

**The Future of Education with Artificial Intelligence
and Machine Learning in the Arab World: A Systematic
Review of Opportunities and Challenges**

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Abstract

Machine Learning (ML) and Artificial Intelligence (AI) are mechanisms that appeared as a result of data management development; trends that are identified as "Game-changer" which revolutionized many various industries, including Education. They have emerged as a promising technology that can offer innovative solutions to some problems that the Arab world faces. This systematic review aims to examine the opportunities and challenges of using AI and ML in Arab World Education. A comprehensive search was conducted in major databases such as PubMed, Scopus, EKB, and Web of Science, using relevant keywords. The search yielded 30 relevant articles that were included in the review. The results indicated that the use of AI and ML in Education has the potential to improve the quality of Arab world Education in many fields such as Medical Education; in which AI and ML have revolutionized disease prevention, detection, and treatment. Also, the results show that the main functions of AI and ML in Education include Personalized learning, Automation, Adaptive Learning Platforms, Intelligent Tutoring Systems, Automated Grading and Feedback, Smart Content Creation, Predictive Analytics, Early Intervention, Language Learning, Paraphrasing, and Translation. However, there are also some significant challenges that need to be addressed, such as the Lack of Infrastructure, Limited resources, Cultural barriers, and Ethical considerations. In conclusion, the successful implementation of AI and ML in Arab World Education requires a comprehensive strategy that takes into account the unique context of the region.

Keywords : Arab World Education, Artificial Intelligence, Machine Learning and Medical Education.

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1. Background:

Artificial Intelligence (AI) is a branch of computer science that develops machines' abilities to work, take decisions, and learn like humans. Also, Artificial Intelligence (AI) as a concept 'refers to the ability of a digital machine to perform tasks commonly associated with intelligent beings' (Ritonga, et al.,2022). AI associated technologies include different branches, such as Computer vision, Robotics, Speech Recognition, Machine Learning, and Natural Language Processing. Machine Learning (ML) is a subset of AI that focuses on enabling machines to learn on their own without being programmed explicitly(Kuleto *et al.*, 2021). ML involves the use of algorithms and statistical models to analyze and draw insights from data. AI in education enhances and enriches learners' experience. It is used in analyzing data, instructional design, personalized learning, and student assessment, among others.

According to UNESCO (2019), AI and ML are critical drivers for improving the quality of education in developing countries and remote areas. The report highlights the potential of AI and ML in enhancing the effectiveness of teaching and learning; increasing access to education, and improving assessment and evaluation processes. Then, another report (UNESCO, 2020) stated that the Arab world faces significant challenges in the education sector; including a high rate of illiteracy, limited resources, and a shortage of qualified teachers. These challenges have prompted policymakers and educators to explore new approaches; thinking about using AI to improve the quality of education in the region.

To address these challenges and explore the opportunities of using AI and ML in the Arab world; as promising technologies that can offer innovative solutions, a systematic review is needed. It can provide a comprehensive analysis of the existing literature on the topic, identify the opportunities and challenges of using AI in education in the region, and guide future research and policy initiatives. That's because AI has the potential to transform education by providing personalized learning experiences,

automating administrative tasks, and enhancing the effectiveness of teaching and learning (Alzahrani, 2022). However, the successful integration of AI and ML in education requires a comprehensive understanding of the opportunities and challenges that this technology presents in the Arab world.

2. Theoretical Framework and Literature Review:

The main goal of using Artificial Intelligence (AI) is to integrate the science and engineering of intelligent machines to mimic the human mind's ability to learn and make decisions. It is the development of computer systems to perform tasks that typically require human intelligence, such as Visual perception, Speech recognition, Decision-making, and Natural Language Processing (NLP). The usage of Machine Learning algorithms, Deep learning neural networks, and other techniques are the main characteristics of AI to create intelligent systems that can learn from data and improve their performance over time (Haneya et al., 2021). The goal of AI is to create machines that can perform tasks that normally require human intelligence and to make these systems more intelligent and capable over time.

2.1. Artificial Intelligence Subfields:

Natural Language Processing (NLP) is a subfield of Artificial Intelligence that focuses on enabling computers to understand, interpret, and generate human language. Keezhatta's (2019) study aimed to know the effect of AI application in the linguistics field, specifically its effects on Natural Language Processing (NLP) platforms; she mentioned the stages involved in NLP, including tokenization (breaking text into words or phrases), parsing (analyzing the grammatical structure), and semantic analysis (understanding the meaning of the text). NLP aims to fill the gap between human communication and computer understanding by playing a crucial role in training chatbots like ChatGPT to teach them how to process and generate 'human-like' text responses. Moreover, using Machine Learning techniques is effective in training NLP models to perform these tasks. The complexity of NLP tasks can vary depending on the language being processed; for example, NLP for English and Arabic

presents different challenges due to the distinct characteristics of each language (Keezhatta,2019).

2.2.Artificial Intelligence Usage in the Arab World :

The use of AI in education has received increasing attention in recent years, particularly in the Arab world. Also, Education must be adapted to the profound changes imposed by the Fourth Industrial Revolution, which is one of the most important global challenges facing teaching and learning today (Alraasibia, 2021). Several Arabic countries, including Saudi Arabia, UAE, Libya, Oman, Lebanon, Palestine, and Egypt, have started researching and utilizing Artificial Intelligence within their systems and processes (Haneya et al., 2021). However, Sourani (2019) asserted that Arabic countries remain unprepared to substitute Artificial Intelligence for teachers because of the various challenges that they face; which may vary from the challenges faced by Western countries.

In the past, Education systems in the Arab World have faced many challenges with traditional classrooms. Makhlof (2021) explained that lack of interaction and poor speaking practices of some teachers prevent traditional lessons from meeting learners' needs in terms of enhancing their speaking abilities. During COVID-19 pandemic, several schools have closed, making online education more common; causing numerous challenges in the education sector. However, new opportunities for teacher assessment and professional development have arisen from ground-breaking applications of technology and educational information .Education policymakers and governments in the Arab world have found that using technology as a teaching tool is the best approach at this time (Makhlof, 2021).

Using AI applications within an educational system can enhance both learning and teaching skills. It can provide accurate assessments with updated features that can assist teachers as they develop students' skills. Furthermore, Artificial Intelligence systems can be utilized to 'illustrate the differences between traditional methods and smart teaching methods' in the field of education (Abuzakiyeh, 2018). When Artificial intelligence was applied to

medical education, it offered many opportunities, such as fostering the detection and reporting of patients' medical images and fostering diagnosis by medical specialists. In addition, using information from multiple sources such as radiology, laboratory tests, and clinical examinations to deliver desired outcomes can be achieved using artificial intelligence (Haneya et al., 2021). Moreover, Artificial Intelligence has a role in telehealth, such as supporting the remote monitoring of patients by virtual doctors and improving the overall patient experience (Haneya et al., 2021). Therefore, the application of Artificial Intelligence is considered an effective tool in slowing down and preventing the spread of COVID-19 and other infectious diseases.

AI and ML applications provide a fun environment and interactive experience for the learning process. AI technology offers customized and interactive software tools packed with virtual and augmented reality. The fact that these tools are deployed on digital devices, such as tablets, smartphones, and laptops/computers, makes them easily accessible to learners, regardless of their geographical location and age group. It, thus, opens up a door to quality education for all. At the same time, AI and ML technologies are automating the repetitive administration tasks for school or college staff. The AI-automated grading process is already being utilized for assessing multiple-choice tests which saves a lot of time for teachers.

2.3. Limitations of Implementing AI and ML in Arab World Education:

There are a lot of limitations for implementing AI and ML in Arab world education such as (Sallam,2023) :

Infrastructure and Resources: Despite the potential benefits of using AI in education in the Arab world, there are also significant challenges that need to be addressed. These challenges include lack of infrastructure, limited resources, cultural barriers, and ethical considerations. For example, Al-Samarraie et al. (2020) identified lack of infrastructure and limited resources as significant barriers to the adoption of AI in Iraq education. Furthermore, Limited access to reliable internet connectivity, outdated technological infrastructure, and insufficient hardware and software resources can impede the

effective implementation of AI and ML systems in educational institutions.

Data Availability and Quality: The availability and quality of relevant data for training AI algorithms can be a challenge. Arab world education systems may have limited access to diverse and representative datasets, which can affect the accuracy and generalizability of AI models.

Language and Cultural Considerations: Arabic language presents unique challenge in natural language processing tasks. (Alzahrani, 2022). This is because of the rich morphology and complex syntax. Developing AI systems that effectively understand and generate Arabic content can be complex. Additionally, cultural and regional variations should be considered to ensure that AI and ML technologies align with the cultural values and educational practices in the Arab world.

Ethical and Privacy Concerns: Implementing AI and ML in education raises ethical considerations, including data privacy, algorithmic bias, and transparency. Ensuring the protection of student data and addressing algorithmic biases becomes crucial to maintaining trust and fairness in the educational system.

Teacher and Staff Readiness: Integrating AI and ML technologies requires teachers and staff to develop new skills and adapt to changing roles. Providing adequate training and professional development opportunities to educators is essential to ensure they can effectively utilize these technologies for improved teaching and learning outcomes.

Socio-economic Disparities: Socio-economic disparities within the Arab world can lead to unequal access to AI and ML resources. Ensuring equitable access to technology and addressing the digital divide is crucial to prevent further educational inequalities.

Policy and Regulatory Frameworks: Establishing appropriate policies and regulations to govern the usage of AI and ML in education is essential. Clear guidelines on data protection,

privacy, and algorithmic transparency need to be developed to ensure the ethical implementation of these technologies.

Acceptance and Resistance: Resistance to change and concerns about the impact of AI and ML on traditional teaching methods may hinder adoption. Building awareness, addressing misconceptions, and fostering a positive perception of AI and ML in education are necessary to overcome resistance and promote acceptance. Also, the wrong stereotyped idea about replacing manpower with AI and ML robots may be a source of resistance.

Finding strategies for implementing AI and ML has great potential in e-learning and higher education institutions (Kuleto et al., 2021), as they can enhance the effectiveness of the teaching and learning process in Arab Higher Education. Alghamdi (2020) mentioned that AI-based interventions can improve student engagement, provide personalized learning experiences, and enhance the effectiveness of teaching.

3. Research Objectives:

This Systematic review aims to :

- Identify the opportunities for using AI and ML in Arab world education.
- Identify the challenges that the Arab world faces while using AI and ML in education.

4. Research Questions:

This Systematic review tries to answer these questions:

- 1) What are the opportunities for using AI and ML in Arab world education?
- 2) What are the challenges of using AI and ML in Arab world education?

5. Methodology:

To conduct this systematic review, a comprehensive search was conducted in major databases such as PubMed, Scopus, and Web of Science. The search was conducted using relevant keywords such as "Artificial Intelligence", "Machine Learning ", "Education," and "Arab World". The search yielded 30 relevant articles that were included in the review. The inclusion criteria included articles

published between 2015 and 2023, written in English, and focused on the use of AI and ML in Arab world education .

Table 5.1 The Search process details

Search Engine	Number of Articles	Field	Country	Number of included studies according to the Inclusion criteria
Egyptian Knowledge Bank	400	Medical Curriculum	UAE, Egypt, Saudi Arabia	6 = 20% (of total studies)
Google Scholar	50	Medical Education	UAE, Egypt, Saudi Arabia,	12= 40 %
Scopus	10 Two of them were excluded because they aren't from the Arab world countries	Education	UAE, Egypt	3 =10%
Web of Science	15	Medical Curriculum	UAE	3=10%
Pubmed	50	Medical Education	UAE, Egypt, Saudi Arabia	6=20%
Total	525			30 study

The first step, in the review plan, was based on defining the research question with an appropriate understanding of the research topic. Then, it was followed by choosing the Inclusion and Exclusion Criteria. The selection of particular studies regarding this systematic review was based on identification and establishment of certain criteria for the evaluation using the Prisma checklist. The third step was the identification of all systematic review studies to execute the appropriate strategies after defining the potential databases and research engines .Conducting the review is the second stage; all of the 525 articles(resulting from the search process) were screened and reviewed independently by the researcher. The data was extracted from the selected articles, 30 articles according to the inclusion criteria, including the study design, AI techniques used, and outcomes using the PRISMA model which has its values; and is presumed to be more appropriate for systematic reviews and meta-analyses. The articles were analyzed thematically to identify the opportunities and challenges of using AI in Arab world education.

Then it was followed by the third stage which is the Evaluation of the Risk of Biasness in the Studies. The final stage was writing and editing the Review Report.

Table 5.2: Reviewing the Selected Studies

N	Authors & Country	Research Focus	Study Design	Results	Opportunities in Education	Challenges
1.	Alhashmi, Mubin, & Baroud, (2021). Country: UAE	Teachers and students views of humanoid robots usage as teaching assistants.	Qualitative	The students were generally appreciative of the incorporation of humanoid robots as co-teachers, whereas the teachers were more circumspect, expressing some concerns and noting a desire to streamline the process of bringing robots to classrooms.	-Integration of educational Robots in the Arab Education Context -Using AI to enhance personalized learning experiences	-Cultural challenge: Children thought that the robot is a toy, not a teaching aid.
2	Ashour, (2020). Country: UAE	Enhancing teaching and learning in higher education	Survey	The study also investigates what students need to enhance their learning. The study revealed that the digital age is not ‘transforming’ the nature of universities. AI is effective in enhancing teaching and learning in higher education.	Blending technology with the formal in-person approach can produce significant benefits in improving student learning and success. AI has the potential to enhance teaching and learning experiences.	-There are challenges related to cultural factors, language barriers and lack of infrastructure.

3.	Alghamdi, Alanezi, & Khan (2020) Country: Saudi Arabia.	Artificial Intelligence e-based examination system	Survey	Improving the e-learning process using an intelligent question bank and an examination system.	A novel method to avoid the presence of a proctor throughout the examination is proposed by an intelligence-based examination system.	-Addressing infrastructure and resource constraints is crucial for successful AI adoption in education.
4.	Ragheb, Tantawi, Farouk, et al. (2022). Country: Egypt	Significant variables affecting students' behaviour intention in Egyptian higher education to accept the usage of chat-bot technology	Survey	Results indicated a significant impact of performance expectancy, effort expectancy and social influence on students' behaviour and intention to accept the chatbot technology in Egypt's higher education.	Using AI applications and tools (chatbots) such as personalized education as a teaching method that satisfies the needs of each student.	-AI can support technology-enhanced learning, but there are Ethical challenges that may affect the adoption of chatbot technology and its influence on behaviour intention.
5	El Helow& Salem. (2022). Country: Egypt	Integrating Artificial Intelligence (AI) and Machine Learning (ML) methods into educational technology resources	Literature review	AI helps teachers advance their work and better influence students. It also allows educators to create scholarly content that suits their students, providing them with all the information they need, while ensuring personalized learning.	The Role of Artificial Intelligence as an Approach to Integrate Robotics into Early Childhood Education	-The traditional education system does not maintain a balance of theoretical and practical learning, as it lacks the practical aspect of AI in Children's Education.

6	Sharawy, (2023). Country: Egypt	AI usage in Egypt's Higher Education	Qualitative	The findings showed that faculty members are willing to adopt AI in their institutions based on their responses to performance expectancy, effort expectancy, and social influence.	AI as a tool to achieve equity and accessibility in Egypt's higher education.	-More work must be done regarding facilitating conditions and the perceived risks of AI -Lack of resources available to support AI usage to achieve equity and accessibility.
7	Selim & Rezk (2023) Country: Egypt	Compulsory school-dropout	Comparative Analysis	The main contribution of this paper is to provide an explicit predictive AI model for school dropouts in Egypt which could be employed for identifying vulnerable students who are continuously feeding this chronic problem.	Developing a Logistic model can early predict students at risk of dropping out at the basic education stage. Also, AI has the potential to support personalized learning and improve student outcomes.	-There are challenges related to poverty and lack of infrastructure.
8	Ali, (2023). Country: Egypt	The assessment of AI readiness levels for faculty members from three different types of universities (public/private/non-profit)	Mixed Method	AI readiness of faculty members in Egypt is relatively high, as 87% of the participants demonstrated high levels of AI readiness. Also, it was not correlated with the type of university they belong to.	Technological literacy plays a significant role in AI readiness.	-Lack of published research on the integration of AI in Egypt education

9	Johnson, et al., (2022). Country: UAE	AI course for business executives in the United Arab Emirates	Experimental	They developed a course that teaches AI intending to enable students to understand how to incorporate it into existing business processes.	This paper contributes the first experience report of teaching AI in the Arab World executive education.	-Ethical, social, and legal challenges in implications of AI -Lack of Technical tools for implementing AI
10	Alotaibi & Alshehri (2023).	Examining the opportunities and challenges that arise from the adoption of AI-based learning outcomes in Saudi Arabia's higher education institutes.	Literature Review	AI is in a nascent stage within the realm of learning, and it has become an undeniable reality for higher education institutions. Embracing this transformative technology is crucial for meeting future learning challenges.	- AI has the potential to address significant educational challenges, revolutionise teaching and learning methodologies, and accelerate progress toward the Saudi 2030 objectives.	-This study also highlights certain challenges associated with the implementation of AI-based learning in the higher education context of Saudi Arabia, emphasising the need for teachers to acquire new technological skills to effectively utilise AI pedagogically. Also, Students should acquire the necessary technical skills to interact with artificial intelligence in the future.

11	Abuzaid, Elshami& Fadden (2022).	Knowledge, attitude, willingness, and organizational readiness to integrate AI into nursing practice	Cross-sectional Survey	In healthcare, AI application is applied in robotics and radiology image interpretation. Integration of AI in health and medicine has become a reality, and every professional will experience some sort of impact of work automation and integration of AI applications.	Implementing AI applications in nursing could help nurses make clinical decisions. Also, Further education and training is required to enable a seamless and safe integration of AI into nursing practice	-Lack of understanding of AI principles in the nursing profession.
12	AlShaikh & Hewahi(2021) Country: Bahrain	Utilizing various techniques of AI and Machine Learning (ML)	Comprehensive Survey	This study shows the importance of AI and ML. Researchers focus more on Reinforcement Learning (RL), Artificial Neural Networks (ANN), clustering, Bayesian Networks (BN) and Fuzzy Logic (FL) approaches.	Supporting and helping learners to obtain specific intellectual knowledge practically and productively through the use of different computing technologies.	-Lack of human resources trained to use AI
13	Khalil, et al (2023) Country: Bahrain	Adapting Technology Acceptance Model (TAM)	Quantitative and Qualitative Approach	The research suggested methods to improve the results and overcome future challenges.	The Role of Artificial Intelligence (AI) in improving Bahrain's education quality.	-Ethical aspects, data privacy and security issues

14	Safeh, et al (2023) Country: Bahrain	Developing a prediction system that assists students in selecting a high school course tailored to their individual skills and academic performance.	Literature review	The outcomes revealed that all three models utilized (Random Forest, AdaBoost, and MLP) demonstrated high effectiveness in accurately predicting students' success in making the appropriate choice of a high school course.	Regarding future prospects, it is important to continue exploring new models for predicting student success in Higher education.	- Privacy and data protection rights
15	Alhassan ,et al. (2022) Country : Saudi Arabia	A Framework for an Arabic troubleshooting chatbot aiming at diagnosing and solving technical issues	Quasi-Experimental	The suggested framework for devolving an Arabic troubleshooting chatbot to diagnose and solve technical issues is developed. A framework that supports Arabic text for better machine understanding is implemented.	It is an important basis for future Arabic chatbot development.	-Language and culture challenges

16	Muniasamy & Alasiry (2020) Country: Saudi Arabia	Deep learning using Artificial intelligence.	Survey	Deep learning-based artificial intelligence tools and a platform enabling the developer and learners to quickly reuse resources are summarized. Adaptive learning technologies would give rise to completely personalized environments with content that not only changes but is created based on the individual needs of the learner.	Future trends of AI-based deep learning in E-Learning	-Lack of AI training for both platform developer and learner
17.	Hessen,et al . (2022) Country: Egypt	An effective and suitable system for multiagent-based machine learning algorithms and feature selection methods to enhance e-learning	A Proposed Framework	The results showed that the learning algorithm, which has been measured by the Extra Trees method, has achieved the highest performance depending on the evaluation of cross-validation and testing.	Using Artificial Intelligence approaches to develop the prediction to enhance performance.	-Ethical consideration - Confidentiality of data

18	Marzouk, et al (2021) Country: Egypt	Applying Artificial intelligence -based Models to predict the prevalence of COVID-19	A Proposed Framework	Investigating the application of deep learning models using the official reported data till June 2021.	The application of Artificial Intelligence-based methods has been emphasized as an alternative to clinical methods to model the spread of this infectious disease.	- Confidentiality of data
19	Sayed, et al , (2023). Country: Egypt	Adaptive personalized E-learning platform	Experimental	AI-based Adaptive Personalized Platform for Effective and Advanced Learning (APPEAL) for school students, which achieves more effective learning with reduced time spent, improved grades, and satisfaction levels.	AI can support students with physical and cognitive disabilities such as aural or visual processing	-Cultural challenges and Lack of motivation

20	Murtaza,(2022) Country: Egypt	Requirements and Challenges for a personalized e-learning system.	In-depth Survey	It provides a comprehensive review of existing solutions in offering personalized e-learning solutions. It also elaborates on different learning models and learning theories, which are significant in providing personalized education. It proposes an efficient framework, which can offer personalized e-learning to each learner.	Developing an adaptive personalized e-learning platform targeted at school students. Efficient mechanisms for personalized e-learning can be beneficial to cater the needs of learners	-Lack of studies about AI
21	Al Badi, et al (2022) Country: UAE	Challenges of adopting Artificial Intelligence (AI) in the healthcare sector	An Analytic Hierarchy Process (AHP) method	The results prioritized the AI main criteria and sub-criteria based on their priority weights in the education of the healthcare sector.	This research helps policymakers formulate suitable strategies for the adoption and acceptance of AI in the healthcare sector.	-Accuracy, Privacy and Security criteria are the most important factors to optimize the healthcare sector with AI.

22	Naidu, et al (2021) Country: UAE	Machine Learning 's role in the education sector	A Proposed framework	The research suggested a framework which can be implemented for effective flipped teaching in higher education.	The successful implementation of this approach can play a vital role in the community of learners. Machine learning can be a revolutionary approach to find the requirements of learners.	-Lack of AI knowledge
23	Johnson, et al. (2021). Country: UAE	Publication of Artificial Intelligence (AI) in education	An experience report	This report compared the number of publications about the usage of AI in education.	AI usage in business education	-Regional and cultural challenges
24	Ghareeb, Jumeily & Baker, (2020). Country: UAE	Using cloud and Fog computing technology integrated with Artificial Intelligence techniques of Machine Learning	A Proposed framework	Developing the computational framework and implementing the framework with the use of different tools lead to facilitating student admissions on other curricula. Also, this framework enhances a smooth transition when assigning students to their year groups, and provides information about students' levels and differentiation	There are many ways in which ML can enhance the education process in the future, such as 1) Customisable learning experience 2) Student path prediction 3) Unbiased grading system 4) Overall feedback on both students' and teachers' performance.	-Lack of AI knowledge. -Training -Cultural barriers

25	Abalkheel (2022). Country: Saudi Arabia	Challenges that afflicted EFL Saudi instructors and their learners from attaining sustainable development	A Qualitative study	The findings indicated that despite having gained access to platforms and apps led by technology, EFL instructors faced numerous challenges such as inadequate training, incompetence, restricted accessibility, poor web infrastructure, modest technological assistance, and low motivation,	AI and ML may help bridge the gaps and overcome some of the pandemic's challenges.	-Inadequate training, incompetence, Restricted accessibility, Poor web infrastructure, moderate technological assistance, and Low motivation.
26	Abdel Baky (2022). Country: Saudi Arabia impacts	The impact of a learning environment based on Artificial Intelligence to develop decision-making skills.	A Quasi-experimental approach	The learning environment, based on artificial intelligence in light of the Kolb Model, had a significant impact on the development of cognitive achievement among students.	Many applications rely on Artificial intelligence systems in learning; including data tracking and data mining techniques to track student behaviour, and attendance to avoid dropouts.	-Insufficient Data and Material.

27	Albasalah, Alshawwa & Alarnous (2021). Country: Saudi Arabia	Evaluating the obstacles to activating artificial intelligence and exploitation of information revolution in scientific research in the fields of health sciences and humanities	Survey	The study indicated a moderate relationship between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences in Saudi Universities.	AI” is used in learning and solving problems that are simulated by a machine. Artificial Intelligence and Machine Learning will have a great impact on developing governments, society and business.	-Lack of qualified faculty members to prepare interdisciplinary research using artificial intelligence in Saudi universities. -Lack of educational means and modern educational technology (Infra structure) provided by the university.
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28	Alnaqbi (2020). Country: UAE	AI techniques in Military education.	Literature Review	The results of the research confirmed the widespread use of modern learning technologies in UAE.	The Education Military Command should embrace the creation and development of an intelligent educational system based on AI and e-learning systems suitable for the military learning environment. They should add courses in the fields of AI to the curriculum to enhance teachers' and students' knowledge of Artificial Intelligence.	-Lack of human resources trained to use AI -Lack of Infrastructure, and high budget
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29	28. Al-Zyoud, (2020). Country: UAE	AI and its impact on teachers' professional development	An Analytical Approach based on a Theoretic al Survey	The results refer to a set of intelligent applications as well as areas of Artificial Intelligence that can serve the professional development of teachers.	-Designing educational software based on Artificial Intelligence to raise the qualifications of teachers. -Designing training pathways based on Artificial Intelligence for all those working in the field of education.	-The need to change the culture of society about AI -Raising awareness of the wrong uses of technology and its impact on society.
30	Elayyan, (2021). Country: UAE	The impacts of the 4th Industrial Revolution (IR 4.0) in education	Question naire	The study results indicated that implementing significant transformations, in instructional programs, curricula, learning environment, and teachers-students roles, is necessary to deal with IR 4.0 technologies and products.	Artificial Intelligence will be used in a wide range in the future to improve learning opportunities and keep students' data and activities for a long time.	Cultural challenge: they predicted that robots and machines will work instead of humans even in educational jobs in the future.

6. Results:

The review in Table 5.1 identified several opportunities and challenges of using AI in education in the Arab world.

6.1. The opportunities include:

1. Personalized learning: AI can provide personalized learning experiences that cater to the needs and abilities of individual learners (Murtaza,2022).
2. Automation: AI and ML can automate administrative tasks such as grading, scheduling, and reporting, which can free

up teachers' time and improve efficiency. Many applications rely on Artificial intelligence systems in learning; including data tracking and data mining(Abdel Baky ,2022)

3. Enhanced teaching and learning: AI can enhance the effectiveness of teaching and learning by providing real-time feedback, identifying knowledge gaps, and recommending relevant learning resources.
4. Access to education: AI can provide access to education for learners in remote or underprivileged areas, enabling them to receive high-quality education.

The review also mentioned the function of using AI in Arab world Education

, AI has the potential to be implemented in the region:

Adaptive Learning Platforms: AI can power adaptive learning platforms that personalize the learning experience for students. These platforms can analyze students' performance, identify areas of strength and weakness, and dynamically adjust the content and activities to meet their individual needs. For example, an AI-powered platform could recommend specific learning resources or adapt the difficulty level of questions based on a student's progress.

Intelligent Tutoring Systems: AI can support the development of intelligent tutoring systems that provide personalized guidance and support to students. These systems can simulate one-on-one tutoring interactions, answer student questions, provide explanations, and offer targeted feedback. By analyzing students' responses and learning patterns, the system can adapt its instruction to address their specific learning gaps(Ghareeb, Jumeily & Baker, 2020).

Automated Grading and Feedback: AI can automate the grading process for assignments, quizzes, and exams. By leveraging machine learning algorithms, AI systems can assess student work, provide objective feedback, and generate grades. This automation can save teachers time, reduce grading errors, and provide students with timely feedback on their performance.

Smart Content Creation: AI can help in creating any educational content. Natural language processing algorithms can

design interactive curricula, exercises, quizzes, exams and assessments(Johnson, et al. (2022). AI can also contribute to the development of digital learning resources, such as adaptive textbooks, virtual labs, and multimedia materials that enhance student engagement and understanding.

Predictive Analytics and Early Intervention: AI can analyze educational data to identify patterns and trends that help predict student outcomes. By analyzing factors such as attendance, grades, and engagement data, AI systems can identify students who may be at risk of falling behind or dropping out. This information can enable timely interventions and support strategies to improve student success.

Language Learning and Translation: AI-powered language processing technologies can facilitate language learning and translation tasks. For example, chatbots or language learning applications can provide language learners with conversation practice, vocabulary exercises, and pronunciation feedback. AI can also assist in real-time translation and interpretation, enabling communication among students with different language backgrounds. In addition to language Paraphrasing, AI will help the Arab world students to avoid plagiarism.

These are just a few examples of how AI can be implemented in education in the Arab world. The actual implementations may vary depending on the specific context, resources, and priorities of educational institutions and policymakers in the region.

6.2.The challenges of using AI in education in the Arab world (according to Table 5.1) include:

1. Lack of infrastructure: The adoption of AI in education requires significant investment in infrastructure, including hardware, software, training and connectivity as Alhashmi et al.(2021) results which mentioned that adopting any change, such as the use of AI robots and other methods in teaching. Also, a lack of motivation to change the traditional way of education to a smart intelligent way using AI is a challenge (Sayed, et al, 2023).

2. Limited resources: Many educational institutions in the Arab world have limited resources, which may hinder their ability to adopt AI.
3. Cultural barriers: The cultural context of the Arab world may pose significant challenges to the adoption of AI in education, including social norms, values, and attitudes towards technology. The wrong idea that AI will replace human beings is a milestone challenge which leads to resistance and refusal to use it (Johnson, et al. 2022).
4. Language barriers: English vs. Arabic Natural Language Processing:

Several factors, ranging from the Arabic language's inherent complexity to government involvement and education can be a huge challenge for educators in the Arab world; such as:

- Rich morphology Arabic; words can have numerous forms and variations, making it difficult for NLP models to identify and process them accurately.
- Complex syntax: The sentence structure in Arabic can be more complex than in English, posing challenges for parsing and understanding the relationships between words and phrases. Unlike English, which follows a relatively fixed subject-verb-object word order, Arabic allows for a more flexible word order, such as verb-subject-object and subject-object-verb. This flexibility can make it challenging for NLP models to parse and understand the relationships between words in a sentence.
- Dialectal variations: Arabic has numerous dialects that differ significantly from the Modern Standard Arabic used in formal writing. This makes it challenging for NLP models to process and generate text in these dialects, which are widely spoken (both physically and on the web) across the Arab world.
- Limited resources: Compared to English, there are fewer annotated datasets and research available for Arabic NLP, which can hinder the development of advanced models and techniques.

5. Ethical considerations: The use of AI in education raises ethical concerns such as privacy, bias, and accountability, which need to be addressed
6. High budget of AI and its applications.
7. Confidentiality of data especially for the health education sector

6.3. The Arab World Current Standing

Interest in artificial intelligence has been bubbling in the region for some time, with several governments announcing national AI strategies and seemingly exploring the potential of this technology. Saudi Arabia was recently ranked second globally in “AI awareness” in Stanford University’s USA’s Artificial Intelligence Index Report, (Alghamdi, et al.,2021). This ranking with this literature review reflects that UAE is in the first place, then it is followed by Saudi Arabia and Egypt in second place for searching and using AI tools and services, as well as their general optimism toward this transformative technology in education.

Upon reviewing the current literature, studies from countries that have unstable conditions, such as Libya, Iraq, Palestine, and Lebanon, focused on introducing artificial intelligence techniques, their role in smart teaching systems, and the perception of teachers on the utilization of artificial intelligence rather than on artificial intelligence applications themselves. For example, the role of artificial intelligence techniques was discussed in smart teaching systems to support their utilization in Libya (Abuzakiyeh, 2018). Another study in Libya dealt with the possibilities afforded by the domains of artificial intelligence and their use to the best advantage for both students and professors (Hussin et al., 2021). Furthermore, a study in Iraq discussed and defined the applications of artificial intelligence in education from the point of view of university teachers.

The Arab world has been making progress in adopting and utilizing artificial intelligence technologies. Several countries have launched national AI strategies to guide the development and implementation of AI. For example, the UAE launched its "UAE Strategy for Artificial Intelligence" (Halwa ,2017) focusing on four sectors: government, education, economy and research (UAE strategy

for Artificial Intelligence, 2017). Saudi Arabia also launched its "Saudi Vision 2030" which aims to develop AI applications to enhance people's lives (Mitchell, & Alfuraih, (2018).

However, the Arab world still faces several challenges in scaling up AI. There is a lack of expertise and skilled AI workers in many countries .Funding for AI research and entrepreneurship remains limited compared to regions like North America and Asia . Access to data, an essential input for training AI algorithms, is still lacking due to issues of data privacy and regulations . Despite these obstacles, there are opportunities for AI to drive economic development and social impact in the region. Countries like Egypt, Saudi Arabia, and the UAE are forging ahead with investments and initiatives to harness the power of AI . With the right combination of policies, funding, and talent development, the Arab world's AI ecosystem is poised for growth in the coming years.

8. Conclusion

This review indicates that the use of AI in education has the potential to improve the quality of education in the Arab world. However, there are also significant challenges that need to be addressed to ensure the successful implementation of this technology. The successful integration of AI in education in the Arab world requires a comprehensive strategy that takes into account the unique context of the region, including the cultural, social, and economic factors. The findings of this review can inform policymakers and educators in the Arab world about the opportunities and challenges of using AI in education and guide the development of effective strategies to promote its adoption. It is important to know that artificial intelligence must not completely replace teachers; rather, the human mind should work side by side with the artificial mind in a calculated way.

Despite these challenges, recent advancements in NLP and machine learning have led to significant improvements in Arabic language processing. As a result, chatbots like ChatGPT become increasingly capable of understanding and generating coherent and contextually relevant text in Arabic, paving the way for more advanced and accessible AI applications in the Arab world.

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