The Relationship Between Learning Motivation and Digital Literacy of High School Students Through Augmented Reality-Assisted E-Modules

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Abstract. This study aims to determine the relationship between learning motivation and students' digital literacy through the use of e-modules assisted by augmented reality (AR). This study used quantitative method with Quasi Experimental nonequivalent control group design. Respondents in this study were 96 high school students in Aceh Province, Indonesia. Data were collected using digital literacy questionnaire and learning motivation with Likert Scale through pretest and post-test activities. Data were analyzed using correlation and regression tests. The results of the correlation test of learning motivation on digital literacy obtained a Pearson Correlation value of 0.57, so there is a positive relationship between learning motivation and digital literacy with a moderate degree of relationship. The regression test results of learning motivation on digital literacy obtained F count of 45.783 means that there is an influence of learning motivation on digital literacy.

Keywords: learning motivation, digital literacy, e-module, augmented reality

1 Introduction

The rapid development of technology and information demands changes in education. Technology has changed the way we communicate, work and think. In the context of education, these changes require adjustments in curriculum, methods and approaches to learning in order to prepare students for future challenges. Students must have the knowledge, skills and attitudes to be able to compete and participate appropriately so that they can fill increasingly complex and dynamic job opportunities (Scott, 2015). One of the skills needed in the digital era is digital literacy.

Digital literacy is the ability to use digital technology to search, access (Bawden, 2008; Greene et al., 2014; Meyers et al., 2013; Ng, 2012; Tiven et al., 2018), manage, integrate, and evaluate information (Donaldson & Alker, 2019; Ng, 2012) so that the

results of the information analysis can be delivered to the public safely and appropriately (Donaldson & Alker, 2019; Jin et al., 2020; Ng, 2012; Tiven et al., 2018). A digitally literate person does not only have the ability to use digital technology devices (Alkalai, 2004; S.-H. Lee, 2014; Themes, 2013) but also requires knowledge, skills, and attitudes so that the utilization of digital technology can be done effectively (Alkalai, 2004; Ferrari, 2013; Jin et al., 2020; Ng, 2012). The use of digital technology includes software and hardware for educational, social, and entertainment purposes (Cassidy et al., 2019; English, 2016; Ferrari, 2013; Hobbs, 2010; Ng, 2012).

In education, digital literacy can help students become lifelong learners (Burnett, 2014; McDougall et al., 2018), enhance creativity, critical thinking, problem solving (McDougall et al., 2018; Tyers-Chowdhury & Binder, 2021), facilitate communication (Arias Soto & González Gutierrez, 2018; Littlejohn et al., 2012), and improve learning outcomes (McDougall et al., 2018). In the social field, digital literacy can increase social empowerment because it helps people stay connected and informed (Meherali et al., 2021), and increases awareness to analyze information from social media (Buckingham, 2015).

On the other hand, learning motivation is also very important because it is a determining factor in students' academic success. Learning motivation is the drive of students to arouse the desire to learn, provide direction for learning activities, ensure the continuity of the learning process (Chue & Nie, 2016; Ferreira et al., 2011; Filgona et al., 2020; Gopalan et al., 2017; Shabani, 2012), overcome problems and evaluate learning activities to achieve a goal (Anderman & Gray, 2015). Therefore, motivation is very important in the learning process (Ferreira et al., 2011; Filgona et al., 2020; Gopalan et al., 2017; Martin, 2003; Riswanto & Aryani, 2017; Torres, 2020; Trigueros et al., 2020). The importance of learning motivation is to stimulate students to think, focus, and learn effectively (Bakar, 2014; Filgona et al., 2020), increase the initiation to work, increase the speed of student work to achieve goals, inspire students to learn, improve cognitive abilities and sustain the learning process(Filgona et al., 2020). With motivation, students have enthusiasm in doing tasks to achieve goals so that it can increase the success of the learning process (Anderman & Gray, 2015; Bakar, 2014).

Students who have low motivation feel frustrated in the learning process (Ryan & Deci, 2000; Wood, 2019). In contrast, students who have high motivation will do more learning activities (Legault et al., 2006; McDermott, 2001). Student motivation is strongly influenced by the teacher's role in the learning process (Ryan & Deci, 2000; Trigueros et al., 2020; Wood, 2019). As educators, teachers must understand students' needs, goals, and attitudes in order to encourage students to learn (Gibbens, 2019; Trigueros et al., 2020). Teachers can present learning in an interesting way to increase students' motivation to learn (Fredricks et al., 2004; Tymms & Bolden, 2008).

The independent curriculum facilitates the development of innovative and personalized learning, including the use of digital technology. Based on pedagogical and practical perspectives, the integration of technology in learning enables a paradigm shift in education (Wang & Coleman, 2009), improves learning effectiveness, increases student learning motivation (Huang et al., 2019), and provides more communicative opportunities (Li, 2014). Teachers can improve the learning process through the development of teaching materials in the form of electronic modules (e-modules). E-modules will

become more attractive if developed with the help of augmented reality (AR) technology.

Augmented reality (AR) can function to stimulate and build interactions between users and real and visual objects with the help of cameras that can be accessed on computers or smartphones (D'Orazi, 2021). With its ability to display virtual objects into reality, this technology has the potential to be used by educators in making the learning process more interesting and explorative (Sudarmilah & Wibowo, 2016), more exciting (Tomi & Rambli, 2013), and concise without reducing the essence of the material (Contreras López et al., 2019; C. Lee & Wong, 2019). Augmented reality has been proven to increase student learning motivation (Anuar Salwa, 2021) because it can affect learning activities and effectiveness (Clayton et al., 2010). This study aims to determine the relationship between digital literacy and high school students' learning motivation through AR e-modules.

2   Method

This study used quantitative method with Quasi Experimental non-equivalent control group design. Respondents in this study were senior high school students in Aceh Province, Indonesia, totaling 96 students. Data collection used digital literacy questionnaire and learning motivation with Likert Scale through pre-test and post-test activities. Data normality test used Kolmogorov-Smirnov Test. Data homogeneity test using Levene's Test. Linearity test using Deviation from Linearity. Data can be said to be normal, homogeneous, and linear if the significance level is> 0.05. If the data is normally distributed, homogeneous, and linear, then proceed with regression and correlation tests.

3   Result and Discussion

The normality test uses the Kolmogorov Smirnov test. The normality test results for student learning motivation were 0.69 and digital literacy was 0.55. The normality test results show that the data is normally distributed because the overall significant value > 0.05 (Table 1).

Table 1. Normality Test Results

No.	Variables	Sig. Value	Description
1.	Learning motivation	0,69	Normal
2.	Digital literacy	0,55	Normal

Homogeneity test using Levene's Test. The homogeneity test result of student learning motivation was 0.078 and digital literacy was 0.38. The homogeneity test results show that the data is homogeneous because the overall significant value > 0.05 (Table 2).

Table 2. Homogeneity Test Results

No.	Variables	Sig. Value	Description
1.	Learning motivation	0,078	Homogeneous
2.	Digital literacy	0,38	Homogeneous

The results of the linearity test obtained a significant value of Deviation from Linearity learning motivation on digital literacy of 0.586. The significance value of the variable> 0.05; then the data is linear. The results of the correlation test of learning motivation on digital literacy obtained a Pearson Correlation value of 0.57 with a significance level of 0.00 or p-value <0.05, so there is a positive relationship between learning motivation and digital literacy with a moderate degree of relationship (Table 3; Figure 1).

Table 3. Correlation Test Results of Learning Motivation to Digital Literacy Correlations

		Learning motivation	Digital literacy
Learning motivation	Pearson Correlation	1	0,572**
	Sig. (2-tailed)		0,000
	N	96	96
Digital Literacy	Pearson Correlation	0,572**	1
	Sig. (2-tailed)	0,000	
	N	96	96

** Correlation is significant at the 0.01 level (2-tailed).

The regression test results of learning motivation on digital literacy obtained F count of 45.78 with a significance level of 0.00 or p-value <0.05, meaning that there is an effect of learning motivation on digital literacy (Table 4). The regression value (R) is 0.572 with an R Square of 0.32; then the effect of learning motivation on digital literacy is 32% (Table 5).
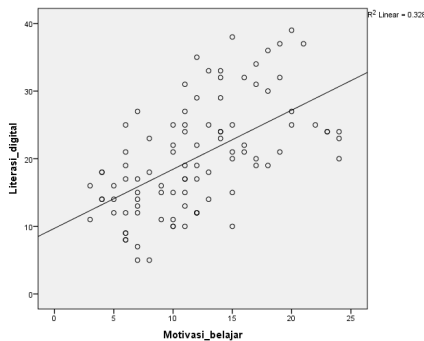

Fig. 1. Correlation between learning motivation and digital literacy

Table 4. ANOVA Test Results of Learning Motivation on Digital Literacy

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2085,260	1	2085,260	45,783	0,000[b]
	Residual	4281,396	94	45,547		
	Total	6366,656	95			

a. Dependent Variable: Literasi_digital

b. Predictors: (Constant), Motivasi_belajar

A

Table 5. Regression Test Results of Learning Motivation on Digital Literacy

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,572[a]	0,328	0,320	6,749

a. Predictors: (Constant), Motivasi_belajar

Based on the correlation test results, it shows that there is a positive relationship between digital literacy and learning motivation. That is, if digital literacy increases, then learning motivation also increases during learning through local potential-based AR e-modules. Students who have good digital literacy can utilize local potential-based AR e-modules more effectively so that it has an impact on increasing learning motivation. With digital literacy, students are able to increase the effective use of digital technology (Qiu et al., 2019; Techataweewan & Prasertsin, 2018), while high learning motivation can increase student activeness in learning (Filgona et al., 2020; Rosenzweig et al., 2019).

Learning with AR e-modules not only improves material understanding, but also increases student (Akçayır & Akçayır, 2017; Tuli & Mantri, 2021) in developing digital technology skills. Students who have good digital literacy can utilize the 3D animation features on the AR e-module to interact directly with digital objects. Students are able to access information quickly and easily through content navigation and features on AR e-modules. Students who are able to master this skill are more interested in learning (G. G. Lee & Mun, 2023; Rosenzweig et al., 2019; Schunk & Dibenedetto, 2020), complete tasks better (Bice *et al*., 2016; Kok *et al*., 2022; Peng & Fu, 2021) and are more confident (Taylor *et al*., 2014).. When students are able to complete tasks easily, they are more motivated and satisfied with their learning outcomes.

In addition, AR e-modules also provide flexibility in the learning process. Students can access information through AR e-modules repeatedly to understand the material. AR technology allows students to access e-modules anytime and anywhere (Duzyol et al., 2022; Jamali et al., 2015) so that students get feedback on the learning process quickly. When students get feedback quickly, students feel more involved in the learning process and are more motivated to get better results (Filgona et al., 2020; Rosenzweig et al., 2019).

4   Conclusion

Based on the results of research and discussion, there is a positive correlation between learning motivation and students' digital literacy, where the contribution is 45.783%. The researcher suggested that further research be carried out by analyzing the factors associated with learning motivation and digital literacy. It is necessary to improve the quality of learning in order to increase learning motivation and digital literacy through innovative learning models and media.

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