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Disruptive AI in Education: Transforming Learning in the Digital Age

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Abstract: ***COVID-19 had a huge impact on our educational system in the world which resulted in the introduction of digital technologies to be adopted in the education systems. This has brought about issues regarding the quality of teaching and learning with ICTs, especially concerning the adoption of Artificial intelligence in the education sector. The use of machine learning models such as chatGpt has changed how learners' outcomes and experiences. "Artificial Intelligence (AI) has emerged as a disruptive force in the education sector, revolutionizing teaching and learning processes. AI's ability to adapt to individual learners' needs, automate administrative tasks, and provide personalized feedback has transformed traditional educational practices. However, the integration of AI in education also presents challenges, including data privacy concerns, the digital divide, and the need for significant infrastructural changes. Despite these challenges, the potential benefits of AI in enhancing educational outcomes, particularly in developing countries, are substantial. This paper explores the disruptive impact of AI on education, highlighting its transformative potential and the obstacles that must be overcome to realize this potential fully. A narrative synthesis and a systematic literature review will be conducted in this review article. The literature and information were obtained from various books and research articles on among others Springer Link, Google Scholar, Scopus, Web of Science, and Science Direct.***

Keywords: COVID-19, digital divide, data privacy, chatbots, Artificial intelligence.

I. INTRODUCTION

Over the last twenty-five years, Artificial intelligence has had a great impact on Education and there has been significant progress in AI in education [1]. AI has been widely used in education since the advancement of computing and information-processing techniques. This has led to it creating new opportunities, potentials, and challenges in educational practices[2]. A report by [3] mentioned those goals. The disruption in AI in education refers to the significant changes and challenges that Artificial Intelligence technologies, particularly Generative AI and Large Language Models (LLMs) like ChatGPT, are bringing to the educational landscape. According to [4]it is that some educational institutions initially banned the use of ChatGPT when it launched as a result of concerns about how it could enable cheating. In sharing the same belief [5] argues that it is necessary for educational systems to integrate AI into teaching and learning, much like how the calculator was seamlessly incorporated into math classrooms hence they should have the same thought process when ruminating about Artificial intelligence. Nicole argues that it should be viewed as an essential tool for promoting a future-ready workforce and used in the same way because text-generating applications will forever shift education and innovation and hence will be needed sooner or later to embrace this new era of learning. AI can help in creating personalized learning experiences for students, which can be tailored to their individual needs and abilities. AI can also help in automating administrative tasks such as grading, which can free up teachers' time to focus on more important tasks such as providing feedback and support to students[3]. In early childhood education, Artificial Intelligence can be employed in Artificial Intelligence powered educational toys and games can help develop cognitive and motor skills. Artificial intelligence has facilitated early language acquisition and pronunciation using Artificial Intelligence-driven language learning tools. AI can be employed to facilitate collaborative learning experiences, connecting students with diverse backgrounds and encouraging global citizenship. In the higher education sector, Artificial Intelligence has greatly created advanced simulations and virtual labs allowing students to engage in hands-on learning and research, even remotely. Artificial Intelligence has enhanced online education through adaptive learning platforms, virtual classrooms, and smart content delivery. In Sub-Saharan countries like Kenya, Artificial Intelligence has several applications in the educational sector which include providing learners with a personalized learning experience which are designed to meet their needs, this includes the ability of students to access learning notes and assignments designed to fit their unique learning experience and enables them to track their performance [3]. Artificial Intelligence has enabled tutors to assess students' capabilities and provide them with customized learning resources as well as an SMS-based platform that enables organizations to deliver learning, evaluation, and data tools.

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While AI is disrupting education in many ways, it also offers opportunities for enhancing teaching and learning notwithstanding it is important for educationists to give careful thought to how it is integrated into educational systems to ensure it benefits all learners.

II. LITERATURE REVIEW

AI is changing the traditional education system worldwide. The traditional education system based on historical paradigms has very little ability to create an interactive environment for specialized students [6].AI offers an innovative, diverse, and impactful roadmap in the education system to improve the teaching-learning experience not only for teachers but also for students. AI with its interactive tools has improved the entire education system by creating tremendous opportunities for technical students. AI-powered tools like live chatbots, class dictation software, verbal command-based e-books, adaptive personalized tutors, image-based learning, and many more have accelerated the teaching-learning experience. Incorporating these tools into the education system promotes critical thinking and improves student engagement in various teaching activities.

A. Review Existing Research on AI Applications in Education.

[7]suggested that AI, when integrated into an education system, can be used in various forms, such as an assistant to learners, to influence teacher-student relationships, as a teaching subject, as well as a direct facilitator.Three types of categories of AI software applications in education that are available today include personal tutors, intelligent support for collaborative learning, and intelligent virtual reality. In their systematic literature review, they examined how intelligent tutoring systems (ITS) can be used to simulate one-to-one personal tutoring. Based on learner models, algorithms, and neural networks, they can make decisions about the learning path of an individual student and the content to select, provide cognitive scaffolding, and help engage the student in dialogue, this was found to be beneficial, especially in large-scale distance teaching institutions, which run modules with thousands of students, where human one-to-one tutoring is impossible.AI on education can also contribute to collaborative learning by supporting adaptive group formation based on learner models, by facilitating online group interaction or by summarizing discussions that can be used by a human tutor to guide students towards the aims and objectives of a course. Intelligent virtual reality (IVR) is used to engage and guide students in authentic virtual reality and game-based learning environments. Virtual agents can act as teachers, facilitators, or student colleagues, for example in virtual or remote laboratories [8]. With the advancement of AI in education and the availability of (large) student data and learning analytics,[9] claim a renaissance of assessment. AI can provide just-in-time feedback and assessment. Instead of stop-and-test, AI in education can be integrated into learning activities to provide ongoing analysis of student performance. Algorithms have been used to predict with high accuracy the likelihood of a student failing an assignment or dropping out of a course[10].Another study by[11] discusses how AI technology is helping education systems use data to improve educational equity and quality especially this works well according ICT4 sustainability. This. The paper highlights the potential of AI in enhancing learning outcomes by providing personalized and adaptive learning experiences. Mary, suggested that AI can support teachers by reducing their workload, providing insights into student performance, and enhancing effective teaching strategies.

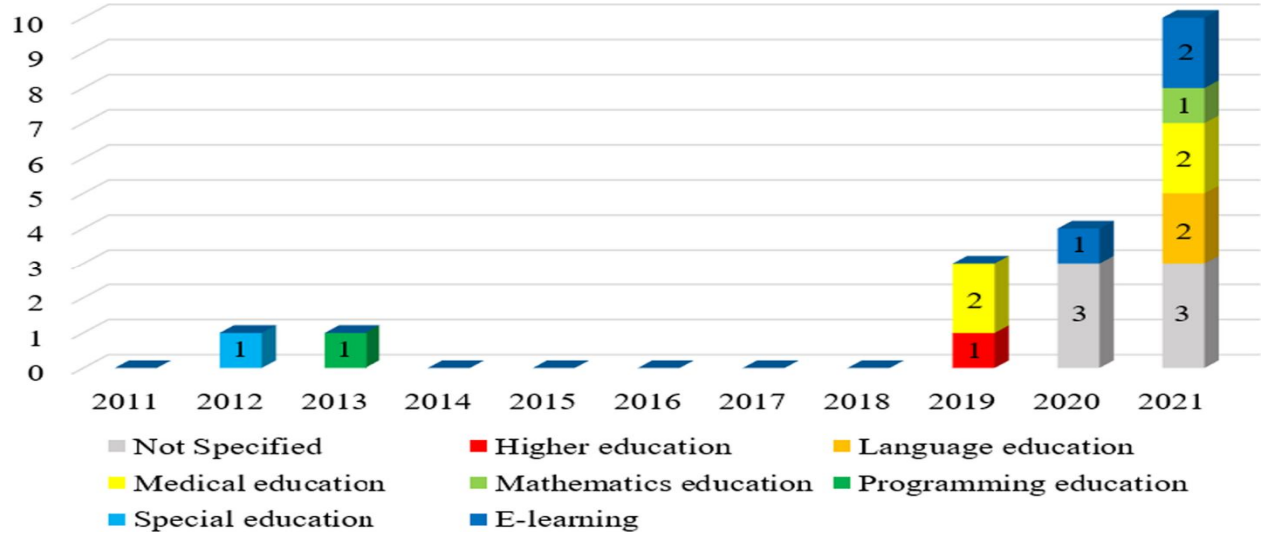

FIG1: SHOWS HOW AI IS USED IN EDUCATION 2011-2021.ADAPTED FROM (Xu & Ouyang, 2022a)

B. Gaps in Literature

The analysis of the literature indicated that Artificial intelligence have a lot of benefits in education sector. According to a study by [12] discusses how AI can automate routine administrative tasks such as lesson planning and assessment, freeing up time in the classroom.

This allows teachers to spend more time building relationships with students and supporting their learning and development. Additionally, AI can increase teacher productivity in key areas such as differentiation, feedback, and communication between teachers and parents. By providing technological resources and AI tools, teachers can personalize learning and provide education that is better tailored to the individual needs of each student. However, the authors note that it is crucial to ensure equitable use of AI in education. They argue that we must avoid repeating existing prejudices and promote holistic and equitable education for all children. In conclusion, the paper highlights the transformative potential of AI in education while highlighting the need for careful implementation to ensure educational equity and quality.

Another study [13] argues that AI can accelerate the transformation of education systems towards inclusive learning and prepare young people to succeed and shape a better future. They see great opportunities for teachers to use these technologies to improve their own teaching practice and professional experience.

The paper emphasizes the importance of developing skills and values that are uniquely human and less likely to be replaced by technology. The authors suggest that AI tools, when used in sophisticated ways for deeper, more engaged learning, can help boost students' critical thinking. The authors also discuss how AI can automate routine administrative tasks such as lesson planning and assessment, freeing up time in the classroom.

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However [14] identifies challenges of using AI in education especially the developed countries are at risk of suffering new technological, economic, and social divides with the development of AI. Much has been done to try and solve the issues of economics, ethical and technological issues affecting AI in education but the impact of these efforts is still insignificant in Africa [15].

Digital divide is one of the technological factor of concern when implementing AI education in developing countries. Digital divide becomes an issue of concern to Kenya as a country and should be addressed in order for the country to accomplish its vision 2030 on ICT sustainable goals.

III. RESEARCH METHODOLOGY

This study used a mixed-methods methodology, integrating qualitative and quantitative techniques, to increase insight on how Artificial intelligence is disrupting education. Secondary data was collected via a review of existing literature. To achieve this, a secondary data analysis approach was employed, using a literature review as the primary method of analysis. Secondary data sources were identified and collected through a comprehensive literature review by only reviewing articles that had “Artificial Intelligence affecting Education”. The literature review focused on peer-reviewed journal articles and conference proceedings that discussed how different techniques of Artificial Intelligence can be used in the Education sector and its impact on education. The search was conducted using academic databases such as Google Scholar, Science Direct, Springer Link, Research Gates, Web of Science, and Springer Link.

IV. DATA ANALYSIS

The collected data was analysed using a narrative synthesis approach. The analysis focused on identifying common themes and patterns in the literature related to the benefits and the challenges in implementation of Artificial Intelligence in Education. The analysis also aimed to identify different technological issues affecting the implementation of Artificial Intelligence in Education and their limitations in the existing literature. This study is limited by the availability and quality of secondary data sources. The findings are based on the existing literature and may not reflect all recent developments in the field. Additionally, the study is limited by the scope of the literature review, which focused on peer-reviewed sources and may not have captured all relevant information.

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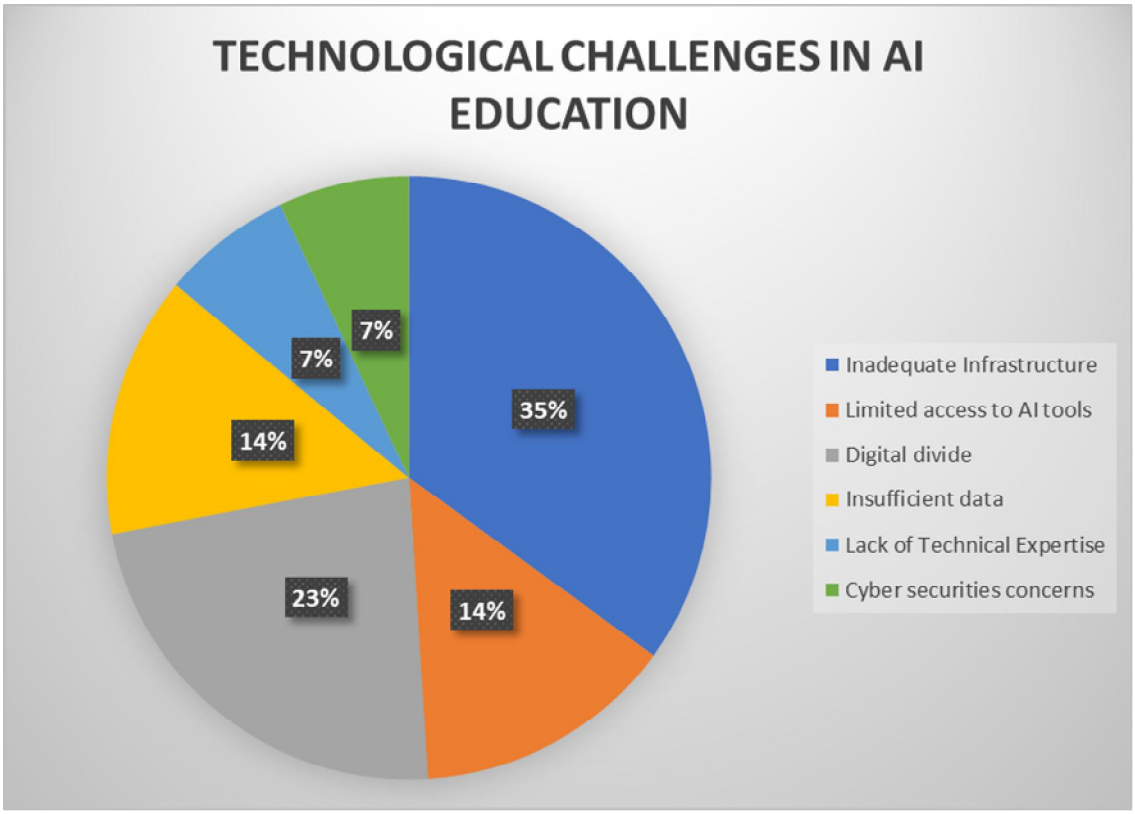

Fig 2: Showing different technological issues affecting implementation of AI in education.

V. WAY FORWARD ON IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN THE EDUCATION SECTOR.

While the developed world is increasingly embracing AI in education, the same is true of developing countries. The path forward for AI education in developing countries, particularly with regard to technological infrastructure, requires addressing several key challenges and opportunities. Addressing the digital divide in the context of AI education will be one of the key to address it. Several key strategies in understanding the digital divide in terms of access to technology, but also having the skills to use it effectively as well as ensuring both the rich and the poor have access to both technology and IT experts to assist in the usage of the same. Development of policy frameworks should be put in place to promote the readiness of educational policy makers for artificial intelligence. Addressing infrastructure challenges should also be a factor to be looked into to integrate AI into their education systems in a way that bridges the digital divide. AI has the potential to address some of the major challenges in education today , teaching and learning practices renewed, and progress toward Sustainable Development Goal 4 accelerated and realized.

VI. CONCLUSIONS

Artificial intelligence offers immense potential for fundamental improvement in schools and universities. However, investment must be done in technologies infrastructure to improve benefits of using AI in education to provide fruitful results. To achieve such benefits, all actors within the school's and universities ecosystem need to share a common vision regarding the integration of AI in education and work towards achieving this goal. Our literature review, which synthesized quantitative and qualitative data from a list of meta-analyses and review studies, provided useful insights into the impact of AI in different school and universities stakeholders and showed the impact of AI in education among the educators as well as learners. If technologies infrastructure is overlooked when the focus is mostly on student achievement as the final output of education then this will not allow the education sector to achieve its expected goals. Furthermore, the concept of digital divide in AI technologies is one of the greatest hindrance in technological infrastructure. Addressing the digital divide in Africa requires a multi-pronged approach such as Investing in infrastructure, significant investments need to be made in digital infrastructure such as broadband connectivity and power grids to ensure all people have access to technology. Promoting digital literacy is also another way of handling the digital divide, it is crucial to promote digital literacy in all age groups and professions. This also includes providing training and education on using digital tools. The affordability of digital tools and internet access can help bridge the digital divide.

This could include government subsidies or partnerships with private companies. Governments must formulate policies that promote digital inclusion. These include regulations that encourage competition between Internet service providers, which can lead to lower prices and improved services. Public-private partnerships between governments and private individuals and businesses can lead to innovative solutions that bridge the digital divide. Community engagement in the planning and implementation of digital initiatives can ensure that these initiatives are tailored to the specific needs of the community. The study results were based on a non-systematic literature review grounded on the acquisition of documentation in specific databases. Future studies should investigate more databases to corroborate and enhance our results.

This research contributes to the ongoing dialogue in the field of education technology and highlights the need for further exploration and refinement of infrastructure technologies in AI education especially in the developing countries. With the continuous advancement of artificial intelligence in education, we anticipate that this will play a significant role in shaping the future of education sector in developing countries. Finally, we propose that future studies could focus on the way in which specific factors, e.g., ethical factors and availability of IT expertise if not handled properly can affect the positive impact of AI education in the world and especially the developing countries.

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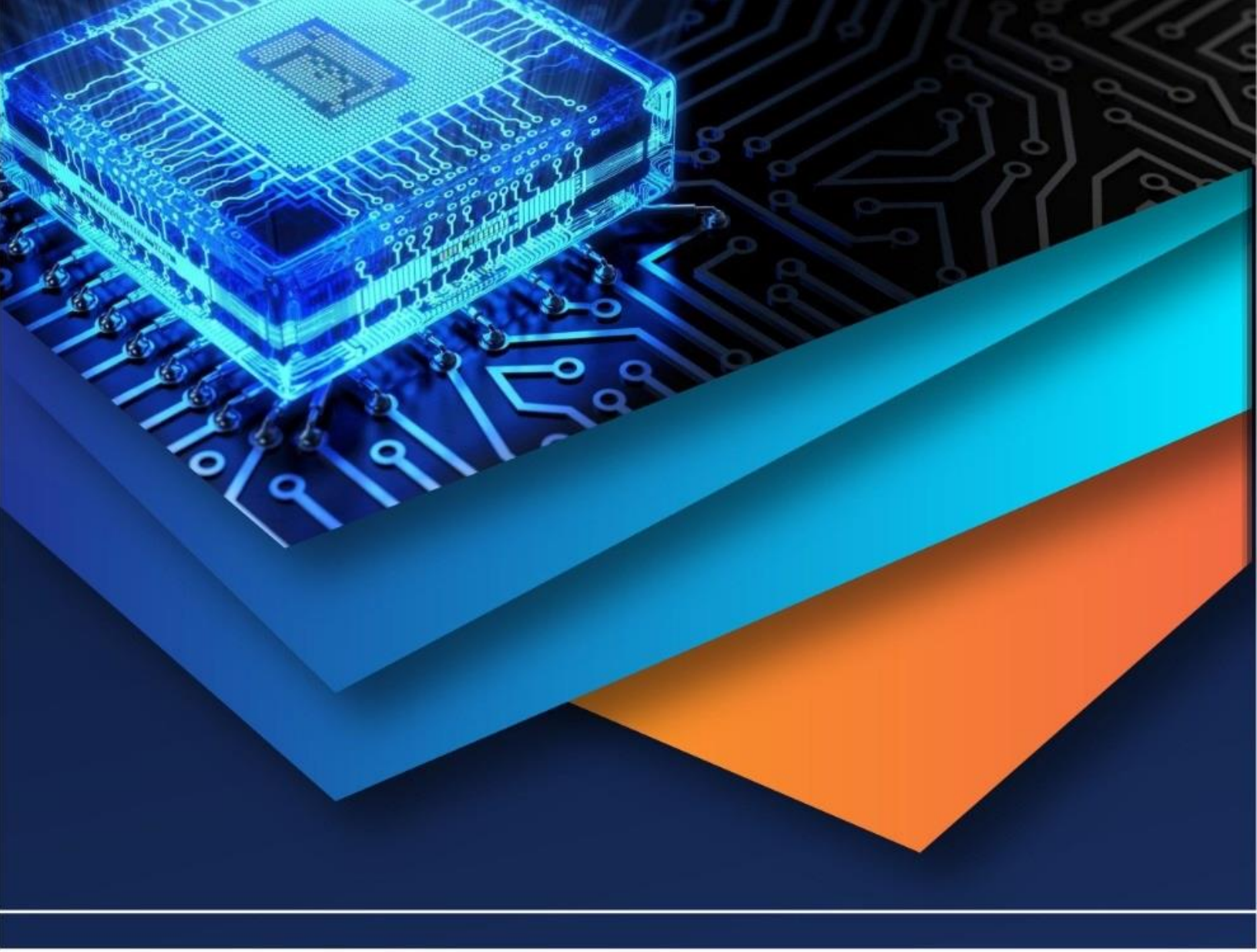

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