

The Effect of AI Literacy and Differentiated Instruction on Educational Scaffolding in FEB UNJ

Muhamad Al Finsih¹, Christian Wiradendi Wolor², Darma Rika Swaramarinda³

^{1,2,3}Department of Office Administration Education, Universitas Negeri Jakarta, Indonesia

Abstract

This study aims to analyze the impact of the synergy between AI literacy and differentiated instruction on the formation of educational scaffolding at the Faculty of Economics, Universitas Negeri Jakarta. The research employs a quantitative method, collecting data through questionnaires distributed to 10 students from the 2022 cohort across nine different study programs. The collected data is processed using SPSS software to perform descriptive analysis, reliability testing, and regression analysis. The results indicate that AI literacy and differentiated instruction significantly and positively influence the formation of educational scaffolding. These findings suggest that enhancing AI literacy and implementing differentiated instruction can improve concept understanding, student engagement, independent learning, problem-solving skills, academic achievement, and social interaction within the educational environment. This research provides valuable insights for developing more effective educational strategies in the digital era.

Keyword: scaffolding, education, AI literacy

1. Introduction

Literacy is the ability to read, write and understand written information. In a broad context, literacy includes the ability to evaluate and use information from a variety of sources including text, images and digital media. AI (Artificial Intelligence) literacy is the ability to understand, use and interact with artificial intelligence technology. This includes understanding the basic concepts of AI, how algorithms work, and the social and ethical impacts of applying AI in specific fields. AI has become an integral part of life as it is used in a wide range of applications, from virtual assistants, virtual search, quick calculations, to big data analysis. AI literacy is important due to the increasing use of AI in various sectors especially education, the need for new skills to prepare individuals for future job demands, and is a social or ethical impact that allows AI users to better understand and address social issues such as data privacy and algorithm bias.

Differentiation instruction emerges as a response to class diversity. Individuals have different backgrounds, abilities, and interests and uniform instruction is often ineffective. This is due to the diversity of learners regarding learning styles, readiness, and interests, then the different engagement and motivation of learners in initiating learning, and finally the way the instructor pays attention to the needs of each individual to reduce the learning gap between learners.

These two variables are important points that need to be discussed. Faculty of Economics and Business, State University of Jakarta is one of the faculties that compete internationally. Various kinds of international programs are held by the Faculty of Economics and Business, State University of Jakarta such as ISC BEAM (International Students Conference: Business, Economisc, Accounting, and Management), student exchanges to renowned foreign campuses, international webinar programs, international research, and others. All of these require individuals who are competent in the use of AI, both in terms of education personnel, and students. The use of AI at the Faculty of Economics and Business, State University of Jakarta, has penetrated into its citizens. However, has this use led to positive things? Is the learning style or educational differentiation instruction at the Faculty of Economics and Business, Universitas Negeri Jakarta, appropriate?

2. Literature Review

2.1 AI Literacy

Artificial Intelligence Center (2024), AI literacy includes an understanding of different types of AI, such as reactive machines, limited memory, theory of mind, and self-awareness. AI literacy also involves the ability to critically evaluate and use AI technologies. AI literacy includes an understanding of different types of AI and the ability to critically evaluate and use AI technologies. Thus, AI literacy is not only important for the development of technical skills, but also for shaping critical and ethical thinking in the use of AI technologies in various aspects of life.

2.2 Differentiated Instruction

Robert J Marzano (2007), developed a teaching model that emphasizes the importance of varied teaching strategies to improve learners' learning outcomes. Marzano emphasizes the use of formative assessment data to adjust instruction and provide constructive feedback to learners. In conclusion, educational differentiation is a comprehensive and flexible approach

that aims to meet learners' individual learning needs through customizing aspects of instruction.

2.3 Educational Scaffolding

Barbara Rogoff (1990), developed the concept of scaffolding in the context of collaborative learning. According to Rogoff, scaffolding involves interaction between learners and educators where educators provide support that is appropriate to the needs of learners. Rogoff emphasizes the importance of social and cultural context in the scaffolding process.

Ann Brown and Annemarie Palincsar (1989), known as Reciprocal Teaching which is a form of scaffolding where educators and learners take turns leading discussions about the text read. This approach aims to improve learners' reading comprehension through strategies such as summarizing, questioning, clarifying, and predicting.

3. Material and Method

3.1 Design Study

This research was conducted at the Faculty of Economics and Business, State University of Jakarta, over two weeks in October 2024, involving 10 students from the 2022 cohort across nine different study programs, both undergraduate and diploma levels, selected randomly to ensure diverse representation. Data were collected using a Google Forms-based questionnaire (<https://bit.ly/ScaffoldingEducation2024>), designed to measure variables such as AI literacy, differentiation instruction, and the formation of educational scaffolding. The use of Google Forms facilitated online questionnaire completion, simplifying data collection and increasing respondent participation. The collected data were analyzed to obtain relevant results aligned with the research objectives, namely examining the influence of AI literacy synergy and differentiation instruction on the formation of educational scaffolding at the faculty.

3.2 Data Analysis

The data collected through the Google Forms questionnaire will be processed using the Statistical Package for the Social Sciences (SPSS), chosen for its ability to comprehensively analyze data. The data processing begins with data input, where data will be exported from Google Forms into a format compatible with SPSS, such as CSV or Excel. Next, data cleaning will be conducted to ensure there are no errors or missing data. Descriptive analysis will then be performed to describe the basic characteristics of the data, such as frequency distribution, mean, median, and standard deviation. Reliability testing using Cronbach's Alpha will measure the internal consistency of the questionnaire, while validity testing will ensure that the instrument is measuring what it is intended to measure. Finally, inferential analysis such as linear regression, ANOVA, or t-tests will be used to test hypotheses and determine relationships between the variables studied.

4. Result

Correlations

		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
A1	Pearson Correlation	1	.339	.312	.097	.384	.368	.553**	.211	.477*	.113	.211	.209

	Sig. (2-tailed)		.133	.168	.676	.086	.101	.009	.358	.029	.625	.358	.363
	N	21	21	21	21	21	21	21	21	21	21	21	21
A2	Pearson Correlation	.339	1	.325	.350	.411	.424	.463*	.065	.513*	.117	.518*	.223
	Sig. (2-tailed)	.133		.150	.120	.064	.055	.034	.780	.017	.614	.016	.332
	N	21	21	21	21	21	21	21	21	21	21	21	21
A3	Pearson Correlation	.312	.325	1	.168	.225	.346	.130	.309	.087	.359	.382	.358
	Sig. (2-tailed)	.168	.150		.467	.328	.124	.574	.173	.709	.110	.087	.112
	N	21	21	21	21	21	21	21	21	21	21	21	21
A4	Pearson Correlation	.097	.350	.168	1	.421	.297	.045	.273	.334	.037	.546*	.506*
	Sig. (2-tailed)	.676	.120	.467		.057	.191	.848	.231	.139	.875	.010	.019
	N	21	21	21	21	21	21	21	21	21	21	21	21
A5	Pearson Correlation	.384	.411	.225	.421	1	.488*	.369	.402	.780**	-.281	.537*	.126
	Sig. (2-tailed)	.086	.064	.328	.057		.025	.100	.071	.000	.217	.012	.586
	N	21	21	21	21	21	21	21	21	21	21	21	21
A6	Pearson Correlation	.368	.424	.346	.297	.488*	1	.630**	.574**	.404	.055	.412	.206
	Sig. (2-tailed)	.101	.055	.124	.191	.025		.002	.006	.069	.814	.063	.370
	N	21	21	21	21	21	21	21	21	21	21	21	21
A7	Pearson Correlation	.553**	.463*	.130	.045	.369	.630**	1	.362	.372	-.253	.264	.041
	Sig. (2-tailed)	.009	.034	.574	.848	.100	.002		.107	.097	.268	.247	.859
	N	21	21	21	21	21	21	21	21	21	21	21	21
A8	Pearson Correlation	.211	.065	.309	.273	.402	.574**	.362	1	.148	-.268	.069	-.158
	Sig. (2-tailed)	.358	.780	.173	.231	.071	.006	.107		.522	.241	.766	.494
	N	21	21	21	21	21	21	21	21	21	21	21	21
A9	Pearson Correlation	.477*	.513*	.087	.334	.780**	.404	.372	.148	1	-.197	.428	.071

	Sig. (2-tailed)	.029	.017	.709	.139	.000	.069	.097	.522		.392	.053	.759
	N	21	21	21	21	21	21	21	21	21	21	21	21
A10	Pearson Correlation	.113	.117	.359	.037	-.281	.055	-.253	-.268	-.197	1	.011	.338
	Sig. (2-tailed)	.625	.614	.110	.875	.217	.814	.268	.241	.392		.961	.134
	N	21	21	21	21	21	21	21	21	21	21	21	21
A11	Pearson Correlation	.211	.518*	.382	.546*	.537*	.412	.264	.069	.428	.011	1	.395
	Sig. (2-tailed)	.358	.016	.087	.010	.012	.063	.247	.766	.053	.961		.077
	N	21	21	21	21	21	21	21	21	21	21	21	21
A12	Pearson Correlation	.209	.223	.358	.506*	.126	.206	.041	-.158	.071	.338	.395	1
	Sig. (2-tailed)	.363	.332	.112	.019	.586	.370	.859	.494	.759	.134	.077	
	N	21	21	21	21	21	21	21	21	21	21	21	21

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

* . Correlation is significant at the 0.05 level (2-tailed).

Variables Entered/Removed^a

Model	Variables Entered	Variables Removed	Method
1	X2, X1 ^b		Enter

a. Dependent Variable: Y

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.457 ^a	.209	.193	2.860

a. Predictors: (Constant), X2, X1

From these results, the value of the R table listed is 0.457. Meanwhile, the result of the R value is 0.209. From this output, the coefficient of determination (R²) is 0.209, which means that the effect of the independent variables X1 and X2 (AI Literacy and Differentiated Instruction) on the formation of educational scaffolding in FEB UNJ is 20.9% while the remaining 79.1% is influenced by other factors outside the variables X1 and X2.

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	220.343	2	110.172	13.467	.000 ^b
	Residual	834.419	102	8.181		
	Total	1054.762	104			

a. Dependent Variable: Y

b. Predictors: (Constant), X2, X1

Based on the ANOVA results, we can conclude that the synergy of AI literacy (X1) and differentiation instruction (X2) significantly influenced the formation of educational scaffolding (Y). This supports the research objective of demonstrating the importance of AI literacy in helping students understand complex educational concepts, as well as how differentiated instruction plays a role in tailoring learning approaches to students' individual needs.

The significance of the model suggests that these two variables together contribute to creating more effective learning strategies and support the formation of relevant educational scaffolds at the Faculty of Economics and Business, Universitas Negeri Jakarta.

Coefficients^a

Model		Unstandardized		Standardized		Collinearity		
		Coefficients		Coefficients		Statistics		
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	40.915	4.438		9.219	.000		
	X1	.307	.062	.497	4.957	.000	.771	1.297
	X2	-.145	.142	-.102	-1.022	.309	.771	1.297

a. Dependent Variable: Y

Based on the Coefficients table, the analysis results show that the AI Literacy variable (X1) has a positive and significant effect on the formation of educational scaffolding (Y), with a coefficient value $B = 0.307$ and a significance of $p = 0.000$ (smaller than 0.05). This means that every one unit increase in AI literacy will increase education scaffolding formation by 0.307 units, assuming other variables remain constant. This confirms the importance of AI literacy as a factor supporting the formation of educational scaffolding at the Faculty of Economics and Business, State University of Jakarta. On the other hand, the Differentiation Instruction variable (X2) has a coefficient $B = -0.145$ with a significance value of $p = 0.309$, which means that its effect on the formation of educational scaffolding is not significant.

This result indicates that in the context of this study, differentiation instruction may make less meaningful direct contribution to the formation of educational scaffolding than AI literacy.

However, the tolerance (0.771) and VIF (1.297) values indicate that there is no multicollinearity problem between the two independent variables, so the regression model can be considered reliable. Overall, these results highlight that AI literacy plays a key role in supporting more effective learning, while the influence of differentiated instruction requires further study to understand its indirect contribution.

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	X1	X2
1	1	2.993	1.000	.00	.00	.00
	2	.006	23.277	.20	.92	.04
	3	.002	39.345	.80	.08	.95

a. Dependent Variable: Y

These results indicate that there is relatively little indication of multicollinearity between variables X1 (AI Literacy) and X2 (Differentiation Instruction), as the Condition Index is close to 30 on certain dimensions. However, the high tolerance (0.771) and low VIF value (1.297) in the previous table confirm that the level of multicollinearity is not significant enough to affect the stability of the model. In the context of this study, the independent variables can be used simultaneously to evaluate their influence on educational scaffolding without worrying about serious multicollinearity. This reinforces the validity of the analysis that AI literacy contributes significantly, while differentiated instruction may have an indirect influence that needs to be further explored.

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	47.97	53.03	51.38	1.456	105
Std. Predicted Value	-2.342	1.132	.000	1.000	105
Standard Error of Predicted Value	.294	.760	.459	.152	105
Adjusted Predicted Value	47.97	52.95	51.39	1.458	105
Residual	-7.674	3.856	.000	2.833	105
Std. Residual	-2.683	1.348	.000	.990	105

Stud. Residual	-2.698	1.360	-.001	1.001	105	
Deleted Residual	-7.761	3.924	-.005	2.893	105	
Stud. Deleted Residual	-2.786	1.366	-.006	1.014	105	
Mahal. Distance	.109	6.345	1.981	2.014	105	
Cook's Distance	.000	.027	.007	.008	105	
Centered Value	Leverage	.001	.061	.019	.019	105

a. Dependent Variable: Y

The results of the residual statistics show that the regression model used in this study is of good quality. No significant problems such as outliers or overly influential data were found, so the model can be relied upon to analyze the effect of AI literacy and differentiation instruction on the formation of educational scaffolding. The normal distribution of residuals and the stability of the model support the conclusion that the independent variables (X1 and X2) can be used to explain the variability of the dependent variable (Y) with a high degree of reliability. This further strengthens the recommendation to improve AI literacy as a key strategy in supporting the formation of educational scaffolding at the Faculty of Economics and Business, Universitas Negeri Jakarta. There are 3 stages in the measurement model, and the first is to analyze internal consistency. Second, evaluate the validity of the construct. Furthermore, the final step is to determine discriminant validity. The internal consistency value is obtained by assessing Cronbach alpha (CA) and Composite Reliability (CR) values, as shown in Table 2. The recommended value to meet good reliability is above 0.7.

5. Discussion

The results of data analysis show that AI literacy (X1) has a significant influence on the formation of educational scaffolding (Y) at the Faculty of Economics and Business, Universitas Negeri Jakarta, as indicated by the regression coefficient value of 0.307 with a significance level of $p = 0.000$. This confirms that AI literacy plays an important role in supporting the development of more structured and effective learning. In contrast, differentiated instruction (X2) did not show a significant influence on the dependent variable with a significance value of $p = 0.309$, although this variable may make an indirect contribution in supporting more inclusive learning. The overall regression model was judged to be significant based on the results of the ANOVA analysis, with an F value = 13,467 and $p = 0.000$, indicating that the independent variables together were able to explain the variation in the formation of educational scaffolding.

In addition, the statistical analysis of the residuals showed that important assumptions in the regression, such as normality and the absence of multicollinearity, were met. A Condition Index value close to the critical limit in the third dimension (39.345) indicates little multicollinearity, but the high tolerance value (0.771) and low VIF (1.297) confirm that

multicollinearity is not a significant problem in the model. Furthermore, the Residual Statistics analysis shows that the distribution of residuals tends to be normal, with standardized residual values ranging from -2.683 to 1.348. There are no significant outliers or observations that have a large influence on the model, as indicated by the maximum Cook's Distance value of 0.027, which is well below the critical threshold.

These results suggest that the regression model used is reliable for analyzing the influence of AI literacy and differentiated instruction on educational scaffolding. Implicatively, AI literacy needs to be prioritized in curriculum development at the Faculty of Economics and Business, State University of Jakarta, as it is proven to contribute significantly to learning. Meanwhile, differentiated instruction strategies need to be further explored to understand its indirect role in creating an adaptive and inclusive educational environment. The synergistic combination of these two factors is expected to improve the quality of learning and students' readiness to face challenges in the technological era.

6. Conclusion, Implication, and Recommendation

This study shows that AI literacy has a significant influence on the formation of educational scaffolding at the Faculty of Economics and Business, State University of Jakarta, while differentiation instruction does not have a significant impact in the regression model analyzed. The regression model used has met the statistical assumptions, so it can be relied upon to explain the relationship between the research variables. AI literacy proved to be a key factor in supporting more structured and effective learning, thus it needs to be integrated in curriculum development.

Based on the results of the study, faculty are expected to adopt a more structured AI literacy program to support technology-based learning. In addition, educators need to evaluate the implementation of differentiated instruction in more depth, given its potential benefits in creating inclusive and adaptive learning.

Future researchers are advised to expand the sample size and involve students from various batches to obtain more representative results. Future research could also use mixed methods, which combines quantitative and qualitative approaches, to explore more deeply the influence of AI literacy and differentiation instruction on learning. In addition, testing with moderator or mediator variables such as interest in learning or technology support could enrich the analysis.

7. References

- Agusnaya, N., & Nirmala, P. (2024). Skala Literasi AI terhadap Prestasi Belajar Mahasiswa dalam Konteks Pendidikan Level Perguruan tinggi di Era Digital. *Journal of Vocational, Informatics and Computer Education*, 2(2), 103–116. <https://doi.org/10.61220/voice.v2i2.20243>
- Ahmadi, M. R., & Gilakjani, A. P. (2012). Reciprocal Teaching Strategies and Their Impacts on English Reading Comprehension. *Theory & Practice in Language Studies (TPLS)*, 2(10).

- Alkhairi, P., Windarto, A. P., & Wanto, A. (2024). Sosialisasi Pemanfaatan Tool AI dalam Literasi Digital Untuk Pengembangan Kompetensi Siswa. *Jurnal Warta Pengabdian Masyarakat Nusantara*, 2(1), 10–17.
- A'yuni, Q. Q. (2015). Literasi Digital Remaja Di Kota Surabaya (Studi Deskriptif tentang Tingkat Kompetensi Literasi Digital pada Remaja SMP, SMA dan Mahasiswa di Kota Surabaya). *Jurnal Fakultas Ilmu Sosial Dan Ilmu Politik Universitas Airlangga Surabaya*, 4(2), 1–15. <http://journal.unair.ac.id/literasi-digital-remaja-di-kota-surabaya-article-9195-media-136-category-8.html>
- Dasar-Dasar AI: Panduan Pemula* ♪ - Artificial Intelligence Center Indonesia. (n.d.). Retrieved September 18, 2024, from <https://aici-umg.com/article/dasar-dasar-ai-panduan-pemula/>
- Freedman, R. (2015). *Enhanced possibilities for teaching and learning: A whole school approach to incorporating multiple intelligences and differentiated instruction*.
- GS, A. D., Ginantra, N. L. W. S. R., Afriliansyah, T., Wanto, A., & Okprana, H. (2024). Workshop Pemanfaatan AI untuk Meningkatkan Literasi Digital Guru-Guru SMK dalam Proses Pembelajaran di Sekolah. *PaKMas: Jurnal Pengabdian Kepada Masyarakat*, 4(1), 224–233.
- Gunawan, kevin. (2016). *Artificial Intelligence*. 1–11. [https://kc.umn.ac.id/id/eprint/1192/3/BAB II.pdf](https://kc.umn.ac.id/id/eprint/1192/3/BAB%20II.pdf)
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education promises and implications for teaching and learning*. Center for Curriculum Redesign.
- Husni, T. (2013). Memerdekakan Peserta Didik Belajar Melalui Pembelajaran Berdiferensiasi. *Jurnal Pendidikan*, 2(3), 2–5.
- Joseph, S., Thomas, M., Simonette, G., & Ramsook, L. (2013). The Impact of Differentiated Instruction in a Teacher Education Setting: Successes and Challenges. *International Journal of Higher Education*, 2(3), 28–40.
- Kong, S.-C., Cheung, W. M.-Y., & Zhang, G. (2023). Evaluating an artificial intelligence literacy programme for developing university students' conceptual understanding, literacy, empowerment and ethical awareness. *Educational Technology & Society*, 26(1), 16–30.
- Literasi Digital di Era Perkembangan AI, Apa Urgensinya? – BINUS @Kemanggisian*. (n.d.). Retrieved September 18, 2024, from <https://binus.ac.id/kemanggisian/2024/04/06/literasi-digital-di-era-perkembangan-ai-apa-urgensinya/>
- Lukitasari, M., Handhika, J., & Murtafiah, W. (2021). *Model Pembelajaran Berdasarkan Masalah Melalui Digital argumentation (PBM-DA)*. CV. AE MEDIA GRAFIKA.
- Maryani, I., Hasanah, E., & Suyatno, M. P. I. (n.d.). *Pendukung Pembelajaran Berdiferensiasi pada Kurikulum Merdeka*.
- Mbato, C. L. (2024). *Paradigma Pendidikan Memerdekakan: Mentransformasi Arena Mengajar Menjadi Ruang Belajar*. Sanata Dharma University Press.

- Mulyanti, D. (n.d.). *Dr. H. Cece Hidayat, M. Si Dr. Hj. Dety Mulyanti, M. Pd.*
- Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041. <https://doi.org/10.1016/j.caeai.2021.100041>
- Nuri, M., Azzahra, A., & Rachman, I. F. (2024). Membangun Masa Depan yang Terhubung: Pendidikan dan Literasi Digital di Era Revolusi Industri 4.0. *Cendikia: Jurnal Pendidikan Dan Pengajaran*, 2(5).
- Pembelajaran Berdiferensiasi: Manfaat, Ciri, dan Contoh Penerapannya.* (n.d.). Retrieved September 18, 2024, from <https://www.kompas.com/edu/read/2022/09/20/160400771/pembelajaran-berdiferensiasi--manfaat-ciri-dan-contoh-penerapannya>
- Prianto, A. (2024). Implementasi Pembelajaran Berdiferensiasi Berbantuan Program Geogebra Materi Gradien Persamaan Garis Lurus. *Jurnal Didaktika Pendidikan Dasar*, 8(2), 475–492.
- Purwowidodo, A., & Zaini, M. (2023). Teori dan Praktik Model Pembelajaran Berdiferensiasi Implementasi Kurikulum Merdeka Belajar. *Yogyakarta: Penebar Media Pustaka*, 65.
- Redhana, I. W. (n.d.). *PEMBELAJARAN DIGITAL PADA ABAD KE-21.*
- Remian, D. (2019). *Augmenting education: ethical considerations for incorporating artificial intelligence in education.*
- Stolpe, K., & Hallström, J. (2024). Artificial intelligence literacy for technology education. *Computers and Education Open*, 6, 100159.
- Suariqi Diantama. (2023). Pemanfaatan Artificial Inteligent (AI) Dalam Dunia Pendidikan. *DEWANTECH Jurnal Teknologi Pendidikan*, 1(1), 8–14. <https://doi.org/10.61434/dewantech.v1i1.8>
- Subban, P. (2006). Differentiated instruction: A research basis. *International Education Journal*, 7(7), 935–947.
- The Impact of AI on Student Engagement and Performance - Teachflow.AI.* (n.d.). Retrieved September 23, 2024, from <https://teachflow.ai/the-impact-of-ai-on-student-engagement-and-performance/>
- Wass, R., Harland, T., & Mercer, A. (2011). Scaffolding critical thinking in the zone of proximal development. *Higher Education Research & Development*, 30(3), 317–328.
- Widhiasih, L. K. S., Dharmayanti, P. A. P., Pramerta, I. G. P. A., & Arsana, A. A. P. (2022). Scaffolding for teaching literacy: a literature review. *International Journal of Applied Science and Sustainable Development (IJASSD)*, 4(1), 7–13.
- XXI, P. A. (n.d.). *Sebuah Bunga Rampai.*