

Review on AI in Higher Education Institutes in Yemen

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Abstract

Nowadays, artificial intelligence is increasingly used in different sectors of industry. Its positive influence changes the operation process and forces these industries to implement artificial intelligence. Education is one of these industries that implement artificial intelligence. Despite this positive impact, in Yemen, up to our knowledge, AI has not been experienced in any education system. This paper aims to overview the AI in higher education institutions with special focus on Yemeni situation. A questionnaire was distributed among public and private Yemeni universities to measure the degree of AI implementation in their environment. Results show that only 30% of the responded public universities have AI programs and only 10% from private universities. These percentages are not promising and still in the traditional area. So, we recommend increasing the awareness of the importance of AI and its role on enhancing the quality of education in Yemen. Furthermore, we hope YCIT-HE and Higher Education Institutes will work on education technology.

Keywords: AI, education quality, Yemen AI, Yemen Education



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Introduction

Nowadays, artificial intelligence (AI) is increasingly used in different sectors of industry (Mishra, 2019). Education is one of these industries that implement AI (Zhang, 2023). Traditional learning methods have become obsolete and rejected by various educational institutions (Krstić, 2022). Besides, AI systems have significantly changed the operation process (Albawwat, 2021) specially the education process (Krstić, 2022, Ahmed, 2025). On the other hand, globalization demands more talent cultivation in education (Zhang, 2023, Al-Ghobesi, 2025) and AI. For this reason, using AI in education has become increasingly apparent (Huang, 2021, Omer, 2024).

Implementing AI in education increases the urgency of embedding innovative technologies and new teaching and learning methods (Krstić, 2022, Alasmari, 2023, Mleiki, 2025).

Innovative AI technologies have an impact on the methods of teaching and learning (Huang, 2021). For instance, educators and policymakers would take better decisions and harness the benefits of AI technology and maximize its impact on developing effective communication skills among English language learners (Rusmiyanto, 2023). As result, AI in education changes the way teachers teach and the way students learn (Krstić, 2022). It will achieve both business and students' objectives through the integration of smart classroom teaching and AI technology (Zhang, 2023). Furthermore, the application of AI technology assists teachers in guiding students to exercise their lessons with application skills (Mishra, 2019). AI also provides personalized, adaptable experiences, interactive engagement (Zhang, 2023), real time teaching and feedback (Krstić, 2022) and that leads to student satisfaction and business growth for education institutions (Mishra, 2019).

Using AI in the education process will increase the competitive environment in private education institutions (Mishra, 2019). It is a viable aid in the field of education, including language acquisition, as technology advances (Rusmiyanto, 2023). It also improves practical abilities like ability to respond to a range of learning styles shortly (Krstić, 2022). For students, it will improve their abilities such as writing and offer a trustworthy simulation dialogue platform like spoken languages (Ghafar, 2023). AI systems are rapidly changing educational institutions at all levels of education, to help people learn effectively and meet their learning goals (Krstić, 2022).

However, AI creates challenges for qualifications on online education (Li and Su, 2020). One of the reasons is that education institutes today are not as flexible as those which will be supported shortly using AI (Krstić, 2022).

In short, AI has been introduced into the field of education, where their use has enormous potential to enhance the teaching and learning processes (Salas-Pilco, 2022).

In Yemen, to the best of the researchers' knowledge, AI has not been experienced in any education system. Moreover, it is seldom to find any scientific research which overviews this obstacle. Hereby, we overview AI applications and the possibilities of improving the quality of education. Thus, this study investigates the idea of the national experience of AI in education and recommending national policy.

This paper is organized as follows: introduction is presented in section 1, followed by literature review in section 2; discussion comes in section 3; and finally, conclusion is provided in section 4.

Literature review

Diverse studies handled Artificial Intelligence (AI) in education issues from different perspectives. Some discussed it as a review while others highlighted its effect and ethical matters. These related studies can be summed up in the following section.

Chheda et. al (2023) and Wang et. al (2023) both conducted a comprehensive examination of the existing literature regarding the utilization of AI in the field of education. This examination employed a combination of research methods, such as bibliometric analysis and content analysis. Chheda et. al (2023) study not only provided a wide-ranging overview of the research field, including major categories of applications and theoretical perspectives, but also delves deeply into the impact of AI on education. It identified four primary categories of AI applications: adaptive learning and personalized tutoring, profiling and prediction, intelligent assessment and management, and natural language processing. The study also emphasized the importance of integrating theories to guide research in this domain. Moreover, it underscored the necessity of considering a variety of outcomes resulting from AI applications, extending beyond mere teaching effectiveness and student learning performance. The outcomes of this study bore significant consequences for researchers and practitioners in the field of education, as they offered valuable insights into the current state of AI research in education and potential areas for further investigation. The study proposed future research directions, including the in-depth analysis of specific AI applications in education and exploration of the societal, organizational, and individual impacts of adopting AI. While Wang et. al (2023) study delved deeply into the impact of AI on education. The outcomes of this study bore significant consequences for researchers and practitioners in the field of education, as they offer valuable insights into the current state of AI research in education and potential areas for further investigation. However, both studies suggested the inclusion of a broader range of theories and frameworks to enhance

the understanding of the role of AI in education. In the same stream and on the other hand, Salas-Pilco et al. (2022) carried out a systematic review of the literature on AI and Learning Analytics (LA) in teacher education. Their findings indicate that machine learning algorithms were employed in most of the studies. Furthermore, the implications would be valuable for teachers and educational authorities, informing their decisions regarding the effective use of AI and LA technologies to support teacher education.

The study of Saputra et al. (2023) undertook a partly systematic review of the existing literature to examine the potential, difficulties, risks, and hindrances associated with the integration of AI in the field of education. It discerned the capabilities of AI in the provision of educational materials, assessment, administrative systems, and policymaking. The challenges encompass aspects of pedagogy, educational frameworks, and literacy. The threats affect the security of personal data, character development, and ethical concerns in education. The obstacles involve significant financial investments, inadequate teacher training, and adjustments in the structure of the curriculum. The study underscored the advantages of AI in personalized education and advocates for substantial investment in AI in education to enhance the quality of education. The research methodology employed a metanarrative approach, which entailed an examination of secondary data from Google Scholar. The opportunities, challenges, threats, and obstacles in the field of AI education were identified. The study underscored the significance of addressing ethical considerations, biases, privacy concerns, and curriculum modifications associated with AI. The recommendations put forth included the formulation of comprehensive policies, the adoption of ethical pedagogy, the preparedness of educators, collaboration among stakeholders, and the prioritization of AI literacy in the design of the curriculum to achieve an optimal AI revolution in education.

The research paper of Kassymova et al. (2023) explored the ethical issues surrounding the digitalization and utilization of AI in the field of education, with a focus on the importance of valuing human beings as much as the machines they created. It emphasized how the creators' perspectives on life can influence the development of AI systems, potentially leading to competition, manipulation, and a decline in human values. Additionally, the study underscored the global implications of digital education, including unforeseen distortions, challenges, and risks, while expressing concerns about its impact on emotional intelligence and the potential alienation from human interaction. The authors argued for a comprehensive understanding of the purpose and consequences of digital education, with an emphasis on incorporating cultural and ethical considerations into the development and implementation of AI systems in the educational context. Although the study did not explicitly state its limitations or provide specific recommendations, it suggested potential areas for improvement. These areas included the need for further empirical research to explore the ethical

implications of digitalization and AI in education, given that the paper primarily relies on theoretical analysis and literature review. Policymakers and educators are encouraged to consider cultural and ethical dimensions when developing and implementing AI systems in education. Collaboration among experts in education, technology, and ethics was also considered crucial to ensure responsible and ethical use of AI in education. Continuous monitoring and evaluation of the impact of digital education and AI systems on students' well-being, social interactions, and learning outcomes were proposed as ongoing research priorities.

Alternatively, some studies were aiming to improve education, such as the study of Trifonov et al. (2020) which introduced AI system that they provided dynamic principles and personalization in the curriculum. They studied the effect of AI applications to improve education, especially Cyber-security.

Another study by Chiu (2021) aimed to develop a curriculum model for AI with four aspects: produce, process, and praxis. His thematic analysis of collected data included individual interviews, teaching documents, and meeting minutes from teachers. His findings revealed six key components: AI knowledge, AI processes, and the impact of AI, student relevance, teacher-student communication, and flexibility.

Smolin et al. (2012) proposed an AI based framework to manage the quality of the syllabus. They applied AI methods to evaluate a syllabus based on such characteristics as validity, usability, and efficiency automatically. In addition, they provided user trials to show the advantages of the developed approach against the traditional human-based process of syllabi verification and evaluation.

Khan et al. (2023) delved into the transformative potential of AI in the field of education, with a particular focus on its ability to personalize learning paths and provide targeted interventions. It also underscored the significance of ethical considerations in the implementation of AI technology. However, the study suggested the necessity for additional research to optimize the applications of AI in education for future endeavors. The study thoroughly examined the role of AI in customizing the educational experience by offering tailored learning materials, facilitating online interactions, and providing flexible learning pathways. Additionally, it highlighted the ethical concerns that arise from the use of AI. The study recommended the continuous assessment of these ethical issues and suggested conducting more comprehensive research to fully maximize the potential of AI in the field of education. The paper placed significant importance on AI's capacity to personalize learning, identified gaps in knowledge, and offered targeted interventions. It emphasized the positive impact of AI on students' autonomy and metacognitive development. However, the paper acknowledged that ethical concerns, data privacy, and potential bias in AI

algorithms must be carefully addressed for successful integration. The collaboration between AI experts, academics, and practitioners was deemed crucial in this endeavor. The study concluded by emphasizing the transformative potential of AI in education and the necessity for further research, including the implementation of surveys, interviews, and longitudinal studies.

The study by Mara et al. (2023) highlighted the significance of AI in the field of education, particularly in higher education, by placing emphasis on its role in enhancing academic and professional performance. It highlighted the ability of AI to automate repetitive tasks, thereby allowing educators to allocate more time to meaningful teaching experiences. Furthermore, the study emphasized the potential for personalization in the learning process, which positively impacted teaching effectiveness, student engagement, and overall performance. While the study's practical implications highlight the advantages of AI in education, it cascaded short in terms of addressing potential limitations and lacks specific recommendations for future research in this domain.

Awad et al. (2022) investigated the interdisciplinary nature of AI, with a particular focus on its applications in the field of education. They focused primarily on around discussing theoretical concepts and practical applications rather than presenting concrete outcomes or sources of data. It emphasized the significant role that AI plays in assisting students in making well-informed career decisions through the utilization of predictive modeling techniques. They found that advancements in AI, specifically in the areas of machine learning and deep learning, were highlighted as catalysts for enhancing productivity and minimizing errors in educational environments. However, it lacked specific empirical evidence or research findings to substantiate its assertions.

In Brazil, Reis et al. (2006) suggested to use an AI approach to develop the computer environment. They found that using this approach would increase the quality of the teaching system.

Cui et al. (2023) studied understanding the problems and challenges faced by innovative online education in the context of the new coronavirus epidemic and look forward to the future on this basis.

Li and Su (2020) designed an evaluation method for online teaching quality of basic education in the context of AI. Their results provided a good reference for the application of online teaching and AI in basic education.

In contrast, other studies were aiming to help students become familiar with the English context and cultural background; such as Zhang et al. (2023) who proposed a method and application assessment for designing a smart classroom for English language and literature based on AI technology. They found that

using smart classroom approach has many potential benefits for English language and literature education. Furthermore, educators can develop a more effective and inclusive approach to language learning that leverages the power of technology while respecting the cultural diversity and individual needs of their students

Ghfar, et al. (2023) found an indication that AI provides a positive learning environment for learning English. The study aimed to understand the function of AI in ELT and examine AI technologies in ELT.

Al-Maliki (2023) explored the interdisciplinary nature of AI with a specific focus on its applications within the field of education. It highlighted the importance of AI in assisting students in making well-informed decisions about their future careers using predictive modeling. The advancements in AI, particularly in the areas of machine learning and deep learning, were emphasized as catalysts for increased efficiency and a reduction in errors within educational environments. Furthermore, the paper examines the potential for AI to provide personalized learning experiences and its transformative impact on the technology industry. However, it acknowledged the ethical concerns and potential job displacement that need to be addressed. The paper lacked specific empirical evidence or research findings to support its claims.

Rusmiyanto et al. (2023) highlighted the transformative role of AI in English language education and its potential to address the diverse needs of language learners. They found that AI had the potential to significantly enhance English language learners' communication skills by providing personalized and interactive learning experiences.

Li (2020) studied the usage of artificial English-learning as mobile application to improve IELTS performance. The results showed that the application was affordable to be used as an online platform for foreign English learning.

Huang et al. (2021) studied the effect of AI application in the field of education especially in learning, teaching, and virtual classroom evaluation. The study found quality improvement in teaching and learning methods among teachers and students who used AI technology, as it made students' learning styles more diversified and personalized.

On the Middle East, some studies have mentioned the use of AI in education. One of these studies is the distribution of AI in the Middle East, which was presented by Jain (2018). The study furnished a comprehensive overview encompassing AI's definition, its pragmatic applications, its economic implications, and the imperative nature of digital transformation across diverse sectors in the Middle East. Furthermore, it underscored the potential economic ramifications of AI, particularly within the confines of Saudi Arabia,

where it is anticipated to make a substantial contribution to the Gross Domestic Product by the year 2030. It emphasized the significance of digital transformation in the realm of healthcare, with the objective of augmenting the proportion of Saudi citizens who possess a unified digital health record. Moreover, the study concentrated on AI's role in enhancing labor productivity through automation and offered an estimation of the magnitude of AI's influence on various industries in the Middle East until 2030.

Another study was implemented on Kuwait by Al-Husseini (2023) to examine the importance of AI in the progression of primary stage education in Kuwait, aligning with the State of Kuwait 2035 Vision. It scrutinized the obstacles encountered in implementing AI in education, especially from the viewpoint of science educators in Kuwait. The research, carried out on 50 male and female science educators in the Hawalli educational district, reveals a minimal level of consciousness among these educators concerning AI's role in science education, a significant decrease in awareness of how to utilize AI applications in this context, and a general lack of comprehension regarding the significance of AI in science education. These findings emphasize the necessity for augmented awareness, training, and support for science educators to effectively incorporate AI into their classrooms. The constraints of the study encompassed its concentration on a specific sample of 50 science educators in one educational district, which might not be entirely representative of all science educators in Kuwait. Moreover, the descriptive approach employed in the research might restrict the comprehensiveness of the analysis of the obstacles and the importance of AI in science education.

Yemen, on the other hand, was highlighted in a study of Mutair (2022) which delved into the incorporation of AI within the educational framework of Yemeni universities. It shed light on the pivotal role that AI plays in augmenting the educational process, delineated the impediments encountered in the implementation of AI, and underscores the significance of adapting educational practices to the technological progressions witnessed in the 21st century.

AI is expounded upon as a revolutionary technology that possesses the capacity to enhance pedagogical and didactic approaches employed within Yemeni universities. It presents opportunities for interactive and tailor-made learning experiences, multimedia-enriched content, and adaptive learning trajectories. Nonetheless, the paper also delineates the barriers impeding the complete realization of AI in education, which encompass fiscal constraints, insufficient information technology resources, and resistance to change. The research done by Mutair (2022) underscored the imperative for Yemeni universities to modernize their pedagogical methodologies and curricula to align with the intellectual and technological revolution. It called

for a comprehensive approach to effectively harness AI, ameliorate the caliber of education, and equip students with the necessary tools to confront the challenges of the contemporary era.

Overall, the study accentuated the potential advantages of AI in the realm of Yemeni education, while simultaneously acknowledging and addressing the challenges that must be confronted for successful implementation. It emphasized the utmost importance of embracing technological advancements to furnish education of the highest quality and adapt to the ever-evolving educational landscape.

Discussion

The researchers distributed the questionnaire via two WhatsApp groups with periodic reminders. The first group targeted rectors of the universities while the second group for the university's representatives in Ministry of Higher Education and Scientific Research.

The questionnaire was minted to measure whether these universities have an AI program and the resources (program description, tools, labs, and qualified instructors) for implementing this program.

Table 1: shows that twelve participants responses (40% of the targeted community) were received. Three public universities (25% of the received respondents and 11% of the targeted community) and nine private universities with 30%. No AI system or technique were mentioned when the sample was asked about teaching techniques systems and tools. Two universities of the three reported to have AI lab as in table 2.

Only three universities (30%) of the received respondents have AI programs. One of them has two Ph.D. holders while the other has one. However, the third one claimed to have 5 Ph.D. holders. None of the staff were from Western Europe or America.

Figure 1 shows that most of the staff graduated from an Indian university with 75% of the received respondents. Nobody graduated from a western country. Yemen came in second position.

The results show that most of the respondents have no AI programs even though some of these universities have qualified instructors who are majoring in AI. However, instructors in AI are still few which is not enough to build an AI. Also, tools and Yemen infrastructure do not support the implementation of AI. The program description for AI is still limited and does not include the major courses that should be involved in such a program until now. Most of these descriptions contain only three or four AI courses and the rest are related to either IT or networking programs. This indicates the weakness of resources in Yemeni educational institutes. 7% received public universities reported that they have AI Programs.

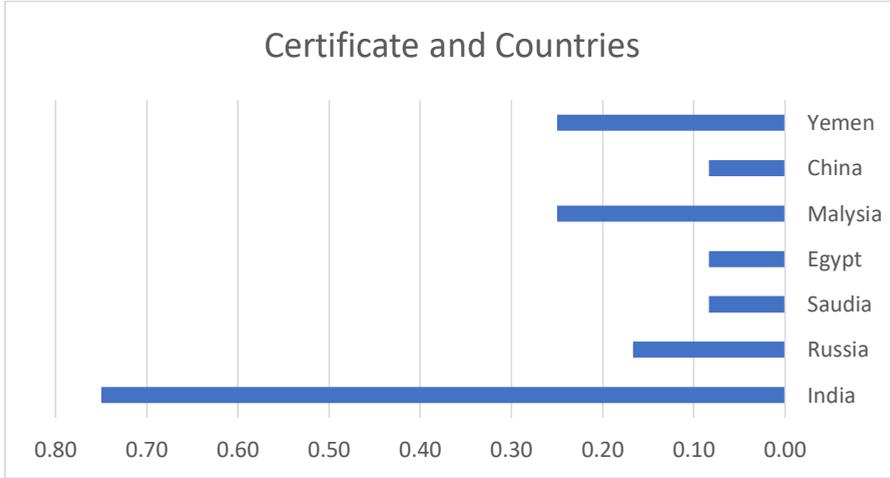


Figure 1: Certificates Origins

No	University Name	Year	Have AI Program	Staff	Degree	Graduation Country
1	Hodeidah	1996	No	3	Ph.D.	1 India + 2 Russia
2	Yemen Gulf	2014	No			
3	IBB	1996	No	4	3 Ph.Ds. +MSc.	1 Saudi 2 India 1 Egypt
4	Razi	2009	Yes	2	Ph.D.	
5	Andalus	1994	No			
6	Wehdah	2014	No			
7	Bayda	2008	No			
8	Shafae	2012	No			
9	Nokhba	2020	No			
10	Watania	1994	Yes	1	Ph.D.	
11	Lebanese	2006	No	1	Ph.D.	1 China
12	University of Science and Technology	1994	Yes	5	Ph.D.	3 Yemen 2Malaysia

Table 1: Received Participants

N	University	Owns AI Systems	Owns AI Tools
1	Watania	No	No
2	Razi	No	Simulation lab
3	Science and Technology	No	Robotic Lab

Table 2: AI Systems and tools Architecture

Conclusion

This study presents a literature review to investigate the function of AI in the development of communication skills in education. Thus, it aims to look at the existing research and literature on the use of AI-based technologies in education. Furthermore, it opens with an overview about AI and its uses in education. It then investigates the various methods in which AI might help education systems to achieve goals.

There is a gap between YCIT-HE and the higher education institutions as the first one has the willingness to tackle future issues, while the latter did not respond to questionnaires and activities.

The study found that Yemen is still in infant stage considering AI in higher education institutions. The process will need huge efforts to leverage the level of education and AI. Besides, it needs experts and methodology to streamline them towards the objectives. It is necessary to bridge the gap before establishing AI national strategy or to be considered at the head of the table.

The study recommends universities to follow up the international standards for building an AI structure. This means developing AI programs that are fully specific to AI, not as a part of other programs. Universities should follow the standards for implementing AI infrastructure as it needs special equipment, labs, software, and tools. The monitoring and the approval process should be done under the supervision of YCIT-HE to ensure the quality of AI programs in Yemen. Finally, we should shed the light on Education Technology via workshops, seminars and projects.

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