



Systematic Review of Artificial Intelligence  
(AI) Research in Higher Education:

# Practice, Gaps, and Future Directions in the GCC

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Acknowledging its potential for diversifying the economy and attaining sustainable development, the Gulf Cooperation Council (GCC) countries, comprising Bahrain, Kuwait, Oman, Qatar, Kingdom of Saudi Arabia (KSA), and the United Arab Emirates (UAE), have been investing heavily on digital transformation and keeping pace with technological advancements. To elaborate, with unified efforts to transition to a knowledge society and enhance educational outcomes over the last years, GCC countries have demonstrated a solid dedication to integrating artificial intelligence into education. However, the current literature shows that the state of knowledge regarding the application of AI within the GCC region is scattered and incomplete. Uncertainties persist in many aspects, such as effectiveness, implementation strategies, and potential impact of AI interventions.

We conducted a systematic review to analyze and synthesize the current knowledge on AI in higher education in the GCC region, providing evidence-based directions for practice, policy, and research. Specifically, this study addressed the following research questions:

1. What are the advantages and disadvantages of using artificial intelligence in higher education?
2. What are the main gaps and issues highlighted in artificial intelligence research in higher education across the GCC countries? What are the corresponding directions for future research in the region?

In the Scopus database, 32 studies were analyzed, all open access documents affiliated to a GCC country, having artificial intelligence and higher education, or related terminologies as keywords. As for the advantages of using AI in higher education, this review showed that the most striking benefits are improving educational outcomes, enhancing institutional decision-making, and advancing institutional systems. Regarding educational outcomes, the results showed that AI was implemented in the region for various academic purposes, including enhancing students' reading skills, measuring anxiety levels, promoting class participation, motivation, knowledge retention, and detecting cheating. While for decision-making, the findings indicated that AI was implemented for several institutional purposes, such as making

predictions for at-risk students, no-detriment rate, and student academic success, to assist in the long-term institutional decision on the admission process, curriculum, and learning. Finally, for advancing institutional systems, the results highlighted that AI was implemented for developing a biometric authentication system and creating an outlier detection system to enhance institutes' cybersecurity systems and for developing a personalized framework to enhance institutes' processes of information collection, development, and accessibility.

As for disadvantages, no study reported any disadvantage, weakness, or negativity from leveraging AI in higher education. This could imply that the application of artificial intelligence in higher education was found to be beneficial from all aspects of the GCC region. Nonetheless, in the literature, there have been various notes on some of the drawbacks of using artificial intelligence in education, such as ethical issues, increased unemployment, difficulty understanding the algorithms, interpretation of data, and poor quality, biased or incorrect output. Yet, the studies analyzed in this review do not seem to have these issues on their radar. There is still much to learn about what is applicable regarding applying artificial intelligence in higher education.

Regarding gaps, issues, and future directions, the findings showed that although there is an established research base on AI research in higher education, nevertheless this topic is still in its infancy form in the GCC region. The most evident gaps are lack of knowledge about AI, poor technology skills of faculty and students, and inadequate technology infrastructure at the institutes. Additionally, major challenges include resistance to traditional educational methods and the conflicting beliefs and values of the local community regarding AI implementation. Higher education institutions must explicitly teach how to use AI technologies and tools, and embed experiential implications into their curriculum. Moreover, studies have stated challenges related to the structural complexity of the Arabic language and have called for more research to tackle Arabic sentiment analysis. Researchers highlighted the security and privacy issues in AI applications and called for more exploration to ensure safe AI adoption in education.

Results suggest a range of implications for practice, policy, and research. As for practice, it is evident that administrators can improve institutional quality by making informed decisions using AI-supported systems that turn large datasets into practical recommendations. They can improve educational quality by providing the latest AI-driven educational technologies to practitioners, students, and staff, and offer training to strengthen their AI literacy and technology competencies. Practitioners can implement AI for e-teaching and learning purposes, creating a supportive and positive educational environment where AI tools provide personalized learning for students to progress at their own pace, consequently, adjusting the difficulty level based on their needs and giving real-time feedback. Furthermore, with immersive learning technologies, such as virtual and augmented reality, practitioners can simulate authentic scenarios, offering students practical and hands-on learning experiences in virtual settings.

For policies, AI practices still present ethical issues regarding personal data privacy and protection,

thereby, institutions can develop policies to guard against these issues and ensure the responsible deployment of AI technologies in higher education. Moreover, higher education institutions must become involved in creating institutional collaborations and public-private collaborations with educational stakeholders to build guidelines, protocols, and policies for the collective good.

For future research, with an increasing number of studies on AI in education, researchers should keep a close eye on AI development and include both content analysis and in-depth quantitative analysis of relevant studies. More reviews are needed to synthesize how AI technologies can be applied in higher education to promote quality teaching and learning, improve users' confidence in using AI technology-assisted tools, and ensure safety, robustness, and prevention against cyberattacks. Furthermore, researchers must be involved in collaborative studies and projects to set research priorities, address current gaps and challenges, and expand AI implications to a broader level to benefit the society.

From the left: Dr. Saba Qadhi, and Dr. Fatma Kayan Fadlelmula.

