INSIGHTS-JOURNAL OF
LIFE AND SOCIAL SCIENCES

INSIGHTS-JLSS
Insights-Journal of Life and Social Sciences

# LEVERAGING ARTIFICIAL INTELLIGENCE (AI) IN HIGHER EDUCATION: FOSTERING SOFT SKILLS COMMUNICATION, COLLABORATION, CREATIVITY AND CRITICAL THINKING AMONG UNIVERSITY STUDENTS

*Original Article*

**Sajid Hasan[1], Saima Nasreen[2]*, Sahibzada Shamim Ur Rasul[3]**
[1]PhD Education, Literacy & NFBE Department, Punjab, Pakistan.
[2]Lecturer, Institute of Education, University of Sargodha, Pakistan.
[3]Assistant Professor, Institute of Education, University of Sargodha, Pakistan.
**Corresponding Author:** Saima Nasreen, Lecturer, Institute of Education, University of Sargodha, Pakistan. saima.nasreen@uos.edu.pk

Conflict of Interest: None

Grant Support & Financial Support: None

Acknowledgment: The researcher extends gratitude to all participants and academic mentors for their invaluable support in this study.

## ABSTRACT

**Background:** Artificial intelligence (AI) has become a transformative force in higher education, reshaping traditional learning paradigms and fostering essential 21st-century skills. AI-powered tools enhance collaboration, communication, critical thinking, and creativity, equipping students with competencies necessary for academic and professional success. However, concerns regarding over-reliance on AI and its potential limitations in fostering independent ideation persist. This study examines the impact of AI on university students' skill development, identifying both opportunities and challenges in AI-integrated learning environments.

**Objective:** The study aims to investigate the extent to which AI contributes to the enhancement of collaboration, communication, critical thinking, and creativity among university students. It further explores the implications of AI usage on cognitive skill development and the necessity of complementary instructional strategies.

**Methods:** A quantitative research approach with a cross-sectional survey design was employed. A self-developed structured questionnaire, validated through a pilot study (Cronbach's alpha = 0.87), was used for data collection. The sample comprised 300 undergraduate and graduate students from public sector universities in Punjab, selected via stratified random sampling. Data analysis was conducted using t-tests, ANOVA, and multiple regression to determine significant relationships between AI usage and skill development.

**Results:** Significant gender differences were observed in collaboration ($p = .034$) and critical thinking ($p = .006$), with female students scoring higher than males. One-way ANOVA indicated that students with high AI usage had significantly better collaboration ($p = .002$), communication ($p = .007$), and critical thinking skills ($p < .001$) compared to those with low AI exposure. Multiple regression analysis confirmed AI usage as a strong predictor of collaboration ($\beta = .29$, $p < .001$), communication ($\beta = .24$, $p = .005$), and critical thinking ($\beta = .36$, $p < .001$), while its impact on creativity was not statistically significant ($p = .059$).

**Conclusion:** The findings highlight AI's effectiveness in enhancing collaboration, communication, and critical thinking skills, yet its role in fostering creativity remains inconclusive. While AI enriches structured learning experiences, independent ideation requires complementary pedagogical strategies. Institutions should integrate AI responsibly to maximize its benefits while mitigating its limitations.

**Keywords:** Artificial Intelligence, Collaboration, Communication, Creativity, Critical Thinking, Education, Learning.

## INTRODUCTION

Artificial intelligence (AI) is revolutionizing higher education by transforming the way students learn, interact, and acquire essential skills. With the rapid digitalization of education, AI-driven tools are being integrated into learning environments to enhance student engagement, foster collaboration, and develop critical thinking and problem-solving abilities. The increasing reliance on AI in higher education is not merely a matter of technological advancement but a necessity in preparing students for an increasingly competitive and technology-driven world. AI-powered educational applications facilitate adaptive learning, providing personalized instruction, interactive content, and accessible learning materials to optimize student outcomes (1). As institutions embrace AI-driven solutions, the traditional paradigms of teaching and learning are evolving, reshaping the academic experience to become more interactive, flexible, and skill-oriented. Collaboration is a fundamental skill in today's workforce, and AI plays a crucial role in fostering teamwork among students. AI-facilitated collaborative learning platforms enable students to engage in group projects, receive real-time feedback, and enhance their interpersonal interactions through intelligent assessment tools (2). These platforms analyze student participation, performance, and communication patterns, allowing for dynamic adjustments that improve teamwork efficiency. AI applications can also pair students with complementary skills, ensuring well-balanced groups where members can learn from each other and develop their strengths (3). Such AI-driven interventions create a more engaging learning environment by promoting cooperative problem-solving and reinforcing the importance of collaboration in professional and academic settings.

In addition to fostering teamwork, AI is instrumental in enhancing communication skills, which are vital for academic success and professional development. AI-powered language processing tools, virtual tutors, and interactive chatbots support students in refining their verbal and written communication abilities (4). By providing instant feedback on language use, argument structure, and clarity of expression, these tools help students articulate their ideas more effectively (5). AI-driven language learning platforms offer both synchronous and asynchronous interactions, enabling students to engage in discussions, debate ideas, and receive personalized recommendations for improvement. The integration of AI in communication training thus bridges the gap between theoretical knowledge and practical application, equipping students with the skills required for academic discourse and professional success. Critical thinking is another essential competency in higher education, and AI contributes significantly to its development. AI-driven learning analytics, intelligent tutoring systems, and problem-solving platforms offer students structured opportunities to analyze information, evaluate evidence, and formulate reasoned conclusions (6). These tools track learning patterns, identify areas where students need support, and suggest targeted exercises to enhance analytical reasoning. By engaging with AI-enhanced problem-solving scenarios, students refine their ability to question assumptions, assess multiple perspectives, and develop innovative solutions. This interactive learning approach not only strengthens students' critical thinking abilities but also cultivates a mindset of inquiry and intellectual curiosity (7).

Beyond analytical thinking, AI plays a transformative role in fostering creativity. Generative AI models, digital design tools, and content creation applications empower students to explore, experiment, and innovate. AI-assisted platforms facilitate artistic expression, storytelling, and multimedia production by providing students with intelligent suggestions, automated design enhancements, and iterative feedback (8). These creative AI applications encourage students to think outside conventional boundaries, helping them develop resilience and adaptability in problem-solving. By leveraging AI-driven tools, students can enhance their creative portfolios, refine their work based on AI-generated critiques, and cultivate skills that are highly valued in an innovation-driven economy. Despite its numerous benefits, the integration of AI in higher education is not without challenges (9). Concerns regarding privacy, ethics, and digital equity must be addressed to ensure responsible AI adoption. Issues such as algorithmic bias, data security, and the role of educators in AI-mediated learning environments require thoughtful policy considerations (10). Additionally, the evolving role of AI in education necessitates continuous professional development for instructors, enabling them to harness AI tools effectively while maintaining the human element in teaching. Institutions, policymakers, and technology developers must collaborate to create AI frameworks that uphold academic integrity, inclusivity, and transparency. Ethical AI implementation should prioritize student agency, ensuring that technology serves as an enabler rather than a replacement for human intellectual engagement (11).

Looking toward the future, AI is set to play an even greater role in reshaping higher education. Advancements in machine learning, natural language processing, and data analytics will further refine AI-driven learning experiences, making education more adaptive, personalized, and efficient. AI-powered systems will support interdisciplinary collaboration, enabling students from diverse academic backgrounds to work together on complex problem-solving tasks. The continued evolution of AI in education necessitates the development of guidelines and best practices to ensure its responsible and equitable use (12). By integrating AI effectively, institutions can create an educational landscape that fosters critical skills, enhances learning accessibility, and prepares students for success in an increasingly complex global society. Given the transformative impact of AI on higher education, this study aims to examine the role of

 

AI in developing key student competencies, particularly collaboration, communication, critical thinking, and creativity. By analyzing the potential and challenges associated with AI-driven learning environments, this research seeks to provide insights into the effective integration of AI tools in higher education. The objective is to explore how AI can be leveraged to optimize student learning experiences while addressing ethical and practical concerns, ultimately contributing to the advancement of education in a rapidly evolving digital age.

## METHODS

The study employed a quantitative research design to examine the impact of AI-based tools on the development of collaborative, communicative, critical thinking, and creative skills among university students. The research aimed to systematically assess students' perceptions regarding AI's effectiveness in fostering these competencies within higher education learning environments. A structured questionnaire was utilized as the primary data collection instrument, designed to measure students' self-reported experiences with AI-enhanced learning. The questionnaire incorporated Likert-scale items (ranging from 1 = Strongly Disagree to 5 = Strongly Agree) to quantify the extent to which students perceived AI to have influenced their skill development (10). To ensure the reliability of the instrument, Cronbach's alpha was used to assess internal consistency, and the tool was validated through a pilot study conducted with 30 students. Based on the pilot study findings, minor refinements were made to improve clarity and comprehensibility before full-scale data collection. The study population comprised undergraduate and graduate students from various disciplines at public sector universities in Punjab. A stratified random sampling technique was employed to ensure adequate representation across diverse academic programs. Inclusion criteria required students to be actively enrolled in programs where AI-based tools were integrated into the learning process, ensuring relevance to the study objectives. Participants with no exposure to AI-enhanced educational technologies were excluded to maintain the validity of the data. A total of 300 students participated in the study, providing a robust dataset for analysis.

Data collection was conducted through self-administered surveys, ensuring confidentiality and anonymity for all participants. Prior to participation, informed consent was obtained, clearly outlining the study's purpose, voluntary nature, and data protection measures. Ethical approval was secured from Institutional Review Board (IRB) ensuring compliance with research ethics and standards. The collected data were analyzed using various statistical techniques. Descriptive statistics, including means and standard deviations, were used to summarize response trends. Inferential statistical tests, such as t-tests and ANOVA, were applied to determine significant differences among subgroups based on academic disciplines and AI exposure levels. Additionally, correlation and regression analyses were conducted to examine the relationships between AI utilization and skill enhancement. Statistical analysis was performed using SPSS software to ensure accuracy and reliability in interpreting the findings.

## RESULTS

The analysis revealed significant differences in AI usage impact based on gender. A t-test demonstrated that female students exhibited significantly higher scores in collaboration ($M = 3.89$, $SD = 0.85$, $p = .034$) and critical thinking ($M = 3.72$, $SD = 0.79$, $p = .006$) compared to male students ($M = 3.56$, $SD = 0.89$; $M = 3.42$, $SD = 0.84$, respectively). However, no significant gender differences were observed for communication ($p = .102$) and creativity ($p = .329$), indicating comparable performance between male and female students in these domains. A one-way ANOVA test was conducted to examine the impact of AI usage levels (low, moderate, high) on collaboration, communication, critical thinking, and creativity. The analysis indicated statistically significant differences among groups in collaboration ($F = 6.78$, $p = .002$), communication ($F = 5.25$, $p = .007$), and critical thinking ($F = 8.91$, $p < .001$). Post hoc comparisons using Tukey's HSD test confirmed that students with high AI usage demonstrated significantly higher proficiency in these skills compared to those with low or moderate AI usage. However, no significant differences were found for creativity ($p = .094$), suggesting that AI's influence on creative skill development was not as pronounced. This finding aligns with previous research indicating that while AI fosters structured learning and analytical skills, its effect on independent creative ideation remains inconclusive.

A multiple regression analysis further assessed AI usage as a predictor of skill development. AI usage significantly predicted collaboration ($\beta = .29$, $p < .001$), communication ($\beta = .24$, $p = .005$), and critical thinking ($\beta = .36$, $p < .001$), confirming its positive association with these competencies. Although AI usage showed a near-significant relationship with creativity ($p = .059$), it did not reach statistical significance, indicating that factors beyond AI integration may play a role in fostering creativity. Gender was not a significant predictor in the regression model ($p = .152$), reinforcing that AI's influence on skill enhancement is not necessarily gender-dependent. These findings highlight AI's potential in enhancing collaboration, communication, and critical thinking skills among university students, with gender differences emerging in collaboration and critical thinking abilities. Increased AI engagement was

 

consistently linked to higher performance in these domains, reinforcing the value of AI integration in higher education. However, AI's impact on creativity remained inconclusive, suggesting the need for further exploration of its role in fostering independent innovation and original thought.

**Table 1: t-Test Results**

| Variable | Gender | M | SD | t | df | P |
|---|---|---|---|---|---|---|
| Collaboration | Male | 3.56 | 0.89 | 2.13 | 198 | .034* |
| | Female | 3.89 | 0.85 | | | |
| Communication | Male | 3.34 | 0.92 | -1.65 | 198 | .102 |
| | Female | 3.51 | 0.87 | | | |
| Critical Thinking | Male | 3.42 | 0.84 | 2.78 | 198 | .006** |
| | Female | 3.72 | 0.79 | | | |
| Creativity | Male | 3.49 | 0.78 | -0.98 | 198 | .329 |
| | Female | 3.56 | 0.81 | | | |

**Table 2: Results of the ANOVA test**

| Variables | Sum of Squares | Df | Mean Square | F | P |
|---|---|---|---|---|---|
| Collaboration | 4.12 | 198 | 2.06 | 6.78 | .002** |
| Communication | 3.56 | 198 | 1.78 | 5.25 | .007** |
| Critical Thinking | 5.67 | 198 | 2.83 | 8.91 | .001** |
| Creativity | 1.89 | 198 | 0.94 | 2.41 | .094 |

**Table 3: Multiple Regression Results AI usage and 4Cs**

| Variables | B | SE B | B | t | P |
|---|---|---|---|---|---|
| AI Usage (predictor) | 0.45 | 0.11 | .38 | 4.09 | .001** |
| Gender (M/F) | 0.13 | 0.09 | .12 | 1.44 | .152 |
| Collaboration | 0.33 | 0.08 | .29 | 4.13 | .003* |
| Communication | 0.29 | 0.10 | .24 | 2.87 | .005* |
| Critical Thinking | 0.41 | 0.09 | .36 | 4.67 | .002* |
| Creativity | 0.21 | 0.11 | .18 | 1.91 | .059* |

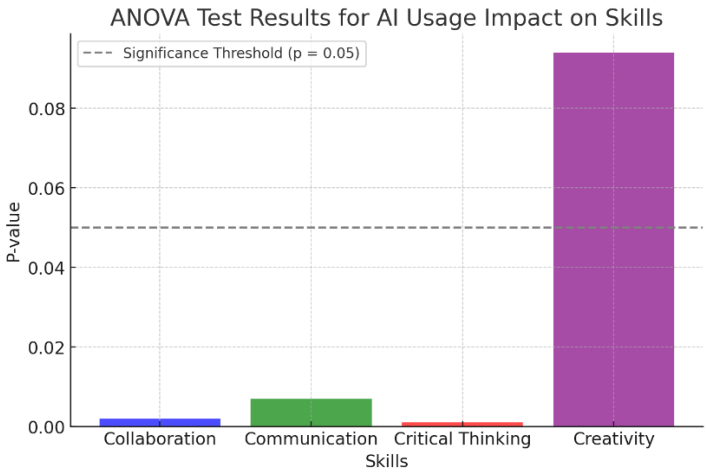


Figure 2 ANOVA Test Result for AI Usage Impact on Skills

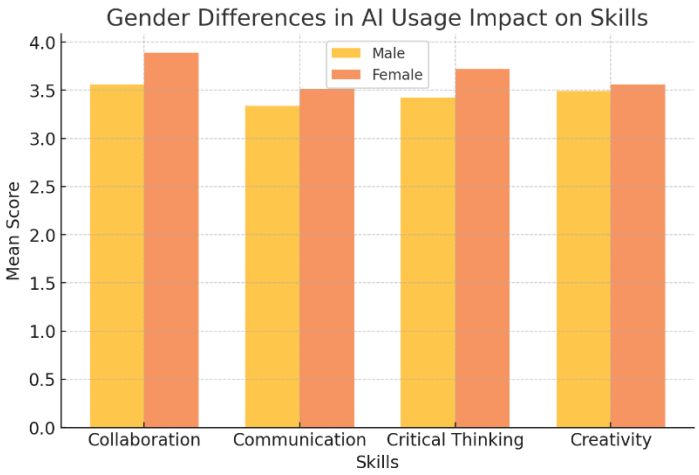


Figure 1 Gender Differences i AI Usage Impact on Skills

## DISCUSSION

The findings of the study highlight the transformative role of artificial intelligence in higher education, particularly in enhancing collaboration, communication, and critical thinking skills. The results indicate that AI-assisted learning environments provide students with structured opportunities to engage in teamwork, express ideas coherently, and develop analytical reasoning. These findings align with prior research that has demonstrated how AI tools facilitate real-time feedback, foster interdependence among learners, and break down barriers to participation in virtual learning spaces (13). The structured nature of AI-based platforms enhances collaborative learning by optimizing group dynamics, reinforcing the importance of teamwork, and promoting efficient communication strategies. AI-driven communication tools further support structured discourse, enabling students to refine their verbal and written communication skills, which are critical for both academic and professional success (14). The study also establishes a strong correlation between AI usage and critical thinking skills, reinforcing previous research that emphasizes AI's role in providing intellectually stimulating challenges. AI-driven learning environments offer adaptive problem-solving exercises and analytical reasoning tasks, pushing students to engage with content more critically (15). These AI-assisted tasks encourage structured analysis and logical reasoning, equipping students with essential competencies required for academic rigor and professional decision-making (16). However, the findings also reveal that AI's impact on creativity is less pronounced. While AI-generated prompts and structured guidance can support creative expression, there is a risk of limiting independent ideation. The nature of AI-based assistance often revolves around predictive modeling and predefined structures, potentially restricting students from exploring unstructured, original thought processes. This aligns with existing literature, which suggests that AI enhances structured skill development but may not be as effective in fostering open-ended creativity (17).

Although the study demonstrates the positive influence of AI on essential academic skills, certain limitations must be acknowledged. The study included participants from diverse academic disciplines, the findings may not be universally generalizable to all higher education settings. The cross-sectional nature of the study further limits the ability to establish causal relationships between AI usage and skill development. Future research should incorporate longitudinal designs to assess the long-term effects of AI on student learning outcomes and skill progression. Furthermore, exploring the differential impact of specific AI tools would provide a more nuanced understanding of how various AI applications contribute to different aspects of learning. The study underscores the need for educational institutions to integrate AI thoughtfully, ensuring that AI tools complement rather than replace traditional pedagogical methods. AI-based platforms should be leveraged to create interactive, collaborative, and intellectually stimulating learning environments while maintaining opportunities for independent thinking (18). Universities should encourage the use of AI-driven virtual environments to enhance teamwork and cognitive development. Additionally, AI-enabled communication tools such as chatbots and discussion forums should be integrated into curricula to support effective discourse and argumentation skills. AI-assisted learning applications designed to enhance critical thinking should be further explored to optimize problem-solving tasks that require higher-order cognitive engagement (19).

 

Given the observed limitations in AI's role in fostering creativity, it is essential to incorporate alternative instructional strategies to complement AI-generated support. Project-based learning, brainstorming sessions, and open-ended assignments should be incorporated alongside AI-assisted learning environments to ensure that students develop independent ideation skills. These approaches can mitigate the risk of over-reliance on AI-generated outputs, fostering originality and divergent thinking. AI should serve as a supplementary tool that enhances, rather than dictates, creative expression (20). Future research should focus on assessing the differential impact of AI tools across various learning contexts and disciplines. Investigating the long-term effects of AI integration on academic performance and skill acquisition would provide deeper insights into its effectiveness. Additionally, research exploring the ethical considerations and cognitive implications of AI-assisted learning would be instrumental in ensuring that AI applications align with educational integrity and student development goals. Addressing concerns such as algorithmic bias, digital equity, and student agency in AI-mediated learning

## CONCLUSION

The findings of this study highlight the significant role of artificial intelligence in enhancing collaboration, communication, and critical thinking among university students, reinforcing its value as a transformative tool in higher education. AI-powered learning environments facilitate interactive and structured engagement, providing students with accessible platforms for teamwork, discourse, and analytical problem-solving. While AI has proven effective in fostering these essential skills, its impact on creativity remains limited, suggesting that independent ideation may require complementary instructional strategies beyond AI-generated assistance. This study underscores the need for a balanced integration of AI with pedagogical approaches that encourage originality and open-ended exploration. The insights gained contribute to the growing understanding of AI's role in shaping modern education, offering practical implications for institutions seeking to optimize learning experiences while addressing the gaps in AI-driven instructional methodologies.

### AUTHOR CONTRIBUTIONS

| Author | Contribution |
|---|---|
| Sajid Hasan | Substantial Contribution to study design, analysis, acquisition of Data<br>Manuscript Writing<br>Has given Final Approval of the version to be published |
| Saima Nasreen* | Substantial Contribution to study design, acquisition and interpretation of Data<br>Critical Review and Manuscript Writing<br>Has given Final Approval of the version to be published |
| Sahibzada Shamim Ur Rasul | Substantial Contribution to acquisition and interpretation of Data<br>Has given Final Approval of the version to be published |

## REFERENCES

1. Chang CY, Jen HJ, Su WS. Trends in artificial intelligence in nursing: Impacts on nursing management. J Nurs Manag. 2022;30(8):3644-53.

2. Wang HH, Wang CA. Teaching design students machine learning to enhance motivation for learning computational thinking skills. Acta Psychol (Amst). 2024;251:104619.

3. Alkahtani BN. The Impact of Artificial Intelligence on Quality of Life for Deaf and Hard of Hearing Students. Am Ann Deaf. 2024;169(4):329-47.

4. Aydınlar A, Mavi A, Kütükçü E, Kırımlı EE, Alış D, Akın A, et al. Awareness and level of digital literacy among students receiving health-based education. BMC Med Educ. 2024;24(1):38.

 

5. Zhou R, He Z, Lu X, Gao Y. Applying Deep Learning in the Training of Communication Design Talents Under University-Industrial Research Collaboration. Front Psychol. 2021;12:742172.

6. Ajani, O. A., Gamede, B. & Matiyenga, T. C. (2025). Leveraging artificial intelligence to enhance teaching and learning in higher education: Promoting quality education and critical engagement. Journal of Pedagogical Sociology and Psychology, 7(1), 54-69.

7. Cerny, M. (2023). Artificial intelligence, creativity and education: finding a new perspective. Journal of Applied Technical and Educational Sciences, 13(3), 1-24.

8. Chen, X., Xie, H., Zou, D., & Hwang, G.-J. (2020). Application and Theory Gaps during the Rise of Artificial Intelligence in Education. Computers and Education: Artificial Intelligence, 1, 1-20.

9. Dwivedi, Y. K. et al. (2021). Artificial Intelligence (AI): Multidisciplinary Perspectives on Emerging Challenges, Opportunities, and Agenda for Research, Practice and Policy. International Journal of Information Management, 57.

10. Hasan, S., Nasreen, S. & Rasul, S. S. (2024b). AI Usage in Education and Mitigation of Abilities: Collaboration, Communication, Critical Thinking and Creativity among University Students. Research Journal of Social Sciences & Economics Review, 5(4), 20-28.

11. Hasan, S., Nasreen, S. &Tasneem, M. (2024a). Impact of Social Media Usage on the Academic Achievements of Undergraduate Students. Research Journal of Social Sciences & Economics Review, 5(3), 68-78.

12. Hasan, S., Nasreen, S., Iqbal, M., & Tasneem, M. (2025). Analysis of the Psychological and Social Factors contributing to the excessive usage of Internet among University Students. Journal of Social Sciences Advancement, 6(1), 19–26.

13. Li, M., & Su, Y. (2020). Evaluation of online teaching quality of basic education based on artificial intelligence. International Journal of Emerging Technologies in Learning, 15(16), 147-161.

14. Lintner, A. (2024). A Case Study on Critical Thinking and Artificial Intelligence in Middle School. The Turkish Online Journal of Educational Technology, 23(4), 1-7.

15. Nasreen, S., & Mirza, N. A. (2023). Effect of Internet Addiction on University Students: Thematic Analysis of Teachers' Perspective. Orient Research Journal of Social Sciences, 8(1), 58–69.

16. Premkumar P. P., Yatigammana, K. & Sampath, K. (2024). Impact of generative AI on critical thinking skills in undergraduates: A systematic review. The Journal of Desk Research Review and Analysis, Vol. 2, Issue 1, 2024, 199-215.

17. Ruiz-Rojas, L. I., Salvador-Ullauri, L. & Acosta-Vargas, P. (2024). Collaborative Working and Critical Thinking: Adoption of Generative Artificial Intelligence Tools in Higher Education. Sustainability, 16(13), 1-28.

18. Slimi, Z. (2023). The Impact of Artificial Intelligence on Higher Education: An Empirical Study. European Journal of Educational Sciences, 1, 17-33.

19. Walter, Y. (2024). Embracing the future of Artificial Intelligence in the classroom: the relevance of AI literacy, prompt engineering, and critical thinking in modern education. International Journal of Educational Technology in Higher Education, 21(1), 1-29.

20. Wongvorachan, T., Lai, K. W., Bulut, O. Tsai, Y. & Chen, G. (2022). Artificial Intelligence: Transforming the Future of Feedback in Education. Journal of Applied Testing Technology, 23(1), 95-116.

 