Students' Attitudes and Perceived Usefulness of Artificial Intelligence (AI) Tools in Physical Education

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***Abstract*—Prior studies have mostly studied artificial intelligence AI education from students' perspectives from various majors. However, it is necessary to understand physical education students' perception and their attitudes towards AI because they are essential personnel for physical education. To fill the gap in literature, the aim of this study is to determine physical education students' attitudes and to analyze the perceived usefulness of AI. The study also investigated the differences in students' attitudes and their perceived usefulness level regarding AI technology. A descriptive research design was used in this study, with a questionnaire to collect data from the study participants. The number of participants was 210 physical education students. The findings revealed that the participants expressed low to moderate positive attitudes towards using AI in their learning. Additionally, students had a moderate level of perceived usefulness of using AI. In addition, student attitudes and their perceived usefulness level regarding AI technology did not differ significantly based on gender, students age and their experiences. These findings provide valuable insight for academicians by filling a knowledge gap in the existing literature and demonstrating the concrete use of AI technology in the realm of physical education. Recommendations are enumerated based on the obtained findings.**

***Keywords*—artificial intelligence, attitudes, perceived usefulness, physical education**

I. Introduction

Developments in technology have integrated in day to day lives throughout various sectors, including education, economy and health [1–3]. Technologies like AI have prevailed in different aspects of life and ultimately resulted in the fourth industrial revolution [4, 5]. In recent studies, technology tools usefulness like those of learning-bases sensing technologies and AI tools have been evidenced to make life activities easier [6]. The world of AI can be described as technologies developed to assist in computer-human interaction and this covers virtual agents and chatbots [7]. In other words, it represents various technologies enabling user communication through virtual assistants that leverage computer algorithms to mimic human intelligence facilitating akin to human interaction with computers [8, 9].

There are constant changes and adaptations to new education recipients based on their unique needs [10] and in this regard, AI has the potential to improve learning and teaching activities in the higher education field – for instance, intelligent tutoring systems are capable of personalizing educational experiences through the adaption of students to content, pace and feedback [11]. Added to this, chatbots powered by AI can also assist students in their learning experience and engagement [12] and considering its high potential in facilitating communication between students and their instructors, where the responses are simulated towards human conversation, the user learns and recognizes in an intuitive manner [13]. According to Chaware [14], AI is a novel technology that can enhance physical education and with AI applications focused on individualized learning and personalized training, overseeing health status and pattern of movements of children, detection and identification of their talents, their contributions could be enormous, which is why focus should be laid by physical education professionals on integrating AI into the curriculum to familiarize students with it and to prepare them for future professional environment [14].

Moreover, the analysis of AI terminal equipment uses its fundamental status in physical education classroom and the opportunities and risks related to its use. Despite the importance role of physical education and sport colleges in Jordanian universities being a rich environment for activating the use of AI tools, there are many challenges related to their implementation such as financial and infrastructure challenges as well as the lack of curricula related to the use of AI tools [15]. Therefore, this study examines the attitudes of students and their perceptions of the usefulness of AI in physical education classrooms to pave the way for further in-depth studies of the same context [16–18]. This is of utmost significance based on its contribution to both literature and practice. The study provides information and knowledge concerning the AI tools' strengths and weaknesses from the point of view of users with the aim of continuous improvement and adaptation. The perceptions of users can be studied to identify the risks the drivers of and barriers to adopting AI in the field of education [19]. There is a need to extend literature for theoretical and practical evidence in physical education of higher educational institutions to explain the attitudes of students and their perceived usefulness regarding AI use. The study therefore

aims to address students' knowledge gaps by exploring their attitudes and their perceived usefulness levels of AI in physical education setting, as well as identify individual factors that influence their attitudes and their perceived usefulness of AI, and as such, the study questions are as:

1) What is the attitudes level of physical education students towards AI technology?
2) What is the perceived usefulness level of physical education students towards AI technologies use.
3) Do physical education students' attitudes and their perceived usefulness level differ in using AI technology according to their individual factors?

Based on the reviewed literature, there is evidence that students' attitudes towards AI ranged between low to moderate. Hence, this study hypothesized that physical education students will exhibit general low to moderate positive attitudes toward AI (H1). Furthermore, it is expected that students' perception towards using AI is quite moderate, thus, physical education students will exhibit general moderate perception on using AI technology (H2). Finally, the student's gender, age and experiences are assumed to have a null effect (H3), given that the preceding evidence is rather mixed concerning these factors in technology perception and AI attitudes.

II. Literature Review

A. Overview Theories

Several learning theories related to learning and technology are often used to describe learning via technology such as technology acceptance model TAM [20] and constructivism theory [21]. TAM models include behavioral aspects and provide insight into the extent to which students belief that AI requires significant efforts to improve their learning experience, which both impacted students' attitudes towards the value of using technology [22]. They suggest that the acceptance of any technology such as AI by the individual is influenced by their perception [23]. TAM model provides a solid theoretical framework to analyze students' attitude and their perception towards technology tools and their willingness to integrate them in the learning processes [23]. On the other hand, to employ AI in university environments, the constructivism theory also must be considered. The theory emphasizes the active role of the students in construction their own new knowledge, which leads to the restructuring of previous knowledge [24]. In this sense, AI tools are adapted to improve students' learning experiences that meet their own individual needs and foster the active construction of their knowledge. In addition, AI facilitates access and interaction with a wide range of information from various resources that improve their cognitive abilities as well as solve their problems based on their understanding [25]. In that scenario, the increasing use of AI is due to its ability to provide tools that enhance individual learning using multiple perspectives and activities to enrich the learning experience of students from diverse categories [26, 27], and this aligned with constructivism [23, 28, 29]. These aspects in the context of the adoption of AI for autonomous learning, TAM provides a solid theoretical framework to analyze the attitude and perception of students towards this tool and their willingness to integrate in the learning processes of university students [23].

B. Artificial Intelligence in Physical Education

In the field of education, AI has been touted as the present emerging technology [10, 11], and it has been evidenced to overcome space and time limitations using mobile devices allowing learners to go through learning contents, practice and gather information at their convenience [19]. Moreover, AI learning systems can guide and provide auxiliary content based on the learning environment as mentioned in related studies [30, 31]. According to Zawacki-Richter *et al*. [32] study that reviewed AI dedicated papers from 2007 to 2018, the primary application fields of the technology in education were limited to prediction and profiling, evaluation and assessment, adaptive systems and personalization and intelligence tutoring systems.

Using technology like AI in higher education institutions provides enrichment in the content of education, changes educational perceptions and brings about the required changes to traditional education models [33]. AI adoption in physical education and sports has been garnering ample attention from studies [4, 34]. Physical education is a crucial subject to develop human beings [33–35], and to this end, AI can improve the applicability and practicability of such education among learners by reconstructing physical education and bringing about ongoing development [33]. AI technology use in the field of physical education and sports involves the use of software to interpret, analyze and extract meaningful conclusions from data constituting physical, physiological and behavioral information [33, 36]. In sports science context, AI has undergone developments in the past few years, particularly in the prediction of individual and team sports performance, determination of sports injuries risks, selection of talent and specialization, match scores prediction and rival analysis [37]. The applications of AI have rapidly developed in physical education and positively contributed to it, such as making it more interactive, improving students' interest and participation, learning effects as well as help teachers optimize teaching strategies [38].

To begin with, Keiper *et al*. [39] investigated the feasibility of using ChatGPT in assisting sport education management and found it to be a versatile tool to help both teachers and students to complete their various physical education tasks. In their developed design [40, 41] also revealed that the learning process of students and teachers teaching ability were improved after implementing the intelligent physical education design. Ozsoy and Karakus [36], upon looking at the relationship between students' attitudes in sports sciences towards AI and their cognitive flexibility found that attitudes of students towards AI and their level of cognitive flexibility was high, particularly those who are familiar with technological devices and male students who exercise regularly. In addition, the authors also found a significant relationship between cognitive flexibility and attitude towards AI, enabling higher acceptance of technological developments in sports, cooperation towards such developments and effective use of them. In Sanchez-Nicolas [42] and Gibbs' [43] studies, the authors revealed negative attitudes towards AI technologies among students. Nevertheless, only a few studies have tackled the

application of AI on physical education regardless of its role in the preparation of future educational systems and this has been highlighted by previous authors [4, 34, 35]. Although AI technology can provide a great contribution in physical education, AI technologies in physical education have yet been used [38], and lack of conclusive findings concerning the attitudes of students and perceived usefulness of AI in physical education was the impetus that drove the carrying out of the present study to focus on the perceptions and attitudes of students.

III. Method

A. Design of the Study

This study focuses on determining the attitudes and perceived usefulness of students concerning innovative AI methods into learning physical education in Jordanian universities. The study is a quantitative one, with the main data collection instrument being the survey questionnaire – an instrument appropriate for determining the abilities, beliefs, views, attitudes, characteristics, thoughts and expectations of respondents [44].

B. The Study Sample

The sample study consisted of physical education students in Jordanian universities, chosen based on their familiar use of technology and their interaction with AI systems. There were 178 students comprising the sample, whose ages ranged from 18 to 30. The chosen number of students in this study was justified based on the suggested minimum number of variable rations of 15–20 per items are preferred [45]. The researchers invited the voluntary participation of the students, and their verbal agreement was sought in the presence of university staff, assuring them that data will be used for the sole purpose of research.

C. Study Measurements

This study gathered data using a questionnaire survey within which two variable scales were adopted from related studies, and they were perceived usefulness from [46, 47] and attitudes towards AI from Al-Qerem *et al*. [48] as shown in Table 1 below. Overall, the variables were gauged using 15 items, measured along a 5-point Likert scale, ranging from 5 (strongly agree) downwards to 1 (strongly disagree). From the TAM model, perceived usefulness and perceived ease of use were used to gauge the perception of the students towards AI systems use in their learning activities – items were adopted from related studies and tweaked to ensure that the statements are understandable and are consistent with the study objectives. In the first part of the instrument, demographic information, namely age, gender and computer experience, of the students were gathered, and in the second one, measuring items were listed to determine the perception of the students of the factors influencing their use of AI in physical education.

Table 1. List of variables, dimensions and items

Variable	Dimension	Items
AI perception	Usefulness	I believe that I should learn the basics of AI
		I believe that AI will be a highly required tool in my field
		I believe ethical implications of AI must be understood by different students
		I believe AI will revolutionize the educational system
		I believe human teachers will be replaced in the foreseeable future
	Ease of use	I believe that using AI makes learning more interesting
		AI-based systems are advantageous for my learning
		AI-based systems make me study easier without limitation of location and time
		Overall, I think that AI-based systems are easy to use
General Attitudes		Using AI tools improve my learning
		Using the AI systems increases my learning outcomes
		AI systems produce desire learning results
		The AI system's functionality and interface is clear and understandable
		I find the AI systems to be flexible to be used
		I find AI systems are easy to use in learning

D. Validity and Reliability

The measurements went through several validity and reliability tests. First, the questionnaires were validated by four experts in education and technology for content and face validity. The experts validated to which items belonged to its variable and ensured the accuracy of the linguistic formulation and the suitability of the scales to achieve the study objectives. Based on the experts' suggestions, modifications were made to the items to ensure proper wording for the participants. The reliability of the items included in the questionnaire was tested using Cronbach's alpha coefficient analysis and factor loading coefficient analysis. The latter analysis was tested against a value of over 0.40 to indicate excellent reliability of the items. Following the analyses, data was encoded and entered into SPSS and exposed to descriptive statistics to obtain the mean and standard deviation values. Internal reliability was confirmed through Cronbach's alpha which was 0.793 for the attitudes of students towards AI use, and 0.765 for their perceptions of perceived usefulness.

IV. Results

The answers to the study questions were obtained through the means, standard deviations and ranks of the responses of the sample concerning their attitudes towards using AI in their learning activities as shown in Table 2.

Based on the results in Tables 2 and 3, the total score of the level of attitudes towards AI use gathered by the respondents revealed a mean value of 3.17, with a standard deviation of 0.66. The results indicate that the items' means ranged between 2.96 and 3.25 (medium to large ratings). More specifically, the sixth item stating, "I believe that using AI makes learning more interesting obtained the highest mean of 3.25 and standard deviation of 1.11 (high degree) and was followed by the third item, which states, "I believe ethical

implication of AI must be understood by different students", as well as, the ninth item that states, "AI-based systems are advantageous for my learning", which have means of 3.23 (high degree). The eighth item states, "AI-based systems make me study easier without limitation of location and time", obtained the lowest mean value of 3.20 (medium degree), and the ninth item states, "AI-based systems make me study easier without limitation of location and time", obtained the lowest mean value of 3.19, and item one states, "I believe that I should learn the basics of AI", obtained the lowest mean value of 2.96.

Table 2. Descriptive statistics of the attitude's levels

Item No.	Mean	SD
I believe that I should learn the basics of AI	2.9	1.1
I believe that AI will be a highly required tool in my field	3.1	1.0
I believe ethical implications of AI must be understood by different students	3.2	1.1
I believe AI will revolutionize the educational system	3.1	1.1
I believe human teachers will be replaced in the foreseeable future	3.1	1.2
I believe that using AI makes learning more interesting	3.2	1.2
AI-based systems are advantageous for my learning	3.2	1.0
AI-based systems make me study easier without limitation of location and time	3.2	1.0
Overall, I think that AI-based systems are easy to use	3.1	1.1
Total Perception	3.1	0.660

Additionally, the total score of the level of student's perception of AI use revealed a mean value of 3.00, with a standard deviation of 0.728. The results in Table 3 indicate that the items' means ranged between 3.23 and 2.85 (medium ratings). More specifically, item stating, "Using AI tools improve my learning, obtained the highest mean of 3.23 and standard deviation of 1.11 (high degree) and was followed by the sixth item, which states, "I find AI systems are easy to use in learning", obtained the highest mean of 3.00 and standard deviation of 1.11 as well as, the ninth item that states, "I find the AI systems to be flexible to be used", which have means of 2.99 and standard deviation of 1.18.

Table 3. Descriptive statistics of the perception levels

Item No.	Mean	SD
Using AI tools improve my learning	3.23	1.1
Using the AI systems increases my learning outcomes	2.94	1.1
AI systems produce desire learning results	2.85	0.98
The AI system's functionality and interface is clear and understandable	2.98	1.1
I find the AI systems to be flexible to be used	2.99	1.1
I find AI systems are easy to use in learning	3.00	1.1
Total Perception	3.00	0.782

For the third research question, which determines whether significant differences exist in student perceive usefulness and attitudes towards AI-based learning based on gender, age and experiences. The results in Tables 4–6 indicate no significant differences between the means concerning perceive usefulness and attitudes level based on gender, age and experiences. More specifically, although insignificant results were obtained based on gender, female students obtained higher mean values in their perceive usefulness (M = 3.12, SD = 0.745) compared to their male counterparts students (M= 2.910, SD = 0.801). The same held true for mean values for learning attitudes: (M= 3.256, SD = 0.653) for female students and (M= 3.11, SD = 0.663) for male students. In terms of age in the sample, older participants obtained higher mean values in their perceive usefulness (M = 3.03; SD = 0.777) compared to participants aged 18–20 years (M = 2.97; SD = 0.790). The same held true for mean values for learning attitudes, elder students obtained higher values (M = 3.18; SD = 0.674) than younger students (M = 3.17; SD = 0.650). The significance of the statistical differences was demonstrated at the 0.05 level, using an independent sample t-test. In terms of experience in the sample, participants with experiences obtained higher mean values in their perceive usefulness (M = 3.037; SD = 0.764) compared to participants who did not experienced AI in learning (M = 2.964; SD = 0.803). The same held true for mean values for learning attitudes, participants with experience obtained higher values (M = 3.18; SD = 0.669) than those who did not experience AI in learning (M = 3.16; SD = 0.657). The insignificance of the statistical differences was demonstrated at the 0.05 level, using an independent sample t-test. Overall, no significant difference existed on the study variables perceive usefulness and attitudes based on gender, age and experiences groups (t = −1.80, df = 176, p = 0.073; t = −1.40, df = 176, p = 0.162; t = 0.492, df = 176, p = 0.623; t = .0128, df = 176, p = 0.898; t = −0.492, df = 176, p = 0.623; t = −0.128, df = 176, p = 0.898) respectively.

Table 4. Differences of the student's perceived usefulness and attitudes level according to gender

Variable		Mean	SD	t	df	Sig.
Perceived usefulness	Male	2.91	0.801			
	Female	3.12	0.745	−1.8	176	0.073
Attitudes	Male	3.11	0.663			
	Female	3.25	0.653	−1.4	176	0.162

Table 5. Differences of the student's perceived usefulness and attitudes level according to age

Variable		Mean	SD	t	df	Sig.
Perceived usefulness	18–20	2.97	0.790			
	Above 20	3.03	0.777	0.492	176	0.623
Attitudes	18–20	3.17	0.650			
	Above 20	3.18	0.674	0.128	176	0.898

Table 6. Differences of the student's perceived usefulness and attitudes level according to experience

Variable		Mean	SD	t	df	Sig.
Perceived usefulness	Yes	3.03	0.764			
	No	2.96	0.803	0.620	176	0.536
Attitudes	Yes	3.03	0.764			
	No	2.96	0.803	0.224	176	0.823

V. Discussion

Regarding the first hypothesis and first question that examines students' attitudes regarding AI technologies, the findings indicate that physical education students have a moderate level of attitudes regarding AI technologies. This result may be explained by the reality of the AI technologies in the current world rather than just a concept – this particularly holds true in its enhancement of human lives; for instance, the learning of physical education students [11, 37]. The extensive application of AI technologies among higher education institutions has enhanced learning and through its advantages, it enables the provision of convenience, psychological and cognitive advantages, and assistance in learning tasks completion and goals achievement. This result may also be related to the university's role in being keen on applying new technology into education, extending the technology culture throughout colleges and universities – this is evidenced by the inclination and engagement of students in technology-related fields, notwithstanding the field they are specializing in. Also, the results may be since students still need support to use digital resources. The results aligned with previous studies [49] indicated that students and teachers might need assistance to be able to use technologies as pedagogical resources. Tou *et al*. [50] also showed that physical education Singaporean teachers had above-average attitudes of technologies. Additionally, AI has been well established as an independent major in Jordan, providing students with services and knowledge throughout the years, which explains the positive attitude that students harbor towards technology and the suitable awareness of applying the apps to easily meet needs – this has conveniently contributed to good attitudes level towards new technology deployment. This result is in contrast with that reported by Sanchez-Nicolas [42] and Gibbs [43] who reported negative attitudes towards AI technologies use among students. Overall, H1 was supported.

Regarding the second hypothesis and question that examines the perceived usefulness of students' regarding AI technologies, the findings indicate that physical education students have a moderate level. The results may be attributable to the recent use of AI systems for learning among university students, honing their experience and perception of its usefulness, and promoting their inclination towards its use in learning. Moreover, the satisfaction of the students of AI systems in facilitating their learning tasks completion may be evidenced by their perceived usefulness of it which according to Li [47] is one of the significant determinants of technology adoption. This study's result is in line with that of previous ones like [51] Roy *et al*. who found perceived usefulness to have a positive effect on the inclination of students towards AI technology adoption. This result was further evidenced by Sudaryanto, Hendrawan and Andrian [52] who supported a positive influence of perceived usefulness on the willingness of the students towards adopting AI technology in their learning. Also [53], study revealed that AI technology applications were perceived to have both positive and negative aspects among students which reflect the ongoing debate regarding AI technologies applications [54, 55]. Overall, H2 was supported.

With regards to the hypothesis and question three on the differences of effects considering demographic factors, namely, gender, age and experience on perceived usefulness and attitudes towards AI technology among students of physical education, no statistically significant difference was found for gender. This may be because of the similar level of awareness among the students, notwithstanding their age, gender and experience. They are aware of AI technology's value and role in enhancing their abilities towards work task completion in an easy manner. The results aligned with previous study [56] who indicated that gender and age have no effect on students' attitudes toward AI technology. Another study [53] revealed that gender is not associated with attitudes toward AI. Zhang *et al*. [57] study with education undergraduate students revealed no difference between male and female students in perceived usefulness of AI technologies. In contrast, some past related studies like [37] revealed significant differences in the attitudes of students based on their gender – this contrasting result may be because of the interest and experience of students in technology usage. As for age, no significant difference was revealed which indicates that students from younger groups may have a higher tendency towards technology use, try outs and not as hesitant to do so compared to their older counterparts [58]. This is driven by their attitudes towards AI technologies, their knowledge about it, its benefits, its interaction and their possible continuous use in the future. Finally, no statistically significant difference was also found based on students' level of experience which may be attributable to the knowledge that students possess concerning AI technology use, which influences their attitudes towards its use. The results of this study supported the nation that attitudes toward adoption toward technology are complex and multifaceted, and often influenced by individual experiences, perceptions, and pedagogical beliefs [56]. Additionally, the results of this study are also supported by technology adoption theories (Technology Acceptance Model TAM 3 and Unified Theory of Acceptance and Use of Technology UTAUT) who confirmed that individual factors such as gender, age and experiences may not directly impacted students' attitudes towards emerging technology [59, 60]. Overall, H3 was supported.

VI. Conclusion and Implications

In this study, university students' perceived usefulness and attitudes towards AI technology use were determined along with the effect of demographic factors in the context of physical education. The study sample consisted of 178 respondents, who were surveyed on their perceptions and attitudes towards AI technology use. This new technology has undergone developments and has been used extensively in education and thus, it became imperative to determine the perceived usefulness and attitude of physical education students towards using the same. The study found such attitude and perception level to be in the range of moderate-high. The study results also showed that demographic factors (gender, age and experience) did not make statistical differences in the perceived usefulness and attitudes of students towards AI use.

The study provides insights that have crucial theoretical and practical implications for Jordanian universities and others besides them. It has become imperative for educational institutions to revise curricula in a way that it includes AI

tools in learning to take advantage of this technology's full potential – this holds true for physical education students who must holds knowledge and skills to achieve success in the ever-changing physical education field. The study contributes to literature by extending relevant studies dedicated to physical education students' use of AI tools. The study also highlights the strengths and weaknesses of technology from the viewpoint of students, assisting in their further development and adaptation. Despite the AI technologies potential to enhance education outcomes for students and to promote ongoing development, only a few studies have been dedicated to their application in the physical education environment, and therefore, this study contributes to literature by supporting and promoting its importance.

The study provides practical suggestions for the educators and policymakers concerned with successful implementation of AI in the education field. Policymakers should support financing and assist in developing and implementing appropriate AI tools and resources in the learning/teaching process. The study also has a limitation, and the top limitation of this study is the lack of past relevant studies tackling the subject, which limits the study's interpretation, justification and discussion of results. The study's use of descriptive survey approach is also another limitation, whereby the study sample members' responses were determined via a questionnaire. Other research approaches may be adopted like the qualitative approach through interviews and observations for an enriching result. Also, only a few studies have been carried out to test the presence of statistical differences based on age and experience and their effect on the attitudes and perceptions of students of AI and thus, further validation of results is required.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Introduction and Literature: Malek Jdaitawi, Shooroq Maberah, Ashraf Kan'an and Muteeb Al-Ahmari conducted literature review; Marwa Kholif, Nahed Alsayed conducted the research methodology. All researchers contributed to the results and discussion sections; all authors had approved the final version.

REFERENCES

[1] M. Jamalian, H. Vahdat-Nejad, H. Mansoor, W. Copiaco and A. Hajiabadi, "Analyzing the effect of COVID-19 on education by processing users' sentiments," *Big Data Cogn. Comput.*, pp. 7–28, 2023. https://doi.org/10.3390/bdcc7010028

[2] E. Hussein, A. Kan'an, A. Rasheed, M. Jdaitawi, A. Abas, S. Mabrouk, and M. Abdelmoneim, "Exploring the impact of gamification on skill development in special education: A systematic review," *International Contemporary Educational Technology*, vol. 15, p. ep443, 2023. https://doi.org/10.30935/cedtech/13335

[3] C. Paupini, V. Zeeuw, and F. Teigan, "Trust in the institution and privacy management of internet of things devices. A comparative case study of Dutch and Norwegian households," *Technology in Society*, 2022. https://doi.org/10.1016/j.techsoc.2022.102026

[4] N. Genc, "Artificial intelligence n physical education and sports: New horizons with ChatGPT," *Mediterranean Journal of Sport Science*, vol. 6, pp. 18–32, 2023. https://doi.org/10.38021asbid.1291604

[5] M. Jdaitawi, B. Hamadneh, A. Kan'an, R. AlMawadieh, M. Torki, N. Hamoudah, R. Ab Alfattah, Y. Alrashed, N. Nasr, M. Kholif, and R. Abduljawad, "Factors affecting students willingness to use artificial intelligence in university settings," *International Journal of Information and Education Technology*, vol. 14, pp. 1763–1769, 2024. Doi:10.18178/ijiet.2024.14.12.2207.

[6] U. Chaware, "Artificial intelligence in physical education and knowledge among students," *International Journal of Physical Education, Sports and Health*, vol. 7, pp. 308–311.

[7] S. Singh and H. Beniwal, "A survey on near-human conversational agents," *Journal of King Saud University-Comuter and Information Sciences*, vol. 34, pp. 8852–8866, 2022. https://doi.org/10.1016/j.jksuci.2021.10.013

[8] Y. Ocana, L. Valenzuela, and L. Garro, "Artificial intelligence and its implications in higher education," *Propositay Representations*, vol. 7, pp. 536–568, 2019. http://doi.org/10.20511/pyr2019.v7n2.274

[9] Y. Yang, Y. Zhuang, and Y. Pan, "Multiple knowledge representation for big data artificial intelligence: framework, applications, and case studies, "*Frontiers of Information Technology & Electronic Engineering*, vol. 22, pp. 1551–1558, 2021. https://doi.org/10.1631/FITEE.2100463

[10] S. Halili, "Technological advancements in education 4.0," *The Online Journal of Distance Education and e-Learning*, vol. 7, pp. 63–69, 2019.

[11] J. Smith, "Personalized learning through AI in higher education," *International Journal of Educational Technology*, vol. 39, pp. 79–94, 2022.

[12] P. O'Connor and S. McAndrew, "Enhancing learning experiences with AI-powered chatbots in higher education," *Journal of Educational Technology*, vol. 48, pp. 167–185, 2021.

[13] I. Garcia-Martinez, J. Fernandez-Batanero, J. Fernandez-Cerero, and S. Leon, "Analysing the impact of artificial intelligence and computational sciences on student performance: Systematic review and meta-analysis," *Journal of New Approaches in Educational Research*, vol. 12, pp. 171–197, 2023. Doi:10.7821/near.2023.1.1240

[14] U. Chaware, "Artificial intelligence in physical education and knowledge among students," *International Journal of Physical Education, Sports and Health*, vol. 7, pp. 308–311.

[15] E. Al-Hwaya, "Challenges of applying artificial intelligence systems in the faculties of sports sciences in Jordanian universities from the viewpoint of faculty members," *Dirasat: Educational Sciences*, vol. 51, pp. 300–318, 2024. https://doi.org/10.35516/edu.v51i1.4654

[16] R. Guo, "Analysis of artificial intelligence technology and its application in improving the effectiveness of physical education teaching," *International Journal of Web-Based Learning and Teaching Technologies*, vol. 19, pp. 1–15, 2024. Doi:10.4018/IJWLTT.335115

[17] W. Xiang, "Application and prospect analysis of artificial intelligence in the field of physical education," *Comput Intell Neurosci*, vol. 13, p. 1042533, 2022. Doi:10.1155/2022/1042533

[18] Q. He, H. Chen, and X. Mo, "Practical application of interactive AI technology based on visual analysis in professional system of physical education in universities," *Heliyon*, vol. 10, p. e24627, 2024. https://doi.org/10.1016/j.heliyon.2024.e24627

[19] Y. Wang, C. Liu, and Y. Tu, "Factors affecting the adoption of AI-Based application in higher education: An analysis of teachers perspectives using structural equation modeling," *Educational Technology & Society*, vol. 24, pp. 116–129, 2021.

[20] F. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly*, vol. 13, pp. 319–340, 1989. http://www.jstor.org/stable/249008

[21] J. Piaget, "Piaget's theory," in P. H. Mussen (Ed), *Carmichael's Manual of Child Psychology*, Wiley, New York, vol. 1, pp. 703–732, 1970.

[22] G. Quinde, M. Munoz, J. Suarez, R. Villarreal, W. Velez, and A. Lainez, "Perception of university students on the use of Artificial Intelligence (AI) tools for the development of autonomous learning," *Revista de Gestao Social e Ambiental*, vol. 18, pp. 1–20, 2024. https://doi.org/10.24857/rgsa.v18n2-136

[23] C. Almenara, V. Marín-Díaz, and B. Sampedro-Requena, "Technology acceptance model in higher education," *Revista de Investigación Educativa*, vol. 36, pp. 435–453, 2018. https://doi.org/10.6018/rie.36.2.292951

[24] I. Z. Saenz, "Constructivism and critical realism in environmental conflicts," *Acta Sociológica*, vol. 73, pp. 273–294, 2017. https://doi.org/10.1016/j.acso.2017.08.010

[25] Y. R. Hernández and G. Jiménez, "Digital literacy in phonoaudiology: Challenges of professional training since technological advances," *Revista de Logopedia, Foniatría y Audiología*, vol. 39, pp. 192–200, 2019. https://doi.org/10.1016/j.rlfa.2019.04.003

[26] S. Moral-Sánchez, F. R. Rey, and M. Cebrián-de-la-Serna, "Analysis of artificial intelligence chatbots and satisfaction for learning in mathematics education," *International Journal of Educational*

Research and Innovation, vol. 20, pp. 1–14, 2023. https://doi.org/10.46661/ijeri.8196
[27] Y. Ocaña-Fernández, L. Valenzuela-Fernández, and L. Garro-Aburto, "Artificial intelligence and its implications in higher education," *Propósitos y Representaciones*, vol. 7, p. 2, 2019. https://doi.org/10.20511/pyr2019.v7n2.274
[28] R. Shahper, G. Marilym, P. Inna, S. Herbert, D. Patrick, "A constructivist approach to integrate AI in marketing education: Bridging theory and practice," *Journal of Marketing Education*, vol. 1, pp. 1–18, 2024. https://doi.org/10.1177/02734753241288876
[29] N. Narayanee, V. Nathiya, G. Preethi Vihashini, and G. Veeramani, "AI-based voice e-mail system for visually impaired," *Journal of Ubiquitous Computing and Communication Technologies*, vol. 6, pp. 14–27, 2024. Doi:10.36548/jucct.2024.1.002
[30] C. Hung, X. Yang, W. Fang, G. Hwang, and S. Chen, "A context-aware video prompt approach to improving students' in-field reflection levels," *Computers & Education*, vol. 70, pp. 80–91, 2014.
[31] J. Liu, Y. Cao, Y. Hu, and L. Wei, "Application status and development of big data in medical education in China," *Medical Data Mining*, vol. 2, pp. 118–125, 2019.
[32] O. Zawacki-Richter, V. Marín, M. Bond, and F. Gouverneur, "Systematic review of research on artificial intelligence applications in higher education–where are the educators?" *International Journal of Educational Technology in Higher Education*, vol. 16, p. 39, 2019. doi:10.1186/s41239-019-0171-0
[33] H. Lee and J. Lee, "Applying artificial intelligence in physical education and future perspectives," *Sustainability*, vol. 13, p. 351, 2021. https://doi.org/10.3390/su13010351
[34] L. Gao and Z. Liu, "Unraveling the multifaceted nexus of artificial intelligence sports and user willingness: A focus on technology readiness, perceived usefulness, and green consciousness," *Sustainability*, vol. 1, p. 13961, 2023. https://doi.org/10.3390/su151813961
[35] J. You, "Why Physical Education Teacher as Curriculum Maker?" *Korean J. Sport Pedagog*, vol. 17, pp. 1–18, 2010.
[36] D. Ozsoy and O. Karakus, "Examining the relationship between cognitive flexibility and attitudes towards artificial intelligence technologies among students studying sports sciences," *Journal of ROL Sports Sciences*, vol. 1, pp. 109–127, 2023. https://roljournal.com/
[37] R. Nadikattu, "Implementation of new ways of artificial intelligence in sports," *Journal of Xidian University*, vol. 14, pp. 5983–5997, 2020.
[38] Y. Wang and X. Wang, "Artificial intelligence in physical education: Comprehensive review and future teacher training strategies," *Frontiers in Public Health*, vol. 12, 2024. https://doi.org/10.3389/fpubh.2024.1484848.
[39] M. Keiper, G. Fried, J. Lupinek, and H. Nordstrom, "Artificial intelligence in sport management education: playing the AI game with ChatGPT," *J Hosp Leis Sport Tour Educ*, vol. 33, 100456, 2023. doi: 10.1016/j.jhlste.2023.100456
[40] F. Cao, M. Xiang, K. Chen, and M. Lei, "Intelligent physical education teaching tracking system based on multimedia data analysis and artificial intelligence," *Mobile Inf Syst.*, vol. 2022, 2022. doi: 10.1155/2022/7666615
[41] S. Banjade, H. Hiran, and S. Pokhrel, "Empowering education by developing and evaluating generative AI-Powered tutoring system for enhanced student learning," *Journal of Artificial Intelligence and Capsule Networks*, vol. 6, pp. 278–298, 2024. Doi:10.36548/jaicn.2024.3.003
[42] E. Sanchez-Nicolas, "All big five tech firms listened to private conversations," *EUobserver*, 2019.
[43] S. Gibbs, "Elon Musk: Artificial intelligence is our biggest existential threat," *The Guardian*, vol. 27, 2014.
[44] U. Sekaran and R. Bougie, *Research Methods for Business: A Skill-Building Approach*, 6th Edition, Wiley, New York, 2013.
[45] J. Hair, B. Babin, R. Anderson, and C. Black, "Multivariate data analysis," *Cengage Learning*, 2019.
[46] W. Wu, B. Zhang, S. Li, and H. Liu, "Exploring factors of the willingness to accept AI-assisted learning environments: An empirical investigation based on the UTAUT model and perceived risk theory," *Front. Psychol*. vol. 13, p. 870777, 2022. doi: 10.3389/fpsyg.2022.870777
[47] K. Li, "Determinants of college students actual use of AI-Based systems: An extension of the technology acceptance model," *Sustainability*, vol. 15, p. 5221, 2023. Doi:10.3390/su15065221
[48] W. Al-Qerem, J. Eberhardt, A. Jarab *et al*., "Exploring knowledge, attitudes, and practices towards artificial intelligence among health professions' students in Jordan," *BMC Med Inform Decis Mak*, vol. 23, p. 288, 2023. https://doi.org/10.1186/s12911-023-02403-0
[49] J. Svendsen and A. Svendsen, "Not for free! An analysis of two digital tools recommended as learning resources for physical education in upper secondary schools in Denmark," *Scandinavian Journal of Educational Research*, vol. 65, pp. 331–344, 2019. https://doi.org/10.1080/00313831.2019.1705896.
[50] N. Tou, Y. Kee, K. Koh, M. Camire, and J. Chow, "Singapore teachers' attitudes towards the use of information and communication technologies in physical education," *European Physical Education Review*, vol. 26, p. 2, 2019. https://doi.org/10.1177/1356336X19869734
[51] R. Roy, M. Babakerkhell, S. Mukherjee, D. Pal, and S. Funilkul, "Evaluating the intention for the adoption of artificial intelligence-based robots in the university to educate the students," *IEEE Access*, vol. 1, p. 99, 2022. Doi:10.1109/ACCESS.2022.3225555
[52] M. Sudaryanto, M. Hendrawan, and T. Andrian, "The effect of technology eadiness, digital competence, perceived usefulness, and ease of use on accounting students artificial intelligence technology adoption," presented at the 4th International Conference of Biospheric Harmony Advanced Research (ICOBAR 2022), E3S Web of Conf, vol. 388, 2023. https://doi.org/10.1051/e3sconf/202338804055
[53] M. Abdaljaleel, M. Barakat, M. Alsanafi *et al*. "A multinational study on the factors influencing university students' attitudes and usage of ChatGPT," *Sci Rep*, vol. 14, 2024. https://doi.org/10.1038/s41598-024-52549-8.
[54] M. Sallam, "ChatGPT utility in healthcare education, research, and practice: Systematic review on the promising perspectives and valid concerns," *Healthcare (Basel)*, vol. 11, 2023. https://doi.org/10.3390/healthcare11060887
[55] S. Rawas, "ChatGPT: Empowering lifelong learning in the digital age of higher education," *Educ. Inf. Technol*, 2023. https://doi.org/10.1007/s10639-023-12114-8
[56] N. Pellas, "The influence of sociodemographic factors on students' attitudes toward AI-generated video content creation," *Smart Learn Environ*, vol. 10, 2023. https://doi.org/10.1186/s40561-023-00276-4.
[57] C. Zhang, J. Schießl, L. Plößl *et al*., "Acceptance of artificial intelligence among pre-service teachers: a multigroup analysis," *Int J Educ Technol High Educ*, vol. 20, p. 49, 2023. https://doi.org/10.1186/s41239-023-00420-7.
[58] M. Alasmari, "The attitudes of public-school teachers towards e-learning in Saudi Arabia," *Arab World English Journal*, 2nd Special Issue on Covid 19 Challenges, vol. 1, pp. 245–257, 2022.
[59] V. Venkatesh and H. Bala, "Technology acceptance model 3 and a research agenda on interventions," *Decision Science*, vol. 39, pp. 273–312, 2008.
[60] V. Venkatesh, M. Morris, F. Davis, and G. Davis, "User acceptance of information technology: Toward a unified view," *MIS Quarterly*, vol. 27, pp. 425–478, 2003.