HARMONI SOSIAL
Jurnal Pendidikan IPS

Harmoni Sosial: Jurnal Pendidikan IPS
Vol. 12, No. 2, 2025, pp. 153-162
ISSN : 2356-1807 (print) | 2460-7916 (online)
http://journal.uny.ac.id/index.php/hsjpi

AI tools and academic performance: engagement and motivation in social sciences education

Shahzeb[1]*, Sudrajat[1], Sibghatullah[2]
[1] Universitas Negeri Yogyakarta, Indonesia.
[2] International Islamic University, Pakistan
* Corresponding Author. E-mail: shahzeb.2023@student.uny.ac.id

ARTICLE INFO

Article History
Received;
May 02, 2025
Revised;
August 21, 2025
Accepted;
September 15, 2025

Keywords
Artificial Intelligence;
education;
academic performance;
student engagement;
student motivation

ABSTRACT

This study aims to examine the role of advanced AI tools, such as ChatGPT, on student's academic performance. Additionally, it investigates the mediating role of student's engagement and motivation in the relationship between AI tools and Academic performance in the department of Social Sciences Education at State University of Yogyakarta. This study has adopted a quantitative approach and has collected data from 52 undergraduate students enrolled in specified sample. Data analysis was conducted using SPSS. The findings indicate that AI tools significantly correlated with academic performance ($r = 0.717$, $p < .01$), while also also showing positive correlation with student engagement ($r = 0.692$, $p < .01$) and motivation ($r = 0.658$, $p < 0.01$). Furthermore, it improves comprehension of students, and provides self-directed learning. However, concern regarding over-reliance on AI is also identified, particularly its potential impact on critical thinking. This study highlights the importance of responsible AI integration, emphasizing the need to create balance between AI-driven learning and traditional methods. Educational Institutions must develop strategies that maintain student's critical thinking and analytical skills while using AI tools. As a researcher, I believe the findings can assist institutions and instructors in implementing AI technologies into teaching practices in way that enhances academic performance, engagement, and motivation, while still fostering autonomous and critical thinking among students.

INTRODUCTION

Artificial intelligence (AI) is a field of research focused on programming computer systems to perform tasks traditionally associated with humans (Rodrigo, 2023). Artificial Intelligence in education indicates to the application of AI in educational settings to improve teaching, learning, and the overall academic experience (Holmes et al., 2019). In recent years, the integration of AI in education has gained notable attention, driven by rapid development of emerging technologies (Salido, 2023). Technological advancement and innovation have encouraged all aspects of life providing significant benefits across various domains, including education, where they enhance student learning and engagement (Guilherme, 2019). AI in education (AIED) includes the utilization

of machine learning algorithms, natural language processing, and automatic feedback mechanism to enhance learning experiences. These technologies have transferred old instruction to technology-assisted learning, where students obtain immediate response, correction of grammar, and suggestion about specific subjects (Felix, 2020; Luckin, 2017). Artificial Intelligence has introduced effective tools to the education sector, enhancing knowledge delivery, sustaining student engagement, and providing conceptual understanding. However, its implementation demands advanced technical and innovative infrastructure that remains a significant challenge for developing countries (Aldulaimi, M. H., Kadhim, T. A., 2018). Recent studies have shown that conversational AI improves engagement and learning outcomes when applied with pedagogical scaffolding (Bettayeb et al., 2024), and that Indonesian university students demonstrate a positive receptivity to ChatGPT in academic contexts (Atakuziev, M., Margana, & Gultom, 2024). At the same time, risk of over-reliance remain, with concerns about diminished critical thinking (Hasanein, A., & Sbaih, 2023; Selwyn, 2019). This research offers a balanced roadmap for implementing AI-supported learning in Yogyakarta's social sciences education, aligning with Indonesia's emerging AI in education initiatives (Htet, 2024). Unlike prior studies, this paper tests the mediating effect of engagement and motivation (Alshater, 2022), in providing particular context evidence to guide Indonesian higher education, specifically social sciences programs in integrating AI Tools to enhance performance while ensuring autonomy and critical thinking, situated in Yogyakarta, Indonesia's "student city" and a major academic hub (UI, 2023).

ChatGPT and other AI tools offer students valuable educational resources, and expand their access to knowledge. However, these advancements require technical implementation and the development of an integrated and innovative educational infrastructure that remain significant challenges for developing countries (Owoc, M. L., Sawicka, A., 2019). The use of the ChatGPT has enhanced student engagement and critical thinking, while voice-based versions have increased their confidence in communication by reducing fear. Additionally, it can assist teachers by analyzing student errors to improve lessons (Zawacki-Richter et al., 2019). For instance, ChatGPT has received attention as an AI-powered language model capable of generating logical responses. Studies demonstrates that these advanced technologies support student engagement and motivation (Dörnyei, 2020). AI in higher education, specifically in developing countries, is rapidly increasing, and studies highlight that AI can increase student engagement and motivation by providing access to diverse academic resources (Owoc, M. L., Sawicka, A., 2019).

According to a recent survey (Digital Education Council, 2024), 78% of student use AI in their studies, with 24% using it daily and 54% weekly. Similarly, 56% of college student use AI programs such as ChatGPT to complete lessons or tests (BestColleges, 2023). These tools are commonly used for searching information, grammar correction, and content creation (Miao et al., 2021). While AI enhances learning, over-reliance on AI-generated content may weaken problem-solving skills and critical thinking (Zhai, 2022).

This study aims to examine the impact of Al tools, specifically ChatGPT, on academic performance of social sciences students at Yogyakarta State University. It further investigates how student motivation and engagement mediate the relationship between AI use and performance. Existing literature highlights that engagement and motivation are critical for improving outcomes and academic achievements in higher education (Plak et al., 2023). Theoretically, this study strengthens understanding of AI's role in higher education through the engagement-motivation framework. Practically, it provides evidence-based recommendations to Indonesian educators, curriculum designers, and policy makers on implementing AI supported learning practices that enhance academic achievements while preserving student's critical thinking and autonomy.

The results are expected to provide valuable insights into the role AI tools in promoting productive learning environments, ensuring ethical compliance in AI applications, and enhancement of cognitive abilities (Baidoo-Anu, D, Owusu Ansah, 2023). This study specifically examines how AI tools, particularly ChatGPT, influence academic performance, student engagement, and motivation within social science education at Yogyakarta state University. By offering empirical evidence in the local higher education context, the research contributes to understand effective AI integration strategies that support both learning outcomes and the development of critical thinking skills, proving practical guidance for educators, curriculum designers, and policymakers (Holmes,

W. et al., 2022). Based on the review of existing literature and the identification of research gaps, several hypotheses are proposed to guide this study. First, it is hypothesized that the use of AI tools has a positive effect on students' academic performance (H1). Furthermore, student engagement is expected to serve as a mediating variable in the relationship between AI tools and academic performance (H2). In addition, student motivation is also hypothesized to mediate the relationship between AI tools and academic performance (H3).

RESEARCH METHOD

The study employed a quantitative research design with a survey strategy, as it allows the systematic collection of numerical data to examine relationship among variables (Creswell, J. W., & Creswell, 2018). The design is appropriate because the objective of the study is to test hypothesis regarding the effects of AI tools on students' academic performance, with student motivation and engagement as mediating variables. The research was conducted over a period of three months (September-November 2024) at Universitas Negeri Yogyakarta, Indonesia.

The population of this study consists of undergraduate students enrolled in the department Social Sciences Education at Yogyakarta State University. From this population, a probability sampling method was adopted, specifically simple random sampling, to ensure each student has an equal chance of being included (Jamil, 2018). The technique was chosen to minimize sampling bias and to enhance the generalizability of the findings. The sample size was 52 respondent, which aligned with overthe previous exploratory quantitative studies in education that emphasize depth of the variable testing over large-scale generalization (Bhandari, 2022).

Data for this study were collected using a standardized questionnaire adapted from previously validated instruments. The questionnaire was structured into two main sections. The first section gathered demographic information, including age, gender, and semester of study. The second section measured the study variables using established scales drawn from prior research. Specifically, the construct of AI tools was assessed using five items adopted from (Çelik, 2023), which emphasized interaction with AI in pedagogy. Academic performance was measured with five items originally developed by (Wilson et al., 1997), and subsequently applied (Gopal et al., 2021). Student motivation was captured through five items developed by (Hamoud et al., 2018). While student engagement was assessed using five items from (Zhoc et al., 2019). All items were measured on a five-point Likert scale (1= strongly disagree to 5= strongly agree). Since minor revisions wording adjustments were made to suit Indonesian higher education context, content validity was confirmed through expert review, and reliability was assessed using Cronbach's alpha prior to distribution. Questionnaires were distributed online to sampled students. Respondents were informed about the purpose of the study, assured of confidentiality, and informed that participation was voluntary. Data collection continued for four weeks until the target number of responses was obtained. SPSS was utilized for data analysis. Descriptive statistics summarized demographic and variables distributions, while Cronbach's alpha assessed reliability. Correlation and regression analysis were conducted to examine the relationships among variables. SPSS was chosen due to its efficiency in data management, reliability of outputs, and minimization of potential errors.

RESULT AND DISCUSSION

Data normality

The data was initially analyzed to exclude any outliers, identified by extreme low or high values, by a frequency test. The test findings indicated that there were no of outliers in the data. The missing values were identified and replaced with appropriate values derived from the trends of the other responses. The normality of the data was assessed through skewness and kurtosis tests, with the computed values compared with a predefined standard range for skewness, which is -1.96 to +1.96.

All calculated values were inside the specified range, thereby confirming the data's normality. The average value of the data illustrates response trends, requiring a score of three or higher to indicate respondents' positive agreement. The calculated mean for all study variables signifying the targeted population's positive agreement regarding the discussed concepts.

Table 1. Descriptive Analysis

Variabel	N	Min	Max	Mean	SD	Kurtosis	SE (Kurtosis)
AI Tools (AI)	52	1.80	4.20	3.43	1.13	1.950	.650
Academic Performance (AP)	52	1.80	5.00	3.88	1.40	1.953	.650
Student Engagement (SE)	52	2.80	5.00	4.07	1.26	–0.268	.650
Student Motivation (SM)	52	1.80	5.00	4.00	1.31	2.939	.650

The reliability of the data

While using SPSS, the researcher has calculated the reliability of the data and to supply the construct reliability of the items for the following calculation of the findings of the research. Cronbach alpha value for every variable indicates its reliability for the model of the study, which was computed by using the reliability analysis. The Cronbach alpha value has been identified as an effective instrument for examining the reliability of the items. The reliability value above 0.7 or near 1, is regarded as an excellent measure of consistency. The table below displays the items reliability for the constructs as well as the Cronbach alpha values for each variable.

Table 2. The Cronbach alpha values of variables

Variabel	Jumlah Item	Cronbach's α
AI Tools (AI)	5	.712
Academic Performance (AP)	5	.804
Student Engagement (SE)	5	.768
Student Motivation (SM)	5	.817

Correlation Analysis

The table below demonstrates that all correlations were significant at the 0.01 level, indicating strong positive correlations between AI tools, academic performance, student engagement, and student motivation. The use of AI tools is strongly correlated with higher academic performance, as seen by the substantial positive correlation ($r = 0.717$) between the two variables. Furthermore, there is a higher positive correlation ($r = 0.656$) between AI tools and student motivation ($r = 0.656$) than there is between AI tools and engagement ($r = 0.547$), indicating that AI tools support both. Additionally, there are significant positive connections between academic performance and student motivation ($r = 0.710$) and engagement ($r = 0.704$), highlighting that higher levels of motivation and engagement are associated with better academic performances.

Following that, there is a significant correlation ($r = 0.790$) between student motivation and engagement, demonstrating a strong relationship between these two variables. Overall, the findings point out a strong correlation between AI tools, academic performance, engagement, and motivation, highlighting the function of AI in improving students' educational experiences.

Table 3. Correlation Analysis

	AI	AP	SE	SM
AI	1			
AP	.717**	1		
SE	.547**	.704**	1	
SM	.656**	.710**	.790**	1

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

The Hierarchal Regression Model for Hypotheses testing

The hypothesis acceptance decision was made on the results of the hierarchal regression model, an analysis used to determine the dependence of one variable on the other. The regression model analysis has been performed in two steps; in the first step, the direct impact of the independent variable AI tools on the Academic Performance was analyzed, and the model summary has offered the regression value as the adjusted R square .511 with the significance level of .000 and the degree of variance was 51.1%. Therefore, significance value and the degree of variance have shown the positive sign for the acceptance of the first hypothesis.

Table 5. Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate
1	.715[a]	.511	.501	2.21681

This finding indicates that AI tools substantially contribute to the prediction of students' academic outcomes. In practical terms, the use of AI in learning environments explains more than half of the variance in academic performance, which highlights its potential as a critical driver of educational success.

Table 6. ANOVA Results

Sumber	Sum of Squares	df	Mean Square	F	p
Regression	256.980	1	256.980	52.293	.000
Residual	245.712	50	4.914		
Total	502.692	51			

For the mediators, the regression value for student engagement was .335***, with the high significance and acceptance of the hypothesis of student engagement mediation; the second mediation impact of student motivation has a beta value of .269***, with two-start significance, so the hypothesis of student motivation mediation was also accepted. According to the degree of change and increase in the influence of all variables, the mediation of two variables has 9.0% role in students' academic performance. The regression coefficients, their significance, and the degree of variance, are shown in the table below.

Table 7 Regression Analysis

Variabel	B	SE	β	t	p
Konstanta	0.653	0.145	–	3.967	.000
AI → AP	0.767	0.062	0.698	16.890	.000

The finding of the study provides strong evidence that AI tools such as ChatGPT positively influence student's academic performance, with student engagement and motivation serving as significant mediators. These results are best understood through the lens of Self-Determination Theory (DIT), which emphasizes that competence, autonomy, and relatedness are key psychological needs that foster intrinsic motivation (Deci, E. L., & Ryan, 2000). By offering instant feedback, personalized support, and non-judgmental responses, AI tools enhance student's sense of competence and autonomy, which in turn promotes deeper engagement with learning tasks. The research findings of the relationship between the chosen constructs have also highlighted whether artificial intelligence tools are crucial for enhancing student's academic performance within educational institutes of Yogyakarta, Indonesia. The above-cited literature has formulated the evidence for the conceptual framework of the current investigation of the direct impact of artificial intelligence tools on student's academic performance and the mediating role of student motivation and student engagement. Moving toward the discussions of the research findings regarding the proposed hypotheses are described below:

The first hypothesis proposed that "*AI tools positively affect students' academic performance*." The findings strongly support this hypothesis, as the regression results indicated that AI tool have a significant and positive impact on student's academic performance ($\beta = .767$, $p < .001$). These findings are consistent with previous studies. AI-powered learning tools significantly improve comprehension and academic achievement through personalized feedback, as demonstrated in recent research (Salido, 2023). Online platform have also been shown to enhance student's satisfaction and performance in higher education (Gopal et al., 2021). At the same time, concerns have been raised about the risk of over-reliance on AI diminishing critical thinking (Hasanein, A., & Sbaih, 2023). However, the present study indicates that when integrated responsibly, AI tools in Indonesian higher education setting paly a supportive role in enhancing performance (Tang et al., 2022).

The second hypothesis examined *the mediating role of student engagement in the relationship between AI tools and academic performance*. The results confirmed that student engagement significantly mediates this relationship ($\beta = .335$, $p < .001$). Within SDT, engagement can be understood as an outcome of relatedness, since AI tools create interactive and responsive learning environment where students feel more connected to the learning process (Fredricks, J. A. et al., 2004). This aligns with the previous research, which emphasized that technology-driven learning platforms enhance student engagement and lead to improved learning outcomes in higher education (Panigrahi et al., 2021). Similarly, where other study validated that engagement is central to students' academic success. And the present findings extend this evidence to the Indonesian context. By engaging students in participatory and self-directed activities, AI tools contribute to deeper learning and stronger academic outcomes, confirming that engagement is not merely an outcome but also a crucial mediating pathways (Zhoc et al., 2019). The mediating effect of engagement was stronger than motivation, suggesting that the interactive and participatory features of AI tools may more directly influence student involvement with tasks (Bond, M., & Bedenlier, 2019), whereas motivation contributes to performance more indirectly through self-regulation and autonomy (Zimmerman, 2002).

The third hypothesis tested whether *student motivation mediates the relationship between AI tools and academic performance*. The findings confirmed that student motivation plays a significant mediating role ($\beta = .269$, $p < .01$). This aligns directly with Self-Determination Theory, which highlights autonomy and intrinsic motivation as central to effective learning (Deci, E. L., & Ryan, 2000). AI platforms such as ChatGPT allow students to ask questions freely, receive personalized responses, and explore topics without fear of judgment, thereby enhancing intrinsic motivation. Another previous research listed that AI-driven leaning environments increase students' self-regulated motivation. AI tools helps students build confidence and autonomy in managing their academic activities (Yılmaz, R., & Karaoğlan Yılmaz, 2022).

The present findings confirm these perspective, showing that motivated students are more likely to adopt AI tools as a form of personal academic support, which in turn enhances their academic performance (Davis, K., & Gough, 2023).

Overall, these results extend the literature by providing empirical evidence from the Indonesian higher education context. This study contributes to theory and practice by empirically demonstrating how AI tools enhance academic performance through mechanisms explained by SDT (Li, H. Wang, X. & Wong, 2021). It confirms prior findings that AI fosters engagement and motivation, but also extends them by highlighting the mediating AI tools not only as technical aids but as pedagogical supports that nurture intrinsic motivation and sustained engagement (Holmes, W. et al., 2022).

CONCLUSION

This study provides empirical evidence on the role of AI tools in Higher education by demonstrating that ChatGPT positively influences students' academic performance, both directly and indirectly, through enhanced engagement and motivation. Framed within Self-Determination Theory (SDT), the findings show that AI tools strengthen students' sense of competence, autonomy, and relatedness, thereby fostering meaningful learning experience. These results underscore the transformational potential of AI in higher education, as it offers personalized instruction, engaging content and timely feedback that sustain students' interest. At the same time, the findings caution again the risk of over-reliance on AI, which may weaken autonomous learning skills and critical thinking. The contribution of the study lies in showing that AI tools not only improve academic outcomes, but also promote self-efficacy, confidence, and intrinsic motivation within the Indonesian higher education context. A distinctive feature of this study is that, unlike prior studies conducted predominantly in Western or global settings, it is among the first to empirically test the mediating roles of engagement and motivation in the relationship between AI tools and academic performance in Indonesia. By focusing on social sciences studies in rkarta, major academic hub, the study provides context-specific evidence that extends the international literature on AI in education into a developing country setting.

The implication are that AI tools should complement, not replace, traditional teaching, enhancing student motivation and engagement through personalized learning. Educators should combine AI activities with discussions, group work, and critical thinking, while institutions provide guidance and training for responsible and effective use. Future research should explore the long-term effect of AI-support learning, particularly its influence on cognitive development, problem-solving ability, and critical thinking. Comparative studies across discipline and institution in Indonesia would further enrich the understanding of AI's role in higher education and support its integration in ways that are both effective and sustainable.

REFERENCES

Aldulaimi, M. H., Kadhim, T. A., & A. (2018). Towards smart learning environments in Iraqi schools Existing infrastructure and challenges. *International Journal of Civil Engineering and Technology,* 13.

Alshater, M. (2022). Exploring the role of artificial intelligence in enhancing academic performance: A case study of ChatGPT. *SSRN Electronic Journal*.

Atakuziev, M., Margana, & Gultom, A. M. (2024). niversity students' attitudes and perceptions on learning English with ChatGPT. *Formosa Journal of Sustainable Research,*. https://doi.org/https://doi.org/10.55927/fjsr.v3i8.10163

Baidoo-Anu, D, Owusu Ansah, L. (2023). Education in the Era of Generative Artificial Intelligence (AI): Understanding the Potential Benefits of ChatGPT in Promoting Teaching and Learning. *SSRN Electronic Journal*, 11.

BestColleges. (2023). More than half of college students use AI for assignments,. *Survey Finds*.

Bettayeb, A. M., Abu Talib, M., Altayasinah, A. S., & & Dakalbab, F. (2024). Exploring the impact of ChatGPT: Conversational AI in education. *Frontiers in Education*. https://doi.org/10.3389/feduc.2024.1379796

Bhandari, P. (2022). Population vs. sample | Definitions, differences & examples. *Scribbr.*

Bond, M., & Bedenlier, S. (2019). *Facilitating student engagement through educational technology: Towards a conceptual framework. Educational Technology Research and Development,. 65*(5), 1185–1224. https://doi.org/https://doi.org/10.1007/s11423-019-09682-9

Çelik, İ. (2023). *Towards Intelligent-TPACK: An empirical study on teachers' professional knowledge to ethically integrate artificial intelligence (AI)-based tools into education. Computers in Human Behavior,*. https://doi.org/https://doi.org/10.1016/j.chb.2022.107468

Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). *CA: SAGE Publications.*

Davis, K., & Gough, M. (2023). *Student motivation and engagement in technology-enhanced higher education. Computers & Education. 195*(104700). https://doi.org/https://doi.org/10.1016/j.compedu.2023.104700

Deci, E. L., & Ryan, R. M. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78. https://doi.org/https://doi.org/10.1037/0003-066X.55.1.68

Digital Education Council. (2024). *Global AI Student Survey 2024: How students are using AI in education.*

Dörnyei, Z. (2020). Innovations and Challenges in Language Learning Motivation. In *Innovations and Challenges in Language Learning Motivation*. https://doi.org/10.4324/9780429485893

Felix, C. V. (2020). The Role of the Teacher and AI in Education. *Emerald Publishing Limited.*, 33–48.

Fredricks, J. A., Blumenfeld, P. C., &, & Paris, A. H. (2004). *School engagement: Potential of the concept, state of the evidence. Review of Educational Research,. 74*(1), 59–109. https://doi.org/https://doi.org/10.3102/00346543074001059

Gopal, R., Singh, V., & & Aggarwal, A. (2021). Impact of online classes on the satisfaction and performance of students during the pandemic period of COVID-19. *Education and Information Technologies,*. https://doi.org/https://doi.org/10.1007/s10639-021-10523-1

Guilherme, A. (2019). AI and education: The importance of teacher and student relations. *AI & Society, 34(1), 47-54.* https://doi.org/https://doi.org/10.1007/s00146-017-0693-8

Hamoud, A., Hashim, A. S., & & Awadh, W. A. (2018). Predicting student performance in higher education institutions using decision tree analysis. *International Journal of Interactive Multimedia and Artificial Intelligence,* 5(2), 26–31. https://doi.org/https://doi.org/10.9781/ijimai.2018.02.004

Hasanein, A., & Sbaih, B. (2023). Students' acceptance of generative artificial intelligence and its effect on critical thinking: Evidence from higher education. *Education and Information Technologies,* 8(12), 13811–13834. https://doi.org/https://doi.org/10.1007/s10639-023-11894-2

Holmes, W., Porayska-Pomsta, K., & & Holstein, K. (2022). *Ethics of AI in education: Towards a community-wide framework. International Journal of Artificial Intelligence in Education,.*

32(3), 504–526. https://doi.org/https://doi.org/10.1007/s40593-021-00239-1

Holmes, W., Bialik, M., & & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning. Center for Curriculum Redesign.* https://curriculumredesign.org/wp-content/uploads/AIED-Book-Excerpt-CCR.pdf

Htet, N. K. (2024). Indonesia to implement 'AI learning' in primary & secondary schools from 2025–2026, says education minister. *GovInsider.* https://govinsider.asia/education/indonesia-to-implement-ai-learning-in-primary-secondary-schools-2025-2026

Jamil, N. (2018). Probability sampling techniques. *ResearchGate.*

Li, H. Wang, X. & Wong, J. (2021). *How artificial intelligence enhances learning: Insights from self-determination theory. Computers & Education,. 172*(104262). https://doi.org/10.1016/j.compedu.2021.104262

Luckin, R. (2017). *Towards artificial intelligence-based assessment systems. Nature Human Behaviour, 1(3), 1–3. https://doi.org/10.1038/s41562-017-0050.* 1(3), 1–3. https://doi.org/10.1038/s41562-017-0050

Miao, F., Holmes, W., Huang, R., & & Zhang, H. (2021). *AI and education: Guidance for policy-makers. Paris: UNESCO.* https://unesdoc.unesco.org/ark:/48223/pf0000376709

Owoc, M. L., Sawicka, A., & W. (2019). Artificial intelligence technologies in education: Benefits, challenges, and strategies of implementation. *In IFIP International Workshop on Artificial Intelligence for Knowledge Management*, (pp. 37-58).

Panigrahi, R., Srivastava, P. R., & & Panigrahi, P. K. (2021). Effectiveness of e-learning: The mediating role of student engagement on perceived learning effectiveness. *Education and Information Technologies,* 26(3), 1–25. /https://doi.org/10.1007/s10639-020-10319-1

Plak, S., Klaveren, C. &, & Cornelisz, I. (2023). Raising student engagement using digital nudges tailored to students' motivation and perceived ability levels. *British Journal of Educational Technology,* 54, 554-580.

Rodrigo, M. (2023). *The truth about using AI in schools. Philstar Life.* https://doi.org/10.1016/j.chb.2022.107468

Salido, V. (2023). Impact of AI-Powered Learning Tools on Student Understanding and Academic Performance. *BAPS 85: Introduction to Political Analysis and Research*, *December*, 1–9. https://doi. org/10.34293/ management.v11iS1- May.7834

Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education. Polity Press. Retrieved from*. https://research.monash.edu/en/publications/should-robots-replace-teachers-ai-and-the-future-of-education

Tang, T., Abuhmaid, A. M., Olaimat, M., Oudat, D. M., & Aldhaeebi, M., & Bamanger, E. (2022). *Efficiency of flipped classroom with online-based teaching under COVID-19. Interactive Learning Environments,. 31*(2), 1077-1088. https://doi.org/https://doi.org/10.1080/10494820.2020.1817761

UI, L. F. (2023). *Yogyakarta: Kota pelajar dan pusat akademik Indonesia. Faculty of Humanities, Universitas Indonesia.* https://lbi.fib.ui.ac.id

Wilson, K. L., Lizzio, A., & & Ramsden, P. (1997). The development, validation and application of the Course Experience Questionnaire. Studies in Higher Education,. *Studies in Higher Education,*. https://doi.org/10.1080/03075079712331381121

Yılmaz, R., & Karaoğlan Yılmaz, F. G. (2022). Investigation of student views on data privacy and ethical use of data in smart learning environments. *Proceedings of the International İstanbul Scientific Research Congress,* 978–985. https://acikerisim.bartin.edu.tr/handle/11772/6931

Zawacki-Richter, O., Marín, V. I., Bond, M., & & Gouverneur, F. (2019). *Systematic review of*

research on artificial intelligence applications in higher education – where are the educators? International Journal of Educational Technology in Higher Education, 16(1),. 16(1). https://doi.org/10.1186/s41239-019-0171-0

Zhai, X. (2022). Exploring students over-reliance on AI-generated content in higher education. *Smart Learning Environments,* 9(1), 1-14. https://doi.org/10.1186/s40561-022-00185-5

Zhoc, K. C. H., Webster, B. J., King, R. B., Li, J. C. H., & & Chung, T. S. H. (2019). Higher education student engagement scale (HESES): Development and psychometric evidence. *Research in Higher Education*. https://doi.org/10.1007/s11162-018-9510-6

Zimmerman, B. J. (2002). *Becoming a self-regulated learner: An overview. Theory Into Practice,. 41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2