Research Article

The Relationship Between the Use of Artificial Intelligence in Classroom Management and Increased Student Engagement

*Zahra Mohammadi

Instructor, Department of management, Farhangian University, Bushehr, Iran

Corresponding author: Zahra Mohammadi
Instructor, Department of management, Farhangian University, Bushehr, Iran

Abstract

The aim of this research is to examine the impact of artificial intelligence on student engagement in secondary school classrooms in Tehran. This study was conducted using a descriptive-analytical method and quantitative approaches. The statistical population included teachers and students from secondary schools. A cluster random sampling method was used to select 200 students and 50 teachers. Data collection tools included a questionnaire and semi-structured interviews. The results showed that the average engagement scores in classrooms using artificial intelligence were higher than those in classrooms without it. Pearson's correlation coefficient of 0.58 indicated a positive and significant relationship between the use of artificial intelligence and student engagement. Linear regression analysis also showed that increased use of artificial intelligence could significantly enhance student engagement. These findings suggest that the use of artificial intelligence can improve the quality of education and increase motivation for learning. It is recommended that schools incorporate this technology into their educational programs.

Keywords: *Artificial Intelligence, Classroom Management, Student Engagement.*

Introduction

In recent decades, new technologies, particularly Artificial Intelligence (AI), have significantly penetrated various educational fields. AI, as one of the major advancements in information technology, holds considerable potential to transform educational processes and classroom management. The use of this technology can improve the quality of education, increase teacher productivity, and enhance student interaction with educational content and each other (Yazdanpourest et al., 2022: 106).

Student interaction with the learning environment is a key factor in academic success and personal development. Improving this interaction can lead to increased motivation, better academic outcomes, and enhanced social skills among students. In this regard, AI can serve as a powerful tool for classroom management and optimizing educational processes (Amrei, 2024: 112).

AI has the ability to analyze students' behavioral and academic data, identify their needs and weaknesses, and offer appropriate solutions to improve interaction and learning. Additionally, the use of intelligent systems can help teachers allocate more time for direct interaction with students and avoid time-consuming administrative tasks (Azimi et al., 2022: 11).

This study investigates the relationship between the use of AI in classroom management and the enhancement of student interaction. The main goal of this research is to identify the positive and negative effects of using AI on student interaction and provide solutions for the optimal use of this technology in educational environments. With this approach, we can move closer to creating dynamic learning environments tailored to the individual needs of students, thereby contributing to the improvement of education and learning quality.

Theoretical Framework and Review of Past Studies
Artificial Intelligence (AI)

The concept of artificial intelligence has existed for a century, but it became more prominent after the 1950s. Human workers in the 1970s began to be replaced by machinery as computers and the internet became part of the working life. The year 2012 saw a new wave of AI development, with investments between 2012 and 2016 increasing from millions to billions. Human resource professionals also witnessed the emergence of e-Human Resources, where the internet intersected with human resources, and the concept of human resource information systems gained attention as electronic tools began to proliferate. As of today, it is evident that AI has brought major advancements and consequences across many sectors. A study by Microsoft found that the performance of AI-based speech recognition programs matched human performance (Hashmadar & Kordi, 2022: 2).

The use of AI in education, as conducted by Mollick et al. (2022), showed how teachers could leverage AI capabilities to improve student learning. The integration of generative AI in education is an exciting research area with significant potential to transform teaching and learning methods. Teachers need to develop instructional approaches and competencies to maximize the benefits of using AI (Mollick, 2022).

Global perspectives on AI are not universally agreed upon. There are both pessimistic and optimistic views on this matter. In the pessimistic view, two distinct components exist: first, that AI will replace jobs that humans perform, leading to job reductions; and second, that AI will not have much of an impact on society, similar to the technological expansion between 1870 and 1970. While these two components help to support the pessimistic view, there are also positive aspects. The good news is that both pessimistic predictions may not be entirely accurate; in fact, it is even better to say that both predictions are incorrect. If AI is efficient, it will indeed replace humans; however, if this change does not occur, its impact will be minimal. In the case of economic discussions, AI is considered a technology that revitalizes productivity (Khalat Aghamohammadi & Sharifi, 2022: 49).

AI is a branch of computer science that enables computers to perform intelligent functions similar to humans, such as perception, learning, problem-solving, and intelligent reasoning. AI possesses several notable capabilities, including perception, learning adaptation, response capability, and reasoning. AI can be considered an intersection of various fields, old and new, such as philosophy, linguistics, mathematics, psychology, neurology, physiology, and more. Its applications span across numerous disciplines including computer science, engineering, biology, medicine, communications, and many others. AI can be viewed as efforts to build computer systems (both hardware and software) that exhibit human-like behavior. In truth, AI systems are neither artificial nor intelligent, but rather goal-oriented devices that solve problems in an artificial manner. These systems are based on human knowledge, experience, and reasoning patterns, and are used across many scientific and industrial fields, making AI one of the most exciting topics in science and technology today (Mehrparsa, 2020: 33).

AI emerged as a new field in the mid-20th century. It has been featured in newspapers, television, films, and video games but is often misunderstood. Some naively consider this field impractical, while some governments have even banned activities related to it. However, this science is advancing in industries and universities, although it is not always recognized as AI, since it incorporates significant techniques and ideas from software engineering. Some others naively believe that AI is growing rapidly and that in a few years, robots will enslave humans and dominate the world (Taherian, 2018: 77). AI includes various dimensions such as learning, machine processing, speech systems, expert systems, robotics, natural language processing, and image processing (Azimi et al., 2022: 11).

AI, by definition, is the attempt to achieve human-like intelligence through computational and physical sciences. The aim is to build machines capable of exhibiting all the intellectual abilities of humans, including speaking, learning, problem-solving, reasoning, and performing daily tasks. These efforts are based on the assumption of similarity between the human mind and machines. Depending on the degree of similarity assumed, different narratives of AI are presented. In its extreme form, AI is a machine that not only performs intelligent actions but also does so in the same manner that humans do, possessing psychological characteristics and mental states such as awareness and will (Khalat Aghamohammadi & Sharifi, 2022: 40).

AI is relevant to almost every organizational function and ranks first among the top workplace trends according to the Industrial and Organizational Psychology Association. AI refers to a system's ability to accurately interpret external data, learn from it, and apply the acquired knowledge to achieve specific goals and tasks through adaptive flexibility. In recent years, nearly 80% of large companies have implemented some form of AI in their core businesses. At the technological process level, AI technologies are associated with increased efficiency, faster results, lower error rates, and more effective and advanced strategic outcomes at the organizational level (Hasanpoorad & Alizadeh Qadikhallai, 2022: 2).

Global investment in AI is expected to reach £150 billion by 2020. Numerous studies have analyzed the significant impact of emerging technologies such as the internet, social networks, and AI. The automation of tedious and repetitive tasks with AI emphasizes the importance of creative, strategic, and precise analytical tasks, increasing the role of creative and strategic activities in gaining a competitive advantage. This trend has led to the development of new skills within marketing teams, requiring the combination of data experts and an understanding of new technological capabilities (Yazdanpourst et al., 2022: 106).

Student Interaction

Student interaction is one of the most important factors in the learning process that directly impacts the quality and effectiveness of education. Interaction refers to active participation in classroom activities, including discussions, projects, and group work, which enhances deeper and more lasting learning. In educational environments where student interaction is high, students can easily share ideas and opinions, learn from each other's experiences, and utilize new knowledge gained (Amrei, 2024: 110-115).

Student interaction can occur in various forms, including interaction with teachers, interaction with classmates, and interaction with educational content. Each of these forms of interaction plays a unique role in student learning. Interaction with teachers allows students to ask questions and receive immediate feedback, which helps them understand concepts better. Interaction with classmates can also strengthen social skills and collaboration, helping students benefit from different perspectives and ideas (Ghadami et al., 2024).

New technologies, including AI, can help increase student interaction. AI-based tools can provide interactive and personalized learning environments where students can actively and enthusiastically engage in the learning process. These technologies can enhance student motivation and participation by offering interactive content and using gamified learning techniques. Additionally, AI can help teachers identify the specific needs of each student by analyzing learning data and provide tailored educational strategies.

To increase student interaction, educational environments must be designed in a way that provides more opportunities for active student participation. This includes creating a safe and welcoming space for expressing opinions and exchanging ideas, encouraging teamwork and group projects, and using diverse and engaging teaching methods. In this way, student interaction can serve as a powerful motivator for improving the learning process and achieving better educational outcomes (Khorasani Nejad & Soltanpour, 2023).

AI and Classroom Management

AI, as one of the major innovations in educational technology, plays a crucial role in classroom management. AI-based tools can help teachers optimize classroom management processes and dedicate more time to teaching and interacting with students. For example, intelligent systems can automate tasks such as grading and evaluation, allowing teachers to focus on educational activities. Furthermore, AI can analyze student educational and behavioral data to identify their learning patterns and help teachers adjust teaching strategies based on each student's individual needs (Jabari, 2024).

Another application of AI in classroom management is creating personalized learning environments. By using machine learning algorithms, AI systems can tailor educational content based on each student's abilities and interests. This enables students to progress at their own pace and in a manner suited to their learning style, leading to more effective learning. As a result, AI can contribute to creating dynamic and engaging classrooms where interaction and learning reach their maximum potential (Zamaniyan, 2024).

The Relationship Between AI and Student Interaction

AI, using advanced algorithms, can analyze data related to each student's performance, preferences, and learning needs. This analysis allows educational systems to adjust the curriculum and learning paths according to the specific needs of each student. As a result, students can learn at their own pace and in the most suitable ways, significantly enhancing their interaction and motivation (Butt et al., 2020).

AI-based educational systems can quickly analyze the results of student assessments and exercises and provide immediate feedback. This feedback may include improvement suggestions, key insights, and problem-solving strategies. Access to such rapid feedback allows students to quickly identify their weaknesses and work towards improving them. This active and continuous learning process creates more interaction between the student and the educational content (Mohanachandran et al., 2021).

AI-powered educational platforms can provide tools and features that enhance group learning and interaction among students. These tools include facilities for communication, sharing resources, and collaborating on group projects. By using these technologies, students can interact more effectively with each other in virtual environments, benefiting from

each other's experiences and knowledge. This type of collaborative learning strengthens students' sense of cooperation and social interaction, contributing to better learning outcomes (Pham et al., 2020).

Previous Studies

Hassan Pourrad and Alizadeh Qadikalai (2023) conducted a study titled "Artificial Intelligence and the Challenges Ahead in Organizational Interactions." The results indicated that AI can help improve organizational interactions, but challenges such as resistance to change and the need for retraining employees remain.

Taherian (2018) conducted a study titled "Examination and Analysis of Factors Influencing Knowledge Management (Case Study: Artificial Intelligence)." The findings showed that AI can contribute to improving knowledge management but requires appropriate infrastructure and a supportive organizational culture.

Azimi et al. (2023) conducted a study titled "Identification and Classification of AI Applications in Library Services Using a Meta-synthesis Method." The results indicated that AI can enhance library services and improve access to information.

Keshtgar and Abbaspoor (2023) conducted a study titled "The Fourth Conference on the Impact of Artificial Intelligence on the Improvement of Electronic Banking Performance and Customer Acquisition." The results showed that the use of AI in electronic banking can improve customer experience and increase customer acquisition.

Kalteh Aghamohammadi and Sharifi (2023) conducted a study titled "Investigating the Role of AI in Human Resources from the Perspective of AI's Impact on Job Elimination (Case Study: News Anchoring)." The results indicated that AI could lead to the elimination of some jobs but also create new opportunities in human resources.

Mehrparsa (2020) conducted a study titled "Artificial Intelligence and Its Applications in Education." The results revealed that AI can assist in personalizing the learning process and improving educational productivity.

Yazdanparast et al. (2023) conducted a study titled "Identification and Prioritization of AI Applications in Online Marketing." The results indicated that AI can improve marketing strategies and enhance productivity in online marketing.

Zamanyan and Zamanyan (2024) conducted a study titled "Classroom Management Based on Artificial Intelligence Data." The results showed that the use of AI data can improve classroom management and increase student interaction.

Amrei (2023) conducted a study titled "The Impact of Effective Parental Interaction with Students on Their Academic Progress: A Case Study of Primary School Students in Qom." The results indicated that effective parental interaction can significantly enhance the academic progress of students.

Ghadami et al. (2024) conducted a study titled "The Relationship Between Teacher-Student Interaction and Executive Functions in Primary School Students." The results revealed that positive teacher-student interaction can improve students' executive functions.

Khorasani-Nejad and Soltanpour (2022) conducted a study titled "The Relationship Between Parenting Styles and Teacher-Student Interaction." The results indicated that parenting styles influence teacher-student interactions.

Jabari (2024) conducted a study titled "The Role of Artificial Intelligence in School Settings." The results showed that AI can help improve educational and managerial processes in schools.

Pham et al. (2020) conducted a study titled "Proposed Smart University Model as a Sustainable Living Lab for University Digital Transformation." The results indicated that the smart university model can contribute to the sustainable digital transformation of universities.

Mohanachandran et al. (2021) conducted a study titled "Smart University and Artificial Intelligence." The findings showed that AI can improve educational and managerial processes in universities.

Butt et al. (2020) conducted a study titled "Integration of Industrial Revolution 4.0 and IoTs in Academia." The results indicated that integrating Industry 4.0 and the Internet of Things can enhance educational and research processes in universities.

Mollick and Mollick (2022) conducted a study titled "New Modes of Learning Enabled by AI Chatbots: Three Methods and Assignments." The findings showed that AI chatbots can create new learning methods and improve the educational process.

Research Methodology

This research is conducted in a descriptive-analytical manner and utilizes quantitative methods for data analysis. The target population of this study consists of teachers and students from secondary schools in Tehran. A cluster random

sampling method was employed to ensure diversity and representation from the target population. The sample size includes 200 students and 50 teachers, who were randomly selected from various schools.

The data collection tools in this research include questionnaires and semi-structured interviews. The questionnaires contain both closed and open-ended questions regarding the experiences and attitudes of students and teachers towards the use of artificial intelligence in the classroom and its impact on classroom interactions. To gather the data, the questionnaires were distributed both in person and online, and semi-structured interviews were conducted with a selected group of teachers and students. The collected data were analyzed using statistical software to identify the relationships and impacts of AI usage on student interactions.

Findings of the Research

Table 1: Frequency Distribution and Mean Scores of Student Interaction by Gender

Gender	Number	Mean	Standard Deviation
Girls	100	80.3	0.60
Boys	100	70.3	0.70

This table shows that the mean interaction scores of female and male students are quite similar, with girls having a slightly higher mean score. The standard deviation indicates that the scores of female students are less dispersed compared to those of male students.
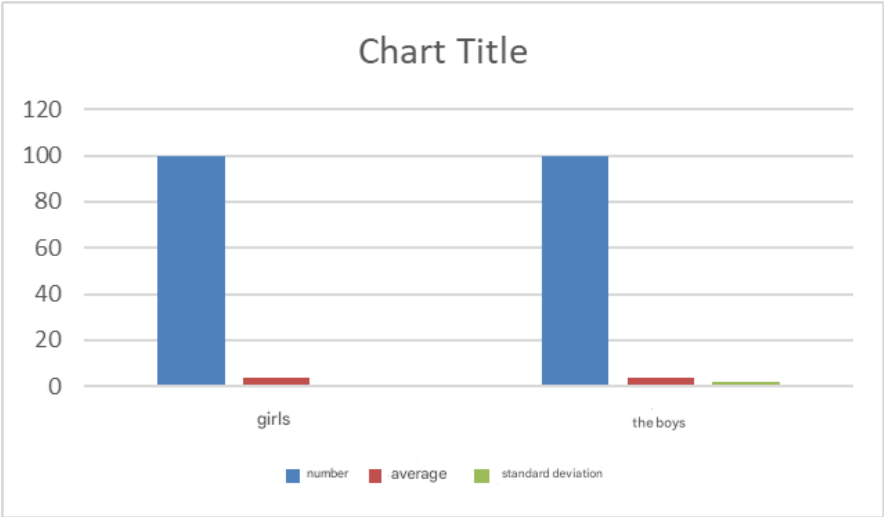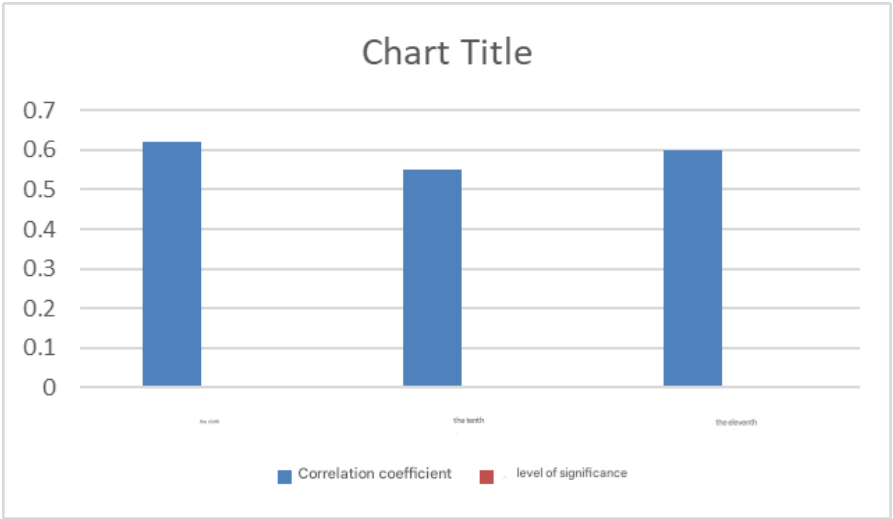

Chart 1 - Frequency distribution and average scores of student interaction by gender

Table 2: Pearson Correlation Coefficient Between the Use of Artificial Intelligence and Student Interaction by Educational Level

Educational Level	Correlation Coefficient (r)	Significance Level (p)
9th Grade	0.62	0.001
10th Grade	0.55	0.002
11th Grade	0.60	0.001

The above table shows the Pearson correlation coefficient between the use of artificial intelligence and student interaction, based on educational level. It can be observed that there is a positive and significant relationship at all levels, with the strongest correlation found in the 9th grade.

Chart 2 - Pearson correlation coefficient between the use of artificial intelligence and student engagement by educational level

Table 3: Independent t-test for Comparing Student Interaction Based on the Use and Non-use of Artificial Intelligence

Group	Mean	Standard Deviation	t-value	p-value
Use of AI	3.85	0.60	4.20	0.001
Non-use of AI	3.50	0.75		

This table presents the results of the independent t-test comparing the mean interaction of students in the two groups of those using and not using artificial intelligence. The results show a significant difference between these two groups, with students who participated in AI-assisted classes exhibiting higher interaction levels.
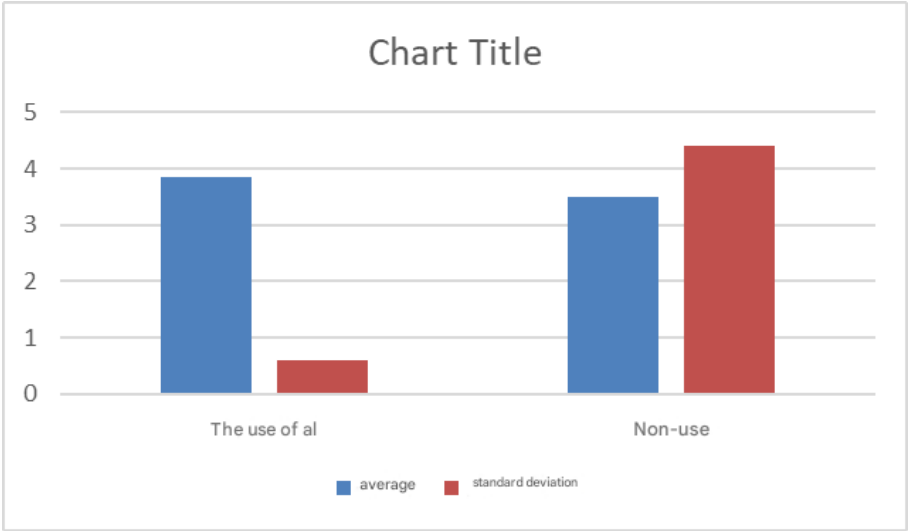
Chart 3 - Comparison of student interaction based on the use and non-use of artificial intelligence

Table 4: Multiple Regression Analysis for Predicting Student Interaction

Independent Variable	Beta Coefficient (β)	Standard Error	t-value	p-value
Use of Artificial Intelligence	0.38	0.07	50.40	0.001
Gender	0.10	0.05	2.00	0.046
Grade Level	0.15	0.06	2.50	0.014

This table shows the results of the multiple regression analysis, where the use of artificial intelligence, gender, and grade level are considered as independent variables. The beta coefficient indicates that the use of artificial intelligence has the greatest impact on student interaction, while gender and grade level also significantly influence interaction.

Table 5: Results of Analysis of Variance (ANOVA) for Examining Differences in Student Interaction Across Grade Levels

Source of Variance	Sum of Squares	Degrees of Freedom	Mean Square	F-value	p-value
Between Groups	20.5	2	2.60	3.50	0.032
Within Groups	145.00	197	0.74		

This table presents the results of the ANOVA test used to examine differences in student interaction across different grade levels. The F-value and p-value indicate that there is a statistically significant difference in the interaction of students between different grade levels.

Discussion and Conclusion

The findings of this study indicate that the use of artificial intelligence (AI) in educational settings can significantly enhance student interaction. The results showed that the average interaction scores in classrooms that incorporated AI were higher compared to those without it. Additionally, the positive and statistically significant correlation between the use of AI and student interaction across different grade levels suggests that this technology can serve as an effective tool for improving the quality of education. These results are consistent with previous research that emphasized the role of emerging technologies in increasing student engagement and interaction.

Therefore, it can be concluded that the integration of AI in classrooms not only leads to increased student interaction but may also contribute to improving academic outcomes and increasing learning motivation. Regression analysis revealed that AI usage had the greatest impact on interaction, though other factors, such as gender and grade level, also influenced interaction. This highlights the importance of considering the specific needs and characteristics of different student groups when implementing new technologies.

Based on the findings of this study, it is recommended that schools and educational centers incorporate AI tools and technologies into their educational programs to improve student interaction and learning quality. Furthermore, additional research is suggested to investigate the long-term effects of AI use in education and learning to better understand its benefits and challenges. Additionally, developing educational programs specifically designed for different student groups could further enhance the effectiveness of this technology.

References

1. Hassanpourrad, Ali; Alizadeh Qadikalaei, Mahdi (1401). "Artificial Intelligence and the Challenges Ahead in the Interaction of Organization Members," Third Conference on Research in Organization and Management, pp. 77-86.
2. Taherian, Hamid (1397). "Examination and Analysis of Factors Affecting Knowledge Management (Case Study: Artificial Intelligence)," New Research Approaches in Management Sciences, No. 4, pp. 69-88.
3. Azimi, Mohammad Hassan; Dakhsh, Sara; Nematollahi, Zahra (1401). "Identification and Classification of Artificial Intelligence Applications in Library Sectors and Services Using Meta-Synthesis Method," Library and Information Science, No. 99, pp. 7-35.
4. Keshtegar, Nafiseh; Abbaspour, Reza (1401). "Fourth Conference on the Impact of Artificial Intelligence on the Improvement of Electronic Banking Performance and Customer Attraction," Management, Tourism, and Technology, pp. 3-13.
5. Kallateh Aghamohammadi, Ameneh; Sharifi, Seyed Mehdi (1401). "The Role of Artificial Intelligence in Human Resources from the Perspective of Job Elimination (Case Study: News Reading)," Future Studies in Media, No. 3, pp. 36-64.
6. Mehrparsa, Sahar (1399). "Artificial Intelligence and Its Application in Education," Management and Entrepreneurship Studies, No. 336, pp. 32-46.
7. Yazdanporest, Seyed Morteza; Jami Pour, Mona; Jafari, Seyed Mohammad Baqer (1401). "Identification and Prioritization of Artificial Intelligence Applications in Online Marketing," Business Management Exploration, No. 28, pp. 105-137.
8. Zamaniyan, & Zamaniyan. (2024). "Classroom Management Based on Artificial Intelligence Data," Conference on Management Researches, Education and Training in Education and Training, 1(1), 5710-5717.
9. Amrei. (2023). "Impact of Effective Parental Interaction with Students on Their Academic Achievement: A Case Study of Primary School Students in Qom," Applied Studies in Social Sciences and Sociology, 19(6), 105-110.
10. Ghadami, Mohammad Ebrahim, Rostami, Hanan, Hosseini, Seyed Mohammad Reza, et al. (2024). "Study of the Relationship Between Teacher-Student Interaction and Executive Functions in Primary School Students," Conference on Management Research, Education and Training in Education and Training, 2(2), 2936-2947.

11. Khorsani-Nejad, & Soltanpour. (2022). "The Relationship Between Parenting Styles and Teacher-Student Interaction," Psychological Studies and Educational Sciences (Nagah Institute of Higher Education), 78(4), 125-138.

12. Jabbari. (2024). "The Role of Artificial Intelligence in the Context of Schools," Conference on Management and Humanities Research in Iran, 15(15), 1670-1676.

13. Pham. T. V., Anh Thu T. Nguyen., Thanh Dinh Ngo., Duy H. Le., Khai C.V. Le., Thuong H.N. Nguyen., & Huy Q. Le. (2020). Proposed Smart University Model as a Sustainable Living Lab for University Digital Transformation. [Conference presentation abstract]. 5th International Conference on Green Technology and Sustainable Development (GTSD). (C33)

14. Mohanachandran, D. K., Yap, C. T., Ismaili, Z., & Govindarajo, S. N. (2021). Smart University and Artificial Intelligence. A. Hamdan et al. (eds.), The Fourth Industrial Revolution: Implementation of Artificial Intelligence for Growing Business Success, Studies in Computational Intelligence 935, https://doi.org/978-3-030-62796-/10.1007 6_ 15(C28)

15. Butt, R., siddiqui, H., Soomro, A., & Asad, M.M. (2020). Integration of Industrial Revolution 4.0and IOTs in academia. Interactive Technology and Smart Education, 1-18. DOI 10.1108/ITSE-02-2020-0022

16. Mollick, E. R., & Mollick, L. (2022, December 21). New modes of learning enabled by AI chatbots: Three methods and assignments. SSRN. Retrieved from https://ssrn.com/abstract=4344763