EURASIAN EXPERIMENT JOURNAL OF SCIENTIFIC AND APPLIED RESEARCH
(EEJSAR) ISSN: 2992-4146
©EEJSAR Publications Volume 5 Issue 2 2024

The Role of Artificial Intelligence in Educational Assessment

Kakungulu Samuel J.

Faculty of Education, Kampala International University, Uganda

ABSTRACT

Artificial Intelligence (AI) is transforming educational assessment, offering innovative solutions to evaluate student learning effectively and efficiently. Traditional assessment methods, though reliable, often fail to adapt to the evolving educational landscape. This paper explores the integration of AI in educational assessment, analyzing its impact on formative and summative assessments. The study highlights the advantages of AI-driven assessments, including scalability, personalization, and improved feedback mechanisms. Additionally, it addresses the challenges associated with AI implementation, such as academic integrity and equity. Future trends and potential directions for AI in educational assessment are also discussed.

Keywords: Artificial Intelligence (AI), Educational Assessment, Formative Assessment, Summative Assessment, Machine Learning.

INTRODUCTION

In recent years, there have been many advancements in Artificial Intelligence (AI). The impact of AI in general is being intensely analysed, and there has recently been a discussion about the impact of AI precisely in the education sector, particularly on the assessment process. There has been an overall suggestion that AI cannot be used in a positive manner for the education sector, particularly in the contextual analysis of knowledge assessment execution and evaluation methodology of assessment tasks [1].

FOUNDATIONS OF EDUCATIONAL ASSESSMENT

The assessment process is at the very heart of evidence-backed education as it provides information that can help teachers teach better, learners learn better, and systems operate better. There are many different assessment practices which range from informal, light-weight assessments to massive high-stakes tests. They can be classified via different criteria such as: when they are administered, who administers them, what is measured, how results are obtained and reported, etc [2]. On the one side, there are formative assessments whose feedback can be used to adjust teaching and learning. The information they produce can be used to control the learning process and hence improve chances of success. Formative assessments are by definition low-stakes, cannot be used to validate conclusions about curricular standards, accountability, etc. Traditional formative assessment includes test items that require essays or numeric solutions accompanied with some textual exchange. Computer-based formative assessments replace most of the text production by filling in blanks procedures and are usually automatically scored. On the other side, there are summative assessments whose feedback is used to examine the worth of the educational endeavor in question. They are by definition high-stakes, and conclusions can be drawn about learners, teachers, curricula, schools, etc. High-stakes tests require strict control over what is tested, how it is tested, and how responses are obtained and processed [3, 4].

TRADITIONAL METHODS

Educational assessment has received increased attention in the last few years as a way to improve the success of a course the students take. Educational assessments, be they formative or summative, are used to improve the learning outcomes expected from a course through the evaluation of the students' knowledge, skills, and attitudes. However, how educational assessments are designed, executed, and evaluated play a key role in how impactful they are in ensuring the success of a course. Numerous technological solutions have been designed to serve as tools to aid in the design and implementation of

different assessment methods. Recently, Artificial Intelligence (AI) has been touted as a technological solution that has the potential to create impactful changes in educational assessments [5, 6]. Traditional educational assessment methods, tools, and techniques that have been used widely and for a good length of time are first detailed. A global overview of traditional educational assessment methods, tools, and technologies is first provided before delving deeper into specific methods that exist. One of the more common approaches to educational assessment that have existed for decades is on-siting a common and single written exam that sets the passing conditions of a course using the same evaluation criteria for all students. Such written exams assess students' knowledge on what has been presented to them throughout a specific course as well as their capacity to think and connect concepts presented in knowledge-based questions. It also assesses students' abilities of making calculations in calculation-based questions. Further, exam questions are typically mixed such that they vary in difficulty and content coverage. To assist with this challenge, a common practice is providing exam questions to a "team" of instructors and teaching assistants [7, 8].

ARTIFICIAL INTELLIGENCE IN EDUCATIONAL ASSESSMENT

The section 'Artificial Intelligence in Educational Assessment' investigates the integration of AI technologies in the realm of educational assessment. The Covid-19 pandemic has forced educational institutions to usher in innovative distance learning methods that have become the new normal, leading to the exploration of technology-enhanced solutions that are constantly evolving to cope with these changes. Educational assessments are crucial in education as they act like a spine, determining whether learning has taken place and how well. However, the current assessment methodologies are mundane, age-old, ineffective for higher-order thinking capabilities, and not able to cope with the overwhelming change in the student pedagogy and learning environment. The educational assessment domain, therefore, needs renovation, and artificial intelligence (AI) is one of the technologies driving the need for this reinvention. There is a rapid proliferation of research interest in this subject. This paper comprehensively surveys AI techniques in educational assessment, including a description of over 60 algorithms based on machine learning, deep learning, and natural language processing technologies with domain knowledge captured for assessment in mathematics, science, and the English language [9]. It elucidates how AI is being utilized to innovate and improve assessment methods in education, in the wake of a continuously changing technology-augmented student pedagogy and research, and growing demand for quality assessment. Over 120 recent literature is comprehensively reviewed to describe, catalogue and differentiates the AI techniques implemented in educational assessment as per the technology being deployed and learning domain being assessed. This work also discusses the issues, challenges, and future prospects of the AI techniques in educational assessment, catering to the changing needs and demands of the educational landscape. Both academically as well as industrially, the formal educational assessment domain is in need of analytics solutions, for which AI is one of the best choices of technologies [5, 10].

OVERVIEW OF AI TECHNOLOGIES

In recent years, artificial intelligence (AI) technologies have been developed and applied widely in teaching and learning, and assessment as well. Many tools and techniques used for assessment practices are AI-based including both machine learning techniques and deep learning techniques. Their detailed application in the assessment domain is presented beneath [11, 12]. Machine learning-based learning outcome (LO) assessment: Several machine learning techniques have been applied for LO assessment. Decision tree and support vector machine classifiers were used for LO assessment in an engineering course. Similarly, support vector machine and Naïve Bayes classifiers were used for LO assessment through students' written texts in engineering courses. Naïve Bayes and k-nearest neighbor classifiers were also used to estimate the level of adopted four different LOs in students' learning portfolios. In many cases, AI for assessment and evaluation are embedded within standard synchronous and asynchronous activities, e.g., evaluating test scores or written work [13, 14]. Natural language processing-based assessment: For evaluating the rubric-based qualitative assessment of written work, natural language processing techniques were used (e.g., and sentiment analysis technique). Different requirements of construction of rubrics for the assessment of different written tasks (including review article, project proposal, and technical report) were also identified. Constructive alignment was suggested to bridge the gap between the learning outcome and the design of assessment [15, 16].

BENEFITS AND CHALLENGES

The advancement and accessibility of Artificial Intelligence (AI) models are profoundly reshaping the landscape of educational assessment. Incorporating AI technology, generative tools, and digital platforms presents a tremendous opportunity to devise innovative solutions for effective, progressive, and contextual educational assessments. AI tools can streamline and provide cost-effective alternative digital methodologies, promoting inclusive and equitable educational outcomes. Intelligent systems can also

generate fresh engagement strategies for learners and teachers, providing new contexts and complexities to shape questions and answers in global citizenry life scenarios. AI can generate various question types about symbol interrelations and afford equitable educational outcomes in classroom conduct or at home. Context and tools significantly affect generated questions, pass percentage, and measures to prevent attempts for right answers. AI technology tools can create diversity in the educational domain through social influence, exposure, and interactions, moving beyond privacy, and academic integrity policymaking concerns [17, 18]. However, the excitement and anxiety associated with AI tools can change approaches to engagement, assessment design, and evaluating digital methodologies. Challenges related to academic integrity, equity of access across socioeconomic backgrounds, and re-evaluating assessment evaluation methodologies are evoking awareness and concern in educational institutions. Varied efforts, awareness generation, and measures are being observed at different educational institutional levels. Skilled personnel development and preserving academic integrity are imminent challenges in incorporating AI tools in educational institutions, personal domains, and age groups. Whether AI-generated questions should form the basis of assessment is a vital philosophical and evaluative question for education [19].

BENEFITS OF AI IN ASSESSMENT

Artificial intelligence (AI) is starting to help develop better educational assessment practices within the educational technology research community. AI uses algorithms or neural networks to accomplish tasks that require intelligent behavior and can help analyze vast amounts of educational data. Using AI to help develop sounder educational assessments has three important benefits. First, AI can power automated mechanisms for efficiently developing fair, valid, and reliable assessments, helping overcome a growing demand for quality assessments. Second, as educational assessments become automated, intelligent machines are better suited to take responsibility for designing and delivering personalized assessments that can facilitate learning. Third, unlike intelligence in human beings, AI can be scaled up and used to design and deliver large-scale assessments in diverse settings worldwide [20]. Utilizing AI to keep improving educational assessments can help develop educational measurements that are better aligned with the changing needs associated with a shifting and expanding range of educational processes and activities. Modern societies increasingly rely on new technologies, where either machines or human-centered technology-based activities dominate educational processes outside of more conventional and everlasting formal and institutionalized settings of education (e.g., school, university). In this context, upon a diversity of teaching, learning, and instructional design opportunities within rapidly growing activities of distance education, Massive Open Online Courses (MOOCs), learning analytics, Intelligent Tutoring Systems (ITS), and others, the demand for educational assessments is rising. To contain fairness, validity, and reliability, better assessments within changing educational processes still need further research and endeavors [21].

FUTURE DIRECTIONS

Educational assessment is now experiencing a profound transformation due to the infiltration of AI. The existing literature reflects various trends regarding the development and application of AI in educational assessment. These trends can serve as the groundwork for further studies and research concerning the role of AI in assessing the learning and skills of students. The absence of analysis of such trends has been designated an urgent issue in recent literature. In order to facilitate the distinctive application of AI in education, there is now an increasing need to delineate the trends and focus of AI applications, specifically in the area of educational assessment and evaluation. An analysis of the trends can lead to further understanding of the effectiveness of applications, which will shed light on pathways for developing AI in education and equipping educational systems with AI-based assessment tools. However, this does not mean that AI will replace teachers, as the importance of formative assessments and the human factor will remain. Nevertheless, the effectiveness, innovation, validity, and fairness of formal assessments within education systems will crucially depend on in-depth understandings of the potential of AI tools and instruments [22].

One potential future development suggested is an increase in the quality of instant feedback mechanisms enabled by AI technologies. Feedback is critical for learning, but providing quality feedback in a timely manner is difficult. AI technologies enable collecting student data while they engage in learning tasks to provide feedback instantly, adaptively, and based on current processes, either closely to the task or right after it, enhancing learning opportunities [5].

CONCLUSION

Artificial Intelligence is poised to revolutionize educational assessment by offering scalable, personalized, and efficient solutions. While traditional methods provide a foundation, they often lack the adaptability required in modern educational environments. AI addresses these gaps by enhancing both formative and summative assessments through advanced technologies like machine learning and natural language

processing. Despite the significant benefits, challenges such as ensuring academic integrity and equitable access remain critical concerns. As AI continues to evolve, its role in educational assessment will expand, necessitating ongoing research and thoughtful implementation to maximize its potential while addressing ethical and practical challenges.

REFERENCES

1. Renz A, Hilbig R. Prerequisites for artificial intelligence in further education: Identification of drivers, barriers, and business models of educational technology companies. International Journal of Educational Technology in Higher Education. 2020 Apr 6;17(1):14. springer.com
2. Yang SJ, Ogata H, Matsui T, Chen NS. Human-centered artificial intelligence in education: Seeing the invisible through the visible. Computers and Education: Artificial Intelligence. 2021 Jan 1; 2:100008. sciencedirect.com
3. Moschella-Schuller JA. Computer-based formative assessment in developmental writing targeting argumentative essay writing skills. 2023. rutgers.edu
4. Crisp V, Ireland J. A structure for analysing features of digital assessments that may affect the constructs assessed. 2022. cam.ac.uk
5. Chen L, Chen P, Lin Z. Artificial intelligence in education: A review. Ieee Access. 2020. ieee.org
6. González-Calatayud V, Prendes-Espinosa P, Roig-Vila R. Artificial intelligence for student assessment: A systematic review. Applied sciences. 2021 Jun 12;11(12):5467. mdpi.com
7. Kubiszyn T, Borich GD. Educational testing and measurement. 2024. cmich.edu
8. Shohamy E. The power of tests: A critical perspective on the uses of language tests. 2020. researchgate.net
9. Treve M. What COVID-19 has introduced into education: Challenges facing higher education institutions (HEIs). Higher Education Pedagogies. 2021. tandfonline.com
10. Limna P, Jakwatanatham S, Siripipattanakul S, Kaewpuang P, Sriboonruang P. A review of artificial intelligence (AI) in education during the digital era. Advance Knowledge for Executives. 2022 Jul;1(1):1-9. researchgate.net
11. Owan VJ, Abang KB, Idika DO, Etta EO, Bassey BA. Exploring the potential of artificial intelligence tools in educational measurement and assessment. Eurasia Journal of Mathematics, Science and Technology Education. 2023 Aug 1;19(8): em2307. ejmste.com
12. Wang Y, Liu C, Tu YF. Factors affecting the adoption of AI-based applications in higher education. Educational Technology & Society. 2021. j-ets.net
13. Rastrollo-Guerrero JL, Gómez-Pulido JA, Durán-Domínguez A. Analyzing and predicting students' performance by means of machine learning: A review. Applied sciences. 2020 Feb 4;10(3):1042. mdpi.com
14. Yağcı M. Educational data mining: prediction of students' academic performance using machine learning algorithms. Smart Learning Environments. 2022. springer.com
15. Rock K. Constructing a data-based analytic rubric for an academic blog post. Assessing Writing. 2022. ⌜HTML⌝
16. Davies PM, Passonneau RJ, Muresan S, Gao Y. Analytical techniques for developing argumentative writing in STEM: A pilot study. IEEE Transactions on Education. 2021 Oct 11;65(3):373-83. ieee.org
17. George B, Wooden O. Managing the strategic transformation of higher education through artificial intelligence. Administrative Sciences. 2023. mdpi.com
18. Perera P. Preparing to revolutionize education with the multi-model GenAI tool Google Gemini? A journey towards effective policy making. 2023. cqu.edu.au
19. Rane N. … of teaching and learning through Gemini, ChatGPT, and similar generative Artificial Intelligence: Challenges, future prospects, and ethical considerations in education. TESOL and Technology Studies. 2024. sabapub.com
20. Hamon R, Junklewitz H, Sanchez I, Malgieri G, De Hert P. Bridging the gap between AI and explainability in the GDPR: towards trustworthiness-by-design in automated decision-making. IEEE Computational Intelligence Magazine. 2022 Jan 12;17(1):72-85. ⌜HTML⌝
21. Kuleto V, Ilić M, Dumangiu M, Ranković M, Martins OM, Păun D, Mihoreanu L. Exploring opportunities and challenges of artificial intelligence and machine learning in higher education institutions. Sustainability. 2021 Sep 18;13(18):10424. mdpi.com
22. Huang X, Zou D, Cheng G, Chen X, Xie H. Trends, research issues and applications of artificial intelligence in language education. Educational Technology & Society. 2023 Jan 1;26(1):112-31. j-ets.net

CITE AS: Kakungulu Samuel J. (2024). The Role of Artificial Intelligence in Educational Assessment. EURASIAN EXPERIMENT JOURNAL OF SCIENTIFIC AND APPLIED RESEARCH, *5*(2):44-48