

Artificial Intelligence supported education system: A study of special educators in Saudi Arabia

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ABSTRACT

The research identifies the indicators for the success of artificial intelligence (AI) experience in digital education in light of recent technological developments. It also aims to assess the extent to which there is a difference in the level of success of the artificial intelligence (AI) experience in digital education in terms of the variables like educational level, gender, and social background of the teachers. The researcher used the descriptive analytical approach. The research sample ($n=218$) consisted of male and female teachers from *Turaif* region of the Northern province of Saudi Arabia. All the teachers were randomly selected from four schools of the region. The results of the study indicates that the success of artificial intelligence (AI) experience in digital education is high and statistically significant. No differences in the level of success of artificial intelligence (AI) experience is observed in terms of educational level and gender. However, in terms of the social background, the rural areas outperformed the urban set up.

Key words: *artificial intelligence, special education, adaptive and intelligent learning system, Saudi Arabia, special educators*

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1. INTRODUCTION

The science of artificial intelligence (AI) emerged as a modern cognitive science, officially in the fifties of the last century, and by looking at various other sciences, it is noted that it was concerned in one way or another with artificial intelligence (AI) (Tegmark, 2017; Torjesen, 2017; UNESCO, 2019). If we review genetics, we find what is related to intelligence is genes. An attempt to trace intelligence if governed by genetic factors. In the field of physics, students, undoubtedly, feel that all good ideas were evolved from Galileo, Einstein, Newton and the rest of the scientists, and it is necessary to study for many years so that new discovery can take place. On the other hand, artificial intelligence (AI) is considered an open field which studies occupies a new Einstein all his times. The nature of intelligence occupied philosophers for many years. How things are seen? how learning, remembering and reasoning is done? are the key areas where effective use of digital medium /computer use can bring in very encouraging solutions to many problems. The last decade turned the research direction into realistic experimental systems, and gave wide scope of artificial intelligence (AI) in the field of multi-purpose applications, be it general-purpose applications such as cognition and logical reasoning, or special-purpose tasks such as playing chess or medical diagnosis. Scientists and experts often turn to artificial intelligence (AI) to make cost and time effective treatment. Artificial intelligence (AI) has replaced many manual works and has made effective intervention in almost all walks of life (Al-Hadi, 2005)

due to its transparency that allows penetration of any science without barriers.

Artificial intelligence (AI) has been increasingly used in classroom settings thanks to advancements in computing and information processing (Artificial Intelligence in Education; AI Ed), including the use of intelligent tutoring systems, teaching robots, learning analytics dashboards, adaptive learning systems, human-computer interactions, and more. (Chen, Xie, and Hwang, 2020). For nearly three decades, since the advent of AI Ed, artificial intelligence has been viewed as a potent instrument for enabling new paradigms for instructional design, technological development, and education research (Holmes et al., 2019; Hwang et al., 2020). In particular, AI Ed has opened up new possibilities for, and presented new problems to, the creation of complex educational systems, such as the shift toward individualised learning and the re-evaluation of the instructor's role (Baker et al., 2019; Holmes et al., 2018; Starcic, 2019). Intelligent learning environments have been developed using a wide range of AI Ed methods (including, but not limited to, natural language processing, artificial neural networks, machine learning, deep learning, and genetic algorithm) for purposes such as behaviour detection, prediction model construction, learning recommendation, etc (Chen, Xie, & Hwang, 2020; Rowe, 2019).

Research in the subject of computers and education has shifted its attention to AI Ed, which has the potential to promote a revolution in how we learn and teach (Hwang et al., 2020). Despite AI's promise to

revamp classroom instruction (Holmes et al., 2019), research shows that employing cutting-edge AI computing tools does not automatically lead to positive results for students (Castaneda & Selwyn, 2018; Du Boulay, 2000; Selwyn, 2016). In addition, the quality of education and training is profoundly impacted by the philosophical and pedagogical assumptions underlying the use of various types of educational technology (Hwang et al., 2020). Although recent literature has reviewed AI Ed categorizations (Holmes et al., 2019), approaches (Baker et al., 2019; Luckin et al., 2016), research issues (Hwang et al., 2020), challenges (Baker et al., 2019), and future visions (Pinkwart, 2016), very few studies explicitly examine what are the various roles of AI in education, how AI are connected to the existing educational and learning theories (Hwang et al., 2020). This position paper seeks to fill this need by proposing three AI Ed paradigms that leverage AI techniques in diverse ways to address learning and instructional difficulties in education. This position paper seeks to provide a concise overview of the most important paradigms by discussing their theoretical underpinnings, conceptual research, and practical applications. This position paper, in particular, provides a reference framework for future AIED practise, research, and development that may help promote learner-centered learning, human agency, and lifelong learning in the present innovation-driven knowledge age.

Humans require mental abilities for every activity in their lives. The field of artificial intelligence (AI) means mechanization of human intelligence and the study of its mental abilities. One of the most important reasons for studying artificial intelligence (AI) is our attempt to understand the operations of the human mind, an approach different from philosophy, psychology and anatomy. The science of artificial intelligence (AI) struggles to build intelligence to the extent of human intelligence. It is believed that no one can predict the details of the future, but it seems to be clear that the coming generations will have huge impact of computer with human intelligence, and in the development of our civilization (Al-Sharia and Faris, 2000).

Research questions

Since the human relationship with computers began, intelligence has proved that computer can be turned into virtual humans by training them to adopt many skills of a human nature. Researchers have also sought to develop new scientific theories and develop techniques to make computer perform work that humans do in a better way - this is known as artificial

intelligence techniques. The present research aims to answer the following questions:

- 1- What are the indicators of the success of the artificial intelligence (AI) experience in digital education?
- 2- What is the level of success of artificial intelligence (AI) experience in digital education?
- 3- Is there an impact on the level of success of artificial intelligence (AI), experience in digital education of the variables such as educational level, gender, social background (Urban/rural)?

Importance of the present research

Artificial intelligence appeared in the last decade of the last century and in the beginning of this century. Since then, it has been used in industrial control, medical development and finding optimal solutions, and perhaps to address the complexity of modest software solutions, which prompted scientists and the other stakeholders exploring the mechanism of human thinking related to processing information, store and retrieve it when needed. By relying on the simulation method in solving these problems, a coherent software structure was built consisting of programming commands, mathematical matrices, and Boolean algebra called artificial neural networks (AI), to make the machine act intelligently on behalf of the human being with effectiveness and flexibility. Artificial intelligence (AI) is many techniques, some of which are still in the early stages of study and research, while others have reached relative maturity that led to the development of new practical systems that address real problems. Therefore, the researcher decided to identify the importance of modern technology in the field of education.

Objective

The current research aims to identify the indicators of the success of the artificial intelligence (AI) experience in digital education, the level of success of the artificial intelligence (AI) experience in digital education, and to address the changes that smart education systems have achieved in light of recent technological developments represented by artificial intelligence. It also aims to identify the extent to which there is a difference in the level of success of the artificial intelligence (AI) experience in digital education as per the variables (educational level, gender, social background).

2. PREVIOUS STUDIES

Al-Muhamadi (2020) aimed to design an adaptive learning environment based on artificial intelligence

(AI), to develop the skills of digital technology applications in scientific research and information awareness among talented secondary school students. His study measured the cognitive and performance aspects of digital technology applications skills among talented female students. With the mixed approach, a sample of gifted female students ($n=54$) from the city of Mecca was studied. The results of the study concluded that there were statistically significant differences at the significance level (0.05) between the mean scores of the students of the study sample in the pre and post application of the achievement test in the cognitive aspects related to the skills of digital technology applications in the research. The results also indicated that the performance aspects related to the skills of digital technology applications in scientific research enhanced after the training. Marouane (2020) aimed to show how artificial intelligence (AI) practices can be beneficial to Moroccan SMEs which suffer from many operational issues; SMEs contribute to the 10% of the national GDP. The study focussed on the quality of artificial intelligence (AI) practices, and the characteristics of Moroccan SMEs. In a qualitative study, the perception of artificial intelligence (AI) by the managers of some Moroccan companies was assessed, and the limitations and challenges of such practices were also outlined (Abu-hasanain, 2018; Bzdok & Meyer, 2018). The study of Al-Zain and Al-Magid (2019) showed the role of digital libraries in supporting scientific research processes, to serve effective educational process for the research scholars in Palestinian universities. Al-Qahtani (2018) aimed to identify the use of digital technology applications in scientific research among male and female graduate students at the College of Education at Umm Al-Qura University, Saudi Arabia. The study followed the descriptive survey method on a sample of ($n=82$) male and female students. The study revealed an average use of digital technology applications in scientific research among male and female students. The study recommended the necessity of holding training courses for male and female graduate students to provide them with the skills of using digital technology applications in scientific research.

In another study (Magnisalis, et al., 2011), a critical review of the published scientific literature on the design and impact of adaptive and intelligent systems was presented to support adaptive intelligent collaborative learning. For this, online bibliographic data indicates that 105 articles were included in the review, and the results indicate that adaptive intelligent collaborative learning support systems improve both learners' domain knowledge and collaborative skills. Mental illnesses have an impact

on a person's psychological, social, behavioural, and emotional well-being. The effects of mental disorders are not limited to the mind; one's mental health affects one's physical well-being and vice versa. Mental disorders affect over 1 billion people worldwide, accounting for 7% of all total disability-adjusted life years (DALYs). They are most prevalent in high and upper-middle-income countries. This burden is exacerbated by the fact that in high-income countries and low-resource settings, up to 50% and 90% of people with mental disorders, respectively, do not receive treatment. Diagnosis of mental disorders is complicated by differences in clinical presentation, symptomatology, and fluctuation in the course of illness, which is exacerbated by gaps in our understanding of etiological mechanisms. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and the International Classification of Diseases (ICD-11) are currently used to diagnose mental disorders. Diagnosis is entirely based on subjective accounts from patients on the one hand, and clinical observations and interpretations on the other; objective measures are still unavailable. Furthermore, diagnosing mental disorders can be time- and resource-intensive due to the use of diagnostic tools, interviews with relatives or caregivers, and the collection of health histories (Frangou et al., 2017; Fiske et al., 2019).

Diagnostic and interventional aspects of psychiatric care can be greatly aided and enhanced by digital health tools and technologies (Gongora et al., 2019; Gartner et al., 2019). Artificial intelligence (AI) is a leading and popular form of such digital technologies, allowing machines to learn complex, latent rules and provide actionable conclusions by understanding queries and sifting through and connecting mountains of data points. Advances in the use of artificial intelligence (AI) for diagnostic and therapeutic mental health interventions are on the rise, with numerous examples including social bots to support dementia care, sexual disorders, and even virtual psychotherapists (Pinaya et al., 2019). AI has the potential to completely transform our understanding of mental disorders and how to diagnose them (Rehm et al., 2019). Using AI to study and understand complex patterns and interactions between one's genes, brain, behaviours, and experiences represents a once-in-a-lifetime opportunity to improve early mental illness detection and personalise treatment options (Ohrnberger et al. 2017; Martinez et al., 2018). A plethora of studies have been conducted to assess the accuracy of AI models in diagnosing mental disorders such as Alzheimer's disease (AD)¹², schizophrenia (SCZ)¹³, bipolar disorders (BD)¹⁴, posttraumatic stress disorder (PTSD)¹⁵, and obsessive-compulsive

disorder (OCD)16 (Tagaki et al., 2017; Su et al., 2020; Salminen et al., 2019; Roland, 2020). Several systematic reviews summarise the evidence generated by these studies (Battista et al., 2017). Although conducting an umbrella review (i.e., a review of systematic reviews) is important for drawing more accurate and comprehensive conclusions on a specific topic, no previous umbrella reviews on the diagnostic performance of AI models for mental disorders have been published to our knowledge. The goal of this comprehensive review is to compile previously published evidence on the performance of AI models in diagnosing mental disorders (tang et al., 2021).

Tools: In order to reach the research goals, a questionnaire was made based on a number of previous studies that were directly related to the research topics. For each paragraph, the following criteria were used:

Category	1-1.80	1.81-2.60	2.61-3.40	3.41-4.20	4.21-5.00
Evaluation	very low	Low	Neutral	High	Very high

The validity of the virtual tool was verified by displaying the questionnaire's paragraphs to a group of specialised and experienced arbitrators from among the faculty members of the Northern Border University for their observations and suggestions. The stability of the search tool was confirmed using the Cronbach-Alpha equation to find the internal

Variables: The research included the following variables:

1. Demographic variables, which included gender (male/female), educational levels (basic/secondary/university), and social background (rural/urban).
2. The independent variable is the experience of artificial intelligence (AI).

Statistical procedure: The following statistical methods were used to answer the research questions and the generalisations of the results: *Calculate percentages, arithmetic averages, standard deviations, one-sample t-test, and three-way ANOVA tests.*

4. GENERALIZATIONS AND DISCUSSION:

It has been suggested that there is a need for a close combination of AI technologies with educational and learning theories to underpin learning and instruction (Chen, Xie, & Hwang, 2020; Hwang et al., 2020; Hwang & Tu 2021). This is because educational and learning theories have been rarely adopted in AIED research. One emerging trend in AI Ed is the rise of the "AI-empowered, learner-as-leader," whose purpose is to encourage the incorporation of human intelligence into AI and to solve problems like the inherent biases of AI algorithms, the absence of proper governance, and the lack of transparency into the reasoning behind an AI's decision-making process (Hwang et al., 2020; Hwang & Tu, 2021). In this paper, the data results in the possibilities available in the area of AI based education in Saudi Arabia. The following research questions seek to explore such possibilities:

3. METHODOLOGY

The descriptive analytical method was used for the research because it fit with what was being done.

The research community consisted of all male and female teachers in *Turaif*. Four schools were intentionally selected because of the geographical proximity to the researcher's residence, where the sample size was ($n = 218$) individuals.

consistency coefficient of the tool to measure the extent of consistency between the respondents' answers for all items The reliability coefficient was (0.801), which is an acceptable value and enhances the accuracy of the tool and its suitability for application to achieve the research objectives.

The first question is: What are the indicators of the success of the artificial intelligence (AI) experience in digital education?

There is a strong possibility that artificial intelligence will surpass human intelligence in all areas within 45 years, and it is expected to be able to take over all human jobs within 120 years. "Machines will outsmart humans at translating languages by 2024; writing school essays by 2026, driving trucks by 2027, working in retail by 2031, writing a bestselling book by 2049, and performing surgery by 2053 ". Artificial intelligence improves its capabilities rapidly, and increasingly proves itself in areas that have been historically controlled by humans. It is expected that within a century, artificial intelligence will be able to do anything that a human can do. If the power of the brain is compared to the power of supercomputers, to help figure out enough devices to power something as complex as the brain, artificial intelligence at the human level will have far-reaching implications for society, particularly over the next century. As artificial

intelligence is one of the most powerful tools that will assist people in their work, as it includes all processes and procedures, as well as the possibility of integrating them with smart decisions and quickly. There are major companies that abandoned most of their employees after activating these tools. The rapid progress in artificial intelligence (AI) technologies is expected to contribute to a major transformation in the modern lifestyle. There is a chance that smart products and humans will clash and not work well together in the future. The main area of conflict will be the economy, but violent political and social effects will follow.

Table 1. Application of the One-Sample t-test to identify the level of success of artificial intelligence (AI) experience in digital education.

average	Standard Deviations	(T) value	Degrees of Freedom	Significance
4.23	0.357	174.841	217	0.001

It appears from the table that the level of success of the artificial intelligence (AI) experience in digital education is high and statistically significant, as the arithmetic mean of the answers of the research sample reached (4.23), which is a high level, and the value of (T) reached (174.841) in terms of (0.001), and this indicates that the level of experience of artificial intelligence (AI) in digital education is statistically significant and feasible from the point of view of the research sample members.

The third question is: Are there differences in the level of success of artificial intelligence (AI) experience in digital education according to the variables (educational level, gender, place of residence)?

Table 2. Arithmetic averages and standard deviations of the research variables (sex, educational level, and social background).

Areas	Gender	Number	SMA	Standard Deviation
gender	Male	95	4.21	0.38
	Female	123	4.24	0.34
educational level	Primary	64	4.23	0.35
	Secondary	97	4.22	0.38
	Undergraduate	57	4.25	0.33
social background	Rural	98	4.28	0.36
	Urban	120	4.19	0.35

It appears from the table that there are apparent sources of differences, the (3-way anova) test was applied, and the following table shows that:

Table 3. The three-way ANOVA test was used to determine the effect of the variables (gender, educational level, and social background).

Variables	Sum of squares	Degrees of Freedom	Mean squares	value (F)	Probability	ETA
G	0.102	1	0.102	0.824	0.365	0.004
EL	0.057	2	0.028	0.229	0.795	0.002
SB	0.747	1	0.747	6.031	0.015	0.028
G * EL	0.586	2	0.293	2.365	0.096	0.022
G * SB	0.001	1	.001	0.010	0.920	0.000
EL * SB	0.314	2	0.157	1.267	0.284	0.012
G * EL * SB	0.583	2	0.292	2.354	0.098	0.022
Error	25,526	206	0.124			
Corrected Total	27,651	217				

* Probability ($\alpha = 0.05$).

The results of applying the 3way ANOVA test to identify the effect of the variables (gender, educational level, social background) on the extent to which there is a difference in the level of success of the artificial intelligence (AI) experience in digital education. ($n=218$)

It appears from the table that there are no differences in the level of success of the artificial intelligence (AI) experience in digital education according to the variables (educational level, gender), as the (F) values did not reach the required significance level ($\alpha = 0.05$). There are differences in the level of success of the artificial intelligence (AI) experience in digital education according to the variable (housing: village, city) and the differences were in favour of the village" with an arithmetic average (4.28). While there were no differences in the interaction between all the variables, this indicates that the variables (gender, educational level, housing) do not affect the level of success of the artificial intelligence (AI) experience in digital education.

The advancement of AI Ed toward the "AI-empowered, learner-as-leader," state requires several key ingredients, such as multimodal data gathering methods, real-time AI algorithm models, and multidimensional characteristics of AI Ed. To begin with, the multimodal collection of data improves the interpretation, proof, and support of human learning's depth and complexity (Cukurova et al., 2019; Giannakos et al., 2019; Yang et al., 2021). The evolution of cutting-edge interaction methods may cause a sea change in current practises of collecting data from multiple sources at once (Xie et al., 2019). To better comprehend the learners' conditions and make accurate predictions about their future performance in class, for instance, researchers have turned to multimodal data gathering techniques like physiological sensing data, eye-tracking, and electroencephalography (Giannakos et al., 2019). Second, real-time AI algorithm models may be able to

gather data and provide rapid feedback to humans, empowering both students and educators. For the purpose of fostering AI-empowered, learner-as-leader, human-computer interaction (HCI) can integrate real-time AI algorithm models and multimodal input data to pursue multi-pronged approaches and the combination of complex, multimodal data, as well as the identification of the most important features of those data-streams.

CONCLUSION

In order to adapt and comply with this change, there will be an urgent need to bring about a change in public policies in line with these anticipated developments. Various plans must be drawn up to redistribute employment, and for individuals, they can go to invest in other areas.

There is also a great amount of optimism surrounding the concept that, as artificial intelligence becomes a more important component of the classroom, educators will be better positioned to provide tailored learning experiences for each and every student. Artificial intelligence has the potential to "enhance human teachers' abilities to tailor lessons to each student without knocking their class schedule off track," as stated in an article published in The Atlantic titled "Artificial Intelligence Promises a Personalized Education for All." This would eliminate the need for educators to "teach to the middle," which is something that frequently occurs when their students have a range of skill levels and learning abilities. According to a quote attributed to Rose Luckin, a professor of learning-centered design at University College London, "the real power of artificial intelligence for education is in the way that we can use it to process vast amounts of data about learners, about teachers, and about teaching and learning interactions." In the end, artificial intelligence can "help teachers

understand their kids more precisely and more efficiently." It is hoped that artificial intelligence will, in the end, be able to assist educators in continuing to make progress in addressing the wide range of physical, cognitive, academic, social, and emotional factors that can affect student learning and ensure that all students have equal opportunity in education, regardless of their social class, race, gender, sexuality, ethnic background, or physical and mental disabilities. In other words, it is hoped that AI will help educators make continued progress in addressing the broad range of physical, cognitive, academic, social, and emotional issues.

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