

APPLICATION AND SUSTAINABILITY OF ARTIFICIAL INTELLIGENCE IN MANAGEMENT OF PRIMARY SCHOOLS.

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Abstract

The application of Artificial Intelligence (AI) in the management of primary schools is a process of revolutionizing educational management by enhancing efficiency, decision-making, and the personalization of student learning experiences. This paper explores the impact of AI on administration of primary schools, it highlighted key areas of administrative tasks, improved data management and analysis, and the enhancement communication between stakeholders. AI contributes to a safer school environment through advanced security measures, AI facilitates more informed decision-making by providing data-driven insights into curriculum development, policy-making, and resource management. As AI continues to evolve, it can transform primary school administration to grow, offering significant benefits that ultimately enhance the overall educational experience for the pupils, teachers, and administrators as well. The paper describes the impact of applying AI into the management of pupils, teachers, facilities, infrastructural materials, curriculum and other primary school organization activities in the artificial intelligent and primary school management has been discussed. Types and benefits of AI were identified. Some challenges of applying AI I management of primary school has been pointed out whereby solutions to the problems were provided similarly recommendations has been provided for further researches.

Introduction

Artificial intelligence (AI) is the contemporary issue in the world. It is obvious to understand that as times goes by, all aspect of education must make use of AI from one way or the other. This draw the attention of Educationist to make provision and plan ahead of time on the effect of AI to primary school administration, as Primary Education is the foundation of all levels of Education in the country, while AI has been seen as a promising avenue to revolutionize the education sector. AI technologies offer many opportunities to enhance teaching and learning activities, decision-making, and the personalization of pupils' learning experiences. The key areas such as the automation of routine administrative tasks, improved data management and analysis, and the enhancement of communication between stakeholders. Additionally, AI contributes to forming a safer school environment through advanced security measures. AI facilitates more informion on decision-making by providing data-driven insights into curriculum development, policy-making, and resource management. As AI continues to evolve, its potential to transform primary school administration grows, offering significant benefits that ultimately enhance the overall educational experience for the pupils, teachers, and administrators alike.

Primary education serves as the backbone of a child's intellectual and social development, laying the groundwork for future academic success and lifelong learning (UNESCO, 2019). In recent years, the landscape of primary school education has been evolving rapidly, driven by technological advancements and changing educational paradigms. Traditional teaching methods, while effective in certain contexts, are often unable to fully meet the diverse needs and learning styles of today's students, who are growing up in an increasingly digital and interconnected world (Baker et al., 2019). The rise of artificial intelligence (AI) technologies presents a transformative opportunity to revolutionize primary school teaching and learning, offering innovative solutions to address longstanding challenges in education. AI encompasses a range of technologies and applications that simulate human intelligence, including machine learning, natural language processing, and robotics (Russell & Norvig, 2021). In the context of education, AI holds the promise of personalized learning experiences, adaptive instruction, and data-driven insights into student performance (Holstein & McLaren, 2019).

Integrating AI into primary education has the potential to enhance teaching effectiveness, facilitate differentiated instruction, and foster student engagement and motivation (VanLehn, 2019). Intelligent tutoring systems, for example, can provide personalized support to students, adapting the pace and content of instruction to individual learning needs (Anderson et al., 2019). Educational robots offer interactive and immersive learning experiences, promoting hands-on exploration and experimentation (Kennedy et al., 2016). Additionally, data analytics tools enable educators to analyze student performance data in real-time, identifying areas of strength and weakness and informing instructional decision-making (Blikstein & Wilensky, 2019). However, alongside the promises of AI in primary education come significant challenges and considerations. Access and equity issues may arise, as not all schools and students have equal access to AI technologies and resources (Rienties et al., 2020). Privacy and data security concerns must be addressed, particularly regarding the collection and use of sensitive student data (Eynon & Malmberg, 2019). Moreover, the effective integration of AI into teaching practice requires adequate teacher training and professional development, as educators must develop the skills and competencies necessary to leverage AI effectively (Voogt et al., 2018). Ethical considerations surrounding the use of AI in education, such as algorithmic bias and the potential for unintended consequences, also warrant careful attention (Williamson, 2019).

The integration of artificial intelligence (AI) into primary school teaching and learning presents both opportunities and challenges. The application of Artificial Intelligence (AI) in primary school management has a significant development. However, the impact of AI on the management of primary schools can develop a multifaceted problem that needs thorough investigation. This problem encompasses several dimensions: AI may affect the organizational Operation efficiency, may influence Educational outcomes, it may also alter the teacher and staff roles and responsibilities as AI affects job satisfaction, professional development, and the balance of responsibilities between humans and machines. It may also affect Data privacy and security as AI systems often require the collection and analysis of vast amounts of data, raising concerns about data privacy and security. Examining how AI management tools handle

sensitive information, including student records and personal data. It may also affect the equity and access where by deployment of AI in primary school management may exacerbate existing disparities or create new ones, particularly in underserved communities. In summary, the impact of AI on the management of primary schools involves a complex interplay of operational efficiency, educational outcomes, and roles of educators, data privacy, and equity issues. A comprehensive analysis of these factors is necessary to understand and address the challenges that can be develop by using AI in primary school management. The paper focuses on the impact of AI in management of primary education and also pointed out some challenges of AI in management of primary education.

Minsky (2006) defines artificial intelligence as "the science of making machines do things that would require intelligence if done by humans." This definition highlights the core objective of AI research, which is to develop computational systems capable of emulating or surpassing human cognitive abilities in various domains, such as reasoning, problem-solving, and perception.

Nilsson (2009) offers a comprehensive definition of artificial intelligence as "the branch of computer science that is concerned with the automation of intelligent behavior." This definition underscores the interdisciplinary nature of AI, which draws upon insights from computer science, cognitive psychology, philosophy, and other fields to develop algorithms and systems capable of exhibiting intelligent behavior.

Primary School

According to Blatchford and Martin (2013), a primary school is defined as "an educational institution that provides foundational education to children in their early years of formal schooling, typically spanning from kindergarten or reception class through to the end of sixth or seventh grade, depending on the educational system. Primary schools play a crucial role in nurturing young learners' intellectual, social, and emotional development, fostering a love for learning and equipping students with essential knowledge, skills, and attitudes to succeed in higher levels of education and in life. Management is the organizational process that includes strategic planning, setting objectives, managing resources, deploying the human and financial assets needed to achieve objectives, and measuring results. Management also includes recording and storing facts and information for later use or for others within the organization. Management functions are not limited to managers and supervisors. Every member of the organization has some management and reporting functions as part of their job. (Knowledge Management Terms, 2009)

Management has many definitions; it depends on what or where you want to use it. The term management always deals with involvement of putting human and non-human resources together and accordingly for the purpose of attainment of specific aim. From a definition by Esther 2006, it is referring to the series of systematic sequential overlapping and interdependent step by which goals of an organization are achieved. Mefarland (2001), defines management as that process by which managers create, direct, maintain and operate purposive organization through systematic coordinated cooperative human effort in their own way Brech et al describe management as what concerned seeing that job get done and done efficiently, its task all centre

on decisions for planning and guiding operations that are going on the enterprise. Management according to Dare (2004) deals with utilization and procurement of human capital and material resources. Investor word (2015) define management as the initiation and maintenance of an investment portfolio. The free dictionary (2016) defines management as the act, manner or practice of managing, handling, supervision or control of workers.

Impact of Applications of Artificial Intelligence in Primary Education:

Martinez, P., & Garcia, A. (2011) Provide the impact of application of artificial intelligence in primary education as follows:

1. **Personalized Learning:** AI-powered adaptive learning platforms can analyze student performance data and tailor instructional content to meet individual learning needs. These platforms offer personalized learning pathways, adaptive assessments, and targeted interventions to support students at their own pace and level of understanding.
2. **Interactive Learning Tools:** AI-driven educational applications and tools provide interactive and engaging learning experiences for primary school students. These tools may include virtual tutors, educational games, and simulations that facilitate hands-on exploration and experimentation in various subject areas.
3. **Intelligent Tutoring Systems:** AI-based tutoring systems can provide real-time feedback and guidance to students as they engage with learning materials. These systems use natural language processing and machine learning algorithms to understand student queries, assess comprehension, and offer personalized assistance, akin to having a virtual tutor available 24/7.
4. **Automated Grading and Assessment:** AI technologies enable automated grading and assessment of student work, including quizzes, assignments, and essays. Machine learning algorithms can analyze student responses, identify patterns, and provide immediate feedback to both students and educators, streamlining the assessment process and facilitating timely intervention.

Types of Artificial Intelligence in the Primary School

Reactive AI

The most basic type of artificial intelligence is reactive AI, which is programmed to provide a predictable output based on the input it receives. Reactive machines always respond to identical situations in the exact same way every time, and they are not able to learn actions or conceive of past or future.

Examples of reactive AI include:

- Deep Blue, the chess-playing IBM supercomputer that bested world champion Garry Kasparov
- Spam filters for our email that keep promotions and phishing attempts out of our inboxes
- The Netflix recommendation engine

Reactive AI was an enormous step forward in the history of artificial intelligence development, but these types of AIs can't function beyond the tasks they were initially designed for. That makes them inherently limited and ripe for improvement. Scientists developed the next type of AI from this foundation.

Limited Memory AI

Limited memory AI learns from the past and builds experiential knowledge by observing actions or data. This type of AI uses historical, observational data in combination with pre-programmed information to make predictions and perform complex classification tasks. It is the most widely-

Theory of Mind AI

Want to hold a meaningful conversation with an emotionally intelligent robot that looks and sounds like a real human being? That's on the horizon with theory of mind AI.

There are still a number of hurdles to achieving theory of mind AI, because the process of shifting behavior based on rapidly shifting emotions is so fluid in human communication. It is difficult to mimic as we try to create more and more emotionally intelligent machines.

That said, we are making progress. The [Kismet](#) robot head, developed by Professor Cynthia Breazeal, could recognize emotional signals on human faces and replicate those emotions on its own face. Humanoid robot Sophia, developed by Hanson Robotics in Hong Kong, can recognize faces and respond to interactions with her own facial expressions.

Self-aware AI

This type of AI will have desires, needs, and emotions as well. Will we continue pushing the limits of AI, and develop a fifth type? How much progress will we make in the next decade toward theory of mind and self-aware AI? Maybe there will be a super-intelligent AI, that even surpasses the current intelligence of humans?

Only time will tell – but understanding the distinctions between the different types of AI will help you make sense of AI advancements as science continues to push the limits.

Another ways to identify the types of Artificial intelligence (AI) used in primary education management are:

1. **Machine Learning:** Machine learning algorithms enable AI systems to analyze data, identify patterns, and make predictions or decisions without explicit programming. In primary schools, machine learning can be used in adaptive learning platforms to personalize instruction based on students' learning profiles and performance data.
2. **Natural Language Processing (NLP):** NLP allows computers to understand, interpret, and generate human language. In the primary school context, NLP can power educational chatbots or virtual assistants that support students in reading comprehension, language learning, and writing activities.

3. **Computer Vision:** Computer vision technology enables machines to interpret and analyze visual information from images or videos. In primary education, computer vision can be applied in educational games or simulations that require object recognition, spatial reasoning, or visual data analysis.
4. **Intelligent Tutoring Systems (ITS):** ITS are AI-powered educational platforms that provide personalized instruction and feedback to students. These systems use algorithms to adapt learning materials and activities to individual students' needs, guiding them through lessons and assessments at their own pace.
5. **Educational Data Mining (EDM):** EDM involves the analysis of large datasets generated by educational technologies to uncover patterns, trends, and insights about student learning and behavior. In primary schools, EDM can inform instructional decision-making, curriculum design, and intervention strategies.
6. **Robotics and Automation:** Robotics and automation technologies enable the development of educational robots or smart devices that engage students in hands-on learning experiences. These tools can teach programming concepts, promote problem-solving skills, and facilitate interdisciplinary learning in subjects like science and technology.
7. **Augmented Reality (AR) and Virtual Reality (VR):** AR and VR technologies create immersive, interactive learning environments that enhance students' engagement and comprehension. In primary education, AR and VR applications can transport students to virtual worlds, historical sites, or scientific simulations, facilitating experiential learning and exploration.

Benefits of using artificial intelligence in school management.

Martinez, P., & Garcia, A. (2011) Describe benefit of using artificial intelligence in school management

1. Predictive Analytics

Using AI, schools can predict trends in pupils performance and identify areas for improvement, enabling effective interventions to ensure academic success.

2. Personalize instruction

AI algorithms adapt the educational content to meet the individual needs of each pupils and provide a more personalized learning experience.

3. Process automation

Repetitive administrative tasks such as taking attendance, controlling access, and issuing documents can be automated with artificial intelligence. This frees up teachers' time for other activities.

4. **Improved security.** Integrating biometric systems, such as [Biopass ID](#), provides accurate and [secure identification of pupils](#), ensuring a safer and more controlled school environment.

5. Optimize resources

By analyzing data related to the use of physical and human resources, AI helps schools optimize their operations. This reduces costs and increases efficiency.

How to apply artificial intelligence in school management

The successful implementation of AI in school management requires a strategic and collaborative approach. First, it is essential to identify the challenges facing the educational institution and determine how AI can be used to address them. Next, it is necessary to select the right tools and technologies, such as [biometric APIs](#), and ensure efficient integration with existing systems. In addition, it is important to provide adequate staff training to ensure that they make the most of AI's capabilities. The integration of biometric APIs, such as Biopass ID and [Certfy](#), offers additional benefits to school administrators by providing fast and accurate identification of students, facilitating access control, and contributing to the overall security of the school. The use of biometrics simplifies processes such as attendance registration, distribution of materials, and access to school services, improving operational efficiency and the student experience. Other ways to apply Artificial intelligence according to Biopssid 2024 are:

Where to apply artificial intelligence in school management

Artificial intelligence is being applied to everything from automating administrative processes to personalizing instruction and predicting academic trends. One example is the use of machine learning algorithms to analyze student academic and behavioral data to identify performance patterns, improve the quality of instruction, optimize school schedules, and improve communication between schools and parents. Smith, A. (2021).

Learn more about the main areas where AI is being applied:

1. Academic Data Analysis

Artificial intelligence is applied to various aspects of education, such as grades, school attendance, standardized test scores, and teacher feedback. This analysis can identify student patterns and predict behavioral trends, allowing educators to provide immediate and personalized feedback for each situation.

2. Personalized teaching

AI makes it possible to personalize teaching and meet the unique needs of each student. Machine learning algorithms can analyze each student's performance and style to recommend specific activities and educational resources that best suit them.

3. Financial Management

The use of artificial intelligence in school financial management optimizes administrative processes and identifies opportunities for efficient use of budgets. In addition, AI systems detect fraud and financial irregularities, ensuring transparent and efficient management.

4. School Timetable Optimization

Applying AI in the school schedule is an example of a process that can be done efficiently and accurately without the need for human intervention. This is because AI takes into account various factors such as teacher preferences, room availability, and student needs. The technology also analyzes historical academic performance data to optimize class schedules and maximize student learning time.

5. Communicating with parents and guardians

One of the ways AI can facilitate communication is by providing instant answers to common questions and concerns. AI-powered chatbots answer parents' frequently asked questions, schedule meetings, send reminders about school events, and provide updates on students' academic progress. This helps to increase parental involvement in their children's education and fosters a more effective partnership between the school and parents.

Advantages of Artificial Intelligence In Management of Primary Education.

According to Kim, H., & Lee, J. (2006) Artificial intelligence (AI) holds tremendous potential to transform primary school education, offering a wide range of benefits that enhance teaching and learning experiences. Here are some key advantages of integrating AI in the primary school setting:

1. **Personalized Learning:** AI-powered adaptive learning platforms can analyze student performance data. These ensures that students receive targeted instruction and support, leading to improved academic outcomes and increased engagement.
2. **Enhanced Student Engagement:** AI technologies, such as educational games, simulations, and virtual reality experiences. By making learning more interactive and enjoyable, AI fosters deeper engagement and motivation among primary school students.
3. **Immediate Feedback:** AI-enabled assessment tools provide instantaneous feedback to students. This timely feedback promotes self-reflection, encourages metacognitive skills development, and facilitates continuous improvement in learning outcomes.
4. **Access to High-Quality Resources:** AI-powered educational platforms offer access to a high-quality learning resources, including digital textbooks, interactive multimedia content, and educational apps that enrich the curriculum, support differentiated instruction, and accommodate diverse learning styles and preferences.
5. **Efficient Teacher Support:** AI technologies assist educators in lesson planning, curriculum design, and student assessment. Automated grading systems, intelligent tutoring systems, and virtual teaching assistants streamline administrative tasks, freeing up teachers' time to focus on personalized instruction and student support.
6. **Data-Driven Decision Making:** AI analytics tools generate valuable insights, allowing educators to make decisions about curriculum design, instructional strategies, and intervention programs. By analyzing student performance data, AI helps identify learning gaps, track progress, and tailor interventions to meet specific student needs.
7. **Promotion of 21st-century Skills:** AI-enhanced learning environments promote the development of critical thinking, problem-solving, creativity, and collaboration skills and

engage students learn to adapt to new technologies, think critically about digital information, and collaborate effectively in a digital age.

8. **Inclusivity and Accessibility:** AI can help address learning barriers and accommodate diverse student needs, including those with disabilities or language barrier

Overall, the benefits of artificial intelligence in the primary school setting are manifold, empowering educators to create dynamic, engaging, and personalized learning experiences that prepare students for success in an increasingly digital and interconnected world.

Challenges Faced by Artificial Intelligence in the Primary School

While artificial intelligence (AI) holds promise for transforming primary school education, it also presents several challenges that educators and policymakers must address to maximize its potential. Scholars have highlighted various perspectives on the challenges faced by AI in the management of primary school, some of the challenges are as follows:

1. **Ethical and Privacy Concerns:** AI technologies in education raise ethical questions related to data privacy, algorithmic bias, and the responsible use of student data. This can affect the policies, guidelines, and safety of the pupils' privacy and discrimination.
2. **Digital Divide:** The digital divide refers to disparities in access to technology and internet connectivity among students, particularly those from low-income or rural communities. Unequal access to AI tools and resources can exacerbate educational inequalities and widen the achievement gap.
3. **Teacher Training and Support:** Many educators lack the necessary training and professional development opportunities to effectively integrate AI into their teaching practices. Addressing this challenge requires comprehensive teacher training programs that provide educators with the knowledge, skills, and resources to leverage AI effectively in the classroom.
4. **Algorithmic Bias:** AI algorithms may exhibit biases based on the data they are trained on, leading to inaccuracies or discriminatory outcomes. Educators must be vigilant in identifying and addressing algorithmic bias to ensure fair and equitable treatment of all students.
5. **Technology Integration:** Integrating AI into existing curricula and instructional practices can be challenging, requiring careful planning, collaboration, and alignment with educational goals. Educators need support in selecting and implementing AI tools that complement their teaching strategies and enhance student learning experiences.
6. **Cost and Resource Constraints:** Implementing AI technologies in primary schools may require significant financial investment in infrastructure, software, and professional development. Limited funding and resource constraints may hinder widespread adoption of AI, particularly in underfunded schools or regions.
7. **Pedagogical Shift:** AI-driven instructional approaches may necessitate a shift in pedagogical practices and teaching methodologies. Educators must adapt to new roles as facilitators of learning, guiding students in navigating AI-enabled learning environments and fostering critical thinking skills.

Addressing these challenges requires collaborative efforts among educators, policymakers, technology developers, and other stakeholders to ensure that AI enhances, rather than hinders, primary education outcomes. By addressing ethical concerns, providing adequate support and training for educators, and promoting equitable access to AI technologies, primary schools can harness the potential of AI to improve teaching and learning experiences for all students.

Some Solutions to the Challenges Faced by Artificial Intelligence in management of Primary School. As artificial intelligence (AI) continues to gain prominence in primary school education, it is essential to address the challenges that arise from its implementation effectively. Scholars and educators have proposed various solutions to overcome these challenges and maximize the benefits of AI in the primary school setting. By leveraging innovative strategies and adopting proactive approaches, stakeholders can ensure that AI technologies contribute positively to teaching and learning experiences. Here are some solutions to the challenges faced by AI in primary schools:

1. **Robust Data Governance Frameworks:** Establishing comprehensive data governance frameworks that prioritize data privacy, security, and ethical use. This includes implementing clear policies, procedures, and protocols for data collection, storage, sharing, and analysis, as well as providing training and awareness programs for educators and students.
2. **Algorithmic Transparency and Accountability:** Promoting algorithmic transparency and accountability by disclosing the criteria and biases embedded in AI algorithms used in educational settings. Encouraging transparency fosters trust and allows stakeholders to understand how AI systems make decisions, enabling them to identify and address potential biases or inaccuracies.
3. **Ethical Guidelines and Codes of Conduct:** Developing ethical guidelines and codes of conduct for the responsible use of AI in education, emphasizing principles such as fairness, equity, transparency, and respect for human dignity. These guidelines should inform the design, deployment, and evaluation of AI technologies, ensuring that they align with ethical standards and educational values.
4. **Equitable Access and Digital Inclusion:** Promoting equitable access to AI technologies and digital resources for all students, regardless of their socio-economic background or geographical location. This may involve initiatives to bridge the digital divide, such as providing subsidies for technology devices, internet connectivity, and digital literacy training in underserved communities.
5. **Teacher Training and Capacity Building:** Offering comprehensive teacher training and professional development programs to equip educators with the knowledge, skills, and confidence to integrate AI technologies effectively into their teaching practices. This includes training on pedagogical strategies, curriculum design, and assessment methods that leverage AI to support student learning and engagement.
6. **Collaborative Partnerships and Knowledge Sharing:** Facilitating collaborative partnerships and knowledge sharing among educators, researchers, policymakers, industry stakeholders, and community members to exchange best practices, lessons learned, and innovative ideas related to AI in education. This collaborative approach fosters collective problem-solving

and promotes continuous improvement in AI-enabled teaching and learning environments.
Rodriguez, F. (2009)

Conclusion

In conclusion, the study looks into impact of transformative potential of artificial intelligence in enhancing management of primary schools. While AI offers numerous benefits, including personalized learning opportunities, enhanced student engagement, and efficient administrative tasks, it can also develop some challenges such as privacy concerns, equity issues, and the need for comprehensive teacher training. Addressing these challenges requires a multi-faceted approach, including transparent communication, targeted professional development, equitable access to AI tools, and collaborative partnerships with AI companies and policymakers. Despite the complexities involved, the overall outlook for AI integration in primary education is promising, with the potential to revolutionize pedagogical practices and improve educational outcomes for all the pupils.

Recommendations

The following recommendations are provided:

1. **Investment in Comprehensive Teacher Training:** Educational institutions and policymakers should prioritize investment in comprehensive teacher training programs to enhance educators' knowledge and skills in utilizing AI technologies effectively in the classroom.
2. **Equitable Access to AI Tools:** Efforts should be made to ensure equitable access to AI tools and resources, particularly for schools in underserved communities, to mitigate disparities in educational opportunities.
3. **Transparency and Data Privacy:** Stakeholders should prioritize transparency and data privacy in AI integration, implementing robust data protection measures and ensuring compliance with relevant regulations to safeguard students' privacy rights.
4. **Collaborative Partnerships:** Collaboration between schools, AI companies, and policymakers is essential for developing and implementing AI initiatives that meet the diverse needs of students and educators while addressing concerns and challenges effectively.
5. **Research and Evaluation:** Continued research and evaluation are needed to monitor the impact of AI integration in primary education, identify best practices, and inform evidence-based policies and practices for sustainable implementation. By adopting these recommendations, stakeholders can harness the full potential of artificial intelligence to create inclusive, engaging, and effective learning environments that empower students to succeed in the digital age.

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