Artificial Intelligence: A Prospective or Real Option for Education?

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Abstract

The education sector is grappling with a plethora of challenges that have compelled scholars and practitioners to begin looking for a solution. Artificial intelligence (AI) is among the proposed solutions that is having significant attention lately. However, its adoption in the education sector remains low because of challenges, such as lack of proper trials, testing, and recommendation for its applicability in the sector. This article seeks to explore the role and potentiality of AI in improving education. A systematic review design is used for this purpose. The methodology corresponds with the rapid survey protocol of Khangura (2012) which provides an eight-step systematic research literature review of several studies that have been carried out on the embedment of artificial intelligence in education. This article concludes that AI could play an instrumental role by developing a digital curriculum, automating basic educational activities, and adopting Chat-bot related Apps. Implications for future research are provided to form the basis for further and future studies.

Key terms: artificial intelligence, education, Arab World, apps, curriculum.
Introduction

Education is among the most influential weapons that could be used for changing the world (Mandela, 2014). However, education cannot change the world in case it has challenges that afflict it from imparting knowledge, skills and values into learners. Today, many studies indicate that the high population increase is having a strain on the available learning resources, both tools and humans, thus impeding the delivery of quality outcomes (Popenici & Kerr, 2017; Marković, Jakupović & Kovačić, 2014). Questions have also been raised regarding the quality of graduates being churned out into the work environment. Failure to address the simmering challenges may lead to more pressure on the human workforce in the academic sector (Popenici & Kerr, 2017; Schweighofer & Ebner, 2015). With increased quest for a viable solution, artificial intelligence has increasingly become one of the solutions proposed for addressing the various challenges in the education sector (Popenici & Kerr, 2017). The application of artificial intelligence would necessitate the combination of human and computer intelligence to improve the quality of education (Timms, 2016).

AI would also establish a more sophisticated learning and teaching environment that has not existed before. However, the major problem is that these benefits remain unsubstantiated, because of the lack of data to support its application, especially in certain areas like the Middle East (Khan, Al-Shihi, Al-Khanjari, & Sarrab, 2015).

Currently, research still focuses on the weaknesses associated with using AI in certain sectors (Timms, 2016). Some of the speculated challenges of AI’s adoption in the Arab World and other areas include the lack of teacher preparedness, data safety, resistance to change, and the inability to effectively...
infuse it into learning environments. In the modern academic context, many innovative companies are rapidly developing integrated systems which incorporate the original computer facilitated programs and the artificial intelligence software to ensure that the established systems can appeal to the market (ibid). There are various areas within which the AI could impact positively namely the tutoring, personalized learning, testing and automating assignments.

**Problem Statement**

Significant steps have been made in AI application in the education sector (Popenici & Kerr, 2017). However, there are significant challenges that deter AI from successful integration into the education sector, especially in the Arab World (Gagne, 2013). Numerous studies have been carried out about the advantages of AI in the education sector, but only few studies examine its integration (Gagne, 2013; Popenici & Kerr, 2017).

More importantly, there are no comprehensive studies that provide detailed information on how to integrate it into pedagogy and curricula. This is despite AI having potential to bring about positive changes in the education sector. It is known that effective learning approaches enhance the quality of learning, and students learn best through experiencing and doing (Timms, 2016). For efficiency and effectiveness, science teaching programs should revolve around the students, founded on research, and incorporate experimental activities.

Integration of AI has also been afflicted by numerous challenges, including the lack of sufficient information in some regions like the Arab World, organizational challenges, administrative challenges, and technical challenges. Artificial Intelligence systems are specialized to complete specific tasks, and each application needs a long period of focused research and careful construction. How can educators overcome these challenges to ensure that AI becomes successfully integrated into the education sector? This is one of the questions that this article will seek to address.

**Research Questions**

The primary objective of the study will be addressed by exploring various research questions highlighted as follows:

Research Questions

Main Research Question: How can artificial intelligence improve education?
Sub-questions
What is the current status of adoption of AI into learning?
What challenges deter the successful embedment of AI into education?
What are the likely consequences of the use of artificial intelligence in education?
What are the prospects of AI integration into education?
How can AI be integrated into education?

Assumption and Hypothesis
Because artificial intelligence has been active and successful in other sectors, this article assumes that it can also be integrated into education to bring about better educational outcomes. Consequently, I hypothesize that embedding artificial intelligence into the education system will result in better educational outcomes by improving the effectiveness and quality of learning.

Literature Review

Literature was obtained from reputable sites including Ebsco host, Google Scholar, Journal of Teacher Education, Jstor, and Elsevier. Amazon was also relied on as a source for the books deployed in this article. The main aim of using these reputable sites to obtain the sources was to ensure that the information obtained was authentic, authoritative and credible.

The study opted to limit research conducted in 2012 and after 2012 to ensure that only the most recent data would be considered for analysis. Despite AI research gaining momentum, it is still evident that the definition of artificial intelligence remains uncertain. Surprisingly, the lack of a universally accepted definition has been beneficial for enabling the field to grow, thrive, and advance in an unanticipated way (Frankish & Ramsey, 2014). Rather, researchers, practitioners, policymakers, and developers of AI base their research on the rough sense of direction as well as the drive to move the debate forward.

Despite this, there is still need for defining the term Artificial Intelligence. Because of the nature of this study, the researcher will rely on Nilson’s (2010) definition of Artificial Intelligence as “that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment. (p.v)” This definition suggests that the characterization of AI relies on the sector one intends to use it.
Current Status of Adoption

AI will have a significant effect on the way teaching, living, working and learning are conducted. AI could positively transform the education sector, and the future provides potential for greater supports and tools (Doucet, Evers, Guerra, Lopez, Soskil, & Timmers, 2018). The academia world is increasingly becoming more convenient and personalized for learners because of recent advancements within AI. The technology has various applications that have transformed the way students learn, increase accessibility to education to learners with smart devices in case they cannot attend classes (Walsh, 2018). Apart from students, Walsh (ibid), Doucet et al (2018) agree that Artificial Intelligence is automating and speeding up administrative tasks, enabling companies to minimize the time taken to complete tedious tasks as well as increase the period spent on each student. Various studies have demonstrated that AI’s use within the education industry will increase by almost double through 2021 as the world becomes more connected (Walsh, 2018; Frankish & Ramsey, 2014). AI will influence education from the Kindergarten level to higher education, thus providing an opportunity to develop great learning features for improving the learning experience.

High costs remain a major obstacle, but scholars believe that the breakthrough of AI in the education sector is near. Contrary to opinions raised against Artificial Intelligence, Walsh (2018) argued that there will come a time when machines with superhuman intelligence levels will be used for certain learning tasks. Walsh remains among the most optimistic scholars in supporting the notion that AI will help in improving learning outcomes. Despite Walsh’s optimism, it remains uncertain on whether AI will perform the same roles played by humans at the same competence level or even exceed their ability. An important aspect is that Walsh (2018) mentions various challenges that continue preventing the adoption of AI in the educational sector including the complex economic, social and political contexts.

Some of the mentioned challenges afflict the Middle East. Some parts of this region have already commenced embracing AI. The International Data Corporation suggests that spending on AI systems within the Middle East will increase by more than 32% in the period between 2017 and 2021 (Doucet et al., 2018). Further evidence suggests that the scope of its impacts on the society will also increase in the Middle East. Areas that have demonstrated robust commitment to AI technologies’ development and implementation are Qatar, UAE and Saudi Arabia (Khan et al., 2015). However, Khan et al (2015)
emphasize that a notable aspect is that various challenges associated with the technology have impeded its integration into the Middle East education sector and made many efforts geared towards its adoption outside gulf economies to become slower. Adoption level differences are determined by the major enabling factors for Artificial Intelligence development, including lack of sufficient skilled labor in the education sector and poor infrastructure to support the adoption (Bayne, 2015). Despite the low levels, the prospects for deployment of AI in education remain high.

**Challenges**

The limited integration of AI into the educational sector has contributed to the few researches that provide a comprehensive overview of the challenges bedevilling its integration. Zardakis (2015) contends that the major challenges for AI integration into education are the natural effects it will pose on the nature of education and data. There has been a surge in the number of students attending online classrooms recently. According to Bayne (2015), classrooms will continue serving a crucial purpose during the introduction of new concepts and development of problem solving skills that cannot be replicated within a machine environment. Zardakis (ibid) argues that the major challenge will be data because of the biases associated with training machine learning algorithms.

The other challenge is ethical and privacy issues that arise during the harvesting and usage of personal data particularly with the enactment of various data protection laws and regulations in various nations (Bostrom & Yudowsky, 2014). Scholars have also widely discussed the challenge of talent whereby organizations could grapple with getting the right persons and skills in AI, data science as well as machine learning to implement the strategy in education (Woolf, Lane, Chaudhri & Kolodner, 2013). This is particularly evident in the Middle East where there is lack of sufficient skills in certain areas to drive AI adoption.

The challenges discussed in the literature can be summarize as organizational (expensive cost of developing and implementing systems, organizational conservatism or status quo, lack of support and cooperation) (Woolf et al., 2013), political or administrative (integration into the current curriculum, overcoming stiff resistance from alternative methods, concerns and needs of teachers, teacher or trainer resistance, learner motivation) (Bostrom & Yudowsky, 2014), the need for continuous feedback, technical
(incorporation of important pedagogy, integrating with all user platforms) (Frankish & Ramsey, 2014), and the need to regularly update the domain subject matter, ethical issues of data privacy and confidentiality.

**Prospects, Impacts and Consequences**

Artificial intelligence is setting a foundation for personalized and adaptive learning. This is critical for the design of learning systems that adapt to individual needs of students, and prior knowledge can be achieved with AI. The systems build on the prior learning of students to influence pathways for today’s learning and provide knowledge on future learning (Popenici & Kerr, 2017). Individualized learning provides a plethora of benefits for learners with different learning styles. However, research indicates that it is not viable in numerous settings (Maseleno, Sabani, Huda, Ahmad, Jasmi, & Barison, 2018). One facilitator with at least 20 students lacks time and resources required for customizing the curriculum.

The other likely impact is automation and expedition of administrative tasks by speeding up administrative processes for educators and institutions of higher learning (Colchester, Hagras, Alghazzawi, & Aldabbagh, 2017). It could help in addressing the tedious process involved in grading homework, evaluation of essays and weighing students’ responses. Artificial Intelligence provides a chance to use adaptive learning processes that are already present in learning games, assessment software and digital textbooks for individualizing learning (Dietz-Uhler & Hurn, 2013). AI has capacity for highlighting and emphasizing major areas where students suffer, and can enable teachers to facilitate the learning process as well as provide the one-on-one support needed by students at all levels (Colchester et al., 2017).

Also, Popenici and Kerr (2017) argue that higher involvement in higher education and increased numbers of students, staff costs as well as wider financial pressures on institutions of higher learning makes the use of AI a lucrative and attractive option. From this literature review, AI is an attractive option for higher learning, but there is need to address the challenges (Maseleno et al., 2018). Moreover, there is no agreeable model or framework on how AI can be embedded into education. The current integration appears to be haphazard and unplanned, thus could impact on its success. There is also little research on the best ways of integrating AI into education. Middle East has attempted to embrace AI into other sectors, but its integration into education remains unfulfilled. Its impact could be greatly felt in the region, especially
the UAE (Halaweh, 2018). To solve some of the integration challenges, Feldman, Monteserin and Amandi (2015) presented two unique approaches that can be used for developing an adaptive learning system, which can form basis for the development and integration of AI into higher learning.

**Methodology**

Rapid reviews have increasingly become important for synthesizing evidence that can inform emergent decisions that policymakers are grappling with. The rationale for this methodology is that it will enhance transparency on the way conclusions will be generated by avoiding misrepresentation of knowledge. This is because they evaluate the way each research is done, and clarifies on the relevance and quality. The fundamental principle of this methodology is that it uses an explicit and methodical approach for avoiding ways through which reviews could misrepresent knowledge (Khangura et al., 2012). A protocol is used for determining the way the systematic review should be carried out prior to the commencement of the work in order to minimize bias. This is because results cannot overly affect procedures. In the current study, exhaustive searches are carried out to find enough relevant research and reduce bias. This ensured that conclusions were not influenced by research that is most accessible.

Also, this systematic review included efforts for finding research that only falls in the category of the review’s research questions, especially the major research question: How can Artificial Intelligence improve education? Limiting the scope to only studies that are related to the research questions ensured that the conclusions made are not influenced by studies that researchers can find easily (Fontaine, Cossette et al., 2017).

The inclusion criterion for studies into this research was to conduct an assessment of each study in order to ascertain whether it actually addresses the main research question. Studies found not to address it were excluded. Also, the nature of the review question and methods only allowed me to identify the chosen examples of evidence. This did not in any way deter it from being a systematic review because of the level of transparency, coherence and rigour in the used approach.

**Eight-Step Approach**

The data collection method entailed database searches, hand-searching the likely journals, specialist bibliographies’ searches, and a scrutiny of unpublished research to ensure that the researcher does not duplicate the
research. This systematic review protocol’s development corresponds with the rapid survey protocol presented by the Khangura et al (2012) which presents eight specific steps. The protocol has also been registered in the database and has a registration number.

Step 1: Assessment Needs

The study’s evidence summaries began with determining the need for comprehensive integration of Artificial Intelligence into higher learning by examining perceptions from managers, education administrators, learners, stakeholders, and decision-makers. Consultation with knowledge users was critical for synthesis of information to support evidence for sound decision-making (Khangura et al., 2012). The review established the need to find more information from knowledge users regarding the specific interests and needs related to how Artificial Intelligence can be incorporated in education. In case the review did not find rapid evidence summary from the studies, priorities raised by stakeholders were prioritized.

Step 2: Question Development & Refinement

This was an iterative process involving editing and refinement of research questions to ensure that current needs were addressed.

Step 3: Article Development and Approval

This entailed the creation of the article to include background information, final research questions, proposed methods, the timelines, research findings and analysis, conclusions and recommendations.

Steps 4 & 5: Systematic Literature Search, Screening and Selection of Studies

Databases used for obtaining data were EBSCO: PsychINFO, Web Science, Google Scholar, Journal of Teacher Education, Jstor, and Elsevier, Amazon, Scopus, and leading educational journals aided in availing the appropriate academic studies. Various studies were targeted in the quest for evidence summaries. The article prioritized obtaining evidence from authoritative systematic reviews (Khangura et al., 2012). Recent primary studies are also incorporated along with often cited studies. Commentaries were also factored in, but rarely, to contextualize the literature. Studies carried out after 2012 were considered to ensure that the information obtained was up-to-date.

Step 6: Narrative Synthesis of Included Studies

Exclusion of studies deemed as irrelevant done in this stage. Evidence
summaries are produced through the extraction of primary aims methods, findings and relevant limitations. Data were synthesized through descriptive analysis. Apart from summary of evidence, all studies are assigned some evidence level to reduce bias. Caution was taken during interpretation of the findings.

Step 7: Article Production

It entailed the development of a concise article that clearly, yet methodically encompasses all components that the study sought to tackle. Summaries of each study were used for providing information for the review.

Step 8: Dialogue with Users of Knowledge & Follow-ups

Evidence summaries sought to establish the connection between the studies. They were used as a foundation for researchers to gain more insight regarding what educational experts feel about the research question. The study continues engaging with knowledge users on a formal and informal level.

Inclusion Criteria

Types of Studies

The study included various types of studies to broaden the scope of the research. Quasi-experimental study designs were considered for inclusion, including the one-group post-test or pre-test studies as well as non-equivalent group studies. The emphasis was to ensure that the studies were peer reviewed and met various educational criteria. Studies carried out between 2012 and 2018’s educational settings are considered for inclusion. Various studies published prior to the stated period were found to be biased towards more positive findings, thus also warranting the exclusion criteria.

Participants

Only primary studies carried out by educationists, proven academicians, reputable researchers, students and educational stakeholders are considered. In the context of the review, this article refers to the stakeholders in the education sector as ‘users.’

Outcome Measures

Included studies should directly relate to the main research question and contribute to the current knowledge base (Khangura et al., 2014). In the context of the study, the cultural-historical activity theory, CHAT, was used to help in understanding and analysing the connection between human minds
and activity (Foot, 2014).

**Findings and Analysis**

Many of the analyzed studies support the argument that AI’s use in higher learning will only increase in the future (Colchester et al., 2017). As AI has the potential to alter the structure of university administrative services, but the aspect of higher education presents unique challenges. AI solutions can also be applied to only tasks that have the capacity to be automated. However, the findings demonstrated that these solutions could not be considered as a solution for the complex higher learning tasks. The studies hype the likelihood of AI being used in education, but there is need to heed of the actual limits that algorithmic solutions have in performing complex higher education tasks (Popenici & Kerr, 2017). Consistent evidence exists that AI provides solutions that could open new possibilities for higher education.

Despite the hype and optimism, current limits of technology suggest that AI is unprepared to substitute teachers because of the various challenges, including transparency (Popenici & Kerr, 2013; Popenici & Kerr, 2017; Pasquale, 2015). However, it continues to present real possibility of augmenting them. Higher education is at crossroads and requires a boost, and perhaps, AI could come in as a solution for complementing teachers rather than replacing them. The crossroad is that AI needs careful consideration, particularly to ensure that it is adopted and augmented for the long-term success of education rather than an experimental one. Also, the actual potential of AI in higher learning should be to extend educational and research possibilities and capabilities.

The purpose of this article was to explore how far AI can be embedded into higher learning. Regarding articles directly examining the main research question, they demonstrated that AI can be adopted into higher learning procedurally by addressing the challenges affecting both technology and education. Various technologies are currently used in higher learning and present key challenges that have not yet been comprehensively addressed, thus impacting learner outcomes (Luckin, 2017). As such, there is need to solve the various challenges, ethical, administrative, educational and political, which afflict the education sector in terms of technological development. Resistance to change also needs to be addressed in order to ensure that in case integration becomes a reality (Pasquale, 2015), AI can be incorporated easily and seamlessly.
In spite of resistance from scholars like Popenici and Kerr (2017), relying on AI as a solution to the challenges afflicting the educational sector could be beneficial for enhancing learning outcomes. Whereas maintenance of academic skepticism on AI is crucial in education, it is worth noting that the values of humanism can be addressed by AI as it is integrated into higher learning. Areas such as Saudi Arabia, UAE and Qatar can benefit from the integration of AI into higher learning (Khan et al., 2015). Such areas find it difficult to embed AI because of the complex nature of challenges associated with it (Bayne, 2015). Talent, skills gap, ethical and privacy issues are some of the challenges that have to be addressed in order for successful integration (Bostrom & Yudowsky, 2014; Woolf et al., 2013).

Regarding potential of AI, it is already laying foundation for adaptive and personalized learning (Popenici & Kerr, 2017; Maseleno et al., 2018; Dietz-Uhler & Hurn, 2013). It has also proven handy in automating and fast-tracking administrative tasks in higher learning (Colchester et al., 2017), addressing areas of weakness in learning, and facilitating the process. The systematic review also highlighted that there is lack of comprehensive studies that document how AI could be integrated into higher education, but the current adoption mechanisms appear to be haphazard (Popenici & Kerr, 2017). This has led to AI remaining only a prospective rather than real option for higher education (Maseleno et al., 2018).

Education is a complex sector and any changes to it need to be based on certain frameworks in order to ensure that it is systematic and holistic. Various studies have recommended the need for such a framework, but do not offer direction on the elements that such a model needs to incorporate. This is particularly to regions such as the Middle East that could be laggards in terms of AI integration. AI may be deemed as a disruptive innovation for the Middle East’s education sector (Khan et al., 2015), despite being successfully integrated into various productive sectors (Halaweh, 2018).

Furthermore, the review established that personalized solutions have increasingly become a reality than the society imagined a decade ago (Rutkin, 2015; Bostrom & Yudkowsky, 2014). The creation of smart content has increasingly become common, including digitized guides at all levels. Content Technologies Inc is one of the AI development companies that specialize in intelligent instruction design and has developed various smart content services. Cram 101 and IBM’S Watson use AI for disseminating and breaking down content into guides (Popenici & Kerr, 2017).
With these new realities, there remains possibility that AI could be integrated into higher learning, but the experience of technologies such as Massive Open Online Courses, MOOCs, points to a greater need for a holistic framework for addressing the bottlenecks rather than rushing into its embedment (Popenici & Kerr, 2013; McKay, 2015). From the findings, it is worth noting that there are robust arguments that support the significance of machine learning and the wave of change that it is causing. Other areas including the Arab World lack sufficient data to substantiate these arguments, but the one evident aspect is that any efforts towards integration must seek to address the mistakes of the past. The systematic reviews and leading scholars seem to be in agreement that AI could be used for meeting the needs of the increasing number of students and support higher education.

**Conclusions**

This article sought to establish how to integrate AI into higher education. The assumption was that full integration of AI into education could lead to better educational outcomes. The systematic review confirms this assumption, but notes that this would not happen without solving the numerous problems. The study hypothesis was that embeddment of AI into the education system would lead to better educational results through improvement of quality of learning and effectiveness. Whereas various studies document these benefits, it is worth noting that many of the studies are still addressing its current status, history, future, and potentiality (Colchester et al., 2017). The review proved the hypothesis, but fell short of identifying the real impacts that are currently being felt. However, the core focus of the study was to identify how AI could be integrated into higher learning.

The emergence and proliferation of AI suggests that it is almost impossible to disregard discussions revolving around its future role in higher education, as well as the kind of decisions that institutions of higher learning will have to make about the issue. Additionally, the high speed of technological innovation and related job displacements that have been recognized by educational experts suggests that teaching and tutoring in higher education should reconsider pedagogies and role of teachers. There is a wave of public consensus that AI may replace many tasks that teachers perform, but this opens up the probability of the transmission of biases within operating systems (McKay, 2015). The positive assumption is that institutions of higher learning remain centers of integrity that will be able to maintain, promote and advance wisdom along with knowledge.
As such, it could be time that these institutions will have to re-orient their thinking and pedagogical models. The solutions presented by AI suggest that the benefits could outweigh the costs, but do not mean that the costs should not in any way be disregarded (McKay, 2015). An AI model adopted should guarantee education for all, especially for poor countries and areas such as the Arab World, promote lifelong learning, focus on the core goals of education, and maintain the integrity of fundamental values. One of the grey areas that should be addressed in research is not only determining the ethical implications of AI (Popenici & Kerr, 2017), but also tackling the negative consequences, if any. With all these considerations, how can AI be integrated into higher education?

**Recommendations**

There is no silver bullet for the challenges ailing the education sector and the embedment of AI into higher learning, but an integrated approach could be instrumental for addressing some of the challenges identified. Solutions must be oriented to each country or region in order to realize optimal outcomes. For example, the problems in the Middle East are not similar to the ones in the United States or Canada. As such, the model developed should be oriented to the specific region or culture in which it is adopted. Any model developed should address various aspects, including lifelong learning, skills, grading, virtual facilitation, feedback, personalized and adaptive learning, accessibility, mentorship, proctoring, and interaction data. Towards this end, this article proposes the following ways through which AI could be embedded into higher education to enhance effectiveness and quality of education.

**Development of a Digital Curriculum**

In this era of globalization, some learners view traditional textbooks as quite boring. While there has been notable progress in multi-dimensional books being developed, there is still a long way to go in ensuring that there is interactive content for students. It is due to the fact that many of the textbooks are currently being created in accordance with the principle of “one-size fits-all.” As such, there is need to commence creating personalized curricula. Tools such as Netex Learning could be used for designing interactive curricula. Apart from videos and audios, social and spaced learning could be personalized during the process (Colchester et al., 2017). Such tools could enable teachers to use analytics for monitoring results and altering the curricula whenever necessary.
Adaptive and Personalized Learning

Ideally, personalized learning refers to various educational programs whereby the instructional approach and learning pace are oriented to each learner’s needs. The preferences and interests of various learners are prioritized in the adaptation of AI. Such integration will ensure that the needs and preferences of both slow and fast learners are fulfilled. Regarding adaptive learning, it is among the most used applications of AI in the field of education (Luckin, 2017). AI should be adapted to tackle the progress of all learners, and informing teachers regarding the difficult parts that students find in materials. Some of the intelligent tutoring systems that are operational today are Smart Content (Chaudhri, Gunning, Lane & Roschelle, 2013) and Mika software.

Automation of Basic Educational Activities

This could be specifically instrumental for the teachers. For example, AI can be integrated into higher education through automated grading to stimulate teachers’ behaviors towards assigning grades. Also, automated grading may be beneficial for assessing the knowledge of learners, development of personalized training plans, analysis of their responses, and providing feedback (Doucet et al., 2017). Large lecture courses have tests and assignments are often associated with tediousness, thus automation could reduce time taken and refocus it in other areas.

Adoption of Chat-bot related Apps

Such apps could be instrumental for providing feedback for both teachers and learners. Chat robots that are driven by AI and machine learning are the most recent examples of how AI could be integrated into education. They can be integrated into higher learning globally to improve the quality of feedback (Colchester et al., 2017). For instance, a chatbot could be used for collecting opinions through dialog interfaces. Teachers could adapt conversations in accordance with the students’ personality and responses. Finally, proctoring and virtual facilitation can also be ways of integrating AI into higher learning, but there is need for further research on how this could be attained.

Limitations and Implications for Further Research

The major limitation was the nature of the study that was a systematic review. Systematic reviews could enable researchers to enhance the scope and rigour of literature reviews, but carrying out a systematic review is quite resource intensive. However, this limitation was addressed through the use of universal guidelines and standards in order to enhance reliability.
I, also, extended the searches beyond the main databases to include grey literature in order to enhance the review’s effectiveness. The second likely limitation of this study is that it is prone to bias, use of out-dated information and could be quite lengthy (Page, McKenzie et al., 2014). However, this article was critical in the way it selected trials, and included many studies of high quality. Also, it was used as a way of finding strong and sensible solutions to the main research question: How can AI be integrated into higher learning?

There is need for further research regarding the roles that teachers will play in an AI-dominated education system. This will be important for kick-starting how the consequences of AI on teachers could be mitigated or enhanced. Key focus should be on the areas of innovation, imagination, and creativity, which are skills and capacities that machines will never replicate. Future research in AI should focus on how it can foster learning of the 21st century skills, enhance accessibility to global classrooms, lifelong learning, and interactive data for supporting the learning process.

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