering more interactive and student-centered learning experiences. Accordingly, schools should continue investing in technological infrastructure and teachers' digital competencies to maximize the educational benefits of ICT. Future studies are recommended to include larger and more diverse samples, investigate different educational levels, and incorporate additional variables, such as learning motivation, learning interest, learning environment, and self-regulated learning, to obtain a more comprehensive understanding of the determinants of students' academic achievement.

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