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The Impacts of AI on Student Academic Performance at the Mwalimu Nyerere Memorial Academy, Tanzania, (MNMA): A Comprehensive Study

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This study explores the impact of Artificial Intelligence (AI) on academic performance at MNMA (Mwalimu Nyerere Memorial Academy) Karume Campus. AI technologies, including adaptive learning platforms, intelligent tutoring systems, automated grading, and generative tools such as ChatGPT and Perplexity AI, have transformed education by enhancing personalized learning and accessibility. AI-driven systems like OSIM, PEPMIS and PIPMIS facilitate staff and student performance evaluation, ensuring data-driven decision-making. Using a mixed-method design, this study gathered primary data through surveys, interviews, and observations, while secondary data was sourced from academic journals and institutional reports. Stratified sampling ensured diverse perspectives from students, faculty, and administrative staff. The study also highlights the role of computer libraries, interactive projectors, and eBooks in enriching academic experiences. Although AI improves learning processes, reduces administrative burdens, and accelerates research, challenges such as limited technological resources and insufficient training hinder full adoption. Addressing these challenges through infrastructure investment and ethical integration can maximize AI's positive impact. This study provides insights into AI's role in education and recommends strategies for its balanced and effective use in academia.

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INTRODUCTION

Artificial Intelligence (AI) revolutionized various industries, including education. At MNMA Karume Campus, the adoption of AI technologies transformed teaching and learning experiences through tools such as intelligent tutoring systems, the Performance Evaluation and Monitoring Information System (PEPMIS) and the Performance Improvement and Progress Monitoring Information System (PIPMIS), adaptive learning platforms, automated grading (OSIM/SIMS), and real-time feedback mechanisms. These technologies streamlined education and enhanced accessibility (Holmes et al., 2021).

In addition to AI-driven systems, the integration of computer libraries, interactive projectors, and eBooks further enriched the learning experience. Computer libraries provide students and instructors with instant access to vast academic resources, allowing efficient research and knowledge acquisition. The use of interactive projectors enhanced classroom engagement by enabling dynamic presentations, collaborative discussions, and interactive learning sessions. Moreover, eBooks transformed traditional study approaches by offering digitized educational materials, ensuring students could access textbooks and scholarly articles anytime and anywhere.

The potential of AI lies in its ability to analyze vast amounts of data and customize learning experiences to fit individual needs. Additionally, the increasing use of generative AI tools such as ChatGPT and Perplexity allowed students to access instant information, receive writing assistance, and solve complex problems resources that influenced academic engagement when utilized effectively (Kasneci et al., 2023).

This study examined AI integration at MNMA Karume Campus, focusing on its benefits and challenges. It assessed AI's role in improving student learning, staff evaluation, and academic efficiency through tools like PEPMIS, PIPMIS, computer libraries, projectors, and eBooks. Additionally, it explored barriers such as limited access, training gaps, and ethical concerns while providing recommendations for balanced and inclusive AI implementation to optimize education.

While AI presented vast opportunities, challenges such as academic integrity, ethical concerns in data usage, and technological accessibility remained essential considerations (Zawacki-Richter et al., 2019). If not implemented thoughtfully, AI could inadvertently increase educational disparities (Smutný & Schreiberová, 2020). Therefore, a balanced and ethical approach to AI integration was necessary to ensure its positive impact on academia.

At MNMA (Mwalimu Nyerere Memorial Academy) Karume Campus, AI-driven education introduced innovative teaching and learning processes, paving the way for more personalized, efficient, and technologically advanced academic experiences. The integration of computer libraries, interactive projectors, and eBooks played a crucial role in enriching the AI-powered learning environment, ensuring students and faculty had access to cutting-edge digital tools to support education.

METHODOLOGY

This study was conducted at MNMA Karume Campus, an institution that embraced AI technologies in education. A mixed-method approach was employed, combining both quantitative and qualitative research methods for a

comprehensive analysis. The target population included students, faculty, and administrative staff utilizing AI tools in academic settings, with a stratified sampling technique ensuring diversity in responses.

Primary data was collected through surveys, interviews, and observational studies, while secondary data was sourced from academic journals, institutional reports, and relevant literature. To ensure accuracy and reliability, research instruments such as questionnaires and interview guides underwent pilot testing before official data collection. The collected data was analyzed using descriptive methods for qualitative findings. Ethical considerations were strictly observed, including obtaining informed consent from participants, maintaining data confidentiality, and adhering to academic integrity standards to uphold the credibility of the study.

REVOLUTIONIZING TEACHING AND LEARNING METHODS

Building on this context, AI has introduced innovative teaching tools and platforms that enhance knowledge dissemination and acquisition. At MNMA Karume Campus, AI-powered educational technologies, such as adaptive learning platforms and intelligent tutoring systems, offer personalized learning experiences to students. For instance, an adaptive learning platform can assist students struggling with accounting principles by providing step-by-step problem-solving guidance and additional exercises tailored to their performance. Similarly, intelligent tutoring systems in subjects like computer programming can offer real-time feedback on coding errors and suggest solutions to enhance student understanding.

Moreover, AI-enhanced language learning tools, such as speech recognition software, help students improve their proficiency in English, Swahili, or other languages by identifying pronunciation errors and offering corrective suggestions. These tools analyze phonological elements, such as stress

patterns, intonation, and articulation, to provide learners with real-time feedback. For example, in English phonology, minimal pairs like "ship" and "sheep" or "bit" and "beat" demonstrate the importance of vowel distinction, which AI-based systems can help learners refine.

Similarly, AI can significantly enhance Swahili language learning by helping students distinguish words with similar phonemes, ensuring precise pronunciation and comprehension. Swahili, like many Bantu languages, has minimal pairs—words that differ by only one sound but carry distinct meanings. AI-driven speech recognition tools can help learners differentiate between words such as "paa" (roof) and "paa" (fly) or "pata" (get) and "pataa" (flat, smooth surface) by analyzing vowel length and phonetic stress. Additionally, AI can support learners in distinguishing consonant sounds that may seem interchangeable to non-native speakers, such as "paka" (cat) vs. "pakaa" (smearing) or "kufa" (to die) vs. "kuvaa" (to wear), ensuring accurate articulation through interactive pronunciation exercises.

Furthermore, Swahili exhibits nasal sounds and plosive consonants, which may present challenges to learners unfamiliar with phonemic contrasts. For instance, AI can train users to differentiate "ndizi" (banana) from "dizi" (traditional drum) by recognizing the nasal /n/ sound. Similarly, AI-enhanced phonetic mapping can aid learners in recognizing aspirated vs. non-aspirated sounds, such as "tatu" (three) vs. "thatu" (a regional variation of the same term used informally).

Another crucial aspect of pronunciation in Swahili is vowel harmony and syllabic structure. AI-powered language models can assist learners in identifying correct vowel sequences, as seen in "endelea" (continue) vs. "elekea" (head toward), where vowel placement dictates meaning. Through speech synthesis and waveform analysis, AI can pinpoint mispronunciations and provide corrective feedback, ensuring learners master Swahili phonology efficiently.

AI-driven pronunciation feedback can also aid in distinguishing words based on tone and emphasis, ensuring learners grasp contextual variations. For example, "sasa" (now) vs. "saa" (hour) differ in vowel length and stress, affecting the meaning. Additionally, homophones such as "jua" (sun) vs. "jua" (to know) can be clarified using AI tools that emphasize contextual distinctions and correct tonal delivery. By integrating real-time audio feedback, AI can enhance learners' ability to produce natural speech patterns, eliminating common pronunciation errors.

Through interactive AI-based exercises, Swahili learners can refine their pronunciation of loanwords that have been adapted into Swahili from Arabic, English, or Portuguese, such as "shule" (school, from German "schule") vs. "safu" (row, from Arabic), ensuring accurate pronunciation while maintaining the language's phonetic integrity. AI-powered learning models, combined with pronunciation guides, phonetic drills, and contextual analysis, provide a comprehensive approach to mastering Swahili phonology, ensuring learners develop fluency and confidence in spoken communication.

Additionally, AI-powered recommendation systems can guide students toward supplementary resources, such as e-books, videos, or articles, that align with their coursework and specific learning gaps. These systems employ natural language processing (NLP) algorithms to assess student proficiency and suggest appropriate materials for improvement. For instance, a student struggling with English diphthongs, such as /ai/ in "time" or /oo/ in "go", can receive recommendations for interactive phonetic exercises and audiovisual pronunciation guides to strengthen their skills. AI-enhanced platforms also support contextual learning, suggesting literature or conversational dialogues that help students grasp intonation patterns and stress placement in natural speech.

Beyond pronunciation, AI-driven tools facilitate phonological awareness, a crucial skill for reading,

comprehension, and verbal fluency. For example, AI can teach students how to distinguish syllable stress in polysyllabic words, such as "photograph" (stress on the first syllable) versus "photographic" (stress on the second syllable). This helps students develop native-like speech patterns, improving their confidence in oral communication. Similarly, learners studying Swahili vowel harmony or tone variations benefit from AI-generated phonetic models, which provide visual and audio comparisons to enhance language acquisition.

These innovations collectively ensure that students at MNMA Karume Campus receive targeted support that maximizes their academic potential. By integrating AI-driven phonological training, personalized resource recommendations, and interactive speech recognition, institutions can foster effective language acquisition and greater student engagement. This approach not only benefits individual learners but also enhances overall linguistic proficiency, preparing students for effective communication in academic and professional settings.

STREAMLINING ADMINISTRATIVE TASKS

AI has significantly reduced the workload of academic staff by automating routine administrative processes. One of the most impactful advancements is AI-enabled grading systems, which have transformed assessments by allowing professors to efficiently grade large volumes of assignments and exams while ensuring consistency and minimizing human error. At MNMA Karume Campus, these AI-powered systems—including the Online Admission System, OSIM (Online Student Information Management System), SIMS (Student Information Management System), PEPMIS (Performance Evaluation and Monitoring Information System), PIPMIS (Performance Improvement and Progress Monitoring Information System), E-Office, and SPSS (Statistical Package for the Social Sciences)—have been particularly beneficial in high-enrollment courses such as

economics and statistics, where processing large datasets would otherwise be time-consuming.

Additionally, AI-driven scheduling tools have optimized the process of creating timetables for students and faculty. These tools ensure efficient allocation of classroom spaces, prevent scheduling conflicts and dynamically adjust schedules when unforeseen changes arise, such as faculty availability or campus events. If a lecture hall suddenly becomes unavailable, AI can swiftly suggest alternative arrangements, minimizing disruptions to learning.

AI applications have also streamlined student record management, simplifying processes such as enrollment, tracking academic progress, and transcript generation. Automated systems efficiently organize and retrieve student data, making tasks such as handling graduation requirements and processing scholarship applications faster and more reliable. Furthermore, AI-powered chatbots have been integrated as administrative assistants, providing students with instant responses to common queries related to registration procedures, deadlines, and academic policies. This allows administrative staff to focus on more complex responsibilities rather than answering routine inquiries.

By automating these administrative tasks, AI enables educators at MNMA Karume Campus to dedicate more time to innovative teaching methods, mentoring students, and conducting research. The integration of AI-driven technologies such as PEPMIS and PIPMIS for performance evaluations, OSIM and SIMS for student information management, and tools like SPSS for data analysis has transformed institutional operations, making education more efficient, accessible, and data-driven. As AI continues to evolve, its role in enhancing administrative efficiency and academic processes will further shape the future of higher education.

ENHANCING RESEARCH CAPABILITIES

For both students and faculty, AI has become an invaluable resource in research, revolutionizing how information is accessed and analyzed. AI-driven databases such as Google Scholar or Semantic Scholar enable researchers to efficiently search for peer-reviewed articles, theses, and conference papers, significantly cutting down the time required for literature reviews. For instance, researchers at MNMA Karume Campus studying environmental conservation can use AI tools to analyze trends in climate change data or track the effectiveness of local conservation strategies using advanced predictive models.

Analytical tools powered by AI, such as SPSS and Tableau, allow faculty and students to interpret complex data sets with precision. Social science researchers, for example, can use these tools to analyze survey results and derive meaningful insights regarding societal behaviour or policy effectiveness.

Additionally, AI algorithms can assist in automating repetitive tasks during research, such as formatting references using citation tools like Zotero or EndNote or summarizing lengthy documents for quicker comprehension. For students working on dissertations, tools like Grammarly can enhance the quality of writing by offering suggestions for clarity and style, while plagiarism checkers ensure the originality of their work.

By streamlining data analysis, visualization, and report generation, AI accelerates the pace of research projects and contributes to producing higher-quality academic publications at the MNMA Karume Campus. This not only improves institutional output but also enables researchers to tackle larger and more complex questions with greater efficiency.

IMPACT ON STUDENT ENGAGEMENT AND PERFORMANCE

Artificial Intelligence (AI) has significantly transformed student engagement and academic performance at MNMA Karume Campus by providing innovative learning tools and digital resources. AI-powered chatbots and learning assistants offer 24/7 academic support, allowing students to resolve coursework-related queries, receive assignment assistance, and access administrative information outside regular class hours. For instance, students struggling with advanced algebra or political science case studies can receive instant explanations, enabling them to grasp difficult concepts more effectively.

Beyond tutoring systems, AI has improved student engagement through gamified learning platforms that feature interactive quizzes, rewards, and adaptive assessments. Platforms like Kahoot, powered by AI-driven analytics, adjust quiz difficulty based on student responses, making learning dynamic and personalized. Virtual collaborative spaces, such as AI-enhanced forums and discussion boards, facilitate interdisciplinary discussions and remote group projects, helping business administration students collaborate on complex case studies.

Additionally, AI-driven video analysis tools assist students in media studies and public speaking courses, providing feedback on presentation skills and highlighting areas for improvement. AI-driven personalized learning pathways also guide students struggling with subjects like economics, directing them to targeted e-books, instructional videos, and expert-led workshops to reinforce learning.

Integration of E-Books, Computer Libraries, and Projectors

AI has also enhanced academic accessibility through digital learning resources. E-books, easily accessible through AI-powered academic databases, allow students to study remotely and access scholarly materials anytime. Computer libraries,

equipped with intelligent search functions, simplify research processes, helping students retrieve relevant literature instantly. Furthermore, AI-integrated interactive projectors provide dynamic classroom experiences, enabling immersive presentations, live demonstrations, and collaborative discussions.

By bridging knowledge gaps, fostering collaboration, and offering dynamic digital learning experiences, AI continues to reshape education at the MNMA, Karume Campus. Its ability to personalize learning, automate processes, and provide instant academic support positions students for success in a modern, tech-driven professional landscape.

CHALLENGES OF AI ADOPTION AT MNMA KARUME CAMPUS

While the benefits of AI are substantial, its adoption at MNMA Karume Campus is not without challenges. Limited access to advanced technology, such as high-speed internet and modern computer systems, creates barriers for students and staff to fully utilize AI tools. Some students struggle to use adaptive learning platforms due to outdated devices or insufficient IT support, while faculty members may face difficulties integrating AI-powered tools into their teaching due to limited experience or inadequate training. These challenges highlight the need for ongoing workshops and skill-building programs to improve AI literacy among educators and students.

Another significant challenge is the ethical concerns surrounding data usage. AI systems require access to sensitive student data for personalization, raising questions about data privacy and security, especially in institutions without robust cybersecurity measures. Ensuring that platforms like ChatGPT and other AI-driven learning assistants do not misuse or compromise student information is critical to fostering trust in AI systems.

Additionally, AI-driven performance evaluation systems such as PEPMIS (Performance Evaluation and Monitoring Information System) and PIPMIS (Performance Improvement and Progress Monitoring Information System) pose challenges for faculty and staff. If staff members lack proper training or fail to update their performance evaluations regularly, they face the risk of not being promoted due to incomplete assessments. This underscores the importance of consistent system usage and regular training sessions to ensure that faculty members can effectively track their progress and meet institutional expectations.

Despite these challenges, MNMA Karume Campus has an opportunity to invest in upgrading technological infrastructure to enhance AI integration. Collaborations with tech organizations could enable access to advanced AI tools, subsidized software licenses, and improved hardware for students and staff. Partnerships with AI developers could also support specialized training programs for faculty, allowing them to fully leverage AI in teaching, research, and administrative processes. Institutions like Microsoft or Google could provide workshops on AI-driven learning applications in economics, engineering, and environmental studies, helping educators enhance their teaching methodologies.

Furthermore, addressing these challenges encourages innovative solutions to bridge the digital divide. Initiatives such as providing affordable devices to students or offering grants to expand campus-wide internet access could increase AI accessibility, ensuring equal opportunities for all learners. By proactively tackling these obstacles, MNMA Karume Campus can establish itself as a leader in AI-powered education, creating a more inclusive, efficient, and technologically advanced academic environment.

THE WAY FORWARD

As MNMA Karume Campus continues to embrace AI technologies, its role in enhancing academic

success and transforming education becomes increasingly evident. Addressing challenges such as limited access to advanced technology and the need for specialized AI training will help create a more inclusive and technologically empowered learning environment. Collaborating with AI-focused organizations to provide affordable devices and facilitating workshops on AI applications in disciplines like ICT and economics can expand opportunities for students and faculty, ensuring broader adoption of AI tools.

Expanding AI applications in education enables MNMA Karume Campus to integrate tools such as predictive analytics, which can track students' academic progress, identify at-risk learners, and facilitate timely interventions like additional tutoring sessions. AI-powered platforms can also introduce virtual career counselling systems, allowing students to explore job prospects and gain real-time insights into industry demands, thereby bridging the gap between academia and professional careers.

Beyond individual learning enhancements, AI creates opportunities for interdisciplinary collaborations. For example, Geography education students could work alongside computer science experts to develop AI-driven crop management solutions, while tourism students could leverage AI-powered algorithms to analyze visitor data and optimize marketing strategies for Zanzibar's tourism industry. These cross-disciplinary projects showcase AI's ability to facilitate innovative research and practical problem-solving.

Additionally, AI can foster global academic collaboration, enabling students and faculty to engage in joint research with counterparts from other universities through AI-enhanced virtual research platforms. AI-driven translation tools can further support researchers by eliminating language barriers, ensuring access to diverse academic resources and enabling a more globalized learning experience.

AI is more than a technological tool—it serves as a catalyst for innovation. By integrating AI technologies strategically, MNMA Karume Campus can pave the way for enhanced academic experiences, prepare students for the demands of a tech-driven future, and solidify its position as a leading institution in Africa's evolving educational landscape.

CONCLUSION AND RECOMMENDATIONS

The integration of Artificial Intelligence (AI) into academia at MNMA Karume Campus has proven to be both transformative and challenging, offering new opportunities to enhance academic performance while addressing critical concerns. AI technologies have revolutionized teaching and learning methods, streamlined administrative tasks, and significantly elevated research capabilities. Through tools like adaptive learning platforms, intelligent tutoring systems, and generative AI, students and faculty have benefited from personalized learning experiences, efficient data analysis, and improved accessibility to resources.

However, challenges such as limited technological infrastructure, unequal access to AI tools, and ethical considerations surrounding data use remain obstacles to its full adoption. Addressing these challenges requires strategic investments in infrastructure, ongoing training, and collaboration with technology organizations to ensure equitable access and responsible usage.

Despite these hurdles, AI's role as a catalyst for innovation cannot be understated. Its potential to foster student engagement, enhance collaboration, and prepare learners for a tech-driven future positions MNMA Karume Campus as a forward-thinking institution in Africa's educational landscape. By thoughtfully embracing AI technologies, MNMA can pave the way for a transformative academic environment that not only meets the demands of the modern world but also empowers students and educators to reach new heights of success. This study contributes valuable

insights into the ongoing evolution of AI in academia and underscores its relevance in shaping the future of education at MNMA Karume Campus and Africa in General.

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