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HARNESSING ARTIFICAL INTELLIGENCE (AI) TECHNOLOGY TO IMPROVE TEACHING AND LEARNING OUTCOMES IN HEALTH EDUCATION

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Abstract
This study examined the role of AI technology in improving teaching and learning outcomes in health education. The study was guided by two research questions. A survey design was used. The population of the study was made up of 360 third and fourth year students and thirty three academic staff of health education department Port Harcourt of the university of Port Harcourt in 2022/2023 academic session. A random sample of 90 respondents was used consisting of 70 health education students and 20 academic staff. Data were collected using questionnaire and analysed by means of weighted mean. The findings of the study revealed that AI has the potential to improve academic achievement by personalizing teaching methods to suit individual student needs, providing prompt feedback and assisting in grading and assessment. The result also offered profound insights into the challenges posed by the integration of AI in higher education. The impact on academic dishonesty, the menace of pedagogical shifts, and the dynamic relationship between students and AI were scrutinized, contributing to a nuanced comprehension of the intricate dynamics within the academy. It was recommended among others that the use of AI should be introduced in the teaching and learning of health education in tertiary institution since it has been found to be effective in instructional delivery
Keywords: Artificial intelligence, Academic integrity, academic performance, teaching method.

Introduction

Health education is a critical component of promoting health and well-being particularly in today's complex and ever-evolving healthcare landscape. Traditional health education methods have been effective in dispersing knowledge and skills to students but they often lack the personalization, interactivity, and adaptability that modern learners require. The integration of artificial intelligence (AI) technology in health education has the potential to harness the teaching and learning process, enabling educators to provide more effective, efficient, and personalized instruction. National Academy of Medicine (2019)) opined that there is a need for innovation in health education because the healthcare industry is rapidly evolving with new technologies, treatments and guidelines emerging regularly. Health educators must ensure that students are equipped with the knowledge, skills and competencies required to succeed in this dynamic environment. However traditional teaching methods often struggle to keep pace with these changes, leading to gaps in knowledge and skills.

AI technology has the potential to address these challenges by providing personalized learning experiences and interactive case studies –enabling students to develop critical thinking and problems solving skills (Harvard/ Business Review, 2019). Artificial

Intelligence (AI) refers to the development of computer systems that can perform tasks that typically require human intelligence such as learning, reasoning, problem solving using algorithms and data and perceptions (Ruswell & Morvig, 2020). Examples of AI include: siri, plexia, self- driving car Robo advisor, talking bots and email span filters e.t.c. AI is the world's new trend as it has proven more efficient in many fields, especially the Covid-19 pandemic where AI helped fight the virus and globally rescued jobs and educational system (Valshaya et al, 2020). In the field of education, specifically, AJ virtual assistants are altering teacher-student interactions, content delivery, and learning method by providing detailed instruction, instantaneous assistance, greater inter-activity and streamlined administration Anuy et al, 2022). With AI, education is improved in terms of accessibility, efficiency and engagement through the use of AI.

Academic performance or achievement refers to an expression used to represent students' scholastic standing (Glawala, 2016). Similarly, Ishaku (2015) saw performance as a test for the measurement and accomplishment of skills in various field of academic performance as what an individual can obtain within a specific criteria domain. He further described academic performance as a systematic and purposeful quantification of learning outcome, thus, it is therefore, not out of place to describe academic performance as the gain in knowledge of students as a result of taking part in a learning activity or programme. Academic achievement of students represents performance outcomes that indicate the extent to which a person has accomplished specific goals that were the focus of activities in instructional environments, specifically in school, college and university (Steinmayr, Meibner, Weidinger & Wirthwein, 2015) while Eze, Ezenwafor and Obidike (2016) saw academic performance as the outcome of students' effort in examinations. Poor academic performance of students in Health Education seems to depend on the use of teaching methods.

Teaching methods are the instructional strategies or techniques that a teacher can adopt to meet the various learning objectives (Farayola, and Salaudeen, 2009). The methods are classified into two categories: traditional pedagogy refers to the traditional methods or approaches to teaching and learning in which the teacher (human) dominates the teaching and learning activities. The learners remain as passive listeners and there is minimum interaction among the students themselves and between the teacher and the students. An example of traditional pedagogy is lecture method. Conversely, technological innovative methods refer to the teaching and learning strategies in which technology or computer (non-human) dominates the teaching and learning activities. Teachers act as facilitators of the learning process, providing direction and feedback rather than just instruction while the learners actively participate in the decision making process. One example of technological innovative method is artificial intelligence technology (AI). AI is a vast branch of -computer science concerned with developing intelligent computers capable of doing tasks that typically need human intelligence.

Statement of the Problem

The poor academic performance of students in health education at tertiary institutions' examination over the years has become a source of concern to stakeholders in education. The stakeholders have taken some steps to address the problem of students' poor academic performance. For instance, governments, through the ministries of education and school

proprietors ensure that qualified teachers are employed to teach in schools. Teachers on the other hand use different teaching methods and strategies to enhance students' academic performance. Despite all the efforts made by these stakeholders to ensure improved academic performance of students their general academic performances have continued to decline. Some stakeholders blamed the traditional method of teaching used by majority of health education teachers as being responsible for the poor academic performance in the subject and call for a more robust and innovative instructional strategy as the AI technology-driven instructional strategy. Research evidences have shown that AI technology-driven strategy is very effective in enhancing the students' general academic performance in school subjects. The poor students' academic performance in health education could be as a result of the non-use of AI technology- driven strategy in the teaching and learning of health education. Therefore, the problem of the study was to determine the effectiveness of AI technology-driven strategy in improving the academic performance and integrity of students in health education in tertiary institutions.

Purpose of the Study

Specifically, the study sought to:

1. Determine the extent to which Artificial Intelligence has improved teaching and learning in health education.
2. Find out the extent to which Artificial Intelligence has improved assessment and grading in health education

Research Questions

The following research questions guided the study:

1. To what extent has Artificial Intelligence improved teaching and learning in health education?
2. To what extent has Artificial Intelligence improved assessment and grading in health education?

Literature Review

The historical progression of artificial intelligent (AI) within the educational system is a narrative that unfolds across decades; representing a profound evolution from embryonic experiment in computer -assisted instruction to the complex combination of sophisticated technologies. Initiatives in the 1960s marked the recent phases, exploring the use of computers as educational instruments (Moricaleario & Russell, 2018). This era witnessed several advancements such as the inception of intelligent tutoring systems and the developments of adaptive learning platforms underscoring the symbiotic relationship between technology and pedagogy (Grat, 2023).

Etich, (2020) pointed out that AI has become a vital part of the virtual world unquestionably, it plays an important role in general education and higher education for example, the efficient uses of filtering, emails, advertising, applications, you tube and virtual assistants such as Google, digital libraries, Google scholar and other digital research engines (Gurcia, Velez et al 2021).

Ma & Siau (2018) label AI as fragile when it is limited to small, restricted and structured tasks such as collecting data. The later research searches AI as sharp and robust when

performing most of all cognitive tasks are typically human (Beight & Reddel, 2005). However, some experts such as Ballgates, Elon Mask and Stephen Hawking are of the opinion that AI is a threat to human civilization.

Al Impact on Teaching and Learning Process

Ma and Siau (2018) maintain that AI ensures consistency and accuracy in curriculum and registration. They went on to say that human sciences and liberal arts majors will become more popular because these areas of study are less vulnerable to the field of Al than other areas such accounting and finance. Similarly, Lithian et al, (2022) opined that the historical evolution underscores not only technological strides but also the pedagogical ambitions draining these innovations. Early experiences paved the way for AI contemporary role as a pedagogical companion, fostering personalized learning experiences, intelligent tutoring systems emerged as a stalwart in adapting to individual student's needs, offering a glimpse into the potentialities and challenge of integrating AI into the educational milieu. Focusing on the learning and teaching process, no one would doubt that AI is replacing lecturers or tutor in many ways, such as blended learning and e-learning. The presence of an e-learning lecturer is limited as the learner interests with a virtual classroom, whether on black board, module, turnatin or any other platform (Flu & Laurie 2018). Moreso, Chin (2018) agrees that AI is meant to revolutionize how we learn, teach, woodhoe and make decisions. Therefore AI is not only about its superficial effect but about radical changes on the teaching and learning process in depth.

"Learning how people learn will hopefully help us and others think about retraining down the road" (Rexford, 2018). Hence according to him efficiency of AI is provisional, as understanding learning styles is the only key to success. In the same vein, Fabar &Yousif (2011) argue that the learning process in this world is becoming more interactive and encouraging, according to recent researchers, because e-learning provides the learner with artistic and pedagogical features as well as incorporates and deals with countless types of content which react effectively to the student's needs.

For instance, AI provides deep learning and teaching process to get higher Performance from both the tutor and the student. For example before discovering AI, it took time for a teacher to assess and grade papers and check for plagiarism. But with the invention of AI checking for academic integrity and language issues takes minutes or less. Indeed, using artificial intelligence, a lecturer submits the work to Turnintin, grammarly, or other software in minimal time, it can provide constructive feedback based on the results generated by software used.

However, AI is perfect in covering language and academic integrity, issues, semantic, pragmatic, and cognitive levels, in many cases require the human/ rural intervention to perform the last touch (Melthul, 2018). Nevertheless, AI offers various learners link about the topic required by the subject matter and cases and inspires both learners and teachers by addressing different learning styles such as individual learning, visual learning, e-learning, audio learning and deep learning. An addition AI enables the teacher to select and apply the learning method that the learner needs and highlights he area of improvement to be focused (Fabar & Yousif, 2011). In addition AI reinforces independent learning as the learner becomes autonomous and free to access input anywhere he finds himself. Furthermore,

according to Richer (1985), AI positively influences education and provides intelligent computer-assisted instruction that facilitates learning instruction and provides expert system to diagnose and cases learning' outcome (Richer 1985). It is obviously clear that the work of AI in academic learning and teaching cannot be overemphasized.

Impact of AI on Assessment

AI also impact on the grading and assessing process for example, AI checks assignment and research projects through software such as Turnitin against millions of resources in a twinkle of an eye. Consequently, Manama et al (2012) opined that similarities are easily generated to judge whether the learner plagiarize. They also added that; similarly, online rubrics and grading forms are added to assignments with criteria and scales, and final grades are automatically added to the submitted work without any stress.

In a study done by Stanford University, AI is applied to evaluate student's responses and create a computer model that endorses rules inferred from the lecturers grading decisions. What is specific about AI is that it improves learning instead of making a final authoritative decision. In addition it reflects more transparency, trust and quality control (Standford University, 2019). Brad Rose Consulting (2019) reported the findings of two separate studies by Toula and Peterroze which showed that Robo-grades (Robots used for grading students' papers) are increasingly used to grade students' essay mainly in Utah, Ohuo and soon Massachusetts to follow; and that AI techniques that can judge up to 100 features abound and that grading essay is highly accurate respectively.

Looking at the above studies, from different perspectives they all address the valuable role of AI in grading and assessing the learner and facilitating the role of instruction a critical thinker would not hesitate to raise or ask questions about the bias in making reports, the guarantee that AI is fair and objective. Also what about the human side of the learning and assessment will AI consider the psychology of learner grading or assessing paper?

AI and Academic Dishonesty

The innovation of AI tools has empowered students with unprecedented access to resources, challenging the very foundations of academics integrity, as such "exponential leaps in information -processing power have coalesced with the omnipresent data extraction capabilities of an ever more dynamics integrated and connected digital world to provide a fecund sprawining ground for the explosion AI/MI technologies (Leshe, 2023). Instances of plagiarism, the automated generation of essays and real-time assistance during examination have burgeoned, propelling the academic community into realm freight with ethical quandaries (Tair & Tohir, 2023).

In this complicated dance between student and AI, or mutual benefits has emerged that need to be verified. The literature resounds with tales of students leveraging AI not merely as tools but as accomplices in by passing the rigors of academic inquiry, plagiarism, once a manual endeavor, now found automated expression through AI generated contents, testing the ethical boundaries of AI education (Simon; 2023, p. 16). Moreover a nuanced examination of the ethical implications surrounding AI driven academic dishonesty reveals the complex terrain where the responsibilities of education institutions and technology

intersect (Lim et al, 2023).They are oolong landscape demand not only a reactive stance against transgression but a proactive strategy to instill value within the academic community.

Implications of AI integration into academics transcend considerations of academic integrity and extend into the pedagogical realm. Research endeavours have contemplated the enrichment of teaching methodologies through Al-driven technologies, encompassing, personalized feedback mechanism and adaptation to diverse learning styles (Shemkuwar & Sharma, 2023). The pedagogical landscape, reshaped by the advent of Al is a tapestry woven with both promise and trepidation. As educators navigate the integration of AI into teaching methodologies, the potential for transformative change echoes through the literature tutoring systems stand as beacons of adaptability, catering to the unique learning styles of individual student (Lin et al, 2023). However this quixotic vision is not free from challenges. Miao & Holmes, (2021) are of the opinion that the delicate balance between human intuition and machine precision requires careful calibration to harness the full potential of AI in fostering effective and inclusive pedagogical practices.

Method

The study employed qualitative survey design which focused on collecting data from people's experiences, perception and feeling. The design was used to ensure the quality and authenticity of the data collected. The population of the study comprised 360 third and fourth year students and thirty three academic staff of health education department of the University of Port Harcourt in 2022/2023 academic session (see Table 1). A random sample of 90 respondents was used consisting of 70 health education students and 20 academic staff (see table 2). Data collection was based on primary and secondary data. The preliminary data were collected through a qualitative survey and secondary data were gathered by reviewing previous studies. Data were presented in tables and analyzed using weighted mean. The four point, Likert scale of strongly agree, agree, disagree and strongly disagree was used.

Decision Rule

Strongly Agree (SA) = 4 points
Agree (A) = 3 points
Disagree (D) = 2 points
Strongly Disagree (SD) = 1 point
Total 10points
Mean $\frac{10}{4}$ = 2..50

The decision rule is that responses or scores with a mean of 2.50 and above are positive (High extent) while scores below 2.50 are negative (Low extent).

Table 1: Population of the Study

Level	Number of students
Years 3	200
Year 4	160
Total	**360**

Source: Department of Health Education, University of Port Harcourt, 2022/2023 academic session

Table 2: Sample of the Study

Level	Number of students
Years 3	50
Year 4	40
Total	**90**

Result and Discussion

Research Question 1: To what extent has AI improved teaching and learning in health education:?

Table 3: Responses to Research Question 1

S/N	Questionnaire Item	SA	A	D	SD	Total	Mean	Decision
i	AI uses better learning styles and teaching methods in Health Education	40 160	21 63	18 36	13 13	90 272	3.02	Positive
2	AI is more effective in improving students' academic performance in Health Education	34 136	23 69	14 28	19 19	90 252	2.80	Positive
	Grand mean						**2.91**	**positive**

The responses to Research Question 1 as shown in table 3 revealed a grand or overall mean of 2..91 which is positive and above the benchmark of 2.50. This means that AI, to a very large extent, has improved teaching and learning in health education

Research question 2: To what extent has AI improved assessment and grading in health education?

Table 4: Responses to Research Question 2.

S/N	Questionnaire Item	SA	A	D	SD	Total	Mean	Decision
1	AI is more effective in assessing simple and complex tasks compared to humans.	45 180	22 66	15 30	8 8	90 284	3.16	Positive
2	AI is more effective in grading simple and complex tasks compared to humans.	49 196	19 57	10 20	12 12	90 285	3.17	Positive
	Grand mean						**3.16**	**positive**

The responses to Research Question 2 as shown in table 4 showed an overall or grand mean of 3.16 which is positive and above the benchmark of 2.50. This implies that AI, to a very great extent, has improved assessment and grading in health education

Discussion

Impact of AI on the learning and teaching

Findings of table 3 show that AI uses better learning styles and teaching methods in health science education. That is, AI is more efficient than humans. The result is in agreement with Brad Rose Consulting (2019) as discussed earlier in Mahama, Johns and Apte (2012). The result of the table also indicates that AI is more effective in improving the academic performance of students in Health Education. The results were supported by the findings of Rexford (2018) and Tuo mi et al (2018) that AI will significantly impact the future of higher education.

Impact of AI on the assessment and grading

Regarding AI's efficiency, accuracy and objectivity in assessing and grading learners, the result reveals that the majority agree with this point (Table 4). The findings agree with Brad Rose and Chin (2018) perceptions about AI's efficiency in grading and accuracy.

Conclusion

From the reviewed literature and the findings of this study it is certain that the role of AI in maintaining the integrity of teacher in learning and assessment in health education cannot be over emphasized. These roles range from: automated grading, detecting academic dishonesty, personalized learning, intelligent tutoring systems, enhancing teachers effectiveness and maintaining academic standards and supporting both students and educators in achieving their goals.

Recommendations

Based on the findings of the study we recommend as follows:

1. The use of Al should be introduced in the teaching and learning of health education in tertiary institution since it has been found to be effective in instructional delivery
2. There should be adequate monitoring of the AI technology to prevent students in using the device to aid themselves in examination malpractice
3. Teachers and students should be trained in the use of AI technology to facilitate their application

References

Ansari, A. N., Ahmad, S., & Bhutta, S. M. (2023). Mapping the global evidence around the use of ChatGPT in higher education: A systematic scoping *YQVIQW. Education and Information* 7ec/?«o/c>g/ej'.https://doi.org/I0.1007/sl0639-023-12223-4/,

Aung, Z. H., Sanium, S., Songsaksuppachok, C., Kusakunniran, W,, Precharattana, M., Chuechote, S., Pongsanon, K., & Ritthipravat, P. (2022). Designing a novel teaching platform for AI: A case study in a Thai school contextJbwma/ *of Computer Assisted Learning, 38(6),* 1714-1729. https://doi.org/i0.11 11/jcal.12706

Bakar-Corez, A., &Kocaman-Karoglu, A. (2023).E-dishonesty among postgraduate students and its relation to *se\f-e$tQQtti. Education and Information* rec/g»o/ogfeg,https://doi.org/10.1007/si 0639-023-12105-9

Brad Rose Consulting. (2019). Robots Grade Your Essays and Read Your Resumes Brad Rose Consulting/ Programme Evaluation/MA.https://bradroseconsulting. com/robots-grade-your-essays-and-read-your-resumes.

Dalalah, D., &Dalalah, O. M. A. (2023). The false positives and false negatives of generative AI detection tools in education and academic research: The case of Chat GPT. *The International Journal of Management Education,* 27(2), 100822. https:// doi.Org/10.1016/i.iime.2023.100822.

Edtech. (2020). Successful AI Examples in Higher Education That Can Inspire Our Future EdTech Magazine, https://edteehmagazine.com/ higher/article/2020/01/ successful- ai-examples-higher-education-can-inspire-our- future

Eze, T.I., Ezenwafor, J.I & Obidile, J.L (2016) "Effect of problem-based teaching method on students' academic performance and retention in financial accounting in Technical colleges in Anambra State" Scholars Journal of Arts, Humanities and Social Sciences, 4 (6A): 634-639.

Farayola, P.I. &Salaudeen, K.A. (2009), Problem -solving difficulties of pre-service NCE Teachers in Mathematics in Oyo State, Nigeria. Abacus, 34 (1): 21-24.

Fyfe, P. (2023). How to cheat on your final paper: Assigning AI for student writing. *AI & Society, 38(4),* 1395-1405. https://dohorg/10.1007/s00146-022-0!397-z

Garcia-Velez, R., Moreno, B. V., Ruiz-Ichazu, A., Rivera, D. M., &Rosero-Perez, E. (2021). Automating the Generation of Study Teams through Genetic Algorithms Based on learning Styles in Fligher Education. In Advances in Intelligent Systems and Computing: Vol. 1213 AISC. https://doi.org/l 0.1007/978-3-030-51328-3 38

Glawala, B.A., Ali¸ D.G. & Durkwa, H. (2016). "Gender difference in academic performance in SSCE among senior secondary school students in Maiduguri Metropolis, Borno State Nigeria" American Journal of Educational Research 4(3): 1-6.

Graf, A. (2023). Exploring the Role of Personalization in Adaptive Learning *Environments International Journal Software Engineering and Computer Science flJSE CS),3(2),*50-56. https://doi.org/10.35870/iisecs.v3i2.1200

Guo, K., Zhong, Y., Li, D., & Chu, S. K. W. (2023).Effects of chatbot-assisted in-class debates on students' argumentation skills and task motivation. *Computers & Education, 203,* lQ4862.https://doi.org/10.1016/i.compedu.2023.104862

Guo, K, & Wang, D. (2023).To resist it or to embrace it? Examining ChatGPT's potential to support teacher feedback in EFL waiting. *Education and Information Technologies* .https:/7doi.org/ 10,1007/s 10639-023-12146-0

Height, M., & Reddell, S. (2005). NOTE: This PDF document has a handy set of "bookmarks" for it, accessible by pressing the Bookmarks tab on the left side of this window. New York Times, 45(10), 672. https: // doi.ore/ 10. 1109/ MSPEC. 2008.4635038 .

Ishaku, C. (2015). Effects of problem-solving and discussion teaching methods on students' achievement in genetics, Unpublished M.Ed Thesis, Department of Science Education, University of Nigeria, Nsukka: 40-42.

Jabar H. Yousif, (2011). Artificial intelligence in e-leaning-pedagogical and cognitive aspects. Proceedings of the World Congress on Engineering, 1, 997-1002.

Jlu, J. J. L, & Laurie A, H. (2018).Artificial Intelligence (AI) and Education.www. crs.gov%7C7-5700

Kim, J. (2023). Leading teachers' perspective on teacher-AI collaboration in E*ducation. Education and Information Technolosies. https://dQJ.Qrs/l* 0.1007/s 10639-023- 12109-5

Kraglund-Gauthier, W. (2015). Book Review- The New Digital Shoreline: How Web 2.0 and Millennials are Revolutionizing Higher Education. *Journal of Teething and Learning with Technology, 4(1),* 80-82. https://doi.org/10.14434/iotlt.v4nl. 13497.

Leslie, D. (2020). Tackling COVID-19 through Responsible AI Innovation: Five Steps in the Right Direction *License. Harvard Data Science Review, 10.*

Li, L., Ma, Z., Fan, L., Lee, S., Yu, H,, & Hemphill, L. (2023).ChatGPT in education: A discourse analysis of Worries and concerns on social media. *Education and Information* rec/?/?o/og7e1y.https://doi.org/10.1007/slQ639-Q23-l 2256-9.

Liang, H., & Zhu, J. J. H. (2017). Big Data, Collection of (Social Media, Harvesting). The International Encyclopedia of Communication Research Methods, December 1-18. https://doi.org/l 0.1002/9781118901731 .iecrtnOOl *5i*

Lim, T., Gottipati, S., & Cheong, M. L. F, (2023).Ethical Considerations for Artificial Intelligence in Educational Assessments. In *Creative AI Tools and Ethical Implications in Teaching and Learning* (pp. 32- 79).https://doi.org/3 0.4018/979- 8-3693-0205-7.ch003

Lin, C.-C., Huang, A. Y. Q., & Lu, O. H. T. (2023). Artificial intelligence in intelligent tutoring systems toward sustainable education: asystematic review. *Smart Learning Environments,* 70(1), 41. https://d0i.0rg/l 0.1186/s40561-023-00260-y

Littman, M. L., Ajunwa, I., Berger, G., Boutilier, C., Currie, M,, Doshi-Velez, F., Hadfield, G., Horowitz, M. C., Isbeil, C., Kitano, H., Levy, K., Lyons, T., Mitchell, M., Shah, J., Sloman, S., Vallor, S., & Walsh, T. (2022). Gathering Strength, Gathering Storms: The One Hundred Year Study on Artificial Intelligence (A1100) 2021 Study Panel Report.^rJT/v, *September,* 1-82. http://arxiv.org/abs/2210.15767

Livberber, T., & Ayvaz, S. (2023). The impact of artificial intelligence in academia: Views of Turkish academics on ChatGPT. *Heliyon,* 9(9), e!9688.

Ma, Y. &Siau, K.L. (2018).Artificial Intelligence Impacts on Higher Education. Proceedings of the Thirteenth Midwest Association for Information Systems Conference, May 17-IS(September), 1-6.

Mahana, M., Johns, M., & Apte, A. (2012).Automated Essay Grading Using Machine Learning. Machine Learning Session Stanford University, 3-7.

MelluI, C. (2018). Emerging techniques in higher education and the workplace: An assessment.

Mills, K. A., Unsworth, L., & Scholes, L. (2022). *Literacy for Digital* Future. Routledge.https://doi.org/10.4324/9781003137368

Moncaleano, S., & Russell, M. (2018). A Historical Analysis of Technological Advances to Educational Testing: A Drive for Efficiency and the Interplay with Validity. *Journal of Applied Testing Technology, I9{* 1), 1-19. www.j attj oumal. com.

Richer, M.H. (1985). Applications of Artificial Intelligence in Education—A Personal View Physiologist, 28(5), 428-431.http://libaccess.mcmaster. ca/login? url= https:// search.proquest.com/docview/63306556 ?accountid= 12347% OAhttp:// srx. ScholarsportaLinfo/mcmaster?iirl_ver=Z39.88-2004&rft_val_fmt=info:ofi /fmt:kev:mtx:joumal&genre:=article&sid=ProQ:ProQ%3 Aerie &atitle=Applicatio

Shamkuwar, M., & Sharma, D. (2023). *Education 4,0: Artificial Intelligence Dimensions, lea* Advancements in Artificial Intelligence, Blockchain Technology, and loT in Higher Education: Mitigating the Impact of COVID-19.

Simon, W. (2023).Distinguishing between student and Al-generated writing; A critical reflection for teachers. Afetap/wr, 5(2023), 16-23.

Song, J., lida, T., Takabashi, Y,, & Tovar, J. (2022). Buying votes across Borders? A list experiment on mexi- can immigrants in the United *StatQS.Canadian Journal of Political Science*, 55(4), 852-872. https://doi. org/10.1017/S0008423922000567

Stanford Encyclopedia of Philosophy. (2020). Epistemology (Stanford Encyclopedia of Philosophy), https://plato.stanford.cdu/entrics/epistcmology/

Stanford University (2019). Artificial intelligence assessment Teaching Commons. https:// teachingcomrnons.stanford.edu/resources/teaching/evaluating-students/ assessing - student-learning/ artificial-intelligence-assessment

Steinmayr, A., Meibner, A.. Weidingar, A.F. & Wirthwein, L. (2015). Academic achievement Retrieved 18th August, 2017 from http:/Avww. Oxford bibliographies.com.

Tuomi, I., Cabrera, G., Marcelino, V., Riina, Y., &Punie. (2018). The Impact of Artificial Intelligence on Learning, Teaching, and Education, https://doi.org/l 0.2760/12297

UNESCOIITE.https://iite.unesco.org/combating-covid-19-togethcr-\ve-are-on-the-move/ United Nations. (2018). Sustainable Development Goals .:. Sustainable Development Knowledge Platform, https ://sustainabledevelopment. un.org/? menu= 13 00

UNESCO. (2020). Combat COVID-19: Keep learning. Together, we are on the move! -

Vaishya, R,, Javaid, M., Khan, I. H., & Haleem, A. (2020).Artificial intelligence (AI) applications for the COVID-19 pandemic. Diabetes and Metabolic Syndrome: Clinical Research and Reviews, 14(4), 337-339. https://doi.org/10.1016/j-dsx.2020.Q4.Q12

Wang, W. & Siau, K. (2017). Impact of Artificial Intelligence , Robotics , Machine Learning, and Automation on the Medical Field. August 4-6. https:// www. researchgate.net/profi 1 e/Keng SJau/publication/318913468 Impact of Arificial_Intelligence_Robotics_Machine_Leaming_and_Automation_on__the_Medical_Field/ Iinks/5984ef5 645 8515605