

Analysis The Effectiveness of E-Learning in Increase Skills Digital Literacy and Shaping Discipline Study Students

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ABSTRACT

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The rapid development of digital technology in the era of Society 5.0 has transformed students' learning methods, including through the use of E-Learning. However, at SMK PGRI 13 Surabaya, there are still students who experience difficulties in operating platforms such as Google Classroom, which impacts their digital literacy and learning discipline. This phenomenon highlights the importance of analyzing the effectiveness of E-Learning as a digital learning medium. This study aims to determine the effect of E-Learning use on improving students' digital literacy skills and shaping their learning discipline. The research is based on the theory of digital literacy and the theory of learning discipline. A correlational quantitative approach was used, employing a survey method. The sample consisted of 250 students from grades X to XII at SMK PGRI 13 Surabaya. The research instruments included the E-Learning Scale, Student Digital Literacy Measure, and ABS. Data were analyzed using descriptive statistics, Pearson correlation, and linear regression tests. The results showed a positive and significant relationship between E-Learning and digital literacy ($r = 0.678$; $p < 0.05$) as well as learning discipline ($r = 0.592$; $p < 0.05$). In addition, a strong relationship was found between digital literacy and learning discipline ($r = 0.641$; $p < 0.05$). Regression analysis indicated that E-Learning contributed 46% to improving digital literacy and 35.1% to students' learning discipline.



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A. INTRODUCTION

The rapid development of digital technology in the past decade has brought significant impacts to almost all aspects of life, including the field of education. This change is marked by the emergence of the *Society 5.0* era, which integrates advanced technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and digital systems into the daily lives of society. In the context of education, digital technology has given rise to various learning innovations such as *E-Learning*, which facilitates the teaching and learning process in a flexible manner without being limited by space and time. However, the implementation of *E-Learning* does not always run effectively, especially at the secondary education level such as vocational high schools (*Sekolah Menengah Kejuruan* or SMK). SMK PGRI 13 Surabaya, for instance, there are still many students who are not yet able to optimally utilize digital learning platforms such as Google Classroom. Difficulties in understanding the *E-Learning* system, limited digital literacy skills, and low learning discipline have become real problems that directly affect the learning process and outcomes. These problems are not only technical in nature but also involve cognitive and attitudinal aspects of students in responding to educational technology.

Theoretically, digital literacy is one of the essential competencies of the 21st century that must be possessed by every individual in facing digital transformation. Digital literacy not only includes the technical ability to use technology but also the critical thinking skills needed to access, evaluate, and use digital information responsibly. On the other hand, learning discipline is an important aspect of character development that is closely related to students' motivation, independence, and self-management in the learning process. Both aspects digital literacy and learning discipline serve as fundamental components in shaping adaptive, productive, and well-prepared students to face the challenges of the digital era. Therefore, it is important to examine how the effectiveness of *E-Learning* can contribute to the development of these two aspects among vocational school students.

Various previous studies have proven that the use of *E-Learning* can have a positive influence on the students' learning process. For example, *E-Learning* is capable of increasing students' enthusiasm and engagement in the learning process, which directly impacts the improvement of digital literacy skills (Amri et al., 2021). Research by Misbah (2018) and Muasyaroh (2020) also shows that the integration of *E-Learning* into primary and secondary education systems can enhance students' understanding of digital information and support independent learning activities.

In addition to the digital literacy aspect, several studies have also highlighted the role of *E-Learning* in shaping students' learning discipline. Sandybayev (2020) and Esra & Sevilen (2021), for instance, found that *E-Learning* provides flexibility in the learning process but still requires active and responsible participation from students in order to make learning effective. This indicates that the success of *E-Learning* is highly determined by students' ability to manage their study time, complete assignments independently, and comply with rules and schedules within the digital system.

However, previous studies also have several limitations. First, many of them examined only one aspect either digital literacy or learning discipline without analyzing the interrelation between the two in the context of *E-Learning* implementation. Second, most of the existing studies were conducted at the higher education level or with university student samples, which may not accurately represent the real conditions at the vocational secondary education level, such as vocational high schools. Third, the research approaches used were mostly qualitative or small-scale experimental studies, which have not yet provided a strong description of the correlation and generalization across a broader context.

The research gap appears in several important aspects that form the basis for the implementation of this study. First, there are still limited studies that explicitly examine the relationship between *E-Learning* and two main variables simultaneously, namely digital literacy skills and students' learning discipline, within one comprehensive framework. In fact, these two components are interrelated and mutually influence the success of digital learning implementation in schools. Second, most previous studies were conducted at the higher education level or in general schools, so the results may not fully align with the needs, characteristics, and educational context of vocational schools. Vocational high schools have their own unique characteristics, both in terms of curriculum, learning culture, and student orientation, which are more directed toward work readiness and practical skills. Therefore, studies based on empirical data within the vocational education environment are still highly needed to develop relevant and applicable technology-based learning models.

The majority of previous studies employed descriptive or qualitative approaches without conducting inferential statistical analyses that could reveal the strength and direction of relationships between variables more deeply. By using a quantitative correlational approach, this study is expected to fill this gap by providing empirical evidence of the significant relationship between the use of *E-Learning*, the improvement of digital literacy, and the formation of students' learning discipline. This research is directed toward analyzing the

influence of *E-Learning*, particularly through the Google Classroom platform, on improving students' digital literacy skills and learning discipline at SMK PGRI 13 Surabaya. The study aims to provide empirical evidence on how *E-Learning* contributes to the enhancement of students' competencies in utilizing digital technology responsibly and effectively, as well as fostering self-discipline in the learning process.

Through a quantitative correlational approach, this research seeks to measure the extent and strength of the relationship between *E-Learning* usage and the development of these two key aspects. The goal is to formulate recommendations for the effective integration of digital learning platforms in vocational education settings. In doing so, the study supports the creation of adaptive, technology-oriented learning models that align with the demands of the 21st century and prepare students to face the challenges of the digital era.

B. METHODS

This study employed a quantitative correlational approach to examine the relationship between the use of *E-Learning* and students' digital literacy skills and learning discipline at SMK PGRI 13 Surabaya. The research involved 250 students from grades X–XII across four departments: Visual Communication Design, Digital Business, Office Automation and Management, and Computer and Network Engineering selected through a non-random quota sampling technique. Data were collected using Likert-scale questionnaires consisting of three instruments: the *E-Learning Scale* (Lin et al., 2023), the *Student Digital Literacy Measure* (Dashtestani, 2022), and the *Academic Behavior Scale* (Guo et al., 2021). All instruments demonstrated high reliability (Cronbach's $\alpha > 0.8$) and normal data distribution ($p > 0.05$). Data analysis employed both descriptive and inferential statistics using SPSS software. The Pearson correlation test and simple linear regression were used to determine the strength and direction of relationships between variables. This method provides empirical insights into the effectiveness of *E-Learning* in improving students' digital literacy and learning discipline within the vocational education context.

C. RESULTS AND DISCUSSION

1. Description Study

This study was conducted on students of SMK PGRI 13 Surabaya, involving 250 respondents from grades X, XI, and XII, representing four majors: Visual Communication Design (DKV), Digital Business (BD), Office Automation and Management (OTKP), and Computer and Network Engineering (TKJ). Based on the characteristics of the respondents, it was found that the majority were female students, totaling 150 individuals (60.0%), while male students amounted to 100 individuals (40.0%). This finding indicates that the proportion of female students participating in this study is higher than that of male students.

Table 1. Distribution Respondents By Gender

Gender Frequency Percentage (%)		
Man	100	40.0%
Woman	150	60.0%
Total	250	100.0%

Table 2. Distribution Respondents By Grade Level

Class Frequency Percentage (%)		
X	85	34.0%
XI	93	37.2%
XII	72	28.8%
Total	250	100.0%

Based on Table 2, students from grade XI represent the largest group involved in this study, totaling 93 respondents (37.2%). This is followed by grade X students, totaling 85 respondents (34.0%), and grade XII students, totaling 72 respondents (28.8%). These results indicate that the participation rate was highest among grade XI students compared to other grade levels.

Table 3. Distribution Respondents Based on Major

Major	Frequency	Percentage (%)
Visual Communication Design	70	28.0%
BD	57	22.8%
OTKP	68	27.2%
TKJ	55	22.0%
Total	250	100.0%

As shown in Table 3, respondents majoring in Visual Communication Design (DKV) represent the largest group, totaling 70 students (28.0%). The Office Automation and Management (OTKP) major follows with 68 students (27.2%), while the Digital Business (BD) and Computer and Network Engineering (TKJ) majors contribute 22.8% (57 students) and 22.0% (55 students), respectively. These findings indicate that the distribution of respondents across majors is relatively balanced, although DKV and OTKP have slightly more students compared to the other majors.

2. Variable Data Description

In this section, the descriptive results of the three main research variables E-Learning, Digital Literacy, and Learning Discipline are presented. The data were analyzed using SPSS software, which included calculations of the minimum, maximum, mean, and standard deviation values for each variable based on the questionnaire responses from 250 students of SMK PGRI 13 Surabaya.

Table 4. Description Variables Study

Variables	Number of Items	Amount Respondents	Minimum Value	Maximum Value	Average	Standard Deviation
E-Learning	15	250	51	66	58	3.39
Digital Literacy	20	250	67	90	78	4.09
Discipline Study	24	250	34	57	56	4.35

Based on the descriptive analysis, the E-Learning variable obtained an average score of 58 with a standard deviation of 3.39. This indicates that, in general, students' perceptions of E-Learning particularly through Google Classroom are in the fairly good category, with moderate variation in responses. This finding aligns with Kumar Basak (2018) and Valverde-Berrocso (2020) who emphasize that E-Learning facilitates flexible and interactive learning, allowing students to access materials and communicate effectively with teachers and peers. The Digital Literacy variable achieved an average score of 78 with a standard deviation of 4.09. This result suggests that students' ability to utilize digital technology to support the learning process is relatively high, though there remains variation among individuals. This supports the theory of Hariono (2017) and Sriyanto (2021), which defines digital literacy as the ability to access, understand, and use information from digital sources effectively. It also confirms Siddiq (2016) who state that

frequent exposure to digital learning environments through E-Learning enhances students' digital competencies.

Meanwhile, the Learning Discipline variable recorded an average score of 56 with a standard deviation of 4.35. These results show that most students possess a moderate to high level of learning discipline, with relatively homogeneous data distribution. This finding is consistent with Guo et al. (2021) through the *Academic Behavior Scale (ABS)*, which explains that disciplined students tend to demonstrate consistent study habits, time management, and persistence in completing academic tasks. It also aligns with Zimmerman (2002), who notes that self-regulated learners exhibit greater discipline and motivation in academic activities. Overall, the descriptive findings suggest that E-Learning contributes positively to improving students' digital literacy and learning discipline, although differences in individual competence and motivation remain. These results provide an empirical basis for the further inferential analysis presented in the next section.

3. Assumption Test Statistics

Reliability Test

The reliability test was conducted to ensure that each measurement instrument used in this study had adequate internal consistency. This test employed the Cronbach's Alpha technique, where an instrument is considered reliable if the alpha value is ≥ 0.60 .

Table 5. Reliability Test Instrument

Variables	Number of Items	Amount Respondents	Cronbach's Alpha	Category Reliability
E-Learning	15	250	0.811	Tall
Digital Literacy	20	250	0.844	Tall
Discipline Study	24	250	0.872	Tall

Based on Table 5, all variables have Cronbach's Alpha values above 0.80, indicating a high level of reliability. This means that all questionnaire items are consistent and dependable in measuring each construct E-Learning, Digital Literacy, and Learning Discipline. According to Carmines and Zeller (1979), an alpha value above 0.70 reflects strong internal consistency, suggesting that the instruments used are stable and reliable across different items. Thus, the instruments in this study can be confidently used for further statistical analysis.

Normality Test

The normality test was performed to determine whether the data distribution was normal, as this assumption is essential in deciding the type of statistical test to be applied (parametric or non-parametric). The Kolmogorov-Smirnov test was used to assess the residual values, with a significance value (p) greater than 0.05 indicating that the data are normally distributed.

Tabel 6. Uji Normalitas
One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		250
Normal Parameters ^{a,b}	Mean	.0000000
	Std. Deviation	3.38392468
Most Extreme Differences	Absolute	.050
	Positive	.045
	Negative	-.050
Test Statistic		.050
Asymp. Sig. (2-tailed)		.200 ^{c,d}

As shown in Table 6, all variables have a significance value greater than 0.05 ($p = 0.200$), which indicates that the data are normally distributed. Therefore, it can be concluded that the assumptions of normality have been met, allowing the use of parametric statistical tests such as Pearson's correlation and linear regression analysis in this study. This result supports the reliability of the data processing process as emphasized by Field (2013), who states that normally distributed data increase the accuracy of inferential statistical testing.

Correlation Test

After the data were confirmed to be reliable and normally distributed, a correlation analysis was conducted to determine the degree of relationship between the three main variables: E-Learning, Digital Literacy, and Learning Discipline. The test used was the Pearson Product-Moment Correlation, since the assumption of normality was satisfied.

Table 7. Correlation Test

Inter- Variable	Coefficient Correlation (r)	Significance (p)	Interpretation
E-Learning and Digital Literacy	0.678	0.000	Connection strong and significant
E-Learning and Discipline Study	0.592	0.000	Connection moderate and significant
Literacy and Discipline Study	0.641	0.000	Connection strong and significant

As shown in Table 7, all pairs of variables demonstrate statistically significant relationships ($p < 0.05$). The correlation between E-Learning and Digital Literacy is categorized as strong, with an r value of 0.678, indicating that increased utilization of E-Learning tends to improve students' digital literacy skills. This supports Siddiq, Scherer, & Tondeur (2016) who argue that exposure to online learning environments enhances students' ability to access, evaluate, and utilize digital information effectively.

The relationship between E-Learning and Learning Discipline is classified as moderate ($r = 0.592$), suggesting that while E-Learning plays a significant role in shaping students' study habits and time management, other external factors such as teacher supervision and learning motivation may also influence learning discipline. This aligns with Zimmerman's (2002) theory of *self-regulated learning*, which emphasizes that technological tools like E-Learning foster self-discipline by encouraging learners to take responsibility for their study routines. The correlation between Digital Literacy and Learning Discipline is strong ($r = 0.641$), implying that students with higher digital literacy tend to be more disciplined in their learning activities. This finding supports Guo et al. (2021) who found that disciplined learners exhibit better self-regulation and academic consistency when they possess strong digital skills.

Overall, these findings indicate that improvements in E-Learning effectiveness and digital literacy competence are significantly associated with increased learning discipline among students at SMK PGRI 13 Surabaya. In other words, as students become more proficient in using digital platforms, they are also more likely to develop disciplined and responsible learning behaviors.

4. Analysis Statistics Inferial

After conducting the descriptive, reliability, and normality tests, the next stage was performing **inferential statistical analysis** to determine the relationships and influences among the research variables. In this study, the **Pearson correlation test** and **simple linear regression analysis** were employed, as the data were normally distributed. The

results of the Pearson correlation test reveal positive and significant relationships between the following variables:

- a) E-Learning with Digital Literacy ($r = 0.678, p < 0.05$)
- b) E-Learning with Discipline Learning ($r = 0.592, p < 0.05$)
- c) Digital Literacy with Discipline Learning ($r = 0.641, p < 0.05$)

This matter indicates that the more tall effectiveness of E-Learning, then the more high digital literacy and discipline Study student.

Table 8. Regression Results of E-Learning Against Digital Literacy

Parameter	Mark
R Square	0.460
Sig. (F-test)	0.000
Koefisien b	0.789
Sig. (t-test)	0.000

The regression analysis in Table 8 shows that E-Learning has a significant influence on students' digital literacy. The R^2 value of 0.460 indicates that 46% of the variation in digital literacy is explained by E-Learning, while the remaining 54% is influenced by other factors such as students' motivation, prior experience, and access to technology. This finding aligns with the theory of Harjono (2018) and Siddiq (2016), which suggests that consistent exposure to digital learning environments enhances students' abilities to access, evaluate, and utilize digital information effectively.

Table 9. Regression Results of E-Learning Against Discipline Study

Parameter	Mark
R Square	0.351
Sig. (F-test)	0.000
Coefficient b	0.654
Sig. (t-test)	0.000

The results in Table 9 demonstrate that E-Learning also has a significant impact on learning discipline. The R^2 value of 0.351 indicates that 35.1% of the variation in students' learning discipline is explained by E-Learning. This suggests that the use of digital platforms fosters structured learning habits, better time management, and self-regulated behavior among students. This finding supports Zimmerman's (2002) concept of *self-regulated learning*, which emphasizes that learners who utilize technological tools tend to exhibit greater self-control and persistence in achieving academic goals.

5. Linear Regression Test

Using simple linear regression analysis, the regression models for Digital Literacy and Learning Discipline produced relatively strong R^2 values of 0.460 and 0.351, respectively. This means that E-Learning has a real and significant influence on both variables. In other words, the higher the effectiveness of E-Learning implementation, the greater the improvement in students' digital literacy skills and their disciplined learning behavior.

Table 10. Linear Regression of E-Learning Against Skills Digital Literacy

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	
(Constant)	15,127	2,114	—	7,154
E-Learning	0.789	0.054	0.678	14,611

- a) Coefficient $b=0.789$

Every increase of 1 unit E-Learning scores will increase score Digital Literacy is 0.789 points, with assumptions other factors are considered constant.

b) Constant $a=15.127$

If the student No using the same e-learning once ($X = 0$), then score literacy digital estimated of 15,127 points.

Table 11. Linear Regression of E-Learning Against Discipline Study

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	
(Constant)	18.233	2.605	—	7.000
E-Learning	0.654	0.076	0.592	8.605

a) Koefisien $b=0.654$

Every 1 point increase E-Learning scores will increase discipline Study by 0.654 points.

b) Constant $a=18.233$

If the student No access the same e-learning once, then discipline study predicted amounting to 18,233 points.

This study aimed to analyze the effectiveness of E-Learning in improving digital literacy skills and fostering learning discipline among students at SMK PGRI 13 Surabaya. Based on the results of the Pearson correlation and simple linear regression analyses, there is a positive and significant relationship between the use of E-Learning and both digital literacy ($r = 0.678$; $p < 0.05$) and learning discipline ($r = 0.592$; $p < 0.05$). Additionally, digital literacy shows a strong correlation with learning discipline ($r = 0.641$; $p < 0.05$).

These findings indicate that the more effectively students use E-Learning platforms such as Google Classroom, the higher their ability to access, understand, and use digital information intelligently, as well as to exhibit better disciplined behavior in the learning process. The regression models further show that E-Learning contributes 46% to the improvement of digital literacy and 35.1% to the enhancement of learning discipline. These contributions are considered substantial, given that many external factors such as motivation, teaching quality, and school infrastructure can also influence both variables. This finding supports the research hypothesis that digital learning enhances both digital literacy and disciplined learning behavior. It also aligns with the views of Kumar Basak (2018) and Valverde-Berrocso (2020), who argue that E-Learning platforms like Google Classroom provide flexibility and interaction that encourage independent, structured, and technologically responsive learning.

Previous studies have also demonstrated similar outcomes. For instance, Amri (2021) found that E-Learning implementation increases student participation and their ability to utilize digital technology in learning. Similarly, Misbah (2018) reported that using digital platforms in physics education significantly enhances students' digital competencies.

In terms of learning discipline, this research supports Gunadi (2022), who found a positive correlation between the implementation of E-Learning and students' discipline in completing assignments. However, these results differ from Hasanah and Fadilah (2022), who found no significant correlation between the two variables. Such discrepancies may arise from differences in educational context, platform characteristics, and the design or implementation of E-Learning in each school. These findings reinforce the theoretical position that the success of E-Learning is strongly influenced by the extent to which the platform is integrated into students' learning routines and its ability to promote structured, disciplined learning habits.

D. CONCLUSION AND SUGGESTIONS

Based on results analysis and discussion that has been done, can concluded that :

1. E-Learning has influence significant to skills students' digital literacy. This proven with mark correlation of $r = 0.678$ which shows strong and significant relationship. This means that the more tall use of E-Learning such as Google Classroom, then the more high level digital literacy of students of SMK PGRI 13 Surabaya.
2. E-Learning also has an impact to discipline Study students, shown through mark correlation of $r = 0.592$. This is show that the use of E-Learning is capable push student become more responsible answer towards the learning process they.
3. There is connection significant between skills digital literacy with discipline Study students, with mark correlation of $r = 0.641$, which indicates that more students digital literacy tends to more discipline in Study.

E-Learning is not merely a technical means of learning but also serves as an instrument for character formation and the comprehensive development of students' learning competencies within the context of 21st-century education. This research can be further developed by employing a mixed-method approach to obtain a more comprehensive and in-depth understanding of the effectiveness of E-Learning on students' learning behavior and outcomes.

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