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Examination of the Usefulness of Figma as a Prototyping Interface Platform on the Learning Outcomes of PJBL-based Informatics in High School

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ABSTRACT

This study aims to examine the effectiveness of using Figma as a prototyping platform in Project-Based Learning (PjBL)-based informatics learning at the senior high school level. Figma, as a cloud-based tool, offers real-time collaboration features that can improve students' interface design skills as well as encourage teamwork. This study uses a quantitative approach with Pearson correlation test, heatmap correlation, correlation matrix and linear regression analysis to analyze the relationship between learning management variables, communication process, student responses, and learning activities to student learning outcomes. The results show that the communication process variable has the most dominant influence on student learning outcomes. This study confirms that the integration of Figma in PjBL-based learning can improve 21st century skills, including critical thinking, creativity, and collaboration, thus preparing students for the challenges of the world of work in the digital era.

1. Introduction

The digital era requires every individual to have a proficient knowledge of technology, so informatics education in schools becomes very vital (Gadioli et al., 2024) . So far, we only think that technology will only make students more lazy because it shortens students' workflow (Dittert & Ferdinand, 2024) . However, according to Van der Stap et al. (2024) technology actually helps students to become more critical of various problems that always appear continuously as a result of questions that always raise other questions. Informatics education in

schools trains logical thinking and also makes students become accustomed to using technology which is closely related to today's digital age (Lintunen et al., 2024) . Therefore, teaching informatics from an early age provides a strong foundation for students to thrive in an increasingly digital-based future (Yunita & Sutabri, 2024) .

Tamimi & Munawaroh (2024) explained that informatics learning in various countries is growing rapidly along with the increasing understanding of the importance of digital skills in modern life. Quoted from a book entitled *One Decade of Indonesia's Digital Development 2014-2024*, countries such as Estonia and Singapore have implemented an integrated informatics curriculum starting from the primary level, which is recognized as the best example of technology-based education. Singapore, for example, has developed an education system that teaches computer programming and application development since students are at the elementary level. On the other hand, Indonesia is also working to improve the quality of informatics education, although challenges such as uneven infrastructure and lack of teacher training are still major obstacles. The Indonesian government has started to integrate informatics subjects in the curriculum of primary and secondary education, in an effort to prepare a generation that is ready to face global challenges (Patria et al., 2014) .

Reporting from the Director General of GTK's website, the Ministry of Education, Culture, and Higher Education of the Republic of Indonesia has launched the Project-Based Learning (PjBL) method in informatics learning. PjBL allows students to learn through real projects that integrate theory and practice in the creation of technology-based applications or solutions (Rehman et al., 2024) . This method can develop practical skills such as programming, application design, and problem solving, which are highly relevant to industry needs (Wang et al., 2024) . Research by Dias-Oliveira et al. (2024) shows that PjBL can improve students' technical skills while strengthening their ability to work in teams. In the context of informatics learning in Indonesia, Aditya & Nugrahanta (2025) revealed that the implementation of PjBL in four regions such as Lampung, Yogyakarta, Kalimantan, and Jakarta successfully improved students' skills and optimism. Another study conducted by Ardiansyah & Indrakusuma (2025) related to the development of learning media based on smart apps creator in informatics class X SMK Negeri 2 Tulungagung showed that students involved in PjBL-based projects were more motivated to learn and more skilled in making mobile-based applications. In addition, observations made by Pambudi & Setiawan (2025) found that PjBL can improve students' creativity and problem solving abilities in informatics learning, which is important in facing the challenges of the world of work.

Although many studies have shown the success of implementing Project-Based Learning (PjBL) in informatics learning, there are still some obstacles that need to be considered. One of the main challenges is the limited resources and time that often hinder the maximum implementation of projects (Sari & Wahyudin, 2024) . In addition, most of the projects carried out by students in previous studies were more focused on simple applications such as websites or basic mobile applications (Arita et al., 2024) . Therefore, the innovation offered in this research is to introduce prototyping of applications based on the latest technologies, such as the Internet of

Things (IoT) or artificial intelligence (AI), to provide a more interactive learning experience that is relevant to industry developments (Putra et al., 2024) . By using advanced technologies in their projects, students not only learn to create applications, but also understand new concepts that can increase their competitiveness in the job market. This innovation is expected to differentiate this approach from previous studies, which focus more on creating mobile device-based applications without integrating more complex technologies.

One of the creative and innovative learning media in high school informatics subjects is Figma. Figma is a cloud-based prototyping platform that enables real-time collaboration, making it a top choice in interactive interface design development. With its intuitive interface, Figma allows students to learn application design skills more effectively, in line with the demands of modern informatics curriculum (Liang & Fung, 2023). Research in secondary schools is particularly important because the age of students at this level is an ideal time to develop logic and problem-solving skills. The implementation of technologies such as Figma in secondary schools not only improves technical skills, but also encourages the critical thinking and collaboration needed in the global digital ecosystem (Pascarella & Terenzini, 2024).

This research draws on Vygotsky's theory of constructivism, which emphasizes that learning occurs optimally through social interaction and the use of tools. In the context of informatics education, technology such as Figma acts as a tool that reinforces project-based learning. This theory is also in line with approaches that integrate technology to improve students' problem-solving skills (Anderson et al., 2024). Furthermore, the theory of constructivism is relevant in supporting the development of 21st century skills, such as collaboration, creativity, and critical thinking, which are needed in the digital age (Prawat, 2023).

Research on the use of technology in informatics education has shown significant results in improving the quality of learning. Anderson et al. (2024) revealed that digital tools such as Figma can increase student engagement in project-based learning, in line with the findings of Liang & Fung (2023) who emphasized that digital collaboration platforms allow students to actively participate and create innovative solutions. Kozma's (2024) research further confirms that modern technology strengthens the link between practical learning and better learning outcomes. In the context of Project-Based Learning (PjBL), Dias-Oliveira et al. (2024) state that this approach not only improves technical ability, but also teamwork and critical thinking skills.

In Indonesia, research by Ardiansyah & Indrakusuma (2025) showed that the implementation of mobile application-based PjBL motivated students to learn and improved their technical skills. In addition, recent research by Prawat (2023) highlights the relevance of constructivism theory in supporting technology-assisted project-based learning such as Figma, which reinforces 21st century skills, including collaboration and creativity. Based on these previous studies, the integration of modern technologies such as Figma in project-based learning not only

enhances learning effectiveness but also equips students with relevant skills in the digital age.

2. Methodology

This research hypothesis was developed based on several previous studies. Good learning management provides a clear structure and helps students understand their learning flow. According to Anderson et al. (2024), well-planned learning management can increase student engagement and provide more optimal learning outcomes. Therefore, H₁: Learning management (X₁) has a positive influence on student learning outcomes (Y). Communicative interactions between teachers and students create positive relationships that increase learning motivation.

Dias-Oliveira et al. (2024) showed that effective communication in project-based learning helps students understand concepts better and encourages productive collaboration. Thus, H₂: The communicative process between teachers and students (X₂) has a positive influence on student learning outcomes (Y). Students' responses to learning, such as giving input or asking questions, reflect their active engagement. Kozma (2024) mentions that modern technology applied in education can improve student interaction and response to learning materials. Therefore, H₃: Student response (X₃) has a positive influence on student learning outcomes (Y).

Students' involvement in learning activities, such as discussions or creative projects, strengthens their understanding. According to Ardiansyah & Indrakusuma (2025), technology-assisted project-based activities improve students' technical and problem-solving skills. Therefore, H₄: Student learning activities (X₄) have a positive influence on student learning outcomes (Y). The use of digital tools such as Figma helps teachers arrange materials in a visual and organized manner, making it easier to manage learning. Liang & Fung (2023) emphasize that digital collaboration platforms such as Figma improve the learning structure by increasing student and teacher engagement.

The use of Figma as a learning tool increases the effectiveness of learning management (X₁) while supporting the communicative process between teachers and students (X₂), as stated by Dias-Oliveira et al. (2024) who stated that technology-based approaches can improve two-way communication in learning. Therefore, H₅: Learning management (X₁) has a positive relationship with communicative process (X₂). In addition, Figma's visually appealing interface motivates students to be more engaged in the learning process, which in turn increases students' positive responses (X₃). This supports Kozma's (2024) findings that visually appealing media can increase students' attention and response. Hence, H₆: Learning management (X₁) is also positively related to student response (X₃). Furthermore, Figma allows students to be active in designing application-based projects, both independently and collaboratively, which encourages increased student learning activities (X₄). Pambudi & Setiawan's (2025) research shows that design and technology-based activities can increase students' creativity and confidence. Thus, H₇: Learning management (X₁) is positively related to student

learning activities (X_4). Effective communicative process (X_2) through Figma's real-time collaboration feature also positively influences student responses (X_3), as more meaningful interactions can increase student attention. Therefore, H_8 : Communicative process (X_2) has a positive relationship with student response (X_3). In addition, a good communicative process (X_2) can also encourage student learning activities (X_4). The integration of Project-Based Learning (PjBL) approach with Figma allows students to be more involved in collaborative and technology-based learning activities, as described by Dias-Oliveira et al. (2024). Thus, H_9 : Communicative process (X_2) is positively related to students' learning activities (X_4). Finally, positive student responses (X_3) play an important role in driving student learning activities (X_4). Students' interest in Figma, both because of its attractive interface and because of its use in design-based activities, creates intrinsic motivation to learn more actively. Anderson et al. (2024) assert that well-designed technology can integrate all aspects of learning simultaneously to achieve optimal learning outcomes. Therefore, H_{10} : Student responses (X_3) are positively related to student learning activities (X_4).

Referring to the preparation of the hypothesis, this research uses a quantitative approach. Sampling was carried out using the *random sampling* method with the aim of obtaining a representative sample of the population (Garson, 2016). Thus, there were 100 respondents in this study, consisting of 25 students each from classes XI.4, X.4, X.5, and X.7 at SMA Negeri 1 Indralaya. There are five variables in this study, namely learning implementation, communication process, learner response, learning activity, and learning outcomes. Several tests were conducted on the data using correlation matrix, heatmap correlation, Pearson correlation, and multiple linear regression analysis. The primary data in this study was collected through questionnaires distributed to the respondents after they attended the learning about Figma application.

Table 1. Variable Measurement

Variable Name		Proxy
Learning Implementation (Independent)		Scores obtained by students on various types of assessments, quality of work produced, level of mastery of the material (Brookhart, 2013)
Communication (Independent)	Process	Number of questions raised by students, duration of discussion, appropriate use of language, diversity of opinions raised (Sharan, 1994)
Learner (Independent)	Response	Students' level of satisfaction with learning, students' interest in the material, students' active participation in learning activities (McMillan & Schumacher, 2010)
Learning (Independent)	Activity	Duration of self-study time, number of practice questions done, use of books, articles, or online media as learning resources (Pintrich & De Groot, 1990)
Learning Outcomes (Dependent)		Total score on the final exam, improvement in problem solving skills, change in attitude towards a concept (Ijriana & Supriadi, 2018).

Source: Some previous research, 2024

3. Result and Discussion

Normality Test

The Shapiro-Wilk test was conducted to test whether the data from each variable (X_1 to X_4 and Y) followed a normal distribution as shown in the following table.

Table 2. Shapiro-Wilk Test Results

Variables	Statistic	p-value	Conclusion
X_1	0.950	0.001	Does not follow a normal distribution
X_2	0.981	0.138	Follows the normal distribution
X_3	0.972	0.029	Does not follow a normal distribution
X_4	0.973	0.037	Does not follow a normal distribution
Y	0.981	0.157	Follows the normal distribution

Source: Python Output, 2024

Based on the analysis results, variables X_1 , X_3 , and X_4 have *p-values* smaller than 0.05, which are 0.001, 0.029, and 0.037 respectively, indicating that these three variables do not follow a normal distribution. In contrast, the variables X_2 and Y have *p-values* of 0.138 and 0.157, which are greater than 0.05, indicating that these two variables follow a normal distribution. These results indicate that the dataset has mixed properties.

Correlation Matrix Test

The Correlation Matrix Test is conducted to identify the relationship between different variables (Hidayatullah & Saepulrohman, 2023). linear relationship between two or more continuous variables.

Table 3. Correlation Matrix Results

Variables	X_1	X_2	X_3	X_4	Y
X_1	1.000000	0.780175	0.705672	0.719082	0.775433
X_2	0.780175	1.000000	0.760076	0.768761	0.994223
X_3	0.705672	0.760076	1.000000	0.991581	0.763335
X_4	0.719082	0.768761	0.991581	1.000000	0.773891
Y	0.775433	0.994223	0.763335	0.773891	1.000000

Source: Python Output, 2024

The correlation matrix shows significant positive relationships between all variables (X_1 to X_4 and Y), with correlation values ranging from 0.706 to 0.994. The strongest correlations are seen between X_2 and Y (0.994) and X_3 and X_4 (0.992), indicating an almost perfect relationship between these pairs of variables. This means that a change in one of the variables in the pair is almost always followed by a comparable change in the other variable. The variable X_1 has fairly strong correlations with other variables, such as with X_2 (0.780) and X_5 (0.775), although the correlations are slightly lower than the pair with the strongest relationship. Moderate to strong relationships were also seen between other variables, such as X_2 with X_3 (0.760) and X_2 with X_4 (0.769). Overall, these results show that all variables are closely related, with most correlation values above 0.70.

Correlation Heatmap

Correlation *Heatmaps* are used to examine the relationship between variables in a dataset in a way that is more intuitive and easy to understand (Hidayatullah & Saepulrohman, 2023). Correlation Heatmap also aims to facilitate data interpretation with the color features presented, as well as a way to analyze the relationship between groups of variables. The following correlation heatmap can be seen in Figure 1.

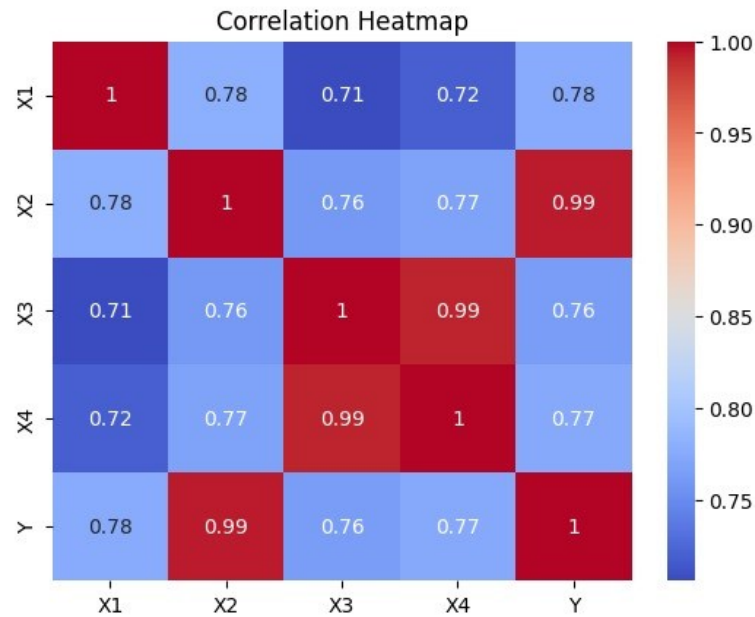


Figure 1. Correlation Heatmap
Source: Phyton Output, 2024

The correlation *heatmap* above illustrates the varying positive relationships between all variables (X_1 to X_4 and Y), with correlation values ranging from 0.71 to 0.99. The strongest relationships in this heatmap are seen in the pairs of variables X_2 and Y , as well as X_3 and X_4 , which have a correlation of 0.99 each. This indicates that a change in X_2 is almost always followed by a comparable change in Y , as well as between X_3 and X_4 . This very high correlation is depicted in bright red, almost close to full red, indicating that these two pairs of variables have a very close relationship.

In addition, a moderately strong relationship is also seen between variable X_1 and other variables. For example, X_1 has a correlation of 0.78 with X_2 , which indicates a strong positive relationship, depicted in light pink. Similar relationships are seen for X_1 with Y (correlation 0.78), as well as X_1 with X_3 (correlation 0.71) and X_1 with X_4 (correlation 0.72), all of which are in the moderate to strong positive relationship category. The correlations between X_2 and X_3 and X_2 and X_4 of 0.76 and 0.77 respectively, also show a moderately strong relationship, although not as strong as the X_2 - Y or X_3 - X_4 pairs. From the color patterns and correlation values, it can be concluded that all the variables in this heatmap have an interrelated and mutually

supportive relationship. Variables such as X_2 and Y , as well as X_3 and X_4 , seem to be very closely related, so that changes in one of these variables can be a strong indicator to predict changes in other variables. Figure 2 shows the students' work using figma.

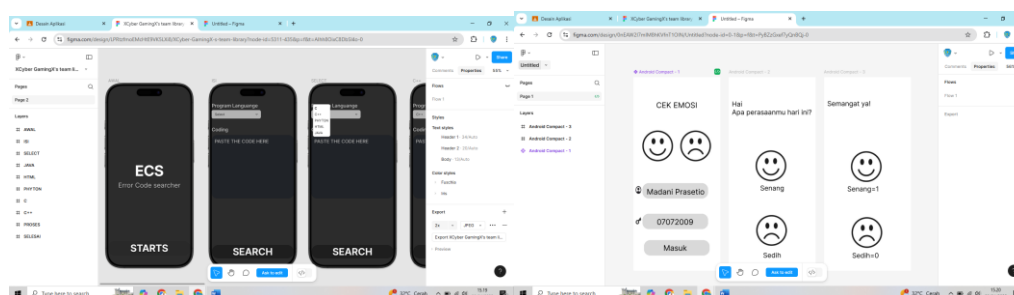


Figure 2: Student work using Figma: XCyber Gaming App (Left) and Emotion Check (Right)

Source: Research Data, 2025

Figure 2 presents two student works in the form of digital application *prototypes*-*XCyber Gaming* and *Emotion Check*-designed using the Figma platform. The *XCyber Gaming* app, as shown in Figure 2, is a prototype interface designed for the world of digital entertainment, particularly in the field of online gaming. The design of the app shows futuristic and energetic visual elements, typical of a *cyberpunk* world, with the use of contrasting colors and dynamic iconography. The interface features organized navigation to make it easy for users to access features such as game selection, tournament list, user profile, and ranking system. This reflects that students not only understand the technical aspects of design, but are also able to adapt the principles of *user experience* (UX) and *user interface* (UI) according to the characteristics of digital native users who are the target of the application. Meanwhile, the *Cek Emosi* app demonstrates a more humanistic and functional approach to technology use. The app is designed to help users monitor and reflect on their emotional state, most likely through features such as a *mood tracker*, daily reminders, and possibly activity suggestions that can improve mood. The interface design of *Emotion Check* is more subdued, minimalistic, and uses a soothing color palette - in keeping with the app's purpose of emotional well-being. Through this app, students appear to integrate the values of empathy and psychological awareness in a technological product, which is an indication of the success of PjBL learning in leading students to create socially relevant and valuable digital solutions.

These works not only represent students' technical ability in designing user interfaces, but also demonstrate their capacity to apply critical thinking, design aesthetics, and understanding of user needs. The use of Figma allows students to explore and visually express their ideas through an intuitive and responsive collaborative environment. In the context of project-based learning (PjBL), the ability to produce a tangible product such as this becomes an important indicator that the learning process has gone beyond the theoretical aspects towards meaningful practical mastery.

Pearson Correlation Test

Pearson correlation test is conducted to test the linear relationship between two continuous variables by calculating the Pearson correlation coefficient (r) to measure the strength and direction of the linear relationship between these variables (Hidayatullah & Saepulrohman, 2023).

Table 4. Pearson Correlation Test Results

Variable Pairs	Correlation Coefficient (r)	p-value	Conclusion
X1 and X2	0.780	0.000	Strong, significant correlation
X1 and X3	0.706	0.000	Strong, significant correlation
X1 and X4	0.719	0.000	Strong, significant correlation
X1 and Y	0.775	0.000	Strong, significant correlation
X2 and X3	0.760	0.000	Strong, significant correlation
X2 and X4	0.769	0.000	Strong, significant correlation
X2 and Y	0.994	0.000	Very strong correlation, significant
X3 and X4	0.992	0.000	Very strong correlation, significant
X3 and Y	0.763	0.000	Strong, significant correlation
X4 and Y	0.774	0.000	Strong, significant correlation

Source: Python Output, 2024

Pearson correlation test results showed significant positive linear relationships between all pairs of variables (X_1 to X_4 and Y), with p -value = 0.000 for all pairs. Very strong correlations were seen in the pairs X_2 - Y ($r = 0.994$) and X_3 - X_4 ($r = 0.992$), indicating an almost perfect relationship, while strong to moderate correlations were found in other pairs, such as $X_{(1)}$ - X_3 ($r = 0.706$). This positive relationship indicates that an increase in one variable tends to be followed by an increase in the other. However, the very high correlation between some pairs, such as X_2 - Y and X_3 - X_4 , indicates the possibility of multicollinearity, which needs to be considered in further analysis.

Linear Regression Analysis

Linear regression analysis is performed to analyze the relationship between one or more independent variables (predictors) and one dependent variable (response) (Hidayatullah & Saepulrohman, 2023). The main objective is to create a model that can predict the value of the dependent variable based on the value of the independent variable and to understand the relationship between variables. The linear regression model of this research data produces the following regression coefficients and intercepts: (1) Regression coefficient: [-0.02615209, 0.98585543, -0.0220547, 0.047363] and (2) Intercept: 2.2382420115640116. The results of the linear regression analysis show that variable X_2 has the greatest influence on the predicted value, with a coefficient of 0.986. This means that every one unit increase in X_2 , assuming other variables remain constant, will increase the predicted value by 0.986. In contrast, variables X_1 and X_3 have a negative effect with coefficients of -0.026 and -0.022 respectively, which indicates that an increase in these variables actually decreases the predicted value, although the impact is relatively small. The variable X_4 contributes positively, with a coefficient of 0.047, but its effect on the predicted value is also smaller than X_2 . The model intercept of 2.238 indicates that

if all independent variables are zero, then the predicted value of the model is 2.238. Overall, X_2 is the dominant variable in this model, while the other variables have a smaller influence.

Model Evaluation

Model evaluation is conducted to measure the performance of a model against data, assess how well the model can predict or explain patterns in the data, and ensure that the model is reliable for use in decision making or prediction (Hidayatullah & Saepulrohman, 2023). To evaluate model performance, two main metrics are used: Mean Squared Error (MSE) and R-squared with detailed values of (1) Mean Squared Error: 0.15265744077386564 and (2) R-squared: 0.9818832262160186. The model evaluation results show excellent performance. With a Mean Squared Error (MSE) value of 0.1527, the model has a very small prediction error, which indicates that the difference between the predicted and actual values is relatively low. The R-squared value of 0.9819 indicates that the model is able to explain about 98.19% of the variability in the data, which means that the model is very effective in describing the relationship between input and output variables. Overall, these results indicate that the model works with high accuracy and can be relied upon for accurate predictions.

Discussion

Learning Management on Student Learning Outcomes

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.775 which means it has a strong correlation. Then, the p value is 0.000 which if the p -value < 0.05 means that there is a significant relationship between the two variables. These results show that learning management has a positive influence of 78% on student learning outcomes and is significant with a p value < 0.05 . So that the first hypothesis is accepted, and supports the statement of Anderson et al. (2024) regarding well-planned learning management can increase student engagement and provide more optimal learning outcomes. In the theory of constructivism, this hypothesis supports social interaction in learning that is optimized through good and planned learning management, thus increasing student involvement in the learning process.

Communication Process to Student Learning Outcomes

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.994 which means it has a strong correlation. Then, the p -value is 0.000 which if the p -value < 0.05 means that there is a significant relationship between the two variables. This result shows that the communicative process between teachers and students has a positive influence of 99% on student learning outcomes and is significant with a p value < 0.05 . So that the second hypothesis is accepted, and supports the statement of Dias-Oliveira et al. (2024) that effective communication in project-based learning can help students understand concepts better and encourage productive collaboration. In the theory

of constructivism, this hypothesis supports optimal social interaction in learning through communicative interaction between teachers and students, so that students can understand concepts well in the learning process.

Student Response to Student Learning Outcomes

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.763 which means it has a strong correlation. Then, the p value is 0.000 which if the p -value < 0.05 means that there is a significant relationship between the two variables. These results show that student responses have a positive influence of 76% on student learning outcomes and are significant with a p -value < 0.05 . So that the third hypothesis is accepted, and supports Kozma's (2024) statement regarding modern technology applied in education can increase student interaction and response to learning materials. In the theory of constructivism, this hypothesis supports social interaction in optimal learning to improve student responses to the learning provided which will be linear with student learning outcomes.

Student Learning Activities on Student Learning Outcomes

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.774 which means it has a strong correlation. Then, the p value is 0.000 which if the p -value < 0.05 means that there is a significant relationship between the two variables. These results show that student learning activities have a positive influence of 77% on student learning outcomes and are significant with a p -value < 0.05 . So that the fourth hypothesis is accepted, and supports Ardiansyah & Indrakusuma's (2025) statement regarding technology-assisted project-based activities improving students' technical and problem-solving skills. In constructivism theory, this hypothesis supports using technology assistance in student learning activities for optimal learning outcomes.

Relationship between Learning Management and Communication Process

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.780 which means it has a strong correlation. Then, the p -value is 0.000 which if the p -value < 0.05 means that there is a significant relationship between the two variables. This result shows that learning management has a positive influence of 78% on the communicative process and is significant with a p -value < 0.05 . So that the fifth hypothesis is accepted, and supports the statement of Dias-Oliveira et al. (2024) which states that technology-based approaches can improve two-way communication in learning. In constructivism theory, this hypothesis supports social interaction that can improve the learning process to be more communicative.

Relationship between Learning Management and Student Response

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.706 which means it has a strong correlation. Then, the

p-value is 0.000 which if the p-value <0.05 means that there is a significant relationship between the two variables. This result shows that learning management has a positive influence of 71% on student response and is significant with a p-value <0.05 . So the sixth hypothesis is accepted, and supports Kozma's (2024) statement that attractive visual media can increase student attention and response. In the theory of constructivism, this hypothesis supports more interactive learning management and attractive visuals in order to increase student response.

Relationship between Learning Management and Student Learning Activities

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.719 which means it has a strong correlation. Then, the p value is 0.000 which if the p-value <0.05 means that there is a significant relationship between the two variables. This result shows that learning management has a positive influence of 71% on student learning activities and is significant with a p value <0.05 . So that the seventh hypothesis is accepted, and supports the statement of Pambudi & Setiawan (2025) that design and technology-based activities can increase student creativity and confidence. In constructivism theory, this hypothesis supports learning management that prioritizes design and technology to increase creativity in student learning activities.

Relationship between Communication Process and Student Response

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.760 which means it has a strong correlation. Then, the p-value is 0.000 which if the p-value <0.05 means that there is a significant relationship between the two variables. This result shows that the communicative process has a positive influence of 76% on student responses and is significant with a p-value <0.05 . So the eighth hypothesis is accepted. In constructivism theory, this hypothesis supports to conduct a good communication process in order to support a responsive learning process from students.

Relationship between Communication Process and Student Learning Activity

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.769 which means it has a strong correlation. Then, the p-value is 0.000 which if the p-value <0.05 means that there is a significant relationship between the two variables. This result shows that the communicative process has a positive influence of 77% on student learning activities and is significant with a p-value <0.05 . So that the ninth hypothesis is accepted, and supports the statement of Dias-Oliveira et al. (2024). regarding the integration of the Project-Based Learning (PjBL) approach with Figma which allows students to be more involved in collaborative and technology-based learning activities. In constructivism theory, this hypothesis supports to conduct a good communication process to support collaborative and technology-based student learning activities.

Relationship between Student Response and Student Learning Activity

Based on the results of the Pearson Correlation Test (r) in the table above, it is known that the r value is 0.992 which means it has a strong correlation. Then, the p value is 0.000 which if the p -value < 0.05 means that there is a significant relationship between the two variables. These results show that student responses have a positive influence of 99% on student learning activities and are significant with a p value < 0.05 . So that the tenth hypothesis is accepted, and supports the statement of Anderson et al. (2024) that well-designed technology can integrate all aspects of learning simultaneously to achieve optimal learning outcomes. In the theory of constructivism, this hypothesis supports to increase student response which will be linear with the process of more optimal student learning activities.

4. Conclusion

This research proves that the use of Figma as a prototyping learning platform in the Project-Based Learning (PjBL) method significantly increases the effectiveness of student learning outcomes in informatics subjects. The variable of communication process between teachers and students proved to have the biggest influence on learning outcomes, which means the importance of social interaction in supporting constructivist learning. In addition, good learning management and students' positive response to technology-based learning media such as Figma significantly increase students' learning activities.

The results of the analysis show that the integration of modern technology in project-based learning not only improves technical skills, but also develops critical thinking, creativity and collaboration. The evaluation model showed excellent performance with a high level of prediction accuracy. Thus, Figma can be recommended as a learning tool to support the achievement of 21st century skills relevant to the needs of the digital industry. However, this study also identified some limitations, such as the need for adequate technological infrastructure and additional training for teachers to utilize this platform optimally.

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