The influence of digital literacy on student engagement and academic achievement

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ABSTRACT

The development of digital technology has brought about major changes in the world of education, making digital literacy an important skill for students to adapt in the era of globalization. Students' ability to access, understand, and utilize digital information critically and ethically is believed to increase their engagement and academic achievement. This study aims to analyze the effect of digital literacy on student engagement and academic achievement at SMAIT Al-Multazam and identify the contribution of digital literacy in increasing student participation in learning and academic achievement. The method used was quantitative descriptive with a population of 118 students, data collection through Likert-scale online questionnaires, and statistical analysis using SPSS 24. The results showed that digital literacy significantly affected student engagement by 55.3% and academic achievement by 52.9%, with normally distributed data and linear relationships between variables and a statistically significant t-test. The implications of this study emphasize the importance of integrating digital literacy in the learning process to increase student engagement and academic achievement in the digital era.

1. Introduction

The influence of digital technology has brought significant changes in various aspects, including in the world of education. In Indonesia, technology can be accessed by various groups, and changes in the order of life have been increasingly felt since the influence of the internet, one of which is in education. According to data from the National Central Agency (BPS) from the results of the 2022 Susenas Survey, 66.48 percent of the Indonesian population has accessed the internet. According to the results of national research conducted by the Indonesian Internet Service Providers Association (APJII) written by Haryanto (2024), he announced that the number of internet users in Indonesia in 2024 reached 221,563,479 people from a total population of 278,696,200 people in Indonesia in 2023. From the 2024 Indonesian Internet penetration survey released by APJII, Indonesia's internet penetration rate reached 79.5%. Of that number, 34.40% of internet users are Gen Z (born 1997-2012), and the rest are millennials (born 1981-1996). Internet users in Indonesia are included in the category of teenagers. In this case, literacy is a skill that is very much needed by everyone, including students (Setyaningsih et al., 2019). The ability of students to access, understand, and use digital information critically and ethically will make it easier for students to adapt to this era of globalization and ever-evolving technology.

In education, digital literacy has a positive impact, one of which is on student learning achievement. In their research, Hidayati & Nurgiansah (2023) showed that digital literacy strongly influenced learning achievement. In addition, another study conducted by Yudha et al. (2023) showed that digital literacy influences 27% of student learning achievement. Holm (2024) also highlighted that digital literacy contributes greatly to academic achievement. Nurramdhani et al. (2023) also added the results of their research that digital literacy provides positive and significant results on student learning outcomes. Similar research results were also shown by Pala & Başıbüyük (2023) who stated that digital literacy and self-control have a significant influence on student achievement. According to them, the better the digital literacy adn sel-control skills, the higher the student achievement will be. Chen (2025) also reinforces this argument through his research, which states that digital literacy hass a significant effect on academic achievement. In other hand, Nassar & Khattab (2023) also proved that digital literacy has a significant positive effect on academic performance, with students who have good digital skills performing better than those who don't. In contrast to several previous studies, Abbas et al. (2019) showed a negative correlation between digital literacy and academic achievement. Their research also proved a negative and insignificant correlation between digital literacy and GPA.

Digital literacy not only influences academic achievement but also student engagement in learning. Jazuli et al. (2023) showed that digital literacy significantly positively affects student engagement. Students who are more digitally literate tend to be more actively involved in their studies. A similar view was also expressed by Jaya & Nurqamarani (2023), who stated that digitalliteracy and self-efficacy have a significant positive effect on student engagement. In line with this research, the results of a study Widowati, A. et al., (2023) widowati indicate that digital literacy does not directly affect academic performance, but it does inflence engagement and self-efficacy. Engagement and self-efficacy have a significant positive effect on academic performance. Engagement also moderates the relationship between digital literacy and self efficacy. Most studies only focus on the influence of variable X on variable Y2, while the influence of variable X on variable Y1 is still underexplored. Thus, there is still limited research on how digital literacy can affect student classroom engagement. Therefore, this study aims to analyze the influence of digital literacy on student engagement and academic achievement. This study will identify the extent to which students' abilities are in accessing, understanding and utilizing digital information, contributing to their level of participation in the learning process and measuring their success in achieving optimal academic results. In addition, this study also aims to provide insight into the importance of digital literacy as a factor in improving the quality of education in the digital era, as well as providing recommendations for educators and educational institutions or institutions in integrating digital literacy into the learning process.

2. Method

This study used a quantitative research method with a descriptive research format. According to Sugiyono (2013), quantitative research is a method used to study a certain population or sample using quantitative or statistical data instruments and analysis to test hypotheses. Meanwhile, according to Ramdhan (2021), descriptive research uses a method to describe a research result and aims to provide a description, explanation, and validation of the phenomenon being studied. This study aims to determine whether there is an influence between one variable and another. There are 3 variables used in this study: digital literacy as an independent variable (X), Student involvement as a dependent variable (Y1), and Academic achievement, which is also a dependent variable (Y2). The research location chosen in this study was a high school in Kuningan, West Java, SMAIT Al-Multazam. According to Kerlingen & Lee (2000), quantitative research requires a minimum of 30 samples for the results to be statistically analyzed.The population in this study was 118 students, consisting of 27 class X students, 38 class XI students and 53 class XII students. The sample used in this study was entirely from the population. Data was collected using an online questionnaire distribution

technique using Google Forms. Before the instrument was used in the study, a questionnaire trial was conducted on 38 respondents who were not included in the main research sample. This is in accordance with Sugiyono (2017), who states that validity and reliabilty tests can be conducted with a minimum of 30 respondents. In this trial, the results of the validity and reliability tests were obtained, which can be seen in Table 1.

Table 1. Table of instrument validity test results

Variable	Item total	Valid item	Invalid item	r Tabel
Digital literacy	26	17	9	0.349
Student engagement	24	23	1	0.349
Academic achievement	12	11	1	0.349

Based on the validity test result using Pearson Product Moment correlation, out of a total of 62 items, 58 items were declared valid because they had a calculated r > table r (0,349), while 11 items were discarded and not used in the study. The reliability test of the instrument showed a Cronbach's Alpha value of 0,938, whic is greater than 0,70, meaning that the instrument is considered reliable, Table 2. After conducting trials and abtaining valid results, it was proven that the research instrument was suitable for use. Thus, this instrument was used in the core research to test the formulated hypothesis. This questionnaire is closed, and only researchers have the answers. In filling out the questionnaire, respondents only need to choose one option for each question provided, and the researcher keeps each answer given confidential.

Table 2. Table of reliability test results

Cronbach's Alpha	N of Items
.938	62

This research instrument uses a Likert scale of 1-5: strongly disagree, disagree, neutral, agree, and strongly agree. Data analysis was carried out through statistical tests using SPSS 24 for Windows. Digital Literacy Scale (S-LD) is adapted from the Digital Literacy Scale for Teenagers previously compiled by Rodríguez-De-dios, Igartua, & González-Vázquez (2016) consisting of 6 aspects: (1) digital technology skills aspect; (2) personal security skills aspect; (3) critical thinking skills aspect; (4) digital device security skills aspect; (5) information seeking skills aspect; and (6) communication skills aspect. Then, the Student Engagement Scale (S-KS) in this study was adapted from Frederick (2004), which consists of 3 aspects, namely (1) behavioral engagement, (2) emotional engagement, and (3) cognitive engagement. The Academic Achievement Scale (S-PA) is adapted from the Bloom Taxonomy learning domain developed by Benjamin S. Bloom. This scale has been widely adopted in educational research in Indonesia, one of which is by Sobur (2006).

3. Results and Discussion

3.1. *Findings*

This study proved that digital literacy significantly influenced student engagement and academic achievement. The data in the study were processed statistically through several tests. The first statistical test is the classical assumption test, which includes the Normality and Linearity Test. The Normality Test of X against Y1 and X against Y2 gave the same Kolmogorov-Smirnov results of 0.200 more than 0.05, so the data is normally distributed. Meanwhile, the linearity test was obtained from the deviation from the linearity sig value. The Linearity Test of variable X against Y1 and variable X against Y2 gave results of 0.576 and 0.352 greater than 0.05, so there is a linear relationship between X against Y1 and X against Y2.

3.1.1. *The Influence of X on Y1*

This study focuses on the influence of digital literacy on student engagement and academic achievement. The data in the study were processed statistically through several tests. The first statistical test is the classical assumption test, including the Normality and Linearity Test. The Normality Test of X against Y1 and X against Y2 gave the same Kolmogorov-Smirnov results of 0.200 or more than 0.05, so the data was normally distributed. Furthermore, the Linearity Test

was obtained from the deviation from the linearity sig value. The Linearity Test of variable X against Y1 and variable X against Y2 each gave results of 0.576 and 0.352, respectively, greater than 0.05, so it is said that there is a linear relationship between X against Y1 and X against Y2. Based on the output results Table 3, the sig value is 0.200 > 0.05, so the data is normally distributed. Good data for research is data that is normally distributed.

Table 3. Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		*118*
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	10.09758959
Most Extreme Differences	Absolute	.057
	Positive	.057
	Negative	-.054
Test Statistic		.057
Asymp. Sig. (2-tailed)		.200[c,d]

Based on the output results Table 4, the sig. Deviation from linearity value has a significant value of > 0.05, which is 0.576, so there is a linear relationship between student engagement and digital literacy. After the classical assumption test was carried out, it was proven by the test.

Table 4. Linearity Test

Variable	Sig
Student Engagement * Digital Literacy	0.576

The results of the t-test of the digital literacy variable in this study were 7.149 with a significance of 0.000 or less than 0.05, so *H0* is rejected, and *Ha* is accepted. Therefore, digital literacy significantly affects student engagement in SMAIT Al-Multazam students, Table 5.

Table 5. T-Test

Variable	t	Sig
Digital Literacy	7.149	0.000

Based on the determination coefficient (R) test in the Table 6, the determination coefficient (R) obtained is 0.553. The percentage of the influence of digital literacy (X1) on student engagement (Y) is 55.3%, while the remaining 44.7% is influenced by other variables not discussed in this study.

Table 6. Determination Coefficient Test (R2)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.553	0.306	0.300	10.141

3.1.2. *The Influence of X on Y2*

Based on the output results Table 7, the sig value of 0.200> 0.05, it can be said that the data is normally distributed. Good data for research is data that is normally distributed

Table 7. Normality Test

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		*118*
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	4.70347722
Most Extreme Differences	Absolute	.067
	Positive	,062
	Negative	-.067
Test Statistic		.067
Asymp. Sig. (2-tailed)		.200[c,d]

Based on the output results Table 8, the sig. deviation from the linearity value has a significance value of 0.352, so there is a linear relationship between student engagement and academic achievement.

Table 8. Linearity Test

Variable	Sig
Student Engagement * Academic Achievement	0.352

The t-test conducted shows that digital literacy has a positive effect on academic achievement, Table 9. It can be seen from the calculated t-value of 6.715 with a significance level of 0.000 <0.05. So H0 is rejected, Ha is accepted, and the hypothesis is supported.

Table 9. T-Test

Variable	t	Sig
Digital Literacy	6.715	0.000

Based on the determination coefficient (R) test in the Table 10, the determination coefficient (R) obtained is 0.529. The percentage of the influence of digital literacy (X1) on academic achievement (Y) is 52.9%, while the remaining 47.1% is influenced by other variables not discussed in this study.

Table 10. Coefficient of Determination Test (R2)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.529	0.280	0.274	4.724

3.2. *Discussion*
3.2.1. *The influence of Digital Literacy on Student Engagement*

Seeking knowledge is a form of worship that every Muslim must do. In Islam, one form of a person's effort in seeking knowledge can be seen from their involvement when studying. Student involvement is important because it can affect all aspects, including learning achievement. According to Luthans et al. (2016), learning involvement refers to a sense of responsibility, self-awareness, positive enthusiasm, and high curiosity when students have the knowledge and skills that motivate them to continue learning and developing their potential. According to Frederick, student involvement is divided into 3 aspects: the behavioral engagement aspect, which refers to student behavior such as their participation in academic and social activities or compliance with school rules. Then, cognitive engagement refers to students' efforts to understand and master learning materials, including when students think about strategies and motivations to learn in depth. Emotional engagement refers to students' reactions to something, such as interest, pleasure, or a sense of attachment to the school environment. Digital literacy is one of the right efforts to increase student engagement in class, especially in today's technological era. According to Shopova (2014), digital literacy is important in helping students understand and assess the information they encounter in cyberspace. Through this literacy, students can hone their critical thinking skills in evaluating the reliability and credibility of various digital information sources, which is a crucial part of the learning process, according to Hague & Payton. (2011) said that knowledge and skills in using digital technology will make it easier for students to do the tasks in learning activities.

Digital literacy significantly influences student engagement in class; this can be proven based on the results of statistical processing in this study, and it is concluded that Ha is accepted. Based on the T-test data shows that digital literacy has a significant influence on student engagement, with a significance value of 0.000 <0.05. These results are also supported by the determination test (R2) results, where the R result obtained was 0.553 or 55.3%, meaning that the influence of digital literacy on student engagement was 55.3%, and other factors influenced the remaining 44.7%. According to Mukaromah et al. (2018), self-efficacy and self-regulated learning are other factors that influence student engagement. The research

that has been done shows that self-efficacy influences student engagement in learning. In addition to self-efficacy, self-regulated learning is an important thing that influences student engagement. Students with high self-regulated learning will actively engage in learning, listen when the teacher explains and focus on the subject matter. According to (Ibrahim et al., 2024), student engagement is also influenced by other factors, such as innovative and interesting teaching methods, but in addition, teachers who can create an interactive learning environment and facilitate productive discussions can also increase student interest and engagement. (Galugu & Baharudin 2017) also revealed that social support is one of the external factors influencing student engagement; students who receive social support morally and materially from their surroundings will be much more involved in activities supporting their education.

Jazuli *et al.* (Jazuli et al., 2023) revealed that several factors, such as digital literacy, technology adoption, and collaborative learning, significantly affect student engagement. This study emphasizes developing digital literacy to create a more engaging learning environment. Shuhidan *et al.* (2022) also provided research results that align with their study, explaining that digital literacy influences student learning engagement with a coefficient of 0.488 or 48.8%. Another supporting study was also conducted by Moses (2022). Digital literacy skills significantly affect student engagement with a value of r = 0.323; he also said that the higher the students' digital literacy skills, the better the students' engagement in class. With the proof of the suitability of the results, this study reaffirms the findings of previous researchers in a relevant context. Therefore, the findings support the results of previous studies and provide additional contributions to strengthening understanding of this topic.

3.2.2. The influence of Digital Literacy on Academic Achievment

Digital literacy has quite a lot of influence in the world of education, not only on student engagement but also on academic achievement. According to Anisa *et al.* (2020), academic achievement is the extent to which educational goals are achieved by students, educators or institutions in the short and long term. Lenggono & Yuzarion (2020) said that academic achievement is one way to get closer to Allah SWT. It is also supported by one of the meanings of the verses in the Quran (QS. Al-Mujadillah: 11). The meaning of this verse shows that knowledge has a high position before Allah SWT. Therefore, knowledgeable people will get a higher degree. Previous research conducted by several researchers has shown a significant influence of digital literacy on academic achievement. Yudha et al. (Yudha et al., 2023) showed that digital literacy influences students' academic achievement by at least 27%. Pala & Başıbüyük (Pala & Başıbüyük, 2023) stated that mastery of skills, especially digital literacy and self-control, have a greater influence on students' academic achievement than motivation alone. Setiawan (2024) also stated that students with good digital literacy skills such as information and data literacy, communication and collaboration, digital data security and digital problem solving have better learning achievements. The results of this study are proven to be in line with the studies above, as evidenced by the T-test data, showing that digital literacy significantly influences academic achievement with a significance value of 0.000 <0.05.

These results are also supported by the determination test (R^2) results, where the R results obtained were 0.529 or 52.9%, meaning that the influence of digital literacy on student involvement was 55.3%, and other factors influenced the remaining 47.1%. Saputro et al. (2018) mentioned other factors that influence academic achievement, namely learning facilities, which are one of the supporters in achieving student learning achievement. Ulum (2024) stated that internal and external factors influence academic achievement. Internal factors come from the students themselves. Each student has different characteristics, not only characteristics but also different interests, intelligence and motivation, so they can affect students' ability to absorb the material taught by Raharjo (2009). In addition, external factors are included in things that influence students' academic achievement. According to Burhanuddin (2014), external factors come from outside the students, such as the family environment; the family environment plays a significant role because the family is the first

place students learn life lessons. So, this results show that although digital literacy contributes significantly, external factors such as family support also play a role in determining students' academic achievement, see Fig. 1.
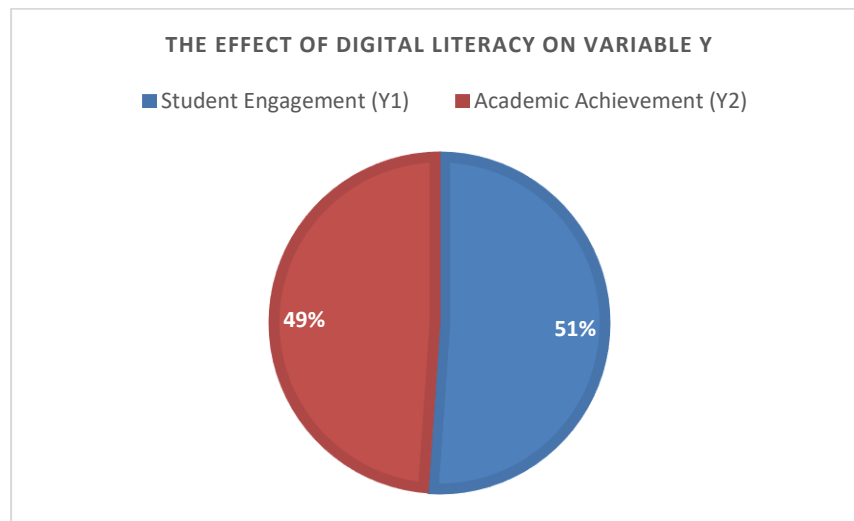
Fig. 1. the effect of digital literacy on variable y

4. Conclusion

Based on the study results at SMAIT Al-Multazam, digital literacy significantly influenced student engagement and academic achievement. The statistical analysis showed that digital literacy contributed 55.3% to student engagement and 52.9% to academic achievement. At the same time, several other factors also contributed but were not included in this study. Students' ability to access, understand, and utilize digital information effectively was also essential to encourage them to actively participate in learning in the current technological era. In addition, digital literacy can increase student activeness, motivation, and ability to complete technology-based tasks. Ultimately, this finding had a positive impact on student learning outcomes. It is recommended that schools and teachers strengthen digital literacy in the learning process through effective training, innovative curriculum development, and the availability of adequate digital-based learning resources and environments. To achieve this goal, they must be trained regularly in digital literacy. Teachers can also enrich teaching materials with interesting and relevant digital content and create a learning environment that supports the use of technology positively and responsibly. This study's limitation is the sample's scope, which is limited to one school, SMAIT Al-Multazam in Kuningan, West Java, so the results cannot be generalized to other schools or wider areas. In addition, data were collected through online questionnaires, which allowed for response bias because the filling was done independently without direct supervision. This study used only descriptive quantitative methods, so it did not explore other qualitative factors that might influence student engagement and achievement. So, further research is needed to find additional elements that can influence student engagement and academic achievement, such as the role of the family, social environment, and creative learning approaches are examples of things that can be done. Therefore, it can be done more comprehensively, sustainably, and adaptively to the development of the times to improve the quality of education in the digital era.

Declarations

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