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Integration of Augmented Reality and Artificial Intelligence: A Review of Framework for Immersive Learning in Oman Vision 2040

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ABSTRACT

Technological breakthroughs are driving a rapid transition of the educational landscape. Among these, artificial intelligence (AI) and augmented reality (AR) stand out as being crucial in changing how knowledge is transmitted and gained. The Oman Vision 2040 seeks to use these technologies to support a creative and forward-thinking educational system. This article presents a thorough framework for immersive learning that is in line with Vision 2040 and examines the integration of AR and AI in higher education institutions (HEIs) in Oman.

Keywords: Immersive Learning, Educational Technology Integration, AR/AI in Higher Education, Vision 2040 Oman, Digital Transformation in Education.

INTRODUCTION

The ethical implications of incorporating artificial intelligence (AI) into higher education were investigated by Slimi and Carballido (2003). In order to identify recurring themes and challenges, they have examined seven AI ethical rules from different areas, including those set by MIT, Sanford HAI, China, the European Commission, UNESCO, Google, and Carnegie Mellon. The main concerns were determined to be protecting data privacy, addressing algorithmic bias, ensuring transparency, bolstering accountability, and investigating how AI might affect educational equity. This article's primary goal is to assist educational institutions in addressing the difficult moral conundrums that arise from the application of AI. By identifying the commonalities and differences in the techniques used by the various locations, the writers have given a thorough understanding of the ethics involved.

Villarreal and co. According to ChatGPT, Al (2023) investigated the potential and difficulties of applying generative AI to higher education. By pointing out the advantages and disadvantages of employing ChatGPT, a generative AI, in higher education, they have talked about the diverse background of the technology. The authors looked at ChatGPT's benefits for individualized learning—namely, its ability to give immediate feedback on learning tasks—as well as and responsible usage of the tool. The authors provided insight into how these AIs can assist instructors in effectively implementing AI in the classroom by outlining the benefits and drawbacks of doing so in higher education.

Augmented Reality in Education

The term "augmented reality," or "AR," describes how digital information is superimposed on the physical world using gadgets like tablets, smartphones, and AR glasses. By offering dynamic and captivating content, augmented reality (AR) improves learning experiences in education and helps close the gap between theoretical

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knowledge and real-world application (Bacca, Baldiris, Fabregat, Graf, & Kinshuk, 2014).

AR's advantages in education

Enhanced Engagement: According to Yimaz (2016), augmented reality (AR) applications increase student motivation and engagement by making learning more engaging and participatory. Better Retention: Compared to traditional teaching techniques, visual and interactive content helps students retain information better (Chang, Morreale, & Medicherla, 2010). Effective Education: Augmented reality (AR) enables the replication of real-world situations, offering hands-on practice without the hazards involved (Ibáñez & Delgado-Kloos, 2018).

AR's Current Use in International Education

AR has a wide range of uses in education around the world. For example, engineering students engage with virtual representations of intricate machinery, medical students utilize AR to visualize human anatomy, and history students employ immersive AR experiences to visit historical sites (Khan, Johnston, & Ophoff, 2019).

AR in Higher Education in Oman

The use of AR in higher education is still in its infancy in Oman. Nonetheless, Vision 2040 programs place a strong emphasis on utilizing cutting-edge technology to improve learning results. Organizations like as Sultan Qaboos University have initiated investigations into augmented reality to enable interactive educational settings (Al-Hadhrami, 2020).

Education and Artificial Intelligence

Artificial intelligence (AI) is the umbrella term for a variety of technologies that allow robots to carry out tasks like learning, reasoning, and problem-solving that normally need human intelligence (Russell & Norvig, 2020). Artificial Intelligence (AI) in education may automate administrative work, customize learning experiences, and offer data-driven insights into student performance.

AI's advantages for education

Personalized Learning: AI algorithms have the ability to modify instructional materials to fit the needs of specific students, increasing the efficacy and efficiency of learning (Zawacki-Richter, Marín, Bond, & Gouverneur, 2019).

Effective Administration: By automating administrative duties, AI-driven technologies free up teachers to concentrate more on instruction (Holmes, Bialik, & Fadel, 2019).

Enhanced Assessment: AI can assist instructors find and close learning gaps by offering real-time feedback and comprehensive analytics on student performance (Chen, Xie, & Hwang, 2020).

Utilizing AI in Global Education Today

Globally, AI is being incorporated into educational institutions more and more. Examples include administrative bots that expedite processes, predictive analytics that identify kids who are at-risk, and intelligent tutoring systems that offer personalized feedback (Luckin et al., 2016).

Artificial Intelligence in Higher Education in Oman

The use of AI in higher education is picking up steam in Oman. Organizations are investigating AI- powered systems for predictive analytics, individualized education, and administrative effectiveness.

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As part of the Vision 2040 plan to establish a knowledge-based economy, the Ministry of Higher Education, Research, and Innovation is actively pushing AI integration (Oman Vision 2040, 2019).

Vision 2040 and the Integration of Technology

Oman's strategic strategy, Vision 2040, aims to use innovation and technology to completely change the country's economy and society.

In terms of education, Vision 2040 seeks to develop an adaptable and dynamic curriculum that satisfies the needs of the labor market of the future (Oman Vision 2040, 2019).

Goals for Higher Education

The following are the main goals of Vision 2040 for higher education:

1. Improving Quality and Relevance: Matching curricula to industry demands and international norms.
2. Encouraging research initiatives that advance national development is known as "promote research and innovation."
3. Using cutting-edge technologies to improve administrative, instructional, and learning processes is known as "technology integration."

AR and AI's Contribution to Realizing Vision 2040

Achieving Vision 2040's educational goals requires the use of AR and AI. Through their integration, learning environments may become more immersive, creativity can be encouraged, and graduates will be prepared with the skills needed in the digital economy.

Oman's Framework for Including AI and AR in Higher Education Planning Strategically and Developing Policies

The creation of policies and strategic planning are essential for the successful integration of AI and AR. In order to create policies that encourage the adoption of these technologies, the Ministry of Higher Education, Research, and Innovation should work with academic institutions, technology suppliers, and industry stakeholders (Ministry of Higher Education, Research and Innovation, 2020).

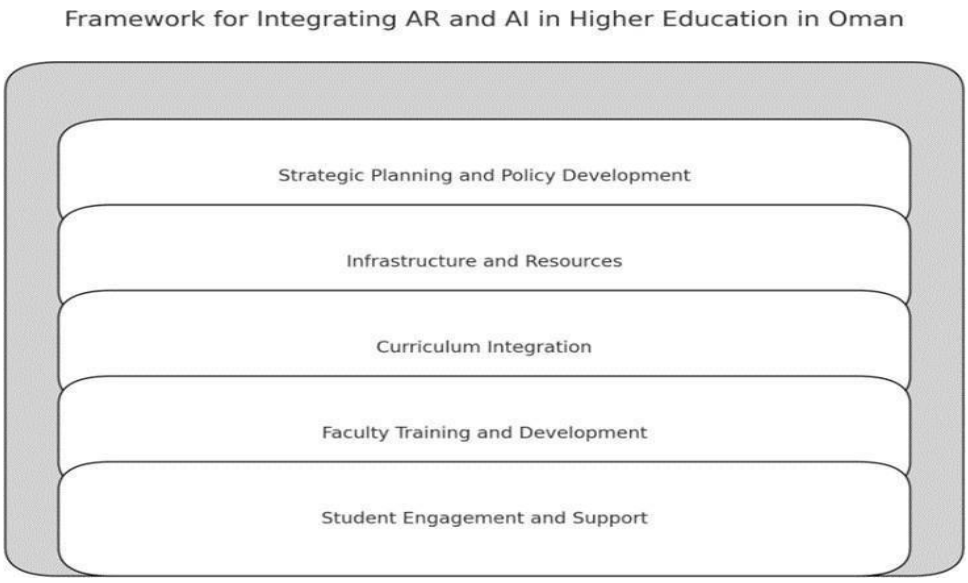

Figure. 1 Proposed framework

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Resources and Infrastructure

Creating the required infrastructure is crucial to implementing AR and AI successfully. This covers AI-powered platforms, AR-capable gadgets, and fast internet. To make sure that institutions have the capacity to support new technologies, infrastructure investment should be given top priority (Al-Hinai & Al-Busaidi, 2019).

Integration of Curriculum

Existing courses must be carefully reviewed and redesigned in order to incorporate AR and AI into the curriculum. To enhance conventional teaching techniques and give students a blended learning experience, educators ought to integrate augmented reality applications and artificial intelligence tools (Qin, Johnson, & Johnson, 2020).

Training & Development for Faculty

Faculty willingness to employ AR and AI technologies is a critical factor in the effective integration of these technologies. To teach teachers how to successfully incorporate augmented reality and artificial intelligence into their lesson plans, programs for ongoing professional development should be set up (Buabeng-Andoh, 2019).

Student Support and Involvement

For adoption to be successful, involving students in the use of AR and AI is essential. Schools should give students the tools and assistance they need to successfully understand and use modern technologies. Workshops, seminars, and technical support services might all fall under this category (Moussa-Inaty & De La Vega, 2021).

Investigation and Originality

Encouraging AR and AI research in higher education can spur innovation and enhance student performance. To investigate new applications and breakthroughs in these technologies, academic institutions should set up research centers and work with industry partners (Sharma, Fantin, Prabhu, Guan, & Dattakumar, 2019).

Considerations for Society and Ethics

Data privacy, security, and the digital divide are just a few of the ethical and cultural issues that are brought up by the combination of AR and AI. To ensure that the use of new technologies is morally righteous and inclusive, policies should be created to address these concerns (Floridi et al., 2018).

Examples and Case Studies

Leading the way in incorporating AI and AR into its academic offerings is Sultan Qaboos University (SQU). The university has started a number of pilot programs that use augmented reality (AR) to provide interactive instruction in fields like engineering and biology. In order to improve student performance, SQU is also investigating AI-driven solutions for individualized learning and predictive analytics (Al-Hadhrami, 2020).

MEC, or Middle East College, has also started working on projects to include AI and AR in its curriculum. The college simulates virtual labs using augmented reality, enabling students to perform experiments in a secure setting.

Additionally, MEC is using AI to improve learning outcomes and retention rates by giving students real-time feedback and help (Al-Badi, Tarhini, & Al-Qirim, 2020).

Challenges and Solutions Technological Difficulties

Difficulties include high prices for AR and AI technology, a lack of technical know-how, and restricted

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access to infrastructure.

Solutions include investments in infrastructure development, collaborations with technology providers, and government financing and incentives.

Educational Difficulties

Challenges: Ensuring the relevancy of content, redesigning the curriculum, and educators' resistance to change.

Solutions include cooperative curriculum development, professional development courses, and continuous evaluation and feedback systems.

Social and Ethical Issues

Challenges include worries about data security and privacy, the possibility of increasing the digital gap, and moral issues with the application of AI.

The creation of thorough data protection regulations, the guarantee of equal access to technology, and the formulation of moral standards for AI integration are the solutions.

Prospective Courses Never-ending Innovation

In order to stay up with the swift progress of technology, constant innovation is necessary. Universities could promote an innovative culture by motivating staff and students to try out novel AR and AI applications (Hao, Lei, & Zhao, 2019).

Cooperation and Joint Ventures

Successful integration requires cooperation between the government, business community, and educational institutions. Through partnerships, one can have access to the newest technology as well as finance and experience (Daniel, 2019).

Observation and Assessment

To determine the impact and efficacy of AR and AI projects, regular monitoring and assessment are required. This can assist in pinpointing areas in need of development and guarantee that the incorporation of these technologies is in line with learning objectives (Lai, 2020). A number of relevant research and scientific publications related to artificial intelligence in education have been found following a thorough assessment and analysis of several of them. Krstić et al. [1] examined the effects of artificial intelligence on education, listed the several ways the technology is being used in the area, and highlighted the benefits that these uses are thought to have. Artificial intelligence is defined by Sadiku et al. [2] as a computer system's ability to perform human functions like learning and cognition. By introducing a degree of flexibility and adaptability, the integration of AI technology in education radically transforms classrooms and schools, relieving strain on educators. As such, AI has the potential to completely transform the educational system. The study looks at several AI uses in the context of education.

With the development of personalized feedback, adaptive learning strategies, and accurate assessments, artificial intelligence (AI) can enhance education. It also draws attention to issues like developers' educational knowledge gaps and unclear decision-making processes [3]. However, [4] Bronwyn, Eager (2023) discovered that artificial intelligence (AI) may help with the creation and design of the exam. Obstacles including concerns with plagiarism and the necessity for educators to pursue professional development are also noted. While there are many advantages to AI for improving teaching, there are also drawbacks, including potential hazards and ethical

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issues that need be taken into account [5].

CONCLUSION

Enhancing educational achievements and aligning with Vision 2040 aims is a major potential provided by the integration of AI and AR in Oman's higher education institutions. Oman can provide an immersive and future-ready learning environment by creating a thorough framework that takes into account strategic planning, infrastructure, curriculum integration, faculty development, student participation, research, and ethical issues. Institutions will be better able to help the country improve overall and educate students for the needs of the digital economy as long as they continue to embrace these technologies.

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