



The Impact of Digital Literacy and Distance Learning on Automotive Measurement Techniques Competence

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ABSTRACT

This study aims to identify: (1) the impact of distance learning on competencies in Automotive Measurement Techniques; (2) the effect of digital literacy on competencies in Automotive Measurement Techniques; and (3) the combined influence of distance learning and digital literacy on competencies in Automotive Measurement Techniques. This research employs a quantitative ex post facto approach. The sample consisted of 42 second-semester students from the Vocational Education Program in Mechanical Engineering at Ivet University, selected using a total sampling technique. Data were collected through questionnaires and documentation and analyzed using SPSS to test the hypotheses with a significance level of 0.05. The results reveal that: (1) distance learning significantly impacts competencies, as indicated by a t-value greater than the critical t-value ($t_{\text{calculated}} = 3.118 > t_{\text{critical}} = 1.685$) and a p-value of 0.003 ($< 0,05$); (2) Digital literacy significantly influences competencies, as shown by a t-value greater than the critical t-value ($t_{\text{calculated}} = 5,101 > t_{\text{critical}} = 1,685$) and a p-value of 0.000 (< 0.05); (3) there is a significant combined effect of distance learning and digital literacy on competencies in Automotive Measurement Techniques, as evidenced by an F-value greater than the critical F-value ($F_{\text{calculated}} = 49,638 > F_{\text{critical}} = 3,23$). Based on the coefficient of determination tests, the findings indicate that: (1) 50.18% of learning outcomes are influenced by distance learning; (2) 60.39% of learning outcomes are influenced by digital literacy; and (3) 70.3% of learning outcomes are jointly influenced by distance learning and digital literacy. Achieving optimal learning outcomes necessitates improving students' understanding of distance learning and emphasizing independent learning strategies. Additionally, students' digital literacy skills significantly enhance the effectiveness of distance learning, particularly in competencies related to Automotive Measurement Techniques.

Keywords: Distance Learning, Digital Literacy, Competence, Measurement Techniques, Automotive.

1. INTRODUCTION

The World Health Organization (WHO) declared COVID-19 a global pandemic in 2020 [1]. The Government of the Republic of Indonesia issued Circular Letter No. 4 of 2020, mandating online learning to prevent the spread of the pandemic [2]. Distance learning refers to an educational approach conducted synchronously or asynchronously without direct physical interaction [3]. It is implemented through the utilization of various technologies as media for delivering instructional materials [4]. Distance learning serves as an appropriate alternative to ensure the continuity of education by reducing physical contact and avoiding gatherings within the academic community [5]. Despite being a viable solution for implementing education during the pandemic, it has posed numerous challenges

for academic communities. From the parents' perspective, they must actively participate in supervising their children during home-based learning. Additionally, maintaining good communication with schools is essential to monitor the progress of their children's learning at home [6].

Assessing the effectiveness of distance learning is crucial, particularly in technical education and in subjects with extraordinary characteristics.

One of the essential requirements for implementing distance learning is digital technology, encompassing the internet, software, and hardware. The role of digital literacy in supporting the implementation of distance learning also needs to be analyzed. Digital literacy refers to the ability to utilize and leverage information and

communication technologies to locate, evaluate, create, and communicate information effectively and responsibly [7].

The characteristics of distance learning include: (1) the separation between educators and learners; (2) the influence of educational institutional organizations; (3) the use of media to facilitate interaction between teachers and learners; (4) the establishment of two-way communication; (5) consideration of learners as individuals engaged in the learning process; and (6) education being regarded as an industry [8].

Digital literacy competence is essential for completing various tasks in the 4.0 era [9]. The role of digital literacy in enhancing self-quality includes knowledge, creativity, critical thinking, resilience in task completion, and a shift in mindset toward self-directed learning that is oriented toward digitalization [10].

Based on observations conducted with second-semester students in the Vocational Education in Mechanical Engineering Program at Universitas Ivet, the learning media utilized include the PJJ-Unisvet Learning Management System, Google Classroom, Zoom Meetings, and Google Meet. The integration of digital technology in the Automotive Measurement Techniques course facilitates the teaching process, enabling lecturers to deliver materials and interact with students both directly and indirectly. For students, the use of digital technology in online learning provides a novel experience, offering access to diverse learning resources related to the course material. However, challenges remain: (1) students have not fully adapted to the distance learning method; and (2) their digital literacy skills are still limited. This is evident in their approach to completing assignments, where students tend to replicate what has been taught by the lecturer without making efforts to seek or utilize information technology and the internet as alternative sources of knowledge beyond the materials provided.

The Automotive Measurement Techniques course is a core subject in the field of mechanical and automotive engineering. This course is categorized as extraordinary because it requires students to study the fundamental theories of measurement and practice the measurement process for application in the automotive sector. During the COVID-19 pandemic, this course was conducted online. The technical implementation included synchronous sessions using teleconference or live chat applications and asynchronous sessions via a Learning Management System (LMS). Students engaged in discussions and independent learning, guided by a course contract and supported by parental involvement during home-based learning. The practical activities in this course involved creating videos that demonstrate the measurement process for vehicle components. This instructional model necessitates strong digital literacy skills, particularly in using the LMS and video editing.

The goal is to ensure that the learning outcomes achieved through online learning are effectively translated into informative videos, which serve as a reference for lecturers in evaluating student performance. In general, if students possess low digital literacy, their grades are likely to be poor because the quality of the videos and assignments they produce will be suboptimal due to digital literacy challenges [11].

There are eight essential aspects in developing digital literacy for students, namely: (1) cultural; (2) cognitive; (3) constructive; (4) communicative; (5) confidence; (6) creativity; (7) critical thinking; and (8) responsibility [12].

Based on this background, a specific analysis is required to examine the impact of distance learning and digital literacy on student learning outcomes in the Automotive Measurement Techniques course, with the following specifications: (1) analysis of the impact of distance learning on student learning outcomes in the automotive measurement techniques course; (2) analysis of the impact of digital literacy on student learning outcomes in the automotive measurement techniques course; (3) analysis of the combined impact of distance learning and digital literacy on student learning outcomes in the automotive measurement techniques course.

2. METHOD

This study is quantitative Ex Post Facto research, conducted to identify the impact of Distance Learning and Digital Literacy on student learning outcomes in the Automotive Measurement Techniques course [13].

3.1 Population and Sample

The population in this study consists of all second-semester students of the Vocational Education Program in Mechanical Engineering at Universitas Ivet Semarang for the 2021/2022 academic year, totalling 42 students. The sampling technique used in this study is total sampling, where the sample size is equal to the population size due to the population being less than 100 individuals. Therefore, the sample size in this study is 42 second-semester students from the Vocational Education Program in Mechanical Engineering at Universitas Ivet Semarang. The research was conducted from February to June 2022.

3.2 Data Collection Techniques

The data collection technique used in this study is a questionnaire utilizing Google Forms and documentation. The variables in this study are: (1) Distance Learning (X1); (2) Digital Literacy (X2); (3) Learning Outcomes in Automotive Measurement Techniques (Y). For variable X1, the data collected and analyzed is based on the following indicators: (1) Learning program objectives; (2) Distance learning

process; (3) Quality of learning program development; (4) Efficiency and effectiveness of the distance learning program; (5) Learning opportunities; (6) Self-directed learning; (7) Integration of subjects; (8) Continuity between tutors and learners able X2, the data collected and analyzed is based on the following indicators: (1) Functional skills and beyond; (2) Creativity; (3) Collaboration; (4) Communication; (5) Critical thinking; (7) Cultural and social awareness; (8) E-safety . For data collected and analyzed is based on the indicators of knowledge, skills, and attitudes in using measurement tools in the automotive field.

The data analysis technique used in this study is descriptive statistics. The prerequisite tests in this study include the Normality Test, Kolmogorov-Smirnov Test, Linearity Test, Heteroscedasticity Test, and Multicollinearity Test, all performed using SPSS software. If the asymptotic probability value is > 0.05 , the data is considered normally distributed. Hypothesis testing is then conducted using the t-test and F-test with the aid of SPSS software. The criteria for the t-test are that the alternative hypothesis (H_a) is accepted if the t-value is greater than the t-table value ($t_{\text{calculated}} > t_{\text{table}}$) and the significance value is smaller than 0.05 ($\alpha > 0.05$), indicating that there is a partial effect of the independent variable X on the dependent variable Y. The F-test is then performed to examine whether all independent variables X have a joint effect on the dependent variable Y. The criteria for the F-test are that H_a is accepted if the significance value of F is less than 0.05 ($\alpha < 0.05$) and the calculated F-value is greater than the F-table value ($F_{\text{calculated}} > F_{\text{table}}$) [16].

3. RESULT AND DISCUSSION

3.1. Result

The results obtained from distance learning, digital literacy, and student learning outcomes are presented in Tables 1, 2, and 3.

Table 1. Frequency of the Distance Learning variable.

No	Interval	Frequency	%	Category
1	66-80	30	71	Very Good
2	56-65	12	29	Good
3	36-50	0	0	Fair
4	20-35	0	0	Poor
Total		42	100	

Based on Table 1, it is observed that the scores for distance learning among second-semester students of the Vocational Education in Mechanical Engineering program at Universitas Ivet Semarang can be categorized as follows: (1) 30 students (71%) fall into the "very good" category; (2) 12 students (29%) fall into the "good" category; (3) 0 students (0%) fall into the "fair" category;

and (4) 0 students (0%) fall into the "poor" category. Therefore, it can be concluded that the majority of second-semester students in the Vocational Education in Mechanical Engineering program at Universitas Ivet Semarang fall into the "very good" category (30 students or 71%).

Table 2. Frequency of the Digital Literacy Variable

No	Interval	Frequency	%	Category
1	66-80	33	79%	Very Good
2	56-65	9	21%	Good
3	36-50	0	0%	Fair
4	20-35	0	0%	Poor
Total		42	100%	

Based on Table 2, it is evident that the digital literacy scores of second-semester students in the PVTM program at Universitas Ivet Semarang can be categorized as follows: (1) 33 students (79%) fall into the "very good" category; (2) 9 students (21%) fall into the "good" category; (3) 0 students (0%) fall into the "poor" category; and (4) 0 students (0%) fall into the "very poor" category. Therefore, it can be concluded that the majority of second-semester students in the PVTM program at Universitas Ivet Semarang tend to fall into the "very good" category (33 students or 79%).

Based on Table 3, it is observed that the learning outcomes of second-semester students in the PVTM program at Universitas Ivet Semarang in the Automotive Measurement Engineering course can be categorized as follows: (1) 5 students (12%) fall into the "excellent" category; (2) 20 students (48%) fall into the "good" category; (3) 16 students (38%) fall into the "fairly good" category; and (4) 1 student (2%) falls into the "adequate" category. Therefore, it can be concluded that the learning outcomes of second-semester students in the PVTM program at Universitas Ivet Semarang in the Automotive Measurement Engineering course tend to fall into the "good" category (20 students or 48%). The results of the normality test are presented in Table 4.

Based on the results in Table 4, it can be seen that the significance values for all variables in the normality test are higher than 0.05 ($p > 0.05$). Therefore, it can be concluded that the data in this study follow a normal distribution.

Table 3. Frequency of Learning Outcomes Variable.

No	Interval	Frequency	%	Category
1	93-100	5	12	Very Good
2	85-92	15	36	Good
3	80-84	5	12	
4	75-79	10	24	Fair
5	70-74	6	14	
6	69	1	2	Poor
Total		42	100	

Table 4. The results of the normality test of the questionnaire distribution.**One-Sample Kolmogorov-Smirnov Test**

		Distance Learning	Digital Literacy	Learning Outcomes
N		42	42	42
Normal Parameters ^{a,b}	Mean	71.36	73.29	82.55
	Std. Deviation	7.73	7.458	7.759
Most Extreme Differences	Absolute	0.179	0.184	0.193
	Positive	0.132	0.124	0.12
	Negative	-0.179	-0.184	-0.193
Test Statistic		0.179	0.184	0.193
Asymp. Sig. (2-tailed)		.002 ^c	.000 ^c	.000 ^c
Sig.		.118 ^d	.090 ^d	.075 ^d
Monte Carlo Sig. (2-tailed)	99% Lower Bound	0.109	0.082	0.068
	Confidence Interval Upper Bound	0.126	0.098	0.082

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. Based on 10000 sampled tables with starting seed 2000000.

Table 5. t Test**Coefficients***

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.59	6.957		1.953	0.058
	Distance Learning	0.352	0.113	0.351	3.118	0.003
	Digital Literacy	0.598	0.117	0.575	5.101	0

a. Dependent Variable: Learning Outcomes

Table 6. F Test**Anova***

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1772.207	2	886.103	49.638	.000 ^b
	Residual	696.198	39	17.851		
	Total	2468.405	41			

a. Dependent Variable: Learning Outcomes

b. Predictors: (Constant), Digital Literacy, Distance Learning

Subsequently, the hypothesis test aims to determine whether the data from the sample taken from the population have an effect on the students' learning outcomes in the Automotive Measurement Techniques course. The hypothesis in this study is tested using t-tests and F-tests. The hypothesis testing is conducted with the assistance of SPSS 25.0 software by comparing the t-calculated value with the t-table value and comparing the significant F value with the probability value of 0.05. If $t_{\text{calculated}} > t_{\text{table}}$ and the t-significant value = $\alpha < 0.05$, then Ha1 and Ha2 are accepted. If the significant F value = $\alpha < 0.05$, then Ha3 is accepted. The results of the

hypothesis tests using the t-test and F-test are presented in Tables 5 and 6.

Based on the results in Tables 5 and 6, for the variable of distance learning, the calculated t-value is greater than the t-table value ($3.118 > 1.685$), and the significant t-value is $0.003 < 0.05$. Therefore, Ho is rejected and Ha is accepted. This statement implies that the understanding of Distance Learning has an impact on Learning Outcomes. Next, for Digital Literacy, the calculated t-value is greater than the t-table value ($5.101 > 1.685$), and the significant t-value is $0.000 < 0.05$. Therefore, Ho is rejected and Ha is accepted. This also indicates that

proficiency in Digital Literacy has an impact on Learning Outcomes.

Furthermore, the significance value for the relationship between Distance Learning and Digital Literacy on Learning Outcomes is $0.000 < 0.05$, and the calculated F-value is greater than the F-table value ($49.638 > 3.23$). Therefore, H_0 is rejected, or H_a is accepted. This statement implies that both Distance Learning and Digital Literacy have an impact on the Learning Outcomes of students in the Automotive Measurement Techniques course.

Since the hypothesis test shows that the expected effects have been observed, the researcher proceeds to the Coefficient of Determination Test to identify the magnitude of the effect of each variable. The results of the Coefficient of Determination Test are presented in Table 7.

Table 7. Coefficient of Determination Test

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Distance Learning	.728 ^a	0.53	0.518	5.387
Digital Literacy	.805 ^a	0.648	0.639	4.663
Distance Learning and Digital Literacy	.847 ^a	0.718	0.703	4.225

a. Predictors: (Constant), Distance Learning, Digital Literacy

3.2. Discussion

Based on the research findings, it was determined that the hypothesis has been accepted, and the data indicates that there is an influence of distance learning on students' learning outcomes in the field of automotive measurement techniques. This influence is shown by a significant value of 0.003, which is smaller than 0.05 ($0.003 < 0.05$). One of the policies implemented by the Ministry of Education and Culture of the Republic of Indonesia in response to the COVID-19 pandemic was the adoption of online/distance learning at the educational unit level, providing a new experience for both students and learners. Distance learning is the best alternative in this era and serves as a future educational model. Distance learning is a system where the educator and the learner are separated and use technology-based media for instructional forms used in distance learning include Learning Management Systems such as Google Classroom, E-Learning PJJ-Unisvet, and video conferencing applications such as Zoom Meet, Google Meet, and Cisco Webex. In the context of distance learning, the ability to manage the learning process actively and independently is essential.

Distance learning emphasizes the method of self-directed learning. Self-study is systematically organized to present learning materials, provide guidance to

Based on the results in Table 7, it can be concluded that: (1) the Adjusted R Square value is 0.518. This result indicates that 51.8% of Learning Outcomes can be explained/influenced by Distance Learning. This means that the Distance Learning variable has an impact on the Learning Outcomes variable, contributing 51.8%. (2) the Adjusted R Square value is 0.639. This result indicates that 63.9% of Learning Outcomes can be explained/influenced by Digital Literacy. This means that the Digital Literacy variable has an impact on the Learning Outcomes variable, contributing 63.9%. (3) the Adjusted R Square value is 0.703. This result indicates that 70.3% of Learning Outcomes can be explained/influenced by both Distance Learning and Digital Literacy. This means that the Distance Learning and Digital Literacy variables have an impact on the Learning Outcomes variable, contributing 70.3%, while the remaining 29.7% can be influenced by other variables outside the scope of this study.

learners, and supervise the learning process to ensure successful outcomes. In this context, students can adapt to the distance learning method so that the learning process continues as intended, and the learning objectives are achieved as expected.

Furthermore, this study found that the second hypothesis has been accepted, demonstrating the influence of digital literacy on students' learning outcomes in automotive measurement techniques competency. This influence is indicated by a significant value of 0.000, which is smaller than 0.05 ($0.000 < 0.05$). In the distance learning method, digital literacy skills are essential to support the learning process. Digital literacy refers to an individual's ability to utilize information and communication technology to find, evaluate, create, and communicate information, which requires both cognitive and technical skills. Digital literacy encompasses various types of literacy, such as computer literacy, information literacy, media literacy, communication literacy, visual literacy, and technological literacy.

Students' digital literacy skills in using and utilizing technology can facilitate the learning process. Digital media can be utilized by students to search for supplementary materials, enhancing the information and stimuli provided by lecturers. The students' ability and active engagement in using media appropriately can help

improve their competencies, even when learning is conducted online.

The next finding indicates that the third hypothesis has been accepted, showing the influence of both distance learning and digital literacy on students' learning outcomes in the Automotive Measurement Techniques course. This influence is demonstrated by the significance value of 0.000, which is smaller than 0.05 ($0.000 < 0.05$). Based on the analysis, one way to achieve learning outcomes is by enhancing understanding of distance learning while maintaining focus on independent learning. With this capability, students can easily adapt to various learning methods and additional instructional materials.

The digital literacy skills possessed by both students and lecturers will improve access to a broader range of materials and facilitate a deeper understanding of the subject matter. The digital literacy skills of both lecturers and students also promote a conducive learning environment within virtual learning spaces. In the context of the Automotive Measurement Techniques course, which is conducted online, digital literacy is essential to enhance access to more comprehensive and in-depth information. A key consideration is the emphasis on self-regulation in learning. Students must understand and implement self-directed learning, ensuring that, despite the distance learning format, the course will continue to progress toward the desired learning outcomes.

4. CONCLUSION

Based on the results and discussion, it can be concluded that: (1) Distance Learning has an impact on students' learning outcomes in the Automotive Measurement Techniques course; (2) Digital Literacy has an impact on students' learning outcomes in the Automotive Measurement Techniques course; (3) Both Distance Learning and Digital Literacy have an impact on students' learning outcomes in the Automotive Measurement Techniques course. In the context of the Automotive Measurement Techniques competencies conducted online, digital literacy is essential to enhance access to broader and deeper information. A key consideration is the emphasis on self-regulation in learning. Students need to understand and implement self-directed learning so that, despite the distance learning format, the learning process will continue to progress toward the desired learning outcomes.

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