



Visualizing Abstract Grammar: How Augmented Reality Shapes Student Technology Acceptance in *Nahwu* Instruction

Anisa, Maman Abdurahman, Asep Sopian

Universitas Pendidikan Indonesia, Indonesia

Corresponding E-mail: mamanabdurrahman@upi.edu

Abstract

Nahwu is often considered difficult because the structure of *nahwu* is too theoretical. As a result, students show a low willingness to learn. The integration of Augmented Reality (AR) through Assemblr Edu Web is considered capable of attracting students' attention and increase willingness to learn. So, the aim of this research is to analyze the effect of perceived usefulness (PU) and perceived ease of use (PEOU) of AR on students' willingness to learn. The quantitative explanatory method was utilized in this research with PLS-SEM analysis techniques. This research provides evidence that the construct of PU has a significant effect on willingness to learn with a t-statistic value of 6.406 and a p-value of 0.000. The construct of PEOU has a significant effect on willingness to learn with a t-statistic value of 7.596 and a p-value of 0.000. This implies that when AR is regarded as useful and easy of use, the more students' willingness to learn in *nahwu* learning increases.

Keywords: *augmented reality, willingness to learn, nahwu learning, PLS-SEM*

Introduction

Arabic has a very strategic position in Indonesia, mainly because of its role as the main language in Islamic sources, and a means of communication for supporting diplomatic cooperation with Middle Eastern countries in educational, economic, etc (Al Shlowiy, 2022; Ritonga et al., 2023). Therefore, this is the basis for why Arabic has a special curriculum in Indonesia and is a compulsory subject for educational institutions under the auspices of the Ministry of Religion Affairs (Alwi, 2023; Muradi et al., 2021).

One of the essential components in understanding things related to Arabic, such as classical or contemporary texts, comprehensively and in depth, is mastery of the science of *nahwu* (Arabic syntax) (Mahdizadeh et al., 2021). *nahwu* is seen as a science that functions to correct language errors (*lahn*), with the aim of enabling a person to construct Arabic sentences correctly and at the same time understand their meaning correctly (Anisa & Sopian, 2025; Haris, 2022). And at that time, the experts in grammar formulated the rules of Arabic grammar by studying and analyzing the language used by Arabs who were considered to be very fluent or spoke very well and correctly (Kelly,

2021). However, the reality in the field often shows that *nabwu* is an academic problem for students (Nasution, 2023). *Nabwu* is usually considered complex, abstract, and irrelevant to their needs (Mulyani et al., 2020; Mustofa et al., 2024). This is in line with research in various MTs/SMP (Putri et al., 2025; Rohmawaty & Abidin, 2024; Siregar, 2025), which revealed that most students admitted to having difficulty in understanding the basic concepts of *nabwu*, such as the function of *al-af'âl al-mu`rabât* and other sentence structure patterns. And this is directly proportional to the interview findings demonstrated in the following sentence.

“A common challenge in learning grammar is feelings of boredom and fatigue. This is likely because the material is extensive and perceived as complex.” (*Nabwu* Subject Teacher, MTs 153 Al-Firdaus in on November 10, 2025).

From this explanation, the result of assuming that *nabwu* is difficult is that they often feel it is difficult, tedious, monotonous, and even tend to avoid this subject (Haris, 2022; Kafahulloh & Al Farisi, 2024; Arif et al., 2025; A'yuni & Arifa, 2022). When this happens, students tend to show symptoms of low motivation, such as low learning resistance, self-efficacy, engagement in the learning process, avoidance attitudes towards lessons, and their willingness to learn (Kucukkaragoz & Meylani, 2025; Q. Wang et al., 2020; Azzahra & Junaedi, 2024; Burić et al., 2024; Kassab et al., 2024; A'yuni & Arifa, 2022; Hotifah et al., 2020). In the end, they are more interested in learning languages that are considered easier and closer to their habitual activities (Mulyani et al., 2020).

In addition, the extent of previous studies states that Arabic language learning, including *nabwu*, still uses many traditional methods (Mustofa et al., 2024) such as lectures, questions and answers, imitation, and memorization, without a variety of interactive learning media and tending to be theoretical (Marhana, 2023; Jamil & Sardiyannah, 2020; Afjalurrahmansyah et al., 2025). This condition is in contrast to the traits of today's student generation as digital natives who tend to prefer highly interactive, visual and multisensory learning (Wang et al., 2022).

Therefore, teachers need to review how to design and implement learning. This includes simplifying learning patterns, shifting from complex to simpler ones. Furthermore, today's learning should be digitally literate, especially in 21st-century learning, which demands innovation through technology integration through digital pedagogy. This ensures the learning process remains relevant to current developments and meets students' needs (Hover & Wise, 2022; González-Pérez & Ramírez-Montoya, 2022). Therefore, in this study, researchers propose *nabwu* learning integrated with augmented reality media. The AR learning application was created using Assemblr Edu Web, an AR platform currently widely used in education.

The application of AR in learning is expected to increase students' willingness to learn. When their learning preferences are met with AR, their motivation to learn will increase. This increase in motivation through the application of AR in learning will encourage a willingness to learn (Gorges et al., 2013; Hotifah et al., 2020). However, the impact of AR on willingness to learn is not immediate, but instead mediated by how students perceive the technology in the learning process. In this context, students' perceptions of the usefulness and ease of use of AR are crucial aspects that determine

the effectiveness of its implementation. When AR is perceived as usefulness in aiding understanding and easy to use without causing excessive cognitive load, students tend to exhibit positive attitudes (Huang, 2021), for example, increase willingness to learn. Therefore, in this study, the researcher tested the effect of AR represented by the constructs of PU and PEOU on students' willingness to learn.

This is in line with several studies that AR is often represented by PU and PEOU in SEM. Such as research by Oyman et al. (2022), a study that examined the PU and PEOU of AR, and concluded that AR perceptions (including perceived usefulness and ease of use) influence consumer behavioral intentions to use AR-enabled applications. Meta-Analysis Research by Chang et al. (2022), AR is represented by various constructs, including PU and PEOU. These two factors work together to create positive attitudes (Huang, 2021). Such as the Systematic Review Chang et al. (2025) which states that AR has other positive impacts on other positive things in learning, such as having an effect on learning outcomes as evidenced by academic achievement, motivation, and skill development. Adi et al. (2025)'s reported in their meta-analysis found that AR significantly enhances student learning outcomes, with the overall effect size indicating substantial improvements in academic performance. Therefore, the perceived usefulness of AR can be proven to foster positive student attitudes toward learning, especially, as indicated by an increased willingness to learn in nahwu instruction in this study.

Method

This research method will employ an explanatory quantitative approach. The exogenous (independent) variables in this study consist of two constructs: PU and PEOU, while the endogenous (dependent) variable is willingness to learn. The population in this sample is the eighth-grade students of MTs 153 Al-Firdaus. In this study, the sample size is established in accordance with the 10-times rule proposed by Hair Jr et al. (2017), which states that the minimum sample size in Partial Least Squares-Structural Equation Modeling (PLS-SEM) analysis can be determined using with the highest number of structural relationships targeting a given construct in the model.

So, the minimum required sample size is $10 \times 2 = 20$ samples. However, to increase the accuracy of the analysis and minimize the risk of bias due to too small a sample size, this study involved 60 samples. Furthermore, samples were selected with a convenience sampling technique under a non-probability sampling framework.

The questionnaire distributed to respondents consisted of six items for the PU construct, six items for the PEOU construct, and nine items for the willingness to learn construct. The questionnaires utilized a Likert scale of 1-5. The collected data were subsequently analyzed by utilizing Partial Least Squares-Structural Equation Modeling (PLS-SEM) statistical tests. Convergent validity, discriminant validity, and composite reliability tests were conducted to assess validity and reliability. Convergent validity used outer loadings with a requirement of ≥ 0.70 (Hair Jr et al., 2017). Then the Average Variance Extracted (AVE) value is required be ≥ 0.50 (Shela et al., 2023; Haryono, 2016). Furthermore, the reliability test is declared reliable if the reliability value exceeds

0.70 (Dolinting & Pang, 2022; Hair et al., 2019). Then each effect between variables will be tested using the t-statistic requirement which must have a value of >1.96, a p-value threshold of <0.05 is required.

Result and Discussion

Result

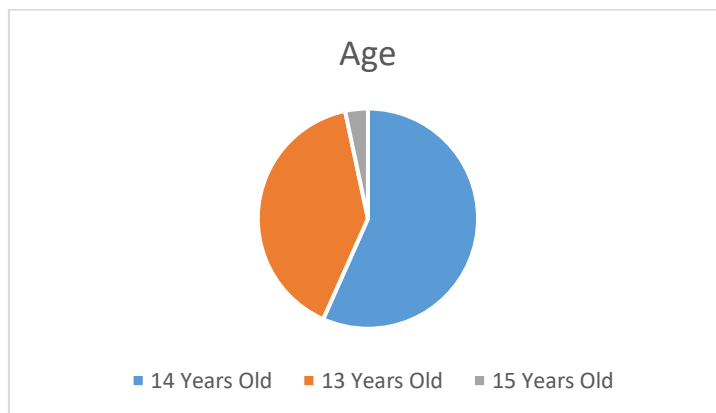


Figure 1. Distribution of Respondents by Age

Based on the figure above, the distribution of research respondents by age shows that the respondents were dominated by students aged 14 years, namely 34 people. This indicates that the majority of the research sample is in that age range, making the 14 years old age group the most representative group in this study. Furthermore, respondents aged 13 years ranked second with a total of 24 people. This condition indicates that respondents aged 13 years also have a significant contribution in compiling research data. Meanwhile, respondents aged 15 years are the group with the smallest number compared to the other two age groups, namely only 2 people. This relatively small number indicates that the participation of students aged 15 years in this study was not too dominant. Overall, the distribution of respondents' ages is in the early adolescent age range and is relatively homogeneous, thus supporting the validity of the research results because the developmental characteristics of respondents are not too diverse in terms of age.

Table 1. Factor Loading Constructs

| Variable | Constructs | Indicators | Factor Loading | Underpinned Theories |
|---------------------------|------------|--|----------------|-----------------------------------|
| Perceived Usefulness (PU) | PU1 | Learning using AR enriches my learning activities in class | 0.918 | (Huang, 2021; Hwang et al., 2013) |
| | PU2 | Learning with AR really helps me in getting new knowledge | 0.941 | |
| | PU3 | The learning mechanism through AR makes the | 0.911 | |

| learning process smoother | | | | |
|------------------------------|-------|---|-------|--------------------------|
| | PU4 | AR helps me get useful information when I need it in learning | 0.931 | |
| | PU5 | Learning using AR helps me learn better | 0.932 | |
| | PU6 | Learning using AR is more useful than traditional learning | 0.911 | |
| Perceived Ease of Use (PEOU) | PEOU1 | The operating system for AR-based learning in the classroom is not difficult for me | 0.942 | |
| | PEOU2 | It only took me a short time to understand how to use AR in learning | 0.914 | |
| | PEOU3 | Learning activities using AR are easy to understand and follow | 0.930 | |
| | PEOU4 | I was quickly able to learn how to use AR in the classroom | 0.932 | |
| | PEOU5 | For me, using an AR-based learning system is not difficult | 0.932 | |
| | PEOU6 | I find the AR system interface is easy to use | 0.940 | |
| Willingness to Learn (WTL) | WTL1 | Plan to learn it in the future | 0.165 | (Darban & Polites, 2016) |
| | WTL2 | | 0.866 | |
| | WTL3 | 0.886 | | |
| | WTL4 | Intend to continue learning it in the future | 0.869 | |
| | WTL5 | | 0.341 | |
| | WTL6 | 0.318 | | |
| | WTL7 | Expect to continue learning it in the future | 0.890 | |
| | WTL8 | | 0.859 | |
| | WTL9 | | 0.876 | |

All indicators have a factor loading value of > 0.70 except WTL1, WTL5, and WTL6. Therefore, the invalid indicators were eliminated. After eliminating the three invalid indicators, all indicators were retested and resulted in the validity of all indicators except WTL1, WTL5, and WTL6. Likewise, discriminant validity met the requirements. To see the details for the validity and reliability tests, it can be seen from the following AVE, composite reliability, Cronbach's Alpha, and rho_A values.

Table 2. Construct Validity and Reliability

| | Cronbach's alpha | Composite reliability (rho_a) | Composite reliability (rho_c) | Average variance extracted (AVE) |
|------------------------------|------------------|-------------------------------|-------------------------------|----------------------------------|
| Perceived Ease of Use | 0.970 | 0.970 | 0.975 | 0.868 |
| Perceived Usefulness | 0.966 | 0.968 | 0.972 | 0.854 |
| Willingness to Learn | 0.941 | 0.942 | 0.953 | 0.772 |

Cronbach's Alpha, Composite Reliability (rho_a), and Composite Reliability (rho_c) values for all constructs were deemed to meet the requirements because they exceeded 0.70. This indicates that these requirements are sufficient to demonstrate the construct's reliability. Likewise, the AVE was considered to meet the requirements because it exceeded 0.50, indicating that each construct met the convergent validity criteria. Therefore, the constructs in this study adequately explained 50% or more of the variance in the measured dimensions.

Table 3. R Square

| | R-square | R-square adjusted |
|-----------------------------|----------|-------------------|
| Willingness to Learn | 0.729 | 0.719 |

Based on the requirements proposed by Ghozali (2021), an R-square value of 0.75 indicates strong model predictive ability. Therefore, based on the table above, 71.9% of the variance in Willingness to Learn can be interpreted by the PU and PEOU variables in the model, thus confirming strong model predictive ability.

Table 4. Standardized Root Mean Square Residual (SRMR)

| Saturated Model | |
|------------------------|-------|
| SRMR | 0.060 |

The Standardized Root Mean Square Residual (SRMR) is used as an indicator to assess the level of model fit by comparing the difference between the observed correlation matrix and the implied correlation matrix. An SRMR value below the 0.10 or 0.08 threshold indicates a good fit for the structural model (Ghozali, 2021). The analysis yielded an SRMR value of 0.060, concluding that the constructed model meets the model fit criteria and is suitable for further analysis.

Table 5. Path Coefficient

| | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (O/STDEV) | P values |
|---|----------------------------|------------------------|-----------------------------------|---------------------------------|-----------------|
| Perceived Ease of Use -> Willingness to Learn | 0.541 | 0.542 | 0.071 | 7.596 | 0.000 |
| Perceived Usefulness -> Willingness to Learn | 0.463 | 0.463 | 0.072 | 6.406 | 0.000 |

Path coefficient analysis was conducted to determine the direction and strength of the correlation between exogenous and endogenous constructs in the structural model. Standardized path coefficient values range from -1 to +1 (Solihin & Ratmono, 2013). Based on the values printed in bold in the table above, the results of the analysis show that the correlation between constructs is positive and relatively strong, as indicated by the correlation value approaching 1. Thus, it can be concluded that the correlation between these constructs has a positive relationship with each other.

The t-statistic value of PU on Willingness to Learn is 6.406, far exceeding 1.96, and the p-value is 0.000, which is smaller than 0.05. Therefore, PU has a significant influence on Willingness to Learn. Likewise, PEOU on Willingness to Learn has a t-statistic value of 7.596, far exceeding 1.96, and the p-value is 0.000, which is smaller than 0.05. Therefore, PEOU has a significant influence on Willingness to Learn.

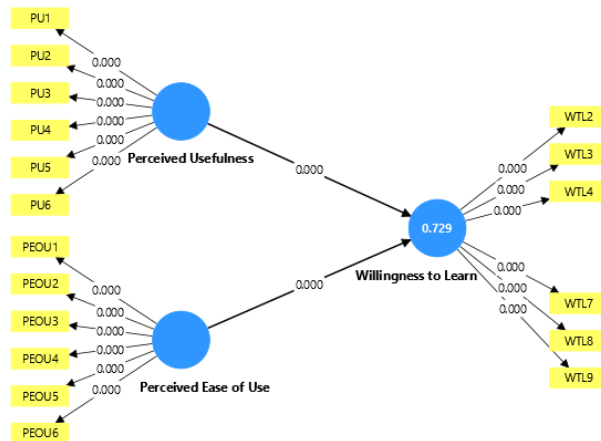


Figure 2. Results of the Structural Model Hypothesis Test

Discussion



Figure 3. Example of Creating Augmented Reality via Assemblr Edu Web

AR is expected to be able to attract attention (Prasetya et al., 2024), because this technology provides an immersive, interactive, and visual learning experience (Singh et al., 2024; Su et al., 2022), so that abstract concepts such as *nahwu* can be understood more concretely (Garlinska et al., 2023). In addition, AR can be relevant to the characteristics of today's students. As an example of Chardonens (2025) research, which shows that Gen Z prefers learning experiences that are personal, dynamic, immersive and interactive. In addition, research by Shorey et al. (2021) in its analysis of Gen Z Health Students explains that learning with visualization meets their learning styles and preferences. And also research by Cosentino et al. (2025) demonstrated that multisensory experiences with interactions through sound, movement, and touch significantly increase engagement and learning outcomes. Therefore, for the PU and PEOU construct analysis, it is hoped that they will also be able to have the same relevance and represent AR itself. The following are the details of the detailed analysis.

First, the perceived usefulness of AR significantly influences willingness to learn, indicating that the more students perceive it as useful and the more AR is optimized for learning, the more likely they are to increase their willingness to learn. This is in line with the immersive nature of AR, which is able to capture students' attention through three-dimensional visualizations integrated with the real environment, resulting in a more contextual and enjoyable (Mendoza-Ramírez et al., 2023; Ebadi & Ashrafabadi, 2022). Not only that, AR is able to realize the visualization of abstract concepts in the form of three-dimensional objects (Singh et al., 2024; Su et al., 2022). Because this technology provides a multisensory learning experience, abstract concepts such as *nahwu* can be understood more concretely (Garlinska et al., 2023). Therefore, according to Prasetya et al. (2024) the use of AR is expected to attract students' attention. This research proves this hope.

This description aligns with research by Oyman et al. (2022), a study that examined the PU and PEOU of AR, and concluded that AR perceptions (including perceived usefulness and ease of use) influence consumer behavioral intentions to use AR-enabled applications. Research conducted by Castaño-Calle et al. (2022) also revealed that students have positive perceptions of the usefulness of AR and VR

technology in learning and teaching activities. These findings confirm that the use of AR and VR is relevant in supporting knowledge delivery and skill development, ultimately shaping positive attitudes toward the use of these technologies. As well as research by Balog & Pribeanu (2010), which stated that the PU of the AR teaching platform (ARTP) can increase behavioral intentions to use the ARTP itself.

Second, the PEOU of AR significantly influences willingness to learn, indicating that the easier it is for students to use AR in learning, the greater their willingness to learn. This is because ease of use is crucial for an application or technology, ensuring students experience ease of use and understand the material presented. In line with Chang et al. (2022) meta-analysis, AR is represented by various constructs, including PU and PEOU. These two factors work together to create positive attitudes (Huang, 2021).

And this is also supported by the Systematic Review Chang et al. (2025) which states that AR has other positive impacts on other positive things in learning, such as having an effect on learning outcomes as evidenced by academic achievement, motivation, and skill development. Adi et al. (2025)'s reported in their meta-analysis found that AR significantly enhances student learning outcomes, with the overall effect size indicating substantial improvements in academic performance. Therefore, the perceived usefulness of AR can be proven to foster positive student attitudes toward learning, especially, as indicated by an increased willingness to learn in nahwu (literary grammar) instruction in this study.

With the above description, with these two things together creating an increase in students' willingness to learn, hopefully other benefits can be felt by students. For example, research by Baghcheghi & Koohestani (2021), showed that Willingness to Learn is a significant predictor of learning achievement, because students who have a strong will to learn tend to be more active, diligent, and focused in participating in the learning process. Furthermore, the concept of willingness aligns with the findings of Hunter & Kivinen (2022), who stated that a person's willingness helps orient and control cognition, motivation, and emotions. This means that students with strong willingness are not only motivated to learn but also able to manage cognitive strategies, maintain focus, and adjust their emotional state to support the achievement of learning goals.

Thus, this study also examines the effect of PU and PEOU of AR on increasing willingness to learn, which is expected to generate other positive impacts, such as positive attitudes among students, particularly on learning outcomes. However, given the limitations of this study, further research is expected to be conducted in greater depth and detail to examine other potential impacts and address any existing shortcomings.

Conclusion

PU and PEOU in AR are the most essential things in measuring the extent to which the application works. Therefore, this study concludes that the two constructs presented, namely perceived usefulness and perceived ease of use, are a representation that AR in nahwu learning can work well, so that it has a significant effect on students'

willingness to learn. This can be seen in the t-statistic value and p-value of PU and PEOU on Willingness to Learn.

Therefore, it can be concluded that students' PU and PEOU of AR play a key role in encouraging the emergence of willingness to learn in learning nahwu. When AR is perceived to be able to help understand the material in a real, relevant, and applicable way, and is easy to operate without causing additional cognitive load, students tend to show a higher willingness to learn. This finding confirms that the success of AR integration in learning is not only determined by the sophistication of the technology alone, but also by how the technology is perceived and directly experienced by students.

REFERENCES

- Adi, N. H., Nelmira, W., Novrita, S. Z., Gusnita, W., Lubis, A. L., & Riyanda, A. R. (2025). Augmented Reality as an Educational Tool: A Meta-Analysis of Its Impact on Student Performance. *TEM Journal*, 14(3).
- Afjalurrahmansyah, A., Assegaf, A. S. W., & Wahyudin, A. (2025). Analisis Kesulitan Siswa MTs dalam Memahami Tata Bahasa Arab “Qawāid.” *JANAH: Jurnal Pendidikan dan Pengajaran*, 2(1).
- Al Shlowiy, A. S. (2022). Language, Religion, and Communication: The Case of Islam and Arabic in the Asia-Pacific. *Journal of Asian Pacific Communication*, 32(2).
- Alwi, A. B. (2023). Perubahan Substansi Kurikulum Bahasa Arab Berdasarkan KMA Nomor 347 Tahun 2022. *Journal of Education Research*, 4(4).
- Anisa, & Sopian, A. (2025). Apakah Nahwu itu Shinā’ah atau Ma’rifah?: Studi Epistemologi. *Shaut Al-Arabiyah*, 13(2).
- Arif, M. S., Az Zafi, A., & Husni, M. W. (2025). The Efektivitas Metode NYAJI (Nyanyi-Ngaji) terhadap Peningkatan Kemampuan Kognitif Siswa Mata Pelajaran Nahwu. *Pekerti: Journal Pendidikan Islam dan Budi Pekerti*, 7(2).
- A’yuni, Q., & Arifa, Z. (2022). How Come Self-Regulated Learning Overcome Speaking Anxiety Arabic Student? *Psychology and Education*, 59(1).
- Azzahra, Z. M. F., & Junaedi, A. (2024). The Relationship Between Learning Environment and Learning Motivation to Natural and Social Sciences Learning Outcomes of The Fourth-Grade Elementary School Students. *Indonesian Journal of Science and Mathematics Education*, 7(2).
- Baghcheghi, N., & Koohestani, H. R. (2021). The Relationship Between The Willingness to Mobile Learning and Educational Achievements in Health-Care Professional Students. *Journal of Education and Health Promotion*, 10.
- Balog, A., & Pribeanu, C. (2010). The Role of Perceived Enjoyment in the Students’ Acceptance of an Augmented Reality Teaching Platform: A Structural Equation Modelling Approach. *Studies in Informatics and Control*, 19(3).

- Burić, I., Jakšić, K., & Balaž, B. (2024). Teacher Self-Efficacy and Teaching Quality: A Three-Wave Longitudinal Investigation. *International journal of psychology*, 59(6).
- Castaño-Calle, R., Jiménez-Vivas, A., Poy Castro, R., Calvo Álvarez, M. I., & Jenaro, C. (2022). Perceived Benefits of Future Teachers on The Usefulness of Virtual and Augmented Reality in The Teaching-Learning Process. *Education Sciences*, 12(12).
- Chang, C.-T., Chao, W.-H., Yang, C.-Y., & Semwaiko, G. S. (2025). Evaluating the Impact of Augmented Reality on Learning Outcomes in K-12 Special Education: A Systematic Review. *European Journal of Educational Research*, 14(4).
- Chang, H.-Y., Binali, T., Liang, J.-C., Chiou, G.-L., Cheng, K.-H., Lee, S. W.-Y., & Tsai, C.-C. (2022). Ten Years of Augmented Reality in Education: A Meta-Analysis of (Quasi-) Experimental Studies to Investigate The Impact. *Computers & Education*, 191.
- Chardonens, S. (2025). Adapting Educational Practices for Generation Z: Integrating Metacognitive Strategies and Artificial Intelligence. *Frontiers in Education*, 10.
- Cosentino, G., Gelsomini, M., Sharma, K., & Giannakos, M. (2025). Students' Experience and Learning Outcomes in Multisensory Environments: The Moderating Role of Interaction Modalities. *Smart Learning Environments*, 12(1).
- Darban, M., & Polites, G. I. (2016). Do Emotions Matter in Technology Training? Exploring Their Effects on Individual Perceptions and Willingness to Learn. *Computers in Human Behavior*, 62.
- Dolinting, P. P., & Pang, V. (2022). Assessing The Validity and Reliability of Adapted Classroom Climates Instrument for Malaysian Rural Schools Using PLS-SEM. *Int. J. Educ. Psychol. Couns*, 7.
- Ebadi, S., & Ashrafabadi, F. (2022). An Exploration into The Impact of Augmented Reality on EFL Learners' Reading Comprehension. *Education and Information Technologies*, 27(7).
- Garlinska, M., Osial, M., Proniewska, K., & Pregowska, A. (2023). The Influence of Emerging Technologies on Distance Education. *Electronics*, 12(7).
- Ghozali, I. (2021). *Partial Least Squares Konsep, Teknik, dan Aplikasi Menggunakan Program SmartPLS 3.2.9 untuk Penelitian Empiris* (3rd ed.). Badan Penerbit Universitas Diponegoro.
- González-Pérez, L. I., & Ramírez-Montoya, M. S. (2022). Components of Education 4.0 in 21st Century Skills Frameworks: Systematic Review. *Sustainability*, 14(3).
- Gorges, J., Schwinger, M., & Kandler, C. (2013). Linking University Students' Willingness to Learn to Their Recollections of Motivation at Secondary School. *Europe's Journal of Psychology*, 9(4).
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to Use and How to Report the Results of PLS-SEM. *European Business Review*, 31(1).

- Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (Second Edition). SAGE Publications.
- Haris, A. (2022). Teaching Reading of Arabic Language in Indonesia: Reconstruction of the Contents and Scope of Nahwu science. *Eurasian Journal of Applied Linguistics*, 8(2).
- Haryono, S. (2016). *Metode SEM untuk Penelitian Manajemen AMOS LISREL PLS: Dilengkapi Tutorial, Mudah untuk Belajar Mandiri*. PT. Intermedia Personalia Utama.
- Hotifah, Y., Suryanto, Hamidah, & Yoenanto, N. H. (2020). Determinant Factors of Willingness to Learn: Systematic Literature Review: *Proceedings of the 1 St International Conference on Information Technology and Education (ICITE 2020)*. 1st International Conference on Information Technology and Education (ICITE 2020), Malang, Indonesia.
- Hover, A., & Wise, T. (2022). Exploring Ways to Create 21st Century Digital Learning Experiences. *Education 3-13*, 50(1).
- Huang, C.-H. (2021). Using PLS-SEM Model to Explore the Influencing Factors of Learning Satisfaction in Blended Learning. *Education Sciences*, 11(5).
- Hunter, C., & Kivinen, N. (2022). *Affect in Organization and Management*. Taylor & Francis.
- Hwang, G. J., Yang, L. H., & Wang, S. Y. A. (2013). Concept Map-Embedded Educational Computer Game for Improving Students' Learning Performance in Natural Science Courses. *Computers & Education*, 69.
- Jamil, H., & Sardiyannah, S. (2020). Eksistensi Metode Qawāid Tarjamah dalam Pembelajaran Bahasa Arab di Era Revolusi 4.0. *Jurnal Naskabi: Jurnal Kajian Pendidikan dan Bahasa Arab*, 2(1).
- Kafahulloh, M., & Al Farisi, M. Z. (2024). Students' Perspectives on the Use of Powtoon Learning Media in Learning Nahwu. *International Journal of Arabic Language Teaching*, 6(01).
- Kassab, S. E., Rathan, R., Taylor, D. C. M., & Hamdy, H. (2024). The Impact of The Educational Environment on Student Engagement and Academic Performance in Health Professions Education. *BMC Medical Education*, 24(1).
- Kelly, T. (2021). *Prophetic Eloquence as Linguistic Precedent: The Philology of Hadīth from Sibawayhi to Al-Farrā'* [Thesis]. The University of Chicago.
- Kucukkaragoz, H., & Meylani, R. (2025). Resistance to Learning: Reasons and Remedies Via A Qualitative Research Synthesis. *Journal of Education and Learning (EduLearn)*, 19(1).

- Mahdizadeh, M. A., Khalili, P., & Bavanpouri, M. (2021). Manhaj Ibn al-Duhan al-Nahw fi Kitabihi Syarh al-Durus fi al-Nahw, Buhuts fi al-Lughah. *Journal of Research in Arabic Language*, 25(13).
- Marhana, M. (2023). Pembelajaran Bahasa Arab di Mts As'adiyah No.33 Babu'e Kabupaten Luwu Utara. *Jurnal Sarjana Ilmu Budaya*, 2(2).
- Mendoza-Ramírez, C. E., Tudon-Martínez, J. C., Félix-Herrán, L. C., Lozoya-Santos, J. D. J., & Vargas-Martínez, A. (2023). Augmented Reality: Survey. *Applied Sciences*, 13(18).
- Mulyani, E. R., Suherdi, D., & Sundayana, W. (2020). Indonesia Islamic Senior High School Students' English Learning Conceptions and Strategies. *Indonesian Journal of Applied Linguistics*, 9(3).
- Muradi, A., Mubarak, F., Permana, F., Hidayat, Y., & Wekke, I. (2021). Revitalization of the Existence of Arabic in Indonesia. *SSRN Electronic Journal*.
- Mustofa, B., Maghfur, T., Kirom, M., & Nurhadi. (2024). Development of Digital Nahwu Material to Improve Reading Skills for Students. *Community Practitioner*, 21(7).
- Nasution, H. S. (2023). *Nahwu Syauqī Dhayf*. UMSU press.
- Oyman, M., Bal, D., & Ozer, S. (2022). Extending The Technology Acceptance Model to Explain How Perceived Augmented Reality Affects Consumers' Perceptions. *Computers in Human Behavior*, 128.
- Prasetya, F., Fortuna, A., Samala, A. D., Rawas, S., Mystakidis, S., Syahril, Waskito, Primawati, Wulansari, R. E., & Kassymova, G. K. (2024). The Impact of Augmented Reality Learning Experiences Based on The Motivational Design Model: A Meta-Analysis. *Social Sciences & Humanities Open*, 10.
- Putri, A. U., Sopian, A., Supriadi, R., Maulani, H., & Alfarizi, M. F. (2025). Learning Obstacles of Al-Af'āl Al-Mu'rabāt Among Madrasah Tsanawiyah Students. *LingTera*, 12(1).
- Ritonga, M., Wahyuni, S., & Novigator, H. (2023). The Future of Arabic Language Learning For Non-Muslims As An Actualization of Wasathiyah Islam in Indonesia. *F1000Research*, 12.
- Rohmawaty, E. N., & Abidin, M. (2024). Effectiveness of *al-Miftah lil 'Ulūm* Method in Improving Understanding of Nahwu MTs Tanwirul Qulub Lamongan. *Thariqah Ilmiyah: Jurnal Ilmu-Ilmu Kependidikan & Bahasa Arab*, 12(1).
- Shela, V., Ramayah, T., Aravindan, K. L., Ahmad, N. H., & Alzahrani, A. I. (2023). Run! This Road Has no Ending! A Systematic Review of PLS-SEM Application in Strategic Management Research Among Developing Nations. *Helvion*, 9(12).

- Shorey, S., Chan, V., Rajendran, P., & Ang, E. (2021). Learning Styles, Preferences and Needs of Generation Z Healthcare Students: Scoping Review. *Nurse Education in Practice*, 57.
- Singh, G., Singh, G., Tuli, N., & Mantri, A. (2024). Hyperspace AR: An Augmented Reality Application to Enhance Spatial Skills and Conceptual Knowledge of Students in Trigonometry. *Multimedia Tools and Applications*, 83(21).
- Siregar, R. S. (2025). Students' Cognitive Difficulties in Mastering the Nahwu Rules: A Descriptive Study at SMP IT Al Farabi Bilingual School. *Jurnal Cendekia Islam Indonesia*, 1(2).
- Solihin, M., & Ratmono, D. (2013). *Analisis SEM-PLS dengan WarPLS 3.0*. Andi Yogyakarta.
- Su, Y.-S., Cheng, H.-W., & Lai, C.-F. (2022). Study of Virtual Reality Immersive Technology Enhanced Mathematics Geometry Learning. *Frontiers in Psychology*, 13.
- Wang, H., Feng, Z., & Ma, J. (2022). On the Foreign Language Teaching Model for Digital Natives. *International Journal of Computational and Engineering*, 7(3).
- Wang, Q., Lee, K. C. S., & Hoque, K. E. (2020). The Effect of Classroom Climate on Academic Motivation Mediated by Academic Self-Efficacy in a Higher Education Institute in China. *International Journal of Learning, Teaching and Educational Research*, 19(8).