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Innovative teaching methodologies in the era of artificial intelligence: A review of inclusive educational practices

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Abstract

Artificial intelligence (AI) is revolutionizing the field of education, offering new opportunities to enhance learning experiences and promote inclusive educational practices. This review explores the impact of AI on teaching methodologies and its role in creating inclusive learning environments. By examining current research and practices, this review highlights the potential of AI to address diverse learning needs and promote equity in education.The review begins by discussing the role of AI in personalized learning, where AI algorithms analyze student data to provide tailored instruction and feedback. This approach allows educators to cater to individual learning styles and preferences, ensuring that all students have access to high-quality education. Additionally, AI-driven adaptive learning systems can identify and address learning gaps, providing targeted interventions to support students who may be struggling. Furthermore, the review explores the use of AI in facilitating collaborative learning environments, where students work together on projects and tasks. AI technologies can enhance collaboration by providing tools for communication, coordination, and knowledge sharing. This approach promotes inclusivity by allowing students to contribute their unique perspectives and skills to group projects. The review also discusses the potential of AI in promoting accessibility and inclusivity for students with disabilities. AI-powered assistive technologies can provide additional support and accommodations, allowing students with disabilities to fully participate in educational activities. Additionally, AI-driven captioning and translation tools can improve accessibility for students who are deaf or hard of hearing, as well as those who speak languages other than the primary language of instruction. Overall, this review highlights the transformative potential of AI in education and its ability to promote inclusive educational practices. By leveraging AI technologies, educators can create more personalized, collaborative, and accessible learning environments, ensuring that all students have the opportunity to succeed.

Keywords: AI; Inclusive; Educational Practices; Innovative; Teaching

1. Introduction

Artificial intelligence (AI) is rapidly transforming the landscape of education, offering new possibilities for enhancing learning experiences and promoting inclusive educational practices. As AI technologies become more sophisticated and accessible, educators are exploring innovative teaching methodologies that leverage AI to address diverse learning needs and create more inclusive learning environments (Alam, 2021, Pham & Sampson, 2022, Rane, Choudhary & Rane, 2023).

AI is revolutionizing education by providing educators with powerful tools and resources to personalize learning, enhance collaboration, and improve accessibility. AI-powered systems can analyze vast amounts of data to identify

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patterns and trends, enabling educators to tailor instruction to individual student needs. Additionally, AI technologies are being used to create immersive and interactive learning experiences, such as virtual reality (VR) and augmented reality (AR) applications, that engage students in new and exciting ways (Adıgüzel, Kaya & Cansu, 2023, Pratama, Sampelolo& Lura, 2023).

AI is also transforming assessment and feedback processes, allowing educators to provide more timely and targeted feedback to students. AI-driven assessment tools can analyze student performance and provide personalized recommendations for improvement, helping to close learning gaps and promote academic success.

Inclusive educational practices aim to ensure that all students, regardless of their background or abilities, have access to high-quality education. AI-driven teaching methodologies offer new opportunities to promote inclusivity by providing personalized support and accommodations for students with diverse learning needs (Addy, et. al., 2024, Love, H. R., & Horn, E. (2021).

By exploring innovative teaching methodologies that leverage AI, educators can create more engaging and effective learning experiences for all students. These methodologies can help address barriers to learning and provide students with the tools and resources they need to succeed. Additionally, AI technologies can help educators identify and address biases in instructional materials and practices, promoting a more equitable learning environment for all students (Alam & Mohanty, 2022, Chen, Chen & Lin, 2020).

In this review, we will examine the impact of AI on teaching methodologies and its role in creating inclusive learning environments. By exploring current research and practices, we aim to highlight the potential of AI to promote equitable access to education and improve learning outcomes for all students.

1.1. Historical Perspective

The historical perspective of innovative teaching methodologies in the era of artificial intelligence (AI) reflects a continuous evolution driven by technological advancements and educational research. While the concept of personalized learning and inclusive practices is not new, the integration of AI has significantly transformed the landscape of education, offering new possibilities and challenges (Hamal, et. al., 2022, Pendy, B. (2023, Ohalete, et. al., 2023).

The early 20th century witnessed the emergence of progressive education movements, such as Montessori and Dewey's approaches, emphasizing individualized instruction and hands-on learning. These movements laid the foundation for personalized learning by recognizing the importance of tailoring instruction to meet the diverse needs of students.

In the mid-20th century, the development of computer-based learning systems marked a significant milestone in the history of educational technology. Early systems, such as PLATO (Programmed Logic for Automated Teaching Operations), pioneered the use of computers for educational purposes, offering interactive lessons and assessments. These systems laid the groundwork for AI-driven educational technologies by demonstrating the potential of technology to enhance learning experiences (Aderibigbe, et. al., 2023, Rai & Singh, 2023, Shareef & Nithyanantham, 2022).

The 21st century has seen a rapid expansion of AI applications in education, fueled by advancements in machine learning, natural language processing, and data analytics. AI-driven adaptive learning systems have emerged, offering personalized learning experiences that adapt to individual student needs. These systems analyze student data to identify learning gaps and provide targeted interventions, promoting inclusivity by addressing diverse learning needs (Chen, et. al., 2022, Kuddus, 2022).

Furthermore, AI technologies have been integrated into collaborative learning environments, facilitating communication and knowledge sharing among students. Virtual reality (VR) and augmented reality (AR) applications powered by AI have also revolutionized education, offering immersive and interactive learning experiences that engage students in new ways (Adekanmbi, et. al., 2024, AlGerafi, et. al., 2023, Lampropoulos, 2023).

Overall, the historical perspective of innovative teaching methodologies in the era of AI reflects a journey of continuous innovation and adaptation to meet the evolving needs of students. As AI continues to advance, educators and researchers must continue to explore new ways to leverage technology to promote inclusive educational practices and enhance learning outcomes for all students.

1.2. Personalized Learning with AI

Personalized learning is an educational approach that aims to tailor instruction to meet the individual needs and preferences of each student. It recognizes that students have different learning styles, interests, and abilities, and seeks to provide them with learning experiences that are meaningful, relevant, and engaging (Adeleke, et. al., 2024, Alamri, et. al., 2020, Odonkor, et. al., 2024). The principles of personalized learning for example, Instruction is tailored to each student's unique needs, interests, and learning styles. Students have the flexibility to learn at their own pace and in ways that work best for them. Students progress through the curriculum based on their mastery of concepts, rather than on a fixed schedule. Students receive personalized support and feedback from teachers to help them achieve their learning goals.

AI algorithms play a crucial role in personalized learning by analyzing large amounts of student data to identify patterns and trends. These algorithms can analyze data from assessments, quizzes, and other sources to understand each student's strengths, weaknesses, and learning preferences. Based on this analysis, AI algorithms can generate personalized learning pathways for students, recommending specific resources, activities, and interventions to support their learning goals. AI algorithms can also provide real-time feedback to students, helping them track their progress and make adjustments to their learning strategies as needed (Abrahams, et. al., 2024, Hwang & Tu, 2021, Osasona, et. al., 2024).

Several AI-driven personalized learning platforms and tools have been developed to support personalized learning. For example, platforms like DreamBox Learning and Khan Academy use AI algorithms to adapt the level of difficulty of math problems based on students' responses, providing targeted practice and support. Similarly, tools like Carnegie Learning's MATHia and Pearson's Realize platform use AI to provide personalized learning pathways for students in various subjects, including math, science, and language arts (Bhutoria, 2022, Chang, et. al., 2023, Maghsudi, et. al., 2021).

AI-driven personalized learning has the potential to promote inclusivity by providing all students, regardless of their background or abilities, with access to high-quality, personalized instruction. By analyzing student data and providing tailored instruction and feedback, AI algorithms can help address diverse learning needs and ensure that all students have the opportunity to succeed. Additionally, personalized learning can help engage students who may be disengaged or struggling in traditional classroom settings, providing them with a more personalized and relevant learning experience (Anis, 2023, Atadoga, et. al., 2024, Oladeinde, et. al., 2023).

1.3. Adaptive Learning Systems

Adaptive learning systems harness the power of artificial intelligence (AI) to provide personalized learning experiences tailored to each student's needs, preferences, and abilities. These systems use AI algorithms to analyze student data, including performance on assessments, interactions with learning materials, and progress through the curriculum. Based on this analysis, the system adapts the content, pace, and level of difficulty of instruction to match the individual student's learning trajectory. Adaptive learning systems aim to optimize learning outcomes by providing targeted interventions, addressing learning gaps, and promoting student engagement and achievement (Gligorea, et. al., 2023, Kaggwa, et. al., 2024, Tan, 2023).

AI algorithms in adaptive learning systems use a variety of techniques to identify and address learning gaps. These algorithms analyze student data to identify patterns and trends, including areas of strength and weakness, misconceptions, and areas where additional support may be needed. Based on this analysis, the system can provide targeted interventions, such as additional practice, remediation, or enrichment activities, to help students master challenging concepts and overcome learning barriers. Adaptive learning systems can also adjust the level of difficulty and complexity of learning materials in real-time, providing students with appropriate challenges that match their current skill level (Daraojimba, et. al., 2023, Egieya, et. al., 2024, Wang, et. al., 2023).

Several case studies have demonstrated the effectiveness of adaptive learning systems in improving student outcomes. For example, a study conducted at Arizona State University found that students who used an adaptive learning platform called Smart Sparrow achieved higher exam scores and course completion rates compared to students in traditional lecture-based courses. Similarly, a study conducted by the Gates Foundation found that students who used an adaptive learning platform called Realizeit made greater gains in math proficiency compared to students in traditional courses.

Adaptive learning systems have been shown to have a positive impact on student engagement, motivation, and academic achievement. By providing personalized learning experiences tailored to each student's needs and preferences, these systems can increase student engagement and motivation by making learning more relevant, meaningful, and enjoyable. Additionally, adaptive learning systems can help students build confidence and self-efficacy by providing immediate

feedback and support, helping them track their progress and celebrate their successes. Overall, adaptive learning systems have the potential to enhance student outcomes by providing targeted interventions, addressing learning gaps, and promoting student engagement and achievement (El-Sabagh, 2021, Muñoz, et. al., 2022, Orieno, et. al., 2024).

1.4. Collaborative Learning Environments with AI

Collaborative learning plays a crucial role in promoting inclusivity and diversity in education by providing students with opportunities to work together, share ideas, and learn from each other's perspectives. Collaborative learning environments encourage active participation, engagement, and collaboration among students, regardless of their background or abilities. By working together on projects and tasks, students can develop important skills such as communication, teamwork, and problem-solving, while also gaining a deeper understanding of diverse viewpoints and experiences (Akindote, et. al., 2023, Anyanwu, et. al., 2023, Zubiri-Esnaola, et. al., 2020).

AI technologies facilitate communication, coordination, and knowledge sharing among students in collaborative learning environments in several ways. For example, AI-powered chatbots and virtual assistants can help facilitate group discussions, providing prompts, suggestions, and feedback to keep conversations on track. AI algorithms can also analyze communication patterns and interactions among students to identify areas where additional support or intervention may be needed. Additionally, AI technologies can help students organize and share information more effectively, improving collaboration and knowledge sharing (Jarrahi, et. al., 2023, Oguejiofor, et. al., 2023, Su & Zou, 2022).

Several AI-driven collaborative learning platforms and tools have been developed to support collaborative learning in diverse educational settings. For example, platforms like Google Workspace for Education and Microsoft Teams use AI technologies to facilitate communication and collaboration among students, providing tools for document sharing, real-time editing, and video conferencing. Similarly, tools like Slack and Trello use AI algorithms to organize and prioritize tasks, streamline workflows, and enhance collaboration among team members (Akindote, et. al., 2023, Andersen, Mørch & Litherland, 2022, Ewuga, et. al., 2023).

To foster inclusive collaboration and promote student engagement in collaborative learning environments, educators can implement several strategies. First, educators can create diverse and inclusive groups, ensuring that students from different backgrounds and abilities are represented in each group. Second, educators can provide clear guidelines and expectations for collaboration, setting goals and objectives that promote inclusivity and diversity. Third, educators can use AI technologies to monitor group dynamics and intervene when necessary to ensure that all students are participating and contributing to the group's success. Overall, fostering inclusive collaboration and promoting student engagement in collaborative learning environments requires a thoughtful and intentional approach that leverages the power of AI technologies to support and enhance the collaborative learning experience.

1.5. Accessibility and Inclusivity with AI

Students with disabilities often face significant challenges in traditional educational settings due to barriers to accessibility and inclusivity. These barriers may include physical barriers, such as inaccessible buildings or classrooms, as well as instructional barriers, such as inaccessible learning materials or teaching methods. Students with disabilities may also face social and attitudinal barriers, such as stigma, discrimination, and lack of support from peers and educators. These challenges can create significant barriers to learning and academic achievement for students with disabilities, limiting their ability to fully participate and succeed in school (Afua, et. al., 2024, Ejairu, et. al., 2024, Lopez-Gavira, et. al., 2021).

AI-powered assistive technologies play a crucial role in addressing accessibility barriers and providing accommodations for students with disabilities. These technologies use AI algorithms to analyze and interpret input from users, such as text, speech, or gestures, and generate appropriate responses or actions to support the user's needs. For example, AI-powered speech recognition technologies can transcribe spoken language into text, providing real-time captions or subtitles for students who are deaf or hard of hearing. Similarly, AI-powered image recognition technologies can describe visual content, such as diagrams or charts, for students who are blind or visually impaired. Additionally, AI-powered translation technologies can translate text or speech into different languages, supporting students who are English language learners or speak languages other than the primary language of instruction (Mohammad Abedrabbu Alkhawaldeh, 2023, Odeyemi, et. al., 2024, Okoye, et. al., 2024).

Several case studies have demonstrated the effectiveness of AI-driven captioning, translation, and other accessibility tools in supporting students with disabilities in educational settings. For example, a study conducted at a university found that students who used AI-powered captioning tools in lectures reported higher levels of comprehension and

engagement compared to students who did not use the tools. Similarly, a study conducted at a high school found that students who used AI-powered translation tools to access instructional materials in their native language achieved higher academic outcomes compared to students who did not have access to the tools (Adeoye, et. al., 2024, Odeyemi, et. al., 2024, Zdravkova, 2022).

AI-powered assistive technologies have significant implications for creating more inclusive learning environments for all students. By providing accommodations and support for students with disabilities, these technologies help level the playing field and ensure that all students have access to the same educational opportunities. Additionally, by promoting accessibility and inclusivity for students with disabilities, AI-powered assistive technologies create more diverse and inclusive learning environments for all students, fostering a culture of acceptance, respect, and inclusion. Overall, AI-powered assistive technologies have the potential to transform education by breaking down barriers to accessibility and creating more inclusive learning environments for all students (Garg & Sharma, 2020, Odeyemi, et. al., 2023, Odeyemi, et. al., 2024).

1.6. Ethical Considerations and Challenges

Artificial intelligence (AI) has the potential to revolutionize education by offering personalized learning experiences and promoting inclusivity. However, the use of AI in education raises several ethical considerations and challenges that must be addressed to ensure equitable and responsible implementation. This review explores the ethical issues related to the use of AI in education, including considerations for data privacy, algorithmic bias, and equity, and discusses strategies for addressing these challenges (Tapalova & Zhiyenbayeva, 2022, Tula, et. al., 2024).

One of the primary ethical concerns related to the use of AI in education is data privacy. AI systems collect and analyze large amounts of student data, including personal information and learning behaviors, raising concerns about how this data is stored, used, and shared. There is a risk that sensitive student data could be exposed or misused, leading to privacy breaches and violations of student rights.

Another ethical issue is algorithmic bias, where AI systems may produce biased outcomes based on the data they are trained on. This can result in unfair treatment or discrimination against certain groups of students, particularly those from marginalized or underrepresented backgrounds. It is important to ensure that AI algorithms are fair and unbiased in their decision-making processes (Hagendorff, et. al., 2023, Ntoutsi, et. al., 2020).

The use of AI in education has the potential to either exacerbate or mitigate existing inequities in education. There is a risk that AI-driven teaching methodologies could widen the achievement gap by favoring students with access to technology or resources, while disadvantaging those without. It is crucial to consider equity issues in the design and implementation of AI-driven educational technologies (Madaio, et. al., 2022, Okogwu, et. al., 2023).

To address data privacy concerns, educators and policymakers must establish clear guidelines and protocols for the collection, storage, and use of student data. This includes obtaining informed consent from students and their parents or guardians, ensuring that data is anonymized and protected from unauthorized access, and providing transparency about how data is used.

To mitigate algorithmic bias, AI systems must be trained on diverse and representative datasets to ensure that they are fair and unbiased. It is also important to regularly audit and test AI algorithms for bias and to provide mechanisms for recourse in cases of bias or discrimination.

To promote equity, AI-driven teaching methodologies should be designed with the needs of all students in mind, including those from diverse backgrounds and with diverse learning needs. This includes providing access to technology and resources for all students, designing inclusive learning materials and assessments, and providing support for students who may be at risk of falling behind.

Educators and policymakers should develop and adhere to ethical guidelines for the use of AI in education. These guidelines should outline principles for data privacy, algorithmic bias, and equity, and provide guidance on ethical decision-making in the design and implementation of AI-driven teaching methodologies.

Educators should receive training on the ethical use of AI in education, including how to recognize and mitigate bias, protect student privacy, and promote equity. Training should also include guidance on how to effectively integrate AI technologies into teaching practices while upholding ethical standards.

It is essential to promote transparency and accountability in the use of AI in education. This includes providing clear explanations of how AI technologies work, how they are used in education, and how decisions are made. It also includes establishing mechanisms for students, parents, and educators to raise concerns or seek recourse in cases of ethical violations.

In conclusion, the use of AI in education offers tremendous potential to improve learning outcomes and promote inclusivity. However, it is essential to address the ethical considerations and challenges associated with AI to ensure that its implementation is equitable, responsible, and beneficial for all students. By considering issues related to data privacy, algorithmic bias, and equity, and implementing strategies to address these challenges, educators and policymakers can harness the power of AI to create more inclusive and effective educational experiences for all students (Mohammed & 'Nell'Watson, 2019, Pedro, et. al., 2019, Vincent-Lancrin& Van der Vlies, 2020).

1.7. Future Directions and Implications

AI-driven teaching methodologies are expected to become even more personalized, with systems analyzing a wider range of data points to tailor instruction to individual students' needs, preferences, and learning styles. This could include more sophisticated adaptive learning systems that dynamically adjust content and pacing based on real-time student performance (Elufioye, et. al., 2024, Hashim, et. al., 2022, Maghsudi, et. al., 2021).

AR and VR technologies are expected to play a larger role in education, providing immersive and interactive learning experiences. AI algorithms could enhance these experiences by personalizing content and interactions based on student behavior and engagement.

NLP technologies could enable more natural and conversational interactions between students and AI-driven systems, facilitating more effective communication and understanding. This could enhance the development of language skills and support students with language-related learning difficulties.

AI-driven systems could be developed to support students' social and emotional development by recognizing and responding to their emotions and providing feedback and guidance on social interactions.

Policymakers will need to develop guidelines and regulations to ensure the ethical and responsible use of AI in education. This could include guidelines for data privacy, algorithmic transparency, and equity in access to AI-driven educational technologies (Miao, et. al., 2021, Nembe, et. al., 2024, Nguyen, et. al., 2023).Educators will need to be trained in the use of AI-driven teaching methodologies and supported in integrating these technologies into their teaching practices. This could include professional development programs and resources that help educators understand how to effectively use AI to support student learning.

Continued research will be needed to evaluate the effectiveness of AI-driven teaching methodologies and their impact on student learning outcomes. This could include studies that examine the long-term effects of AI integration in education and the potential benefits and challenges of different AI technologies (Alahira, et. al., 2024, Alotaibi & Alshehri, 2023, Zheng, et. al., 2023).

Policymakers and educators should work to ensure that all students have equitable access to AI-driven educational technologies, regardless of their background or abilities. This could include providing funding for schools in underserved areas to acquire AI technologies and training educators to effectively use these tools.

Developers of AI-driven educational technologies should prioritize the development of algorithms that are fair and unbiased. This could include implementing strategies to mitigate bias in data collection and algorithm design, as well as regular auditing and testing of AI systems for bias.

AI-driven technologies should be designed to promote collaboration and communication among students, teachers, and parents. This could include features that facilitate group work, peer feedback, and parent-teacher communication, enhancing the overall learning experience for students.

In conclusion, the future of education is likely to be shaped significantly by AI-driven teaching methodologies. By recognizing the potential of these technologies to enhance personalized learning, promote inclusivity, and support student development, policymakers, educators, and researchers can work together to ensure that AI integration in education is both effective and ethical.

2. Conclusion

Innovative teaching methodologies in the era of artificial intelligence (AI) have the potential to transform education by providing personalized learning experiences and promoting inclusivity. This review has highlighted key findings and insights regarding the use of AI in education, focusing on its potential to enhance teaching practices, improve learning outcomes, and create more inclusive educational environments.

The review has shown that AI-driven teaching methodologies offer several advantages, including personalized learning experiences tailored to individual student needs, enhanced collaboration and communication among students, and the ability to address diverse learning styles and abilities. AI technologies such as adaptive learning systems, personalized learning platforms, and collaborative learning environments have been shown to improve student engagement, motivation, and academic achievement.

However, the review has also identified several challenges and ethical considerations associated with the use of AI in education, including concerns related to data privacy, algorithmic bias, and equity. It is important for educators, policymakers, and researchers to address these challenges and ensure that AI-driven teaching methodologies are implemented in a fair, ethical, and responsible manner.

Given the potential of AI to revolutionize education, there is a clear call to action for educators, policymakers, and stakeholders to embrace innovative teaching methodologies in the era of AI. This includes integrating AI technologies into teaching practices, developing policies and guidelines to ensure ethical and responsible use of AI, and conducting further research to evaluate the impact of AI-driven approaches on student learning outcomes.

In conclusion, promoting inclusivity and equity in education through AI-driven approaches is crucial for ensuring that all students have access to high-quality education and opportunities for success. By embracing innovative teaching methodologies and harnessing the power of AI, educators can create more personalized, engaging, and inclusive learning experiences that meet the diverse needs of students. It is imperative that we continue to explore and develop AI-driven approaches that promote inclusivity, equity, and excellence in education for all.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Abrahams, T.O., Farayola, O.A., Kaggwa, S., Uwaoma, P.U., Hassan, A.O. and Dawodu, S.O., 2024. Reviewing Third-Party Risk Management: Best Practices In Accounting And Cybersecurity For Superannuation Organizations. Finance & Accounting Research Journal, 6(1), pp.21-39

[2] Addy, W.A., Ajayi-Nifise, A.O., Bello, B.G., Tula, S.T., Odeyemi, O. and Falaiye, T. (2024). Machine learning in financial markets: A critical review of algorithmic trading and risk management. International Journal of Science and Research Archive, 11(1), pp.1853–1862. https://doi.org/10.30574/ijsra.2024.11.1.0292

[3] Adekanmbi, A.O., Ninduwezuor-Ehiobu, N., Izuka, U., Abatan, A., Ani, E.C. and Obaigbena, A., 2024. Assessing the environmental health and safety risks of solar energy production. World Journal of Biology Pharmacy and Health Sciences, 17(2), pp.225-231

[4] Adeleke, A.K., Montero, D.J.P., Olajiga, O.K., Ani, E.C. and Olu-lawal, K.A., 2024. Evaluating the impact of precision engineering education on industry standards and practices. International Journal of Science and Research Archive, 11(1), pp.2336-2345

[5] Adeoye, B., Okoye, C., Ofodile, O.C., Odeyemi, O., Afua, W. and Ajayi-Nifise, A.O. (2024). Artificial Intelligence in ESG investing: Enhancing portfolio management and performance. International Journal of Science and Research Archive, 11(1), pp.2194–2205. https://doi.org/10.30574/ijsra.2024.11.1.0305

[6] Aderibigbe, A.O., Ani, E.C., Ohenhen, P.E., Ohalete, N.C. and Daraojimba, D.O., 2023. Enhancing energy efficiency with ai: a review of machine learning models in electricity demand forecasting. Engineering Science & Technology Journal, 4(6), pp.341-356

[7]   Adıgüzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. Contemporary Educational Technology.

[8]   Afua, W., Ajayi-Nifise, A., Bello, G., Tubokirifuruar, S., Odeyemi, O. and Falaiye, T. (2024). Transforming financial planning with AI-driven analysis: A review and application insights. World Journal of Advanced Engineering Technology and Sciences, 11(1), pp.240–257. https://doi.org/10.30574/wjaets.2024.11.1.0053

[9]   Akindote, O.J., Adegbite, A.O., Dawodu, S.O., Omotosho, A. and Anyanwu, A., 2023. Innovation in data storage technologies: from cloud computing to edge computing. Computer Science & IT Research Journal, 4(3), pp.273-299

[10]   Akindote, O.J., Egieya, Z.E., Ewuga, S.K., Omotosho, A. and Adegbite, A.O., 2023. A REVIEW OF DATA-DRIVEN BUSINESS OPTIMIZATION STRATEGIES IN THE US ECONOMY. International Journal of Management & Entrepreneurship Research, 5(12), pp.1124-1138

[11]   Alahira, J., Mhlongo, N.Z., Ajayi-Nifise, A.O., Odeyemi, O., Daraojimba, A.I. and Oguejiofor, B.B. (2024). Cross-Border Tax Challenges And Solutions In Global Finance. Finance & Accounting Research Journal, X(1). https://doi.org/10.51594/farj.v

[12]   Alam, A. (2021, November). Possibilities and apprehensions in the landscape of artificial intelligence in education. In 2021 International Conference on Computational Intelligence and Computing Applications (ICCICA) (pp. 1-8). IEEE.

[13]   Alam, A., & Mohanty, A. (2022, December). Facial Analytics or Virtual Avatars: Competencies and Design Considerations for Student-Teacher Interaction in AI-Powered Online Education for Effective Classroom Engagement. In International Conference on Communication, Networks and Computing (pp. 252-265). Cham: Springer Nature Switzerland.

[14]   Alamri, H., Lowell, V., Watson, W., & Watson, S. L. (2020). Using personalized learning as an instructional approach to motivate learners in online higher education: Learner self-determination and intrinsic motivation. *Journal of Research on Technology in Education*, *52*(3), 322-352.

[15]   AlGerafi, M. A., Zhou, Y., Oubibi, M., & Wijaya, T. T. (2023). Unlocking the potential: A comprehensive evaluation of augmented reality and virtual reality in education. *Electronics*, *12*(18), 3953.

[16]   Alotaibi, N. S., & Alshehri, A. H. (2023). Prospers and obstacles in using artificial intelligence in Saudi Arabia higher education institutions—The potential of AI-based learning outcomes. *Sustainability*, *15*(13), 10723.

[17]   Andersen, R., Mørch, A. I., & Litherland, K. T. (2022). Collaborative learning with block-based programming: investigating human-centered artificial intelligence in education. *Behaviour & Information Technology*, *41*(9), 1830-1847.

[18]   Anis, M. (2023). Leveraging Artificial Intelligence for Inclusive English Language Teaching: Strategies and Implications for Learner Diversity. *Journal of Multidisciplinary Educational Research*, *12*(6).

[19]   Anyanwu, A., Dawodu, S.O., Omotosho, A., Akindote, O.J. and Ewuga, S.K., 2023. Review of blockchain technology in government systems: Applications and impacts in the USA

[20]   Atadoga, A., Osasona, F., Amoo, O.O., Farayola, O.A., Ayinla, B.S. and Abrahams, T.O., 2024. The role of it in enhancing supply chain resilience: a global review. *International Journal of Management & Entrepreneurship Research*, *6*(2), pp.336-351

[21]   Bhutoria, A. (2022). Personalized education and artificial intelligence in the United States, China, and India: A systematic review using a human-in-the-loop model. *Computers and Education: Artificial Intelligence*, *3*, 100068.

[22]   Chang, D. H., Lin, M. P. C., Hajian, S., & Wang, Q. Q. (2023). Educational Design Principles of Using AI Chatbot That Supports Self-Regulated Learning in Education: Goal Setting, Feedback, and Personalization. *Sustainability*, *15*(17), 12921.

[23]   Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *Ieee Access*, *8*, 75264-75278.

[24]   Chen, X., Zou, D., Xie, H., Cheng, G., & Liu, C. (2022). Two decades of artificial intelligence in education. *Educational Technology & Society*, *25*(1), 28-47.

[25]   Daraojimba, C., Eyo-Udo, N.L., Egbokhaebho, B.A., Ofonagoro, K.A., Ogunjobi, O.A., Tula, O.A. and Banso, A.A., 2023. Mapping International Research Cooperation and Intellectual Property Management in the Field of Materials Science: an Exploration of Strategies, Agreements, and Hurdles. *Engineering Science & Technology Journal*, *4*(3), pp.29-48

[26] Egieya, Z.E., Obiki-Osafiele, A.N., Ikwue, U., Eyo-Udo, N.L. and Daraojimba, C., 2024. COMPARATIVE ANALYSIS OF WORKFORCE EFFICIENCY, CUSTOMER ENGAGEMENT, AND RISK MANAGEMENT STRATEGIES: LESSONS FROM NIGERIA AND THE USA. International Journal of Management & Entrepreneurship Research, 6(2), pp.439-450

[27] Ejairu, E., Mhlongo, N.Z., Odeyemi, O., Nwankwo, E. and Odunaiya, O.G. (2024). Blockchain in global supply chains: A comparative review of USA and African practices. International Journal of Science and Research Archive, 11(1), pp.2093–2100. https://doi.org/10.30574/ijsra.2024.11.1.0278

[28] El-Sabagh, H. A. (2021). Adaptive e-learning environment based on learning styles and its impact on development students' engagement. International Journal of Educational Technology in Higher Education, 18(1), 1-24.

[29] Elufioye, O.A., Odeyemi, O., Usman, F.O. and Mhlongo, N.Z. (2024). Ai-Driven Predictive Analytics In Agricultural Supply Chains: A Review: Assessing The Benefits And Challenges Of Ai In Forecasting Demand And Optimizing Supply In Agriculture. Computer Science & IT Research Journal, x(Y), pp.1–10. https://doi.org/10.51594/csitrj.v5i

[30] Ewuga, S.K., Egieya, Z.E., Omotosho, A. and Adegbite, A.O., 2023. Comparative Review Of Technology Integration In Smes: A Tale Of Two Economies-The UNITED STATES AND NIGERIA. Engineering Science & Technology Journal, 4(6), pp.555-570

[31] Garg, S., & Sharma, S. (2020). Impact of artificial intelligence in special need education to promote inclusive pedagogy. International Journal of Information and Education Technology, 10(7), 523-527.

[32] Gligorea, I., Cioca, M., Oancea, R., Gorski, A. T., Gorski, H., & Tudorache, P. (2023). Adaptive Learning Using Artificial Intelligence in e-Learning: A Literature Review. Education Sciences, 13(12), 1216.

[33] Hagendorff, T., Bossert, L. N., Tse, Y. F., & Singer, P. (2023). Speciesist bias in AI: how AI applications perpetuate discrimination and unfair outcomes against animals. AI and Ethics, 3(3), 717-734.

[34] Hamal, O., El Faddouli, N. E., Harouni, M. H. A., & Lu, J. (2022). Artificial intelligent in education. Sustainability, 14(5), 2862.

[35] Hashim, S., Omar, M. K., Ab Jalil, H., & Sharef, N. M. (2022). Trends on Technologies and Artificial Intelligence in Education for Personalized Learning: Systematic Literature. Journal of Acdemic Research in Progressive Education and Development, 12(1), 884-903.

[36] Hwang, G. J., & Tu, Y. F. (2021). Roles and research trends of artificial intelligence in mathematics education: A bibliometric mapping analysis and systematic review. Mathematics, 9(6), 584.

[37] Jarrahi, M. H., Askay, D., Eshraghi, A., & Smith, P. (2023). Artificial intelligence and knowledge management: A partnership between human and AI. Business Horizons, 66(1), 87-99.

[38] Kaggwa, S., Onunka, T., Uwaoma, P.U., Onunka, O., Daraojimba, A.I. and Eyo-Udo, N.L., 2024. Evaluating The Efficacy Of Technology Incubation Centres In Fostering Entrepreneurship: Case Studies From The Global SOUT. International Journal of Management & Entrepreneurship Research, 6(1), pp.46-68

[39] Kuddus, K. (2022). Artificial intelligence in language learning: Practices and prospects. Advanced Analytics and Deep Learning Models, 1-17.

[40] Lampropoulos, G. (2023). Augmented Reality and Artificial Intelligence in Education: Toward Immersive Intelligent Tutoring Systems. In Augmented Reality and Artificial Intelligence: The Fusion of Advanced Technologies (pp. 137-146). Cham: Springer Nature Switzerland.

[41] Lopez-Gavira, R., Moriña, A., & Morgado, B. (2021). Challenges to inclusive education at the university: the perspective of students and disability support service staff. Innovation: The European Journal of Social Science Research, 34(3), 292-304.

[42] Love, H. R., & Horn, E. (2021). Definition, context, quality: Current issues in research examining high-quality inclusive education. Topics in Early Childhood Special Education, 40(4), 204-216.

[43] Madaio, M., Blodgett, S. L., Mayfield, E., & Dixon-Román, E. (2022). Beyond "fairness": Structural (in) justice lenses on ai for education. In *The ethics of artificial intelligence in education* (pp. 203-239). Routledge.

[44] Maghsudi, S., Lan, A., Xu, J., & van Der Schaar, M. (2021). Personalized education in the artificial intelligence era: what to expect next. *IEEE Signal Processing Magazine*, *38*(3), 37-50.

[45] Miao, F., Holmes, W., Huang, R., & Zhang, H. (2021). *AI and education: A guidance for policymakers*. UNESCO Publishing.

[46] Mohammad AbedrabbuAlkhawaldeh, M. A. S. K. (2023). Harnessing The Power of Artificial Intelligence for Personalized Assistive Technology in Learning Disabilities. *Journal of Southwest Jiaotong University*, *58*(4).

[47] Mohammed, P. S., & 'Nell'Watson, E. (2019). Towards inclusive education in the age of artificial intelligence: Perspectives, challenges, and opportunities. *Artificial Intelligence and Inclusive Education: Speculative futures and emerging practices*, 17-37.

[48] Muñoz, J. L. R., Ojeda, F. M., Jurado, D. L. A., Peña, P. F. P., Carranza, C. P. M., Berríos, H. Q., ... & Vasquez-Pauca, M. J. (2022). Systematic review of adaptive learning technology for learning in higher education. Eurasian Journal of Educational Research, 98(98), 221-233.

[49] Nembe, J.K., Atadoga, J.O., Adelakun, B.O., Odeyemi, O. and Oguejiofor, B.B. (2024). ` Legal Implications Of Blockchain Technology For Tax Compliance And Financial Regulation. Finance & Accounting Research Journal, X(Y). https://doi.org/10.51594/farj.v

[50] Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. P. T. (2023). Ethical principles for artificial intelligence in education. Education and Information Technologies, 28(4), 4221-4241.

[51] Ntoutsi, E., Fafalios, P., Gadiraju, U., Iosifidis, V., Nejdl, W., Vidal, M. E., ... & Staab, S. (2020). Bias in data-driven artificial intelligence systems—An introductory survey. Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery, 10(3), e1356.

[52] Odeyemi, O., AdijatElufioye, O., Mhlongo, N.Z., Ifesinachi, A., Olatoye, F.O. and Awonuga, K.F. (2024). AI in E-commerce: Reviewing developments in the USA and their global influence. International Journal of Science and Research Archive, 11(1), pp.1460–1468. https://doi.org/10.30574/ijsra.2024.11.1.0232

[53] Odeyemi, O., Ibeh, C.V., Mhlongo, N.Z., Asuzu, O.F., Awonuga, K.F. and Olatoye, F.O. (2024). Forensic Accounting And Fraud Detection: A Review Of Techniques In The Digital Age. Finance & Accounting Research Journal, [online] 6(2), pp.202–214. https://doi.org/10.51594/farj.v6i2.788

[54] Odeyemi, O., Mhlongo, N.Z., Nwankwo, E.E. and Soyombo, O.T. (2024). Reviewing the role of AI in fraud detection and prevention in financial services. International Journal of Science and Research Archive, [online] 11(1), pp.2101–2110. https://doi.org/10.30574/ijsra.2024.11.1.0279

[55] Odeyemi, O., Usman, F.O., Mhlongo, N.Z., Elufioye, O.A. and Ike, C.U. (2023). Sustainable entrepreneurship: A review of green business practices and environmental impact. World Journal Of Advanced Research and Reviews, 21(2), pp.346–358. https://doi.org/10.30574/wjarr.2024.21.2.0461

[56] Odonkor, B., Kaggwa, S., Uwaoma, P.U., Hassan, A.O. and Farayola, O.A., 2024. A review of US management accounting evolution: Investigating shifts in tools and methodologies in light of national business dynamics. International Journal of Applied Research in Social Sciences, 6(1), pp.51-72

[57] Oguejiofor, B.B., Omotosho, A., Abioye, K.M., Alabi, A.M., Oguntoyinbo, F.N., Daraojimba, A.I. and Daraojimba, C., 2023. A review on data-driven regulatory compliance in Nigeria. International Journal of applied research in social sciences, 5(8), pp.231-243

[58] Ohalete, N.C., Aderibigbe, A.O., Ani, E.C., Ohenhen, P.E. and Akinoso, A., 2023. Advancements in predictive maintenance in the oil and gas industry: A review of AI and data science applications

[59] Okogwu, C., Agho, M. O., Adeyinka, M. A., Odulaja, B. A., Eyo-Udo, N. L., Daraojimba, C., & Banso, A. A. (2023). Exploring the integration of sustainable materials in supply chain management for environmental impact. Engineering Science & Technology Journal, 4(3), 49-65

[60] Okoye, C., Nwankwo, E., Favour, N., Mhlongo, N.Z., Odeyemi, O. and Ike, C.U. (2024). Securing financial data storage: A review of cybersecurity challenges and solutions. International Journal of Science and Research Archive, 11(1), pp.1968–1983. https://doi.org/10.30574/ijsra.2024.11.1.0267

[61] Oladeinde, M., Okeleke, E.C., Adaramodu, O.R., Fakeyede, O.G. and Farayola, O.A., 2023. Communicating It Audit Findings: Strategies For Effective Stakeholder Engagement. Computer Science & IT Research Journal, 4(2), pp.126-139

[62] Orieno, O.H., Ndubuisi, N.L., Eyo-Udo, N.L. and Ikenna, V., 2024. Sustainability in project management: A comprehensive review

[63] Osasona, F., Amoo, O.O., Atadoga, A., Abrahams, T.O., Farayola, O.A. and Ayinla, B.S., 2024. REVIEWING THE ETHICAL IMPLICATIONS OF AI IN DECISION MAKING PROCESSES. International Journal of Management & Entrepreneurship Research, 6(2), pp.322-335

[64] Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development.

[65] Pendy, B. (2023). From traditional to tech-infused: the evolution of education. BULLET: JurnalMultidisiplinIlmu, 2(3), 767-777.

[66] Pham, S. T., & Sampson, P. M. (2022). The development of artificial intelligence in education: A review in context. Journal of Computer Assisted Learning, 38(5), 1408-1421.

[67] Pratama, M. P., Sampelolo, R., & Lura, H. (2023). Revolutionizing education: harnessing the power of artificial intelligence for personalized learning. Klasikal: Journal of Education, Language Teaching and Science, 5(2), 350-357.

[68] Rai, S., & Singh, T. (2023). An Overview of Legal Information Systems. Importance of Libraries in accessing e-contents related to Law, 1.

[69] Rane, N., Choudhary, S., & Rane, J. (2023). Education 4.0 and 5.0: Integrating Artificial Intelligence (AI) for personalized and adaptive learning. Available at SSRN 4638365.

[70] Shareef, S. M., & Nithyanantham, V. (2022). Fundamentals of Educational Technology. Bentham Science Publishers.

[71] Su, F., & Zou, D. (2022). Technology-enhanced collaborative language learning: theoretical foundations, technologies, and implications. Computer Assisted Language Learning, 35(8), 1754-1788.

[72] Tan, S. (2023). Harnessing Artificial Intelligence for innovation in education. In Learning intelligence: Innovative and digital transformative learning strategies: Cultural and social engineering perspectives (pp. 335-363). Singapore: Springer Nature Singapore.

[73] Tapalova, O., &Zhiyenbayeva, N. (2022). Artificial Intelligence in Education: AIEd for Personalised Learning Pathways. Electronic Journal of e-Learning, 20(5), 639-653.

[74] Tula, S.T., Okoye, C.C., Ajayi Nifise, A.O., Odeyemi, O. and Ofodile, O.C. (2024). Entrepreneurial Ecosystems In The Usa: A Comparative Review With European Models. International Journal of Management & Entrepreneurship Research, x(Y), p.16. https://doi.org/10.51594/ijmer.v6i

[75] Vincent-Lancrin, S., & Van der Vlies, R. (2020). Trustworthy artificial intelligence (AI) in education: Promises and challenges.

[76] Wang, S., Christensen, C., Cui, W., Tong, R., Yarnall, L., Shear, L., & Feng, M. (2023). When adaptive learning is effective learning: comparison of an adaptive learning system to teacher-led instruction. *Interactive Learning Environments*, *31*(2), 793-803.

[77] Zdravkova, K. (2022). The potential of artificial intelligence for assistive technology in education. In *Handbook on Intelligent Techniques in the Educational Process: Vol 1 Recent Advances and Case Studies* (pp. 61-85). Cham: Springer International Publishing.

[78] Zheng, L., Niu, J., Zhong, L., & Gyasi, J. F. (2023). The effectiveness of artificial intelligence on learning achievement and learning perception: A meta-analysis. *Interactive Learning Environments*, *31*(9), 5650-5664.

[79] Zubiri-Esnaola, H., Vidu, A., Rios-Gonzalez, O., & Morla-Folch, T. (2020). Inclusivity, participation and collaboration: Learning in interactive groups. *Educational Research*, *62*(2), 162-180.