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EXPLORING ARTIFICIAL INTELLIGENCE IN ARABIC LANGUAGE LEARNING IN HIGHER EDUCATION

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Abstrak

Penelitian ini mengeksplorasi penerapan Artificial Intelligence (AI) dalam pengembangan konten pembelajaran Bahasa Arab di perguruan tinggi, dengan landasan kerangka konstruktivis. Tujuan utama adalah menganalisis hasil belajar mahasiswa sebelum dan setelah integrasi AI, dengan mempertimbangkan variabel pengganggu seperti usia, jenis kelamin, latar belakang sekolah, dan mata kuliah dasar. Penelitian menggunakan desain eksperimental sejati dengan satu kelompok eksperimen yang terdiri dari mahasiswa Program Studi Bahasa dan Sastra Arab. Instrumen penelitian berupa 11 soal penyusunan kalimat dengan tingkat kesulitan berbeda. Analisis statistik membandingkan skor pretest dan posttest serta menilai signifikansi ($p < 0,05$). Hasil menunjukkan peningkatan keseluruhan pada hasil belajar, dengan peningkatan signifikan pada beberapa soal dan variasi pada soal lain yang membutuhkan interpretasi kontekstual. Alat AI, seperti LingQ, mendukung pembelajaran yang dipersonalisasi, meningkatkan keterlibatan, dan memberikan umpan balik berkelanjutan. Temuan mendukung kombinasi AI dengan pendekatan konstruktivis untuk menciptakan pembelajaran Bahasa Arab yang lebih interaktif, kontekstual, dan etis, sambil menekankan perlindungan privasi, integritas akademik, dan pengurangan bias.

Kata Kunci: Kecerdasan buatan; Kurikulum; Konstruktivisme; Konten pembelajaran

Abstract

This study explores the implementation of Artificial Intelligence (AI) in developing Arabic language learning content in higher education, grounded in a constructivist framework. The main objective was to analyze students' learning outcomes before and after AI integration, considering confounding variables such as age, gender, school background, and foundational courses. A true experimental design with one experimental group was conducted among Arabic Language and Literature students. The instrument included 11 sentence construction tasks with varying difficulty levels. Statistical analysis compared pretest and posttest scores and assessed significance ($p < 0.05$). Results showed overall improvement in learning outcomes, with significant gains in some tasks and variable patterns in others requiring contextual interpretation. AI tools, such as LingQ, facilitated personalized learning, enhanced engagement, and provided continuous feedback. Findings support combining AI with constructivist approaches to create more interactive, contextualized Arabic learning, while emphasizing ethical guidelines, privacy protection, academic integrity, and bias reduction.

Keywords: Artificial intelligence; Curriculum; Constructivism; Learning content



INTRODUCTION

The advent of the Artificial Intelligence (AI) era in the learning process is an inevitability that educational institutions cannot avoid. AI is used in various ways, for example through chatbots and applications that provide fast and easy assistance for the learning process and student services¹. Based on a study conducted at Nobel Indonesia Institute of Technology and Business in 2024, the frequency data show that 71.7% of students use ChatGPT to assist in completing academic assignments². Meanwhile, Cyber University in 2024 demonstrated that regular class students frequently use AI at a rate of 70%, and 80% of students in the work-class (karyawan) program use it; the AI type used is chatbot ChatGPT³. These figures are quite high when compared with students who do not use ChatGPT in completing academic tasks.

However, concerns about the limitations and potential threats of ChatGPT to higher education persist, prompting people to take steps to mitigate the risks⁴. ChatGPT is regarded as a learning aid for students, thereby playing a distinctive role in instructional strategies, although Stojanov's study shows a relatively low correlation between reliance on ChatGPT and student learning outcomes⁵. The use of AI in the teaching and learning process provides fast information and significant benefits; however, excessive use of AI requires serious attention. In relation to critical thinking, research shows a tendency to overly rely on AI can actually weaken students' critical thinking abilities⁶.

Several studies demonstrate that excessive AI usage can negatively affect concentration, reduce critical thinking, and impede creative thinking. Smith 2021 in Faisal found that AI can help students explore analytical thinking competencies, but this finding cannot be generalized to a single study case. Faisal's study included discussions among students where AI was said to slow critical thinking if used excessively. In interviews with students, it was revealed that AI can generate and locate very fast and easy answers, causing students to lack motivation to think

¹ University of Alberta, Canada et al., "Artificial Intelligence and the Student Experience: An Institutional Perspective," *IAFOR Journal of Education* 6, no. 3 (2018): 63–78, <https://DOI.org/10.22492/ije.6.3.04>.

² Aulyah Zakilah Ifani et al., *Analisis Ketergantungan Penggunaan Chat GPT di Kalangan Mahasiswa Menyebabkan Penurunan Kualitas Belajar*, 3, no. 1 (2024).

³ Michael Sitorus and M David Fadillah Murti, "Analisis Pengaruh Penggunaan Artificial Intelligence Pada Pembelajaran di Cyber University," *Jurnal Ilmu Komputer* 1, no. 2 (2024).

⁴ Ting Ma, "Systematically Visualizing ChatGPT Used in Higher Education: Publication Trend, Disciplinary Domains, Research Themes, Adoption and Acceptance," *Computers and Education: Artificial Intelligence* 8 (June 2025): 100336, <https://DOI.org/10.1016/j.caai.2024.100336>.

⁵ Ana Stojanov et al., "University Students' Self-Reported Reliance on ChatGPT for Learning: A Latent Profile Analysis," *Computers and Education: Artificial Intelligence* 6 (June 2024): 100243, <https://DOI.org/10.1016/j.caai.2024.100243>.

⁶ Sitorus and Murti, "Analisis Pengaruh Penggunaan Artificial Intelligence Pada Pembelajaran di Cyber University."

because AI provides all the needed answers ⁷. In line with Carr's research in Harmilawati, addiction to AI can hinder the development of students' independent thinking competencies ⁸

The use of AI, particularly ChatGPT, can be an effective learning tool to enhance student engagement; however, the problem in education today is that students adopt technologies faster than teachers, so teachers must strive to keep pace with students' usage of ChatGPT in the teaching and learning process⁹.). In terms of ChatGPT use in learning processes, data indicate that 70.8% of students are motivated to use ChatGPT on an ongoing basis. This finding suggests that policies and practices governing ChatGPT use must be promptly established in higher education¹⁰.

To maximize benefits and foster AI innovation with academic integrity, AI integration into higher education curricula is needed as a balancing measure to mitigate risks such as technology dependence, social exclusion, data privacy, spread of misinformation, and ethical concerns surrounding AI use, so that students can reap the benefits of AI technology with responsibility. The AI use guidelines in higher education learning specify that leveraging AI in teaching and learning comes with requirements that must be understood by students, lecturers, and stakeholders, upholding the principles of joint ownership, fairness, transparency, and accountability, which pose challenges for academics in utilizing AI in higher education pedagogy. Therefore, research on the Implementation of Artificial Intelligence in the Curriculum: A Study on Developing Arabic Language Learning Content in Higher Education is warranted.

METHOD

This study adopts a quantitative research approach with a True Experimental design. This design is used to control all extraneous variables that could influence the course of the experiment. In this design there is a single group: the experimental group that receives the treatment. The group is given an initial test (pretest) at the start; after the learning phase, the group is given a posttest to determine whether the students' learning outcomes are good or not following the implementation of Artificial Intelligence in the Curriculum for Developing Arabic Language Learning Content. The population consists

⁷ Muhammad Faisal, "Dampak Kecerdasan Buatan (AI) terhadap Pola Pikir Cerdas Mahasiswa di Pontianak," *NUCLEUS* 5, no. 1 (2024): 60–66, <https://DOI.org/10.37010/nuc.v5i1.1684>.

⁸ Harmilawati et al., "Peran Teknologi AI Dalam Pengembangan Kemampuan Berpikir Kritis Mahasiswa," *Prosiding Seminar Nasional Fakultas Tarbiyah dan Ilmu Keguruan IAIN Singai* 3 (October 2024): 26–31, <https://DOI.org/10.47435/sentikjar.v3i0.3134>.

⁹ Yuk Mui Elly Heung and Thomas K.F. Chiu, "How ChatGPT Impacts Student Engagement from a Systematic Review and Meta-Analysis Study," *Computers and Education: Artificial Intelligence* 8 (June 2025): 100361, <https://DOI.org/10.1016/j.caear.2025.100361>.

¹⁰ Nagaletchimee Annamalai et al., "Artificial Intelligence in Higher Education: Modelling Students' Motivation for Continuous Use of ChatGPT Based on a Modified Self-Determination Theory," *Computers and Education: Artificial Intelligence* 8 (June 2025): 100346, <https://DOI.org/10.1016/j.caear.2024.100346>.



of all active students in the Arabic Language and Literature Study Program, Faculty of Ushuluddin and Humanities, UIN Raden Fatah Palembang.

Dependent variable (the variable being influenced) is Students' Learning Outcomes. Independent variable is Artificial Intelligence in the Curriculum for Developing Arabic Language Learning Content. Confounding variables are gender, age, place of origin, and the study program courses. Data collection techniques are divided into two parts: first, administering a questionnaire for the learning outcome measure variable, gender, and age; second, observation to view and assess the implementation of AI in learning. The measurement instrument consists of sentence-construction items referencing previous research with difficulty levels: easy 30%, medium 40%, hard 30%¹¹. The number of questions to be administered to students is 11, with details: 6 questions at medium difficulty, 3 questions at easy difficulty, and 2 questions at hard difficulty.

Data Analysis Plan

Data	Ukuran	Analisa Data
Hasil Belajar Siswa	Proporsi, Mean, Max, Min, Mod, CI, dan SD	Univariat
Pengaruh Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Mean	Uji One Way ANOVA
Pengaruh Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Risk (RR)	Uji Chisquare
Pengaruh Usia Pada Implementasi Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Risk (RR)	Mantel Haenszel
Pengaruh Jenis Kelamin Pada Implementasi Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Risk (RR)	Mantel Haenszel
Pengaruh Asal Daerah Pada Implementasi Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Risk (RR)	Mantel Haenszel

¹¹ Fitrah Dinanti Massofia et al., "Analisis Penyusunan Soal Maharah Istima' dan Maharah Qiraah Kelas VII MTs Al-Hikmah Purwoasri," *Lughati Jurnal Pendidikan Bahasa Arab*, Volume 2 (No. 02), Desember 2024, no. Volume 2 (No. 02), Desember 2024 (2024).

Pengaruh Asal Sekolah Pada Implemenatai Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Risk (RR)	Mantel Haenzel
Pengaruh Mata Kuliah Program Studi Pada Implemenatai Artificial Intelligence dalam Kurikulum Pengembangan Konten Pembelajaran Bahasa Arab terhadap Hasil Belajar Siswa	Perbedaan Risk (RR)	Mantel Haenzel

RESULT AND DISCUSSION

CONSTRUCTIVISM IN ARABIC LEARNING

Constructivist learning is an approach that focuses on how concepts are formed by learners through the ability to reason and integrate various components that can be measured and known relatively, in order to deepen true knowledge¹². Constructivist learning theory is a theory that emphasizes that humans are given the freedom to learn or seek their own needs. Through facilitation from others, individuals are encouraged to be active in discovering and understanding those desires or needs. Thus, this theory asserts the importance of human activity in the learning process to obtain competencies, knowledge, technology, and other things needed for self-development¹³. In the framework of constructivist philosophy, Vygotsky prefers to call his learning theory social cognition. This approach believes culture is the primary factor that shapes an individual's development. According to Vygotsky, humans are the only beings on Earth whose culture is the product of their own making, and every child develops within a culturally distinctive context for them. Therefore, the development of a child's learning processes is highly influenced by various aspects of their culture, including the family environment culture where they grow up. Vygotsky's view of constructivism stems from his interest in language, as he believes that language is the foundation of the entire developmental process. In addition, Vygotsky studied various fields to broaden his insights and knowledge. From these ideas, Vygotsky developed a paradigm that emphasizes the role of language in a socio-cultural context as a key factor in developmental psychology. For him, language is not only a tool of communication, but also serves as the key in the thinking process and the mental development of the individual through social interaction¹⁴. Implications of constructivist learning theory in education include: (1) the

¹² M. Abdul Hamid et al., "Pengembangan Bahan Ajar Bahasa Arab Berbasis Teori Belajar Konstruktivisme untuk Mahasiswa," *Arabi: Journal of Arabic Studies* 4, no. 1 (2019): 100, <https://DOI.org/10.24865/ajas.v4i1.107>.

¹³ Giry Marhento, "Efektivitas Pembelajaran Kontekstual Dalam Mengajarkan Matematika," *Formatif: Jurnal Ilmiah Pendidikan MIPA* 1, no. 3 (2015), <https://DOI.org/10.30998/formatif.v1i3.73>.

¹⁴ M. Nugroho Adi Saputro and Poetri Leharja Pakpahan, "Mengukur Keefektifan Teori Konstruktivisme Dalam Pembelajaran," *Journal of Education and Instruction (JOEAI)* 4, no. 1 (2021): 24-39, <https://DOI.org/10.31539/joeai.v4i1.2151>.



main goal of education in this approach is to shape individuals who are able to think critically and solve various problems they face; (2) the curriculum is designed in such a way to create conditions that support learners in constructing their own knowledge and skills. This process is often facilitated through group learning that analyzes contextual problems from everyday life; and (3) students are expected to take an active role and be able to find the learning style that best fits their needs and personal characteristics¹⁵.

Score Data Distribution

Tabel 1. Distribution of Student Learning Outcomes Scores: Pretest and Posttest

Variabel	N	Mean	Min	Max	SD
Pretest	25	9.0	22.0	19.760	3.2311
Posttest	25	12.0	29.0	18.920	3.4990

This table presents a summary of statistics for students' learning outcome scores at two evaluation stages: before (Pretest) and after (Posttest) participating in a learning program. The sample size at both stages is the same, N = 25 students. The measured variables are Pretest (before instruction) and Posttest (after instruction). N: the number of observations for each variable is 25. Mean: average pretest score = 9.0 and average posttest score = 12.0 with interpretation: the mean score increased after the intervention, indicating an improvement in learning outcomes on average. In the context of education, AI not only serves as a tool to facilitate and personalize the learning process, but also has the ability to create a more interactive and engaging learning environment. In addition, AI can develop educational simulations and engaging games, giving students the opportunity to explore complex concepts in a safe and interactive environment. These games can adapt the difficulty level based on students' progress, providing the right challenges to keep them engaged and motivated in the learning process¹⁶. Furthermore, AI enables students from different locations to connect in collaborative projects or discussions through this technology-based collaborative platform. Through AI-powered virtual learning spaces, learners can exchange ideas, give each other feedback, and complete group tasks more effectively. Overall, the integration of AI VR/AR creates an educational experience that is not only interactive and engaging, but also strengthens teamwork, problem-solving, and students' critical thinking abilities in realistic and adaptive contexts¹⁷. In addition, AI can also support teachers in giving individual feedback to students within a busy classroom

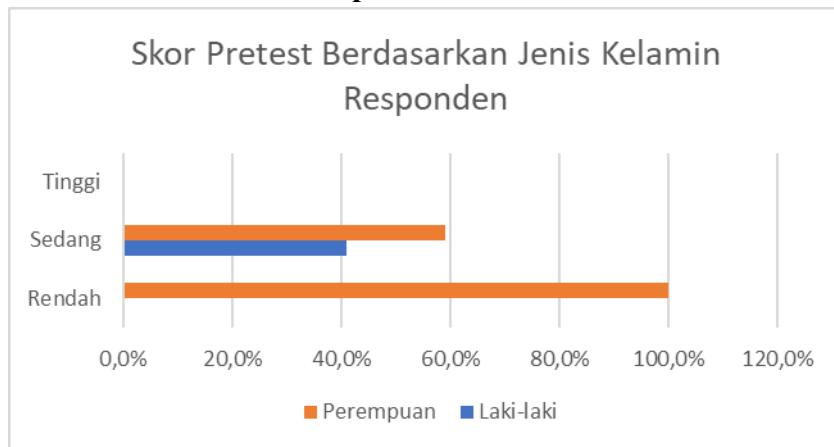
¹⁵Herliani Herliani et al., *Teori Belajar dan Pembelajaran* (Penerbit Lakeisha, 2021), [https://repository.unmul.ac.id/bitstream/handle/123456789/9171/EditTeori%20belajar%20dan%20pembelajaran%20\(danar\)%20Lakeisha.pdf?sequence=1](https://repository.unmul.ac.id/bitstream/handle/123456789/9171/EditTeori%20belajar%20dan%20pembelajaran%20(danar)%20Lakeisha.pdf?sequence=1).

¹⁶ Hindra Kurniawan et al., "Potensi AI Dalam Meningkatkan Kreativitas dan Literasi Dalam Pembelajaran Bahasa Indonesia," *JAMI: Jurnal Ahli Muda Indonesia* 5, no. 1 (2024): 10–17, <https://DOI.org/10.46510/jami.v5i1.285>.

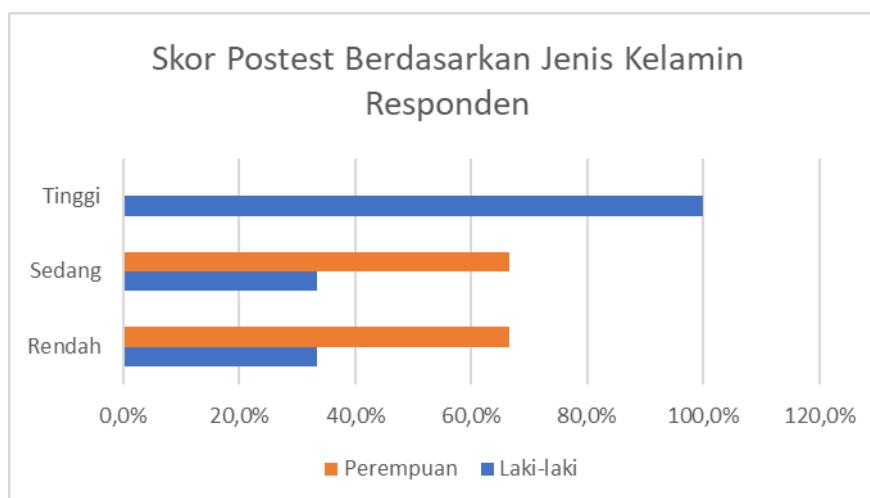
¹⁷ Syarifuddin Tundreng et al., "Strategi Pembelajaran Bahasa Berbantuan Kecerdasan Buatan," *JPPI (Jurnal Penelitian Pendidikan Indonesia)* 9, no. 4 (2023): 626, <https://DOI.org/10.29210/020233183>.

environment, thereby enhancing the quality of interactions between teachers and students in a more personal and effective way¹⁸

Distribution of Pre- and Post-test Learning Outcome Answer Level Categories Based on Respondent Characteristics



The diagram above shows that the female group predominantly showed low scores (100%), while the male group was more likely to be in the medium category, with shorter bar lengths than the female group. Overall, the pretest pattern indicates an initial gender-based learning gap, with females needing to focus on improving their understanding.



This is in line with the study conducted by Syarif et al. on Gender Differences in Knowledge, Attitudes, and Behaviors of Physics Education Students, which demonstrates that the processed data from 22 male respondents and 46 female respondents show that the range of male students' knowledge scores spans from 2.23 to 3.60, with a standard deviation of 0.382. The median is higher than the mean, which is 3.08, so it can be concluded that male students in the Physics Education study program have a knowledge

¹⁸ Joupy G. Z. Mambu et al., "Pemanfaatan Teknologi Artificial Intelligence (AI) Dalam Menghadapi Tantangan Mengajar Guru di Era Digital," *Journal on Education* Volume 06, No. 01, no. eptember-Desember2023 (2023): 2689–98, <https://DOIorg/10.31004/joe.v6i1.3304>.



level in the high category¹⁹. This is at the level of inspecting processes and results; female students are more capable of reaching this level, as can be seen from the precision of their answers. Meanwhile, male students are less meticulous in performing the subtraction matrix calculations²⁰. In the study conducted by Novianti in 2020, it can be concluded that the hypothesis test shows $F_{hitung} = 2.270$ and $F_{tabel} = 1.97$ at a 5% significance level, so F_{hitung} is greater than F_{tabel} . This means there is a significant difference in biology learning outcomes between male and female students at Madrasah Tsanawiyah Negeri 1 Kota Cirebon. Next, a simple effects test was performed to compare the learning outcomes between male and female students. This test result shows $F_{hitung} = 2.597$, which is also greater than $F_{tabel} = 1.97$, indicating that female students' learning outcomes are better than those of male students²¹. There are potential solutions that could help both genders achieve an equal academic level, for example by incorporating more technology into the learning process and including more practical tasks in the academic field²².

In the 2017 study by Budi, differences were found in the processes and outcomes of critical thinking tests between male and female students when teaching transformation geometry was conducted across three parallel classes with the same instructor. Therefore, the following recommendations are made: (a) educators should consider gender differences in learning, particularly when training students' critical thinking; (b) both male and female students should be aided with teaching methods that support the development of critical thinking and with more challenging problem practice so they can develop critical thinking through problem solving across various types of questions; (c) female students require more practice in time management to help them focus on things relevant to the problem; (d) future research could involve different student backgrounds, for example by including other cognitive or affective factors such as socio-cultural factors²³.

Influence Based on Age

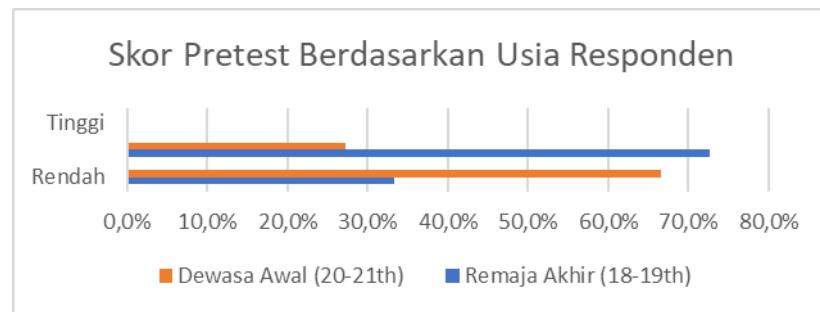
¹⁹ Syarif Barnas and Irwan Muhammad Ridwan, "Perbedaan Gender Dalam Pengetahuan, Sikap dan Perilaku Mahasiswa Pendidikan Fisika," *DIFFRACTION* 1, no. 2 (2019): 34–41, <https://DOI.org/10.37058/diffraction.v1i2.1328>.

²⁰ Widi Lestari et al., "Kemampuan Pemecahan Masalah Matematika Ditinjau dari Perbedaan Gender," *AKSIOMA: Jurnal Program Studi Pendidikan Matematika* 10, no. 2 (2021): 1141, <https://DOI.org/10.24127/ajpm.v10i2.3661>.

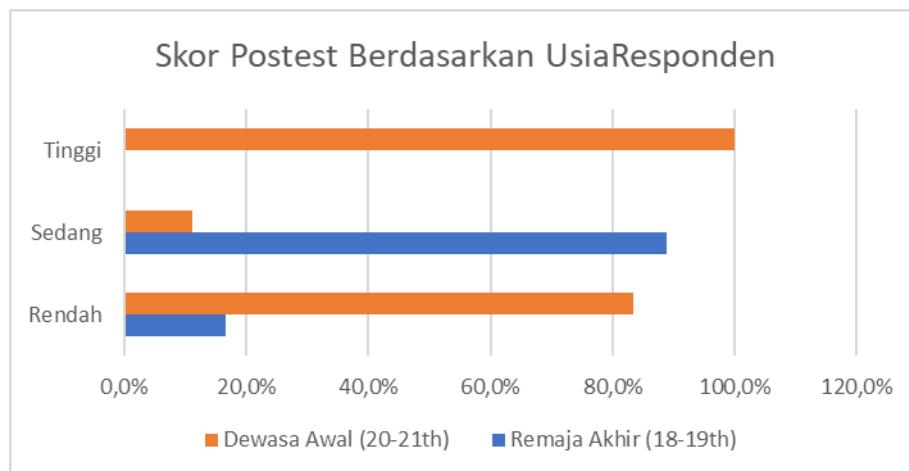
²¹ Novianti Muspiroh, "Perbedaan Hasil Belajar Peserta Didik Berdasarkan Gender pada Mata Pelajaran Biologi," *Equalita* Vol. 2, no. 1 (2020), <http://syekhnurjati.ac.id/jurnal/index.php/equalita/article/view/6441>.

²² Mousa Khaleel, "Female Students Are More Likely to Get Higher Grades than Male Students," *International Journal of Scientific and Research Publications* 7, no. 3 (2017): 378–286.

²³ Budi Cahyono, "Analisis Ketrampilan Berpikir Kritis dalam Memecahkan Masalah Ditinjau Perbedaan Gender," *AKSIOMA: Jurnal Program Studi Pendidikan Matematika* 8, no. 1 (2017).



The diagram above displays pretest scores based on respondents' age, with two age groups: early adulthood (20-21 years old) and late adolescence (18-19 years old). The horizontal axis shows the percentage score (0.0% - 80%) in the pretest diagram. The vertical axis displays the age categories of respondents, which are distinguished by three score levels: high, medium, and low. In the early adult category, low scores are close to 60-70%, indicating a low score in this group; medium scores are short bars around 20-30%; and high scores are invisible or zero. In this pretest, the Late Adolescent group is more likely to be in the Medium category, while Early Adults tend to be in the Low category. This difference indicates variations in initial understanding between age groups.



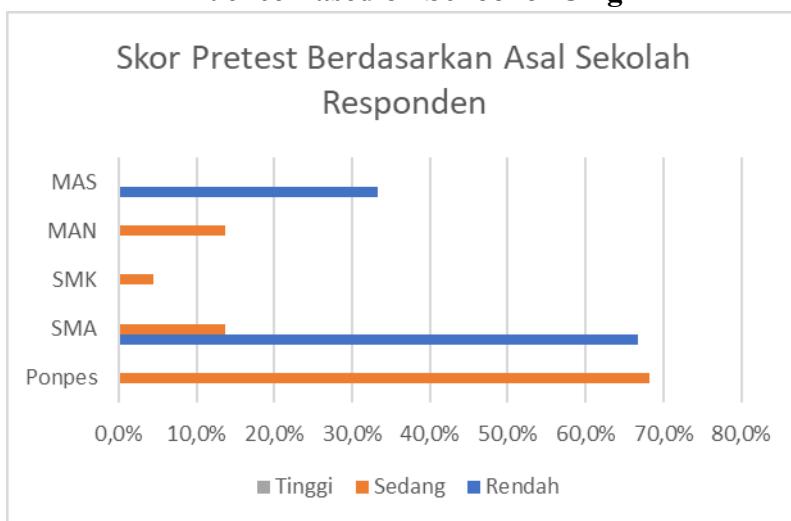
The diagram above shows the posttest scores with the early adult category (20-21 years old) the highest score was obtained in this category with a long bar approaching 100%, a medium score with a fairly small bar and a low score not visible. In the late adolescent category (18-19 years old) the medium score with a long bar is around 60-70%, a low bar score is around 20-30% and a high score is not visible. In the posttest, the Early Adult group showed a significant increase with a large proportion of High, while Late Adolescents were more in the Medium-Low category. In general, the posttest showed an increase in understanding in both age groups, but with different patterns of increase between the two.

Differences between purely cognitive-based IQ tests and tests of general knowledge also influence the magnitude of the effect. Theoretical implications: Age-related cognitive decline is not uniform; some cognitive functions are more resilient. These results support the idea that the process of cognitive aging is a multilayered



phenomenon²⁴. The author proposes that the transition to adulthood is not uniform and involves periods of relative uncertainty, resulting from structural social-economic changes, including the need for longer education, shifts in the labor market, and changes in family norms. EA is considered a distinct developmental phase from late adolescence and conventional young adulthood, with important implications for research, policy, and clinical practice²⁵. Baumeister et al. (2011) in their study titled "Self-esteem and academic achievement: a comparative study on adolescents" state that there is a positive but weak correlation between self-esteem and academic achievement in adolescents. In other words, self-esteem may play a supporting role in academic achievement, but it is not a strong primary predictor²⁶.

Influence Based on School of Origin

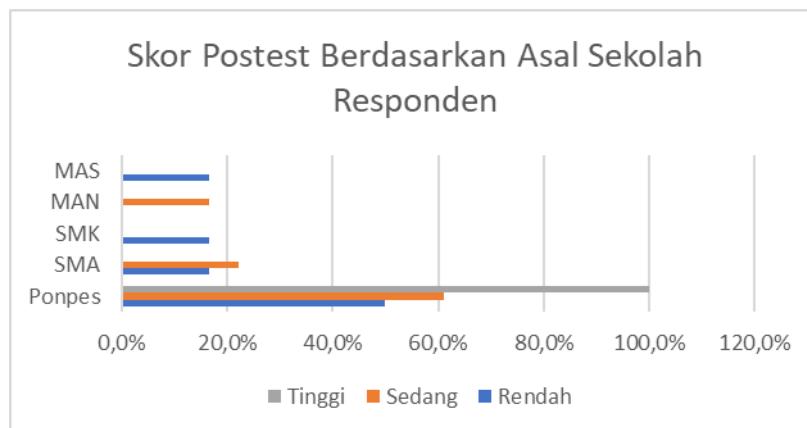


The diagram above displays pretest scores based on respondents' school of origin. The horizontal axis represents the percentage score, while the vertical axis indicates the school/respondent category. In general, many respondents from high schools and Islamic boarding schools fell into the low/medium category. MAS respondents tended to have low scores, while vocational high school respondents also had relatively low scores. The general interpretation indicates a significant variation in initial understanding between schools, with some groups showing a preponderance of low scores.

²⁴ Gary F. Marcus et al., "Infant Rule Learning Facilitated by Speech," *Psychological Science* 18, no. 5 (2007): 387–91, <https://DOI.org/10.1111/j.1467-9280.2007.01910.x>.

²⁵ Jeffrey Jensen Arnett, "Emerging Adulthood: A Theory of Development from the Late Teens through the Twenties," *American Psychologist* 55, no. 5 (2000): 469–80, <https://DOI.org/10.1037/0003-066X.55.5.469>.

²⁶ Margaret Zoller Booth and Jean M. Gerard, "Self-Esteem and Academic Achievement: A Comparative Study of Adolescent Students in England and the United States," *Compare: A Journal of Comparative and International Education* 41, no. 5 (2011): 629–48, <https://DOI.org/10.1080/03057925.2011.566688>.



The diagram above shows that Islamic boarding school origin schools showed a strong increase with a dominance of high scores on the posttest, while respondents from high school schools also showed a diverse distribution of scores with a medium/low tendency, then respondents from MAS, MAN, SMK schools tended to have a dominant medium-low score on the posttest. The presence of posttest score results indicates a consistent increase in understanding in some groups (especially those from Islamic boarding schools) to High. Other groups (SMA, MAN, SMK) showed a variation in scores that were not uniform, with a dominance of Medium and Low in some cases.

The Card paper emphasizes that school quality can serve as a mediator or contextual factor influencing the decision and ability to pursue postgraduate studies, even though Card highlights the economic mechanism through income²⁷. The quality of the origin school can enhance the cognitive readiness and learning competencies required to succeed in higher education, thereby influencing the probability of applying to and completing further study. Selection into higher-quality schools is often correlated with unobserved characteristics (e.g., family support environment or learning culture), so the increased likelihood of continuing studies can be perceived as the result of a combination of school-related and non-school factors²⁸. The effect of secondary school quality on the continuation of studies can be mediated through factors such as academic achievement, college readiness, and expectations regarding further education. Policy implications often emphasize improving overall secondary school quality as a means to broaden access to and success in higher education, not only for social justice reasons but also for the purpose of elevating national educational outcomes²⁹.

An additional challenge students face academically is stress and anxiety about making mistakes when completing tasks. Self-efficacy (one's belief in their own abilities) is a crucial strategy that motivates individuals to become more confident. Presentations and exams are additional factors that increase stress and erode self-confidence due to the

²⁷ David Card, *The Causal Effect of Education on Earnings* (Berkeley, 1998), <http://cle.berkeley.edu/wp/wp2.pdf>.

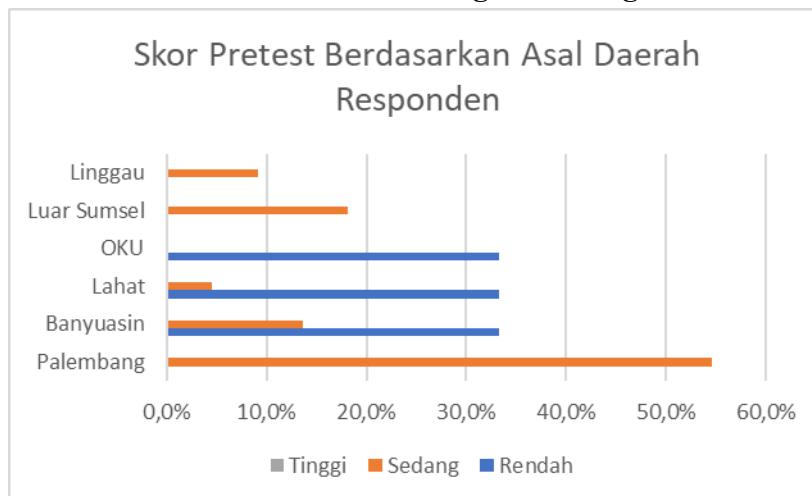
²⁸ Reardon Sean, F, "The Widening Academic Achievement Gap between the Rich and the Poor," *Educational Researcher* 40, no. 5 (2011): 312–23, <https://DOI.org/10.3102/0013189X11430818>.

²⁹ P Gleason, *The Influence of High School Quality on College Success* (Center for Education Policy, 2006).



fear of embarrassment in front of the class. Developing self-efficacy and communication skills can enhance their progress³⁰. The transition from secondary school to university is a key milestone in a person's life. This transition period allows individuals to face changes physically, mentally, emotionally, and spiritually; all experienced largely on their own. Recognizing the importance of stress for mental health, it is crucial to prioritize student well-being and provide an appropriate support system to ensure their overall success and happiness³¹.

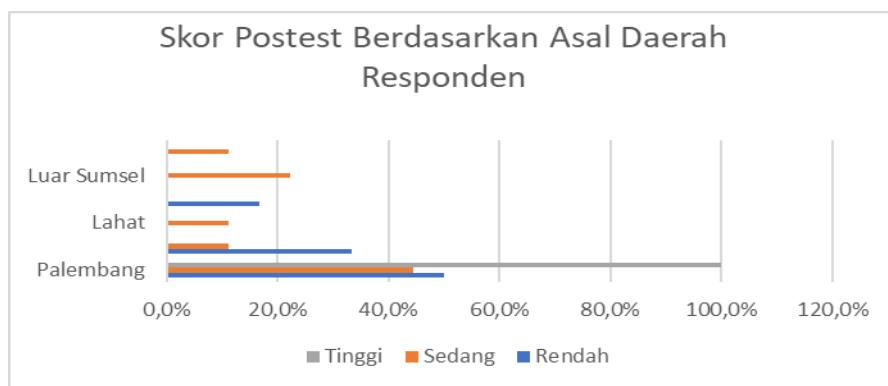
Influence Based on Region of Origin



This diagram shows that Regions/respondents (from top to bottom): Linggau, Outside South Sumatra, OKU, Lahat, Banyuasin, Palembang Bar pattern per region: Linggau: High is almost invisible; Medium is relatively small; Low is not dominant. Outside South Sumatra: Medium is quite dominant (long bar), Low is also quite large compared to High. OKU: Low is dominant (blue bar is quite long); Medium is also present; High is not visible. Lahat: Low is quite long; Medium is also visible; High is not dominant. Banyuasin: Low is quite long; Medium is also significant; High is not visible dominant. Palembang: Low is very dominant (blue bar is long), Medium is also long; High is not visible. The pretest shows large variations between regions. In general, some regions display a dominance of Low or Medium scores, while High scores are relatively low in almost all regions.

³⁰ K. Jeyagowri and M. Ilankumaran, "The Role of Students in Transition from School to College: Different Challenges in Elt," *International Journal of Engineering & Technology* 7, no. 4.36 (2018): 630–35, <https://DOI.org/10.14419/ijet.v7i4.36.24213>.

³¹ Udksha Dangi and Swarn Mittal, "Transition of Students from School to College," *International Journal of Humanities and Social Science Invention* 12, no. 6 (2023): 153–59.



The diagram above displays the Regions/respondents (from top to bottom): Linggau, Outside South Sumatra, OKU, Lahat, Banyuasin, Palembang. The bar pattern per region is: Linggau: Medium is relatively small; High is not visible; Low is also not dominant. Outside South Sumatra: Medium is quite large; Low is also present; High is not seen as dominant. OKU: Low is visible (blue bar is quite short); Medium is also present; High is not seen as dominant. Lahat: Medium is visible (orange bar); Low is also present. Banyuasin: Medium is quite large; Low is present; High is not seen as dominant. Palembang: High (grey) dominates almost 100%, followed by Medium and Low to a lesser extent. The posttest shows a significant increase for Palembang, with a dominant High score. Other regions show more varied increases, often still dominated by Medium or Low. The pretest shows initial variation between regions, some regions tend towards Low/Medium scores, while High is relatively low in general. The posttest shows a stronger upward trend in Palembang (High dominates), while other regions show more limited increases with a Medium/Low pattern still dominant.

The analysis results clearly indicate that the existing inequities do not arise spontaneously but are triggered by a series of significant differences across multiple dimensions. These challenges include uneven budget distribution across regions, as well as obstacles in monitoring and evaluating policy implementation, making these barriers persistent impediments to achieving equitable education quality. Therefore, a more comprehensive approach is needed, along with greater collaboration among stakeholders and sustained efforts capable of reaching all corners of Indonesia if we truly hope to realize nationwide educational quality equity³².

Zahl states that there is a widening spatial inequality in higher education between rural and urban youth. The study shows that differences in access and environmental characteristics between rural and urban areas contribute to an ever-growing education gap, reinforcing patterns of social inequality based on geographic location. In other words, higher education is increasingly concentrated among those from urban environments, while access and participation from rural regions are more limited. This is indicated as a major challenge in achieving educational equity and opening equal

³² Renita Yolanda et al., "Ketimpangan Kualitas Pendidikan Antara Sekolah di Perkotaan dan di Pedesaan," *Edusola: Journal Education* 1, no. 1 (2025), <https://publisherqu.com/index.php/edusola/article/view/2253/2018>.



opportunities for generations from different geographic backgrounds³³. Rojaz further reveals that this study highlights a significant gap in mathematics achievement among secondary school students between urban and rural areas in Peru, with urban students showing a superior performance by 63.28 points after adjusting for socio-economic factors and school contributions. This gap is not only a local issue but reflects a global phenomenon with complex challenges that require a multidimensional approach, including improvements in socio-economic conditions, meeting educational facility needs, and family support to realize educational equity for all children regardless of their geographic location³⁴.

Abamba's study in the IIARD International Journal of Geography & Environmental Management finds that school location—whether urban or rural—has a significant influence on high school students' academic performance in physics in Delta State, Nigeria. Therefore, to improve education in rural areas, there must be improvements in facilities alongside strengthening a conducive learning environment and garnering support from all stakeholders³⁵.

CONCLUSION AND SUGGESTIONS

Effectiveness of AI implementation in the curriculum: Data show an increase in the average learning outcomes scores of students after AI incorporation into the curriculum for developing Arabic language learning content in higher education. In general, the posttest scores are higher than the pretest scores, indicating an enhanced understanding of the material through AI intervention (LingQ as a tool for Arabic language learning intervention).

Differences in responses across confounding variables: Age: Analysis shows variation in pretest scores by age group; late adolescents tend to be at different score levels compared to early adults in several subgroups, but this pattern is not consistent in the posttest. Gender: Several patterns indicate differences in results between males and females on posttest scores in several Courses/Topics, with some indications that AI interventions respond differently by gender in certain contexts. Origin region/school: Pretest shows differences across regions/schools; for example, Palembang tends to have higher posttest scores, but in the posttest regional differences are no longer statistically significant, indicating relatively even benefits from AI implementation.

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³⁴ Raúl Rojas Apaza et al., "Urban-Rural Gap in Education Performance in Peruvian Public Institutions during 2018: An Analysis Using the Oaxaca-Blinder Decomposition," *Frontiers in Education* 9 (August 2024): 1394938, <https://doi.org/10.3389/feduc.2024.1394938>.

³⁵ Diepreye Okodoko and Isaac Micah Owobete, "School Location and Students' Academic Performance in Public Secondary Schools in Bayelsa State," *IIARD International Journal Of Geography And Environmental Management* 11, no. 4 (2025): 37–49.

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