The Synergy of Artificial Intelligence and Experiential Learning in Cultivating Student Creativity

Efrita Norman[1], ArmanParamansyah[2], Robiatul Adawiyah[3]
Lina Marliani[4] & Sofyan Mustoip[5]

[1]*Islamic University of Bunga Bangsa Cirebon, 45131, Cirebon, West Java,*
[2]*Indonesia STIT Marhalah, Bekasi West Java*
[3]*Indraprasta University, Jakarta, jakarta*
[2] *Islamic University of Bunga Bangsa Cirebon, 45131, Cirebon, West Java, Indonesia*
[3] *Islamic University of Bunga Bangsa Cirebon, 45131, Cirebon, West Java, Indonesia*

Abstract

This research investigates the impact of Artificial Intelligence (AI) and Experiential Learning (EL) on student engagement and creativity, moderated by the digital education ecosystem. The study employs a quantitative methodology, surveying 103 university students with AI-integrated learning experiences. Statistical analyses, including regression and ANOVA, reveal that both AI and EL significantly enhance student engagement, with EL having a slightly stronger effect. Engagement serves as a significant predictor of creativity. The study further highlights the moderating role of the digital ecosystem in amplifying the impact of engagement on creativity. These findings emphasize the importance of a robust digital ecosystem in optimizing AI and EL integration to foster creativity.

Keywords: *AI in Experiential Learning, Student Engagement, AI-driven Creativity, Digital Education Ecosystem, Learning Innovation.*

1.0. Introduction

The development of digital technology, especially artificial intelligence (AI), has had a major impact on the world of education. AI not only increases flexibility and personalization in learning, but also makes educators' jobs easier and revolutionizes existing teaching methods. Through intelligent learning systems, smart tutors, and administrative automation, AI is able to create more effective and efficient learning experiences (Lievertz, 2019). The application of AI in education has also changed the structure of work in the education sector. Some jobs will be replaced, while others undergo significant changes, even creating new jobs within the sector (Jaakkola et al., 2020). This transformation illustrates how AI is able to change not only the way we teach and learn, but also the way we view the role of educators in the future.

On the other hand, AI plays an important role in helping personalize learning, allowing students to acquire learning experiences that are more tailored to their needs (Sadiku et al., 2021). While the benefits are enormous, the application of AI in education also presents challenges, especially those related to ethical and equality issues. One of the concerns that arises is the potential for AI to replace the role of some educators, which requires more attention in the use of this technology (Tilepbergenovna, 2024). Despite these challenges, AI has been shown to have a positive impact in improving learning outcomes, student engagement, and the automation of various administrative tasks so that educators can focus more on teaching (V, 2024).

Advances in AI have also enriched adaptive learning by making it more interactive and personalized. For example, AI-based platforms that can customize teaching materials, provide automated feedback, and monitor student engagement have been developed (Pradeep et al., 2024). Additionally, AI-based intelligent assistants that provide data-driven learning experiences and interactive feedback are increasingly being introduced (Sajja et al., 2023). The use of AI to analyze student performance and provide personalized recommendations and feedback is also growing in

popularity (Akavova et al., 2023). This shows how AI can improve personalization, provide instant feedback, and deepen interactions in learning (Thuan et al., 2024). Lebih jauh lagi, AI mendukung

keterlibatan siswa dan improving learning outcomes through adaptive learning analytics (C. F. Mahmoud & J. T. Sørensen, 2024). With this technology, learning becomes more tailored to individual needs, increases engagement, and results in more effective experiences.

However, despite the enormous potential of AI in improving learning in higher education, its application still faces a number of significant challenges. One of the main problems is the low engagement of students in the learning process, which can reduce the effectiveness of AI in enhancing their creativity. Nguyen et al. (2024) show that while AI technology can improve student engagement, challenges in effective integration are still major obstacles, where there is still an over-reliance on technology and a lack of direct interaction between students and teachers. In the context of design education, Flechtner and Stankowski (2023) identified that while AI can facilitate creativity, there is a risk that the standardization implemented by this technology can actually limit students' originality and creativity in their assignments, as seen in design education. Another problem is the difficulty in optimizing the use of AI in experiential learning. Ojha (2024) stated that obstacles such as inadequate technological infrastructure and lack of training for teachers often hinder the maximum use of AI in improving students' creativity and learning experience (Ojha et al., 2024). Additionally, Rodzi et al. (2023) highlight that while AI offers potential for personalization of learning, barriers such as data privacy issues, technical infrastructure, and ethical challenges often hinder the effective adoption of AI in higher education institutions (Md Rodzi et al., 2023).

The combination of AI and experiential learning, especially in the context of higher education, is still rarely discussed in the literature. Although these two concepts have been researched separately, the application of both to increase student engagement and creativity in the digital ecosystem of education is still not widely discussed. This research aims to fill this gap by examining the application of AI in experiential learning, as well as the challenges associated with the use of this technology, such as reliance on technology, ethical issues, and data privacy, which have not been extensively discussed in the literature before. By examining the application of AI in experiential learning, this study is expected to provide new insights into the potential of AI in creating more creative and adaptive learning experiences in higher education.

Against this background, this study aims to analyze the influence of interrelationships between AI and experiential learning in the context of higher education. This research will analyze the influence of AI on student engagement in the learning process, as well as how experiential learning can affect student engagement levels. In addition, this study also aims to assess the influence of student involvement on their level of creativity in learning. This research will investigate how student engagement can affect their creativity moderated by the digital ecosystem of education. This research is expected to provide deeper insights into the interaction between AI, learning experiences, engagement, and student creativity in an increasingly digitally connected educational environment.

2.0 Research Methods

This study aims to analyze the influence of artificial intelligence (AI) and experiential learning on student engagement, as well as their impact on creativity, both directly and indirectly, moderated by the digital ecosystem of education. This research was conducted in Bogor City on 139 students who have used AI in their learning. This study uses a quantitative design with a path analysis approach, which allows researchers to test the direct and indirect relationships between the variables involved in the research model. This pathway analysis will identify how AI and learning experiences affect student engagement, as well as how these engagements, in turn, affect student creativity moderated by education's digital ecosystem.

The research sample consisted of 139 students who were selected using the purposive sampling

technique, namely students who already have experience using AI in their learning process. Data was collected through a structured questionnaire designed to measure several variables relevant to the research objectives, including the use of AI, experiential learning, student engagement, creativity, and

the digital ecosystem of education. This questionnaire uses a 5-point Likert scale to measure these variables, such as the frequency of AI use, the type of AI application used, the level of engagement in experiential learning, and the understanding of creativity and support of existing digital infrastructure.

The collected data will be analyzed using path analysis with SPSS 25 software to test the relationship between variables and estimate the path coefficient that shows the strength of the relationship between the variables. Path analysis will identify direct and indirect relationships between the variables involved in the research model, as well as examine the moderation influence of the education digital ecosystem. Before the path analysis is carried out, the questionnaire used will be tested for validity and reliability. Validity tests are performed using content validity and construct validity to ensure that the instrument measures what it is supposed to measure. Reliability tests were performed using Cronbach's alpha to ensure the internal consistency of the questionnaires used.

With the model tested, this research is expected to provide a deeper understanding of how AI and experiential learning contribute to student creativity and how the digital ecosystem of education moderates this relationship. The findings of this study can be a reference for the development of more effective education policies, as well as provide insights into the importance of technology and tailored learning experiences in increasing student engagement and creativity in the digital era.

3.0 Research Results

Table 1. Results of Sub Structure 1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	21.724	3.378		6.431	.000
	Artificial Intelligence	.277	.057	.340	4.885	.000
	Experiential Learning	.291	.045	.451	6.477	.000

a. Dependent Variable: Engagement

Based on the results of regression analysis, it can be concluded that both Artificial Intelligence (AI) and Experiential Learning (EL) have a significant influence on student engagement. A very small significance value (0.000) indicates that the relationship between AI and EL and Engagement is not a coincidence. The coefficient B for AI is 0.277 and for EL is 0.291, which indicates that both have a positive influence on Engagement, with EL having a slightly greater influence than AI. The Beta score shows that the influence of EL (0.451) is greater than that of AI (0.340), which indicates that hands-on learning experiences contribute more to student engagement. In addition, the t-value for both is much greater than 2, which confirms that the influence of AI and EL on Engagement is statistically significant. Overall, both variables made an important contribution to increasing student engagement in learning, with EL having a slightly greater impact. Educational institutions are advised to consider the use of AI and experiential learning as key strategies to increase student engagement and creativity.

Table 2. Model Summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.661[a]	.437	.429	5.11485

a. Predictor: (Constant), Experimental Learning, Artificial Intelligence

Based on the results of the Model Summary, it can be concluded that the relationship between independent variables (Artificial Intelligence and Experiential Learning) and student engagement is moderate, with a value of R = 0.661 which shows a fairly strong correlation. However, there are still other factors that affect Engagement. An R Square value of 0.437 shows that about 43.7% of the variation in Engagement can be explained by these two variables, which means that this regression model is quite good at describing student engagement.

Adjusted R Square = 0.429 indicates that the model is still of good relevance even though it has been adjusted for the number of variables. The Standard Error of the Estimate value of 5.11485 indicates the mean deviation between the predicted value and the actual value of the Engagement, which is still acceptable in this analysis. Overall, this regression model shows a significant influence of Artificial Intelligence and Experiential Learning on student engagement, but there are other factors that also affect the variation of engagement.

Based on the results of ANOVA, it can be concluded that the regression model used to test the influence of Artificial Intelligence (AI) and Experiential Learning (EL) on Engagement is statistically significant. A value of F = 52,756 indicates that this regression model is able to effectively account for variations in Engagement. With a value of Sig. = 0.000, which is much smaller than 0.05, it can be confirmed that the relationship between AI and EL and Engagement is not a coincidence, but a real and significant relationship. The Sum of Squares for Regression of 2760,359 shows the variation that this model can explain, while the Sum of Squares for Residual of 3557,986 shows the variation that the model cannot explain. An R Square of 0.437 indicates that about 43.7% of variation in Engagement can be explained by these two independent variables. Overall, this regression model is very relevant and provides strong evidence that Artificial Intelligence and Experiential Learning have a significant influence on the level of student engagement in learning.

Based on the results of the regression coefficient displayed, it can be concluded that Engagement has a significant influence on Creativity. A Constant (Intercept) value of 37,206 indicates that if Engagement is worth 0, then Creativity is expected to be worth 37,206. In addition, the coefficient B for Engagement is 0.818, which means that every increase of one unit in Engagement will increase Creativity by 0.818 units, assuming that other factors remain constant. This shows that Engagement has a considerable positive influence on Creativity. A Standard Error value of 0.127 indicates that the estimation of this coefficient is quite accurate. In addition, Standardized Coefficients (Beta) of 0.482 showed a greater relative influence of Engagement on Creativity, in standard units. The t-value for Engagement is 6,432, which is much greater than 2, indicating that the influence of Engagement on Creativity is statistically significant. With a value of Sig. = 0.000, which is less than 0.05, it can be ensured that the relationship between Engagement and Creativity does not occur by chance and is reliable. Overall, these results show that the higher the level of student engagement, the higher their level of creativity, and this regression model can be used to predict creativity based on the level of engagement with a very high level of significance.

Based on the results of the Model Summary displayed, it can be concluded that this regression model shows a moderate relationship between Engagement and Creativity, with a value of R = 0.482.

This indicates that Engagement makes a significant contribution to Creativity, although this relationship is not perfect. An R Square value = 0.232 indicates that about 23.2% of the variation in Creativity can be explained by Engagement, while the rest (76.8%) is influenced by other factors that are not included in this model. The Adjusted R Square value = 0.226 is slightly lower than the R Square, which indicates that the model is quite good at explaining the Creativity variation, although there is room for improvement. In addition, the Standard Error of the Estimate value = 10.11323 gives an idea that the mean deviation between the predicted value and the actual value of Creativity is about 10.11, which indicates that although the model is quite accurate, there is still variation in the data that is not fully explained. Overall, while this model explains some of the variation in Creativity, there are other factors

that play a role, and the model can still be improved by adding other relevant variables.

Based on the ANOVA results displayed, this regression model shows that Engagement has a very significant influence on Creativity. The value of F = 41.376 indicates that the regression model used provides a significant explanation of the variation in Creativity, much better compared to the model without independent variables. The value of Sig. = 0.000, which is much smaller than 0.05, confirms that the relationship between Engagement and Creativity does not occur by chance and is reliable in explaining the variation in Creativity. In addition, a Sum of Squares for Regression value of 4231,789 indicates that Engagement can account for most variations in Creativity, while a Sum of Squares for Residual of 14012,010 indicates variations that cannot be explained by this model. Overall, the results of ANOVA show that regression models that incorporate Engagement as predictors have a significant contribution in improving Creativity, with results that are highly reliable and not coincidental.

Based on the results of regression analysis, it can be concluded that Y1_Y2 has a positive and significant influence on Creativity. The constant value of 53.078 indicates that when Y1_Y2 is zero, creativity is estimated at 53.078, which is also statistically significant with p-value = 0.000. A coefficient for Y1_Y2 of 0.009 indicates

that every increase of one unit in Y1_Y2 will increase Creativity by 0.009. This relationship is very significant, as evidenced by the value of p-value = 0.000, which is much smaller than 0.01, suggesting that the influence of Y1_Y2 on creativity is reliable. In addition, a Beta value = 0.574 indicates that the influence of Y1_Y2 on Creativity is quite strong. Thus, it can be concluded that the education ecosystem contributes significantly to increasing creativity, which is reflected in the high value of t-value = 8.196, which shows the statistical significance of the coefficient.

Based on the results of regression analysis, it can be concluded that Artificial Intelligence and Engagement have a significant influence on Creativity, while Experiential Learning does not show a significant influence. For Artificial Intelligence, the coefficient of 0.458 with p-value = 0.000 indicates that every single unit increase in AI will increase Creativity by 0.458, and the effect is statistically significant at a significance level of 1%. This indicates that Artificial Intelligence is an important factor in increasing creativity. Meanwhile, for Engagement, the coefficient of 0.387 with p-value = 0.016 indicates that Engagement also has a significant positive influence on Creativity, with every increase in one unit in Engagement increasing creativity by 0.387. However, the effect of Experiential Learning on Creativity, although positive, was not statistically significant. With a coefficient of 0.159 and p-value = 0.098, these results suggest that despite the positive trend, the influence of Experiential Learning on creativity is not strong enough to be considered significant at a significance level of 5%. Overall, this model shows that Artificial Intelligence and Engagement are significant factors in increasing creativity, while Experiential Learning does not make a significant contribution in this model.

4.0 Discussion

Based on the results of statistical processing that show a significant influence between the use of artificial intelligence (AI) and experiential learning (EL) on student engagement, this study finds that

AI and EL have a positive contribution to student engagement, which is in line with the theory of constructivist learning, which states that hands-on experience and technology can enrich the learning process and increase participation student.
The Effect of Artificial Intelligence (AI) on Engagement Research conducted by Ezeoguine and Eteng-Uket (2024) shows that the use of AI tools can significantly increase student engagement in higher education, with results reflecting the findings in this study. They noted that the use of AI increases student interaction and engagement with learning materials, which creates a more personalized and well-rounded learning experience. AI, through adaptive learning systems, enables more personalized learning, which in turn increases student motivation and engagement in the learning process (Ezeoguine & Eteng-Uket, 2024). In addition, Tulasi and Ahamed (2024) also found that AI improves students' critical thinking skills and problem-solving skills, which contributes to improved engagement and their academic outcomes (Sri Tulasi & Inayath Ahamed, 2024).

The Effect of Experiential Learning (EL) on EngagementThe hands-on learning experience provided through EL has also been shown to have a significant influence, as explained by Zhang (2023), who noted that the experiential approach is very effective in increasing student engagement by providing a more meaningful and applicative learning experience (Zhang, 2023). The findings in this study are also in line with Farrukh's (2024) view, which suggests that experiential learning supports the development of critical skills, problem-solving, and collaboration skills, which contribute to higher levels of engagement among college students (Farrukh et al., 2024)
Comparison of the Influence of AI and EL Although AI shows a significant influence on student engagement, Capinding and Dumayas (2024) show that experiential learning has a slightly greater influence than AI, especially in building students' emotional and social engagement (Capinding & Dumayas, 2024). This supports the findings in this study that while AI is very useful in personalizing learning experiences, hands-on experiences through EL are more in-depth in fostering social engagement and collaboration, which are crucial in 21st century skill development.

The Effect of Engagement on Creativity Research by Álvarez-Huerta et al. (2021) shows that student engagement in learning is directly related to their creative confidence. The results of this study found that high engagement increases students' confidence in their creative abilities. Furthermore, engagement through collaborative learning and reflective interaction with teachers plays a big role in increasing creativity (Álvarez-Huerta et al., 2021). These findings are in line with the regression coefficient found in this study, which suggests that increased engagement is positively associated with increased creativity.

Exposure to Creative Learning Miller (2018) found that exposure to creative courses served as a significant predictor of student engagement. This exposure strengthened their engagement in deeper learning, which increased their ability to think creatively, encouraging them to think more critically and innovatively (Miller et al., 2018). This finding supports the finding that engagement plays an important role in motivating and enhancing student creativity. He & Li (2024) showed that positive relationships between instructors and students mediate the relationship between engagement and creativity.

Active involvement in learning driven by good relationships with faculty can increase students' creativity, as they feel supported and valued in the learning process (He & Li, 2024). These results reinforce the finding that engagement facilitated by deep interaction can increase creative outcomes Creative Learning ApproachesIn the context of art and humanities, Alimen et al. (2021) found that creative involvement in art learning has a great influence on the development of student creativity. Creative art-based learning provides opportunities for students to explore new ideas, which contributes to the enhancement of their creativity (Alimen et al., 2021). This is in line with the results of this study which shows that the higher the engagement in learning, the higher the creativity produced. Overall, these findings support the view that engagement is a key factor in increasing student creativity. Learning that involves active involvement, good relationships with teachers, and exposure to creative courses are

important factors that increase creativity in the context of higher education.

The Education Ecosystem Strengthens the Relationship of Engagement to Creativity Zamana (2022) in its article states that the creative education ecosystem plays a vital role in developing students' creativity in the future. In his view, creativity is an essential component that transforms education and prepares students for an uncertain future. This concept is in line with the findings in this study which suggest that the educational ecosystem, as described by Y1_Y2, can enhance creativity by facilitating deep interactions between educational elements, which helps students develop their creative abilities in a broader context (Zamana, 2022).

Involvement in Education and Creative Innovation Research by Curoșu and Benea-Popușoi (2024) also explores the role of policy in the development of the creative education ecosystem in the Republic of Moldova. They show that policies that support creative education strengthen students' ability to innovate and enhance cultural and artistic expression. This is relevant to the findings of this study, which shows that the measurement of the education ecosystem plays a role in increasing student creativity through the creation of an environment that supports innovation and exploration of new ideas (Curoșu and Benea-Popușoi, 2024).

An Ecosystem-Based Approach in Creative Education Mackie (2021) in his research on Creative Forest proposes that an educational ecosystem that supports creativity can empower students to collaborate, interact, and create shared knowledge. In this model, creativity thrives in an open and dynamic community. This supports the results of this study which shows that Y1_Y2, as a representation of the educational ecosystem, has a significant influence on creativity because it supports collaborative learning and creative exploration among students (Mackie, 2021).

Creativity Ecosystem in the Context of Engineering and Innovation Education In the context of engineering education, Panthalookaran (2019) shows that an educational ecosystem that supports research and creativity is essential to prepare students for the era of entrepreneurship and startups. This study reveals how the integration of faculty research with student research and industrial research creates an ecosystem that supports the development of creativity and innovation, which is very relevant to the finding that Y1_Y2 has a strong influence on student creativity in this study (Panthalookaran, 2019).

Engagement has a significant influence on Creativity, while Experiential Learning (EL) does not show a significant influence. Experimental learning is highly dependent on the specific context in which it is applied (Guo 2013) Experimental learning can be more effective in some specific contexts, (Chan at.al 2021) The outcome of EL is highly dependent on participant involvement (Asyari et al., 2021) The duration and intensity of the experimental learning program also have a major effect on the outcome (Lin et al., 2023) EL is often influenced by social factors and the environment outside the classroom, such as support from teachers, family, and peers (Kuraoka, 2019).

In addition, Engagement plays an important role in stimulating creativity, especially through deep interaction with learning materials involving AI (Pont-Niclós et al., 2024). Although Experiential Learning is generally thought to improve creativity, in this study, the effect was not statistically significant enough, which may be due to other factors that were not taken into account in this model (Mackie, 2021). Overall, AI and Engagement are proving to be key factors in boosting creativity, whereas EL may require more in-depth conditions or applications to demonstrate significant influence.

5.0 Conclusion

This study aimed to examine the influence of Artificial Intelligence (AI) and Experiential Learning (EL) on student engagement and creativity, with a specific focus on the moderating role of the digital education ecosystem. The results indicate that both AI and EL significantly contribute to enhancing

student engagement, with EL having a slightly stronger impact. Engagement, in turn, plays a crucial role in fostering creativity, as evidenced by the significant positive relationship between engagement and creativity. Furthermore, the digital education ecosystem, including infrastructure, digital literacy, and teacher preparedness, was found to moderate the relationship between engagement and creativity, further emphasizing the importance of a well-developed educational environment in maximizing the potential of both AI and EL.

This research contributes to the existing literature by demonstrating the interconnections between AI, experiential learning, student engagement, and creativity within a digital ecosystem. It also provides valuable insights for educational institutions looking to enhance their teaching methods by integrating AI and experiential learning techniques. By focusing on the role of engagement, this study underscores the importance of active student involvement in the learning process and its direct effect

on creativity. The findings support the implementation of AI and experiential learning as key strategies for boosting student engagement and fostering innovative thinking, both essential for success in the digital age.

However, the study does have limitations. The sample size, although sufficient for statistical analysis, may not fully represent all student demographics, limiting the generalizability of the results. Additionally, the study only focused on the impact of AI and EL within a specific digital ecosystem, and other external factors influencing engagement and creativity were not explored in-depth. Further research could address these limitations by incorporating a more diverse sample and exploring additional factors that may moderate or mediate the relationship between AI, experiential learning, and creativity.

In conclusion, the research highlights the significant roles of AI and experiential learning in enhancing student engagement and creativity. For future educational practice, integrating these two elements, while considering the moderating effects of the digital education ecosystem, will provide a more adaptive and innovative learning experience for students.

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