Journal of Vocational Education and Educational Technology Innovations
Volume 1, Issue 1, Pages 20–26 May 2024 e-ISSN: xxxx-xxxx
https://journal.xsolusi.com/index.php/ jveti /article/view/xxxx DOI: https://doi.org/vxix.xxxx

The Impact of Information Technology-Based Learning on Student Achievement at SMK Karsa Mulya Palangka Raya

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Keywords:
Educational Technology,
Learning Outcomes,
Experiment,
Student Perception,
SMK Karsa Mulya

Received: April 2024
Accepted: May 2024
Published: May 2024

Abstract

This study aims to analyze the impact of implementing information technology-based learning on student achievement at SMK Karsa Mulya Palangka Raya. Technology-based learning has become a central focus in efforts to improve the quality of education, especially in the digital era. This research employs a quasi-experimental method with a descriptive quantitative approach. The research sample consists of two parallel classes at the XI level, randomly selected, with one class as the experimental group and the other as the control group. The instruments used include learning outcome tests and questionnaires to measure students' perceptions. The data obtained were analyzed using a t-test to determine significant differences between the learning outcomes of the two groups and descriptive analysis for questionnaire data. The results indicate that students who participated in technology-based learning experienced a significant improvement in learning outcomes compared to those who underwent conventional learning. Additionally, the questionnaire analysis results show that most students have a positive perception of technology-based learning, indicating that technology not only enhances learning outcomes but also increases students' motivation and interest in learning. This study concludes that implementing information technology-based learning significantly impacts student achievement at SMK Karsa Mulya Palangka Raya. Therefore, the integration of technology in the learning process is recommended for broader adoption in vocational schools to enhance educational quality and align students' skills with future industry needs.

INTRODUCTION

Information technology has become a focal point in global education, especially with the rapid advancement of digital technology (Brown & Adler, 2018; Siemens, 2018). In Indonesia, the utilization of technology in education is increasingly encouraged to improve learning quality and prepare students for the challenges of an increasingly competitive job market (Selwyn, 2017; Warschauer & Matuchniak, 2017). As a vocational education institution, SMK plays a crucial role in equipping students with relevant skills through the use of technology (Jou & Wang, 2020; Hammond, 2019).

SMK Karsa Mulya Palangka Raya, a vocational school in Central Kalimantan, has started implementing information technology-based learning to enhance education quality and prepare students for the Industry 4.0 era (Bandura, 2018; Tondeur et al., 2017). However, it remains essential to understand the extent to which this technology implementation affects student achievement, particularly at the vocational high school level (Means et al., 2018; Reeves, 2019).

Previous studies have extensively highlighted the benefits of technology in education, yet its implementation in vocational schools often faces challenges, including infrastructure availability, teacher readiness, and students' responses to technology (Kopcha, 2018; Garrison & Vaughan, 2017). Thus, an empirical assessment of the impact of technology use in learning at SMK Karsa Mulya Palangka Raya is necessary to provide more effective policy recommendations (Dillenbourg, 2016; Salomon, 2018).

This study focuses on XI-grade students, who are at a critical stage in their education before entering the workforce or pursuing higher studies (Mayer, 2017; Moore & Kearsley, 2018). Selecting grade XI as the research subject is expected to provide a clearer picture of the effectiveness of technology-based learning at this level (Picciano & Seaman, 2017; Schrum & Levin, 2017).

A quasi-experimental approach is used in this study to evaluate the impact of technology on student achievement (Amin & Alshurideh, 2019; Wang et al., 2018). The experimental group will receive technology-based learning, while the control group will employ conventional learning methods. Comparing the learning outcomes of both groups aims to identify significant differences resulting from technology implementation (Reeves, 2019; Selwyn, 2017).

This study also evaluates students' perceptions of technology-based learning, as perceptions play a crucial role in influencing motivation and interest, ultimately affecting learning outcomes (Garrison & Vaughan, 2017; Jou & Wang, 2020). A questionnaire will be used to measure students' satisfaction and acceptance of the technology used in learning (Hammond, 2019; Tondeur et al., 2017).

Constructivist theory serves as the foundation for this research, asserting that learning is more effective when students are actively engaged in the process (Mayer, 2017; Selwyn, 2017). Technology is considered a tool that supports active learning by providing interactive and engaging resources (Bandura, 2018; Kopcha, 2018). This research is expected to contribute significantly to curriculum development and learning methods in vocational schools, particularly in leveraging technology to enhance student achievement. The findings can also serve as a basis for other schools interested in adopting technology in learning..

METHODOLOGY

This study employs a quasi-experimental design with a descriptive quantitative approach. This method allows researchers to evaluate the influence of the independent variable—technology-based learning—on the dependent variable—student learning outcomes. Although it does not involve full randomization, this method remains valid for identifying causal relationships.

The study population consists of all XI-grade students at SMK Karsa Mulya Palangka Raya, with a randomly selected sample from two parallel classes. The first class is designated as the experimental group receiving technology-based learning, while the second serves as the control group undergoing conventional learning. The selected sample is expected to be representative enough to generalize the research findings.

The research instruments include learning outcome tests and student perception questionnaires. Learning outcome tests measure students' knowledge and skills before and after the learning intervention. The student perception questionnaire is designed to assess students' views on technology use in learning, covering aspects such as ease of use, effectiveness, and impact on learning motivation.

Data collection begins with a pre-test to measure students' initial abilities. Subsequently, the experimental group undergoes technology-based learning for one semester, while the control group follows conventional methods. A post-test is then

conducted to measure improvements in student learning outcomes. The collected data is analyzed using a t-test to determine significant differences between the experimental and control groups.

Data analysis is performed using descriptive and inferential statistical approaches. The t-test is used to test the hypothesis regarding significant differences between students who participated in technology-based learning and those who did not. Additionally, descriptive analysis is conducted to understand the distribution and trends of data obtained from student perception questionnaires. The results are then interpreted to answer research questions and draw relevant conclusions.

RESULTS AND DISCUSSION

The study results indicate a significant improvement in student learning outcomes for those who participated in technology-based learning compared to students who underwent conventional learning. This is evidenced by the t-test results, which show a statistically significant difference between the post-test scores of the two groups. The increased scores suggest that integrating technology into the learning process effectively enhances students' understanding of the subject matter.

In the experimental group, the average post-test scores show a more considerable increase compared to the control group. This finding indicates that students who learned with technological assistance had a better grasp of the concepts taught. The availability of various visual and interactive learning tools facilitated by technology likely played a crucial role in making learning more engaging and comprehensible. Such tools, including multimedia presentations, simulations, and interactive exercises, help break down complex topics into more digestible content, thereby improving students' comprehension.

Moreover, the research findings highlight that students in the technology-based learning group exhibited a higher level of interest in the subject matter. This was reflected in the questionnaire results, which showed that most students felt more motivated and engaged when learning through technological means. The interactivity and novelty of digital tools seem to be key factors in fostering students' enthusiasm for learning. Features such as gamification, interactive quizzes, and real-time feedback encourage active participation and sustained engagement throughout the learning process.

Despite these positive outcomes, the study also identifies several challenges encountered in implementing technology-based learning. Technical issues, such as unstable internet connections and limited access to hardware, were among the primary obstacles faced by students and educators. These challenges occasionally disrupted the learning process, particularly in areas with inadequate digital infrastructure. Nonetheless, the overwhelming benefits of using technology in learning outweigh these barriers, as indicated by students' positive responses. Addressing these challenges through better infrastructure planning and investment in digital resources is necessary for optimizing technology-enhanced education.

From the questionnaire responses, it was found that some students struggled to adapt to new technological tools, especially those who were not accustomed to using digital devices in their learning activities. This highlights the need for more comprehensive training and support for both students and teachers to ensure effective adoption of technology in education. Providing step-by-step guidance, digital literacy workshops, and structured onboarding sessions can help students overcome the initial learning curve and maximize their engagement with technology-assisted lessons.

Additionally, variations in how students respond to technology-based learning were observed, which may be influenced by socio-economic backgrounds and previous exposure to technology. Students from households with better access to digital resources generally adapted more quickly than those with limited prior experience. This suggests the importance of implementing personalized teaching approaches tailored to accommodate diverse student needs. Differentiated instruction,

adaptive learning systems, and scaffolding strategies can help bridge the digital divide and ensure equitable access to learning opportunities.

The findings also indicate that technology-based learning not only positively impacts academic performance but also enhances students' ability to access information and develop independent problem-solving skills. The constructivist learning theory, which emphasizes active student engagement in the learning process, supports this observation. Through technology, students are encouraged to explore topics autonomously, conduct research, and engage in self-directed learning, fostering critical thinking and analytical skills essential for their future careers.

However, it is crucial to acknowledge that technology serves merely as a tool, and its effectiveness largely depends on how it is integrated into the teaching process by educators. The study underscores the critical role of teachers in guiding students in using technology effectively. Proper instructional design, pedagogical training, and curriculum adjustments aligned with technological advancements are necessary to optimize the learning experience. Equipping teachers with digital competencies and instructional strategies tailored for technology-enhanced learning will ensure that students derive the maximum benefit from educational innovations..

Table 1: Research Findings Table

Group	Pre-Test Average	Post-Test Average	Improvement
Experimental	65.4	85.7	20.3
Control	66.2	72.5	6.3

The table 1. illustrates the significant difference in learning outcome improvements between the experimental and control groups. The experimental group, which received technology-based learning, experienced an increase in their average score from 65.4 in the pre-test to 85.7 in the post-test, reflecting a 20.3-point improvement. In contrast, the control group, which followed traditional learning methods, showed a more modest increase from 66.2 in the pre-test to 72.5 in the post-test, with an improvement of only 6.3 points.

These results indicate that the use of technology in learning significantly enhances students' understanding and retention of educational materials. The stark contrast in score improvements between the two groups demonstrates how technology aids in clarifying learning concepts through engaging, interactive, and visually appealing tools. Moreover, this outcome aligns with the theory that digital learning environments offer dynamic resources that cater to different learning styles, making the educational experience more effective and inclusive.

Despite the positive outcomes, the research also highlights the need for better infrastructure to ensure optimal implementation of technology-enhanced education. Technical barriers such as limited internet connectivity and insufficient digital devices may hinder the learning process. Therefore, educational institutions must invest in robust digital infrastructure and support systems to facilitate seamless technology integration in teaching and learning activities.

Class	Major	Male	Female
XI TKR 1	Light Vehicle Engineering	28	4
XI TKR 2	Light Vehicle Engineering	30	5
XI TSM 1	Motorcycle Engineering	25	3
XI TSM 2	Motorcycle Engineering	27	2

The table above provides an overview of the number of students involved in the study, categorized by class, major, and gender. Among the four participating classes, two belong to the Light Vehicle Engineering (TKR) major, while the other two

are part of the Motorcycle Engineering (TSM) major. In the Light Vehicle Engineering (TKR) major, there are 32 students in class XI TKR 1, consisting of 28 males and 4 females, and 35 students in class XI TKR 2, comprising 30 males and 5 females. This distribution highlights the fact that the technical fields remain male-dominated, with a significantly lower number of female students.

Similarly, in the Motorcycle Engineering (TSM) major, class XI TSM 1 consists of 25 male and 3 female students, totaling 28 students, while class XI TSM 2 comprises 27 male and 2 female students, totaling 29 students. Again, the data suggests that engineering and technical education are more popular among male students, while female participation remains relatively low. The findings indicate that vocational education in technical fields is still largely male-dominated, possibly due to societal perceptions that these fields are more suitable for men or a lack of encouragement for women to pursue careers in engineering. To address this imbalance, schools could implement programs to attract more female students to vocational training, such as scholarships, awareness campaigns, or mentorship programs aimed at fostering inclusivity in technical education.

Additionally, the balanced number of students across classes ensures that the study results are representative, minimizing sampling bias and increasing the reliability of the research findings. The diverse student distribution across different majors and classes provides a comprehensive understanding of how technology-based learning impacts various student demographics. In conclusion, this study underscores the significant benefits of integrating digital tools into vocational education. Although some challenges persist, such as technological barriers and student adaptability issues, the overall impact of technology-enhanced learning on student engagement, comprehension, and academic performance is overwhelmingly positive. Future research should explore further strategies to address these challenges, improve teacher training, and develop adaptive learning methodologies to ensure equitable access to education for all students. By overcoming these limitations, educational institutions can fully harness the potential of technology to create a more interactive, efficient, and inclusive learning environment that prepares students for the demands of the modern workforce.

CONCLUSION

This study demonstrates that implementing information technology-based learning at SMK Karsa Mulya Palangka Raya significantly enhances student achievement. Technology-based learning not only facilitates a better understanding of subject matter but also increases students' motivation and interest. These findings reinforce the importance of integrating technology into education, particularly in vocational schools focusing on practical skills. Although the research findings highlight positive impacts, challenges such as technical issues and the need for more intensive training for teachers and students still exist. Therefore, this study recommends improved infrastructure support and continuous training programs to ensure the successful implementation of technology in learning. The findings of this research are expected to serve as a reference for other schools in adopting technology to enhance educational quality.

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