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The Influence of Using Virtual Reality-Based Learning Media on Increasing Learning Motivation, Practical Skills, and Learning Outcomes of Jayapura Aviation Polytechnic Students

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Abstract: This study evaluates the influence of learning motivation, practical skills, and learning outcomes on the use of Virtual Reality (VR) learning media. The method used is ex-post facto with a quantitative correlation approach on 30 student samples using questionnaires and analysis through multiple linear regression. The results of the analysis show that learning motivation contributes significantly to the use of VR media, confirming the importance of motivation in maximizing the benefits of this technology in education. In contrast, practical skills have a negative but insignificant influence, indicating that this factor does not significantly affect the use of VR media in this context. Learning outcomes are proven to have a positive and significant influence, indicating that good learning achievement encourages the effective use of VR media. These findings emphasize the need to focus on motivation and learning outcomes in implementing VR technology to improve the quality of education.

Keywords: learning media, learning outcomes, motivation, practical skills, virtual reality

INTRODUCTION

Education plays a central role in the progress of a nation. The quality of education has a very important value, because in essence, education is a significant element in creating superior human resources (Hidayat & Abdillah, 2019). Quality education is the key to the progress and development of the nation, because through education, individuals can develop their potential, skills, and character that support the progress of society and the country. Education plays a crucial role in changing individual mindsets and skills, as well as in achieving national goals in accordance with Law of the Republic of Indonesia No. 20 of 2003, namely developing the potential of students to become faithful, noble and responsible citizens (Satriani, 2018).

In 2021, Indonesia ranked 54th out of 78 countries in terms of education quality, indicating the need for significant improvement. To move to education 4.0, Budi Trikorayanto suggested the integration of AI and the shift from traditional to modern learning media, along with digitalization that accelerates access to information and business process transformation (Janattaka & Adella, 2021). Digitalization has the most important role in the concept of

education 4.0 because it facilitates the connection between humans and technology (Alifah et al., 2023; Sucahya, 2013).

Education 4.0 involves three main elements: digitalization and vertical and horizontal integration of the value chain, digitalization of products and services accessible online, and the introduction of innovative digital business models. The success of organizations in this context depends on effective resilience strategies to overcome challenges and maintain operational continuity (Narji et al., 2022). Virtual Reality, which is now gaining global attention from companies such as Facebook and Microsoft, is expected to become the main interaction model in the future (Mystakidis, 2022). The Industrial Revolution 4.0 encourages the use of ever-evolving technology, including metaverse in education, to create superior human resources and face global challenges in the field of education (Zhang et al., 2022). The use of Virtual Reality (VR) technology has grown rapidly and shows great potential in education by increasing student understanding and engagement (Bonafix & Nediari, 2022). This study aims to explore the use of VR as a learning medium in Indonesia, focusing on factors of technology adoption, perceptions of effectiveness, and its impact on learning experiences, audience engagement, and ninnovation.

The quality of education in Indonesia remains a concern, with a ranking of 54th out of 78 countries according to the World Population Review in 2021. Issues that caused this low ranking include ineffective education management, gaps in facilities, inadequate government support, traditional views of society, low teacher qualifications, and limited evaluation standards (Sidabutar et al., 2020). According to Budi Trikorayanto, an education expert in Indonesia, the country is still implementing the 2.0 education approach, while the transition to 4.0 education must occur immediately in accordance with the development of the industrial revolution triggered by artificial intelligence (AI) (Pangestu & Rahmi, 2022). The education system and norms in Indonesia must be revised and adjusted in a balanced manner with the evolution of competencies needed in the context of developing technology (Wijayanto et al., 2023). In improving the quality of education, Indonesia needs to switch to education 4.0 by integrating modern learning media, such as Virtual Reality (Endarto & Martadi, 2022).

This technology offers an innovative and creative way of presenting teaching materials and virtual practice tools that can enrich the learning experience in the digital era. Based on research conducted by Rauschnabel et al. (2022) stated that the use of Virtual Reality was concluded to be beneficial for students and universities. The cognitive and pedagogical benefits of students led to improvements in their performance and grades. This was directly the result of the design of the Virtual Reality application focused on learning objectives, in addition to the integration of learning theories (Martono, 2011). In addition, active involvement of learners using Virtual Reality is a better learner-centered approach than passive and traditional learning approaches (Sulistiani et al., 2023). This study aims to explore the potential of Virtual Reality (VR) in improving motivation, practical skills, and learning outcomes of students at Jayapura Aviation Polytechnic, as well as providing empirical evidence of its effectiveness in education. Innovations such as VR are expected to help adjust the curriculum to the needs of the times and improve the quality of national education..

METHOD

This research is a type of ex-post facto research that is correlational in nature, which was conducted at the Jayapura Aviation Polytechnic from January to June 2024. Prior research plays a crucial role in scientific articles, as it helps reinforce the theoretical foundation and the observed relationship or impact between variables (Bunahri et al., 2023). The authors favored the quantitative method for its greater validity and ability to analyze a wide range of factors

numerically, unlike the qualitative method, which relies solely on non-numeric descriptions and analysis (Bunahri, 2023). The research population consisted of all 2020 students of the Jayapura Aviation Polytechnic, totaling 67 people. The sample was taken using a purposive sampling technique, by selecting 30 students who met certain criteria. Data collection was carried out through observation, documentation, and questionnaire methods that had been tested for validity and reliability. Data analysis was carried out using multiple regression, which included prerequisite tests and hypothesis tests to determine the relationship between the variables studied.

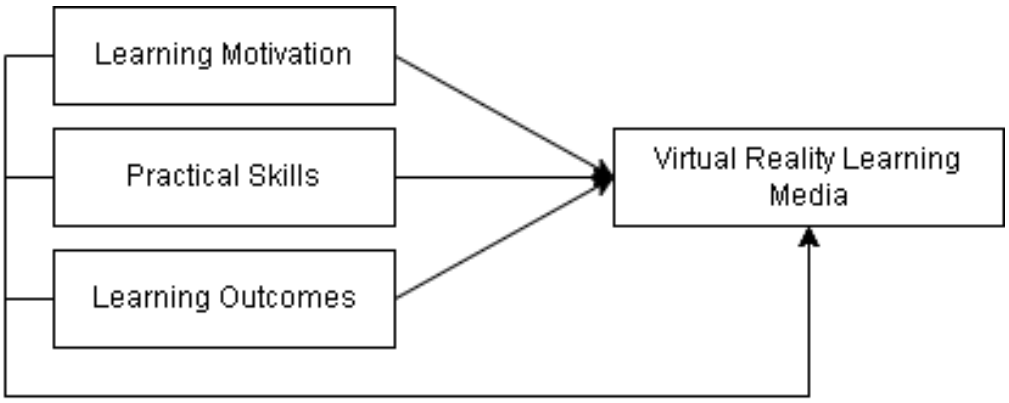

Figure 1. Research Design

RESULTS AND DISCUSSION

Descriptive data was obtained from distributing questionnaires to 30 respondents. From the results obtained, the tendency of respondents' assessments of the learning motivation statements that had been given was then seen.

Table 1. Descriptive Statistics of Learning Motivation Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Achievement Motive	30	1.00	5.00	4.0667	.94443
Hope For Success	30	1.00	5.00	4.2667	.94443
Assignment Value	30	1.00	5.00	4.3333	1.12444
Valid N (listwise)	30				

The data shows that out of 30 respondents, learning motivation consists of three main indicators: achievement motive (mean 4.0667, SD 0.94443), hope for success (mean 4.2667, SD 0.94443), and task value (mean 4.3333, SD 1.12444). The three indicators show that respondents have high learning motivation, with variations in each indicator but still significant to overall motivation.

Table 2. Descriptive Statistics of Practical Skills Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Real Experience	30	1.00	5.00	3.9667	1.21721
Reflection	30	1.00	5.00	4.1333	1.07425
Project Based Learning	30	1.00	5.00	4.3667	.99943
Valid N (listwise)	30				

The data shows that out of 30 respondents, the practical skill indicators include: real experience (mean 3.9667, SD 1.21721), reflection (mean 4.1333, SD 1.07425), and project-based learning (mean 4.3667, SD 0.99943). These three indicators show that respondents have high practical skills, with project-based learning showing the highest engagement and smaller variation compared to other indicators.

Table 3. Descriptive Statistics of Learning Outcome Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge	30	2.00	5.00	3.6000	1.22051
Understanding	30	2.00	5.00	3.5667	1.25075
Implementation	30	2.00	5.00	3.4333	1.27802
Analysis	30	1.00	5.00	1.8667	1.00801
Synthesis	30	1.00	5.00	1.8000	.96132
Evaluation	30	2.00	5.00	3.9000	1.18467
Valid N (listwise)	30				

The data shows that of the six learning outcome indicators in 30 respondents, knowledge (mean 3.6000, SD 1.22051) and understanding (mean 3.5667, SD 1.25075) show good mastery of the material with significant variation. Application (mean 3.4333, SD 1.27802) is also quite good but slightly lower. Analysis (mean 1.8667, SD 1.00801) and synthesis (mean 1.8000, SD 0.96132) abilities show a low level with quite large variations. Evaluation has the highest mean value (3.9000, SD 1.18467) indicating a fairly high evaluation ability but still has significant variation. Overall, these indicators show variation in the level of respondents' learning outcomes, with lower analysis and synthesis abilities compared to knowledge, understanding, application, and evaluation. It describes different aspects of learning outcomes and provides an idea of areas that may require further improvement.

Table 4. Descriptive Statistics of VR Learning Media Variables

	N	Minimum	Maximum	Mean	Std. Deviation
Immersion	30	2.00	5.00	3.8333	1.14721
Interactivity	30	2.00	5.00	3.6333	1.32570
Valid N (listwise)	30				

The data shows that of the two VR learning media indicators in 30 respondents, immersion (mean 3.8333, SD 1.14721) shows a fairly high level of engagement with significant variation, while interactivity (mean 3.6333, SD 1.32570) is also good but with greater variation. Both of these indicators indicate that VR media is quite effective in providing immersive and interactive learning experiences, although interactivity can still be improved.

Analysis Prerequisite Test

Table 5. Normality Test

One-Sample Kolmogorov-Smirnov Test		Unstandardized Residual
N		30
Normal Parametersa,b	Mean	.0000000
	Std. Deviation	1.31491511
Most Extreme Differences	Absolute	.118
	Positive	.118
	Negative	-.082
Test Statistics		.118
Asymp. Sig. (2-tailed)		.200c,d

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

The results of the Kolmogorov-Smirnov normality test showed a significance value of 0.200 (> 0.05), which indicates that the data is normally distributed and the study can proceed to the next prerequisite test. To detect heteroscedasticity, the Glejser test is used which involves the regression of absolute residual values with independent variables, considering that the scatterplot graph has weaknesses in detecting heteroscedasticity.

Table 6. Heteroscedasticity Test

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1,658	1.289		1.287	.210
	X1	.107	.109	.325	.981	.336
	X2	-.104	.088	-.393	-1.186	.246
	X3	-.039	.040	-.194	-.964	.344

a. Dependent Variable: ABS

Based on the results of the heteroscedasticity test through the Glejser test in table 4.6, it can be seen that sig. on each variable is worth more than 0.05. and it can be said that this indicates that there is no heteroscedasticity in the regression model in this study. and the independent variables can be stated not to experience heteroscedasticity.

Table 7. Multicollinearity Test

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Learning Motivation	.322	3.104
	Practical Skills	.323	3,096
	Learning Outcomes	.874	1.144

The results of the multicollinearity test show that although the Tolerance values for learning motivation and practical skills are relatively low, the Variance Inflation Factor (VIF) values below 10 for all variables indicate that multicollinearity is not a serious problem in this model. Thus, the regression model involving these variables can be considered stable and can be interpreted well.

Research Hypothesis Testing

Table 8. Research R-Squared Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.810a	.655	.616	1.38871

a. Predictors: (Constant), X1 , X2 , X3

Based on the results of the linear regression analysis, the correlation coefficient value is 0.810 which is included in the category of strong relationship strength. So there is a moderate relationship between learning motivation, practical skills, and learning outcomes with VR learning media. The determinant coefficient value of 0.655 means that 65.5% of the VR learning media variables are influenced by learning motivation, practical skills, and learning outcomes with VR learning media, while 34.5% are influenced by other variables.

Table 9. Simultaneous F-Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	95,326	3	31,775	16,477	.000b

Model		Sum of Squares	df	Mean Square	F	Sig.
	Residual	50.141	26	1,929		
	Total	145,467	29			

a. Dependent Variable: y
b. Predictors: (Constant), X1 , X2 , X3

The results of the simultaneous ANOVA test show that the regression model involving three predictors, namely learning motivation (X1), practical skills (X2), and learning outcomes (X3), on the dependent variable of VR learning media, significantly explains the variation in the dependent variable. The Sum of Squares for Regression of 95,326 indicates the total variation in the use of VR learning media that can be explained by the combination of the three predictors. In contrast, the Sum of Squares for Residual of 50,141 indicates the variation in the use of VR learning media that cannot be explained by the regression model, possibly caused by other factors not included in the model. The degrees of freedom for regression are 3, in accordance with the number of predictors, while the degrees of freedom for residuals are 26, which are calculated from the total number of samples minus the number of predictors minus one.

The Mean Square for Regression is 31.775, which is the result of dividing the Sum of Squares for Regression by the degrees of freedom for Regression, while the Mean Square for Residual is 1.929, obtained by dividing the Sum of Squares for Residual by the degrees of freedom for Residual. The F value of 16.477 is obtained by dividing the Mean Square for Regression by the Mean Square for Residual, indicating that the overall regression model provides a significant explanation of the variation in the use of VR learning media compared to the model without predictors. The significance value of 0.000 indicates that the F value obtained is very statistically significant, lower than the general significance level of 0.05, confirming that there is a significant relationship between learning motivation, practical skills, and learning outcomes with the use of VR learning media in the context of this study.

Overall, the results of this simultaneous ANOVA test provide strong evidence that learning motivation, practical skills, and learning outcomes jointly influence the use of VR learning media. These findings can help in designing more effective VR-based learning strategies by considering these factors holistically.

Table 10. Research Hypothesis t-Test

Coefficientsa						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	-5.233	2.183		-2.397	.024
	X1	.632	.185	.692	3.412	.002
	X2	-.265	.148	-.362	-1,787	.086
	X3	.440	.068	.799	6.485	.000

a. Dependent Variable: y

The coefficient table above shows the results of the t-test for each predictor in the regression model that connects learning motivation (x1), practical skills (x2), and learning outcomes (x3) to the dependent variable of VR learning media (y). For the constant, the B value is -5.233 with a Standard Error of 2.183 and a t value of -2.397 which has a significance (Sig.) of 0.024. This shows that the constant has a significant effect on the dependent variable when all predictors are zero, indicating a significant contribution from the constant in the model. While for learning motivation (x1), the B value is 0.632 with a Standard Error of 0.185 and a t value of 3.412 which is significant at the 0.002 level. The positive B coefficient indicates that

learning motivation contributes positively to the use of VR learning media. The significant t value confirms that the relationship between learning motivation and the use of VR learning media is statistically significant, indicating that learning motivation is an important predictor in this model.

In practical skills (x2), the B value is -0.265 with a Standard Error of 0.148 and a t value of -1.787 with a significance (Sig.) of 0.086. The negative B coefficient indicates that practical skills have a negative effect on the use of VR learning media. However, the insignificant t value at the p-value level of 0.05 ($p > 0.05$) indicates that this relationship is not strong enough to be considered statistically significant in this model. This indicates that although practical skills may affect the use of VR learning media, their influence is not significant enough to make a meaningful contribution in this regression model. Meanwhile, for learning outcomes (x3), the B value is 0.440 with a Standard Error of 0.068 and a t value of 6.485 with a significance (Sig.) of 0.000. The positive B coefficient indicates that learning outcomes contribute positively and significantly to the use of VR learning media.

The very high t-value and very low statistical significance ($p < 0.05$) confirm that the relationship between learning outcomes and the use of VR learning media is very strong and does not occur by chance. This indicates that learning outcomes are a very important predictor in this model and significantly affect the use of VR learning media. Overall, the results of this analysis indicate that learning motivation (x1) and learning outcomes (x3) have a significant influence on the use of VR learning media, while practical skills (x2) tend to have a statistically insignificant effect. These findings can be used to inform more effective educational policies and practices in adopting and utilizing VR learning media, with a focus on strengthening motivation and improving learning outcomes as key factors in the implementation of new learning technologies.

CONCLUSION

Based on the regression analysis, it can be concluded that learning motivation and learning outcomes have a significant influence on the use of VR learning media at Jayapura Aviation Polytechnic, with learning motivation contributing positively and learning outcomes showing a very significant relationship. High learning motivation drives the use of VR, while good learning outcomes are also related to increased adoption of this technology. In contrast, practical skills do not show a significant influence on the use of VR. These findings indicate that focusing on increasing motivation and learning outcomes can be more effective in increasing the use of VR learning media compared to practical skills. To maximize VR adoption, institutions are advised to integrate this technology into the curriculum by considering students' motivation and academic achievement.

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