PROSPECTS AND CHALLENGES OF ARTIFICIAL INTELLIGENCE FOR EFFECTIVE TEACHING AND LEARNING IN PRIMARY SCHOOLS IN RIVERS STATE

[1]OPUTA, C'FINE CHUKWUMA, *Ph.D* **[2]YINKORIE, BLESSING EBINIPERE,** *Ph.D*
& **[3]IDIBIA CHRISTIAN,** *Ph.D*
[1]Dept. of Educational Foundations, University of Port Harcourt, Rivers State
oputacfine@gmail.com 08034636661
[2]General Studies Dept., Int'l Institute of Tourism, and Hospitality, Opolo, Yenagoa, Bayelsa State;
ebinipereblesyn@gmail.com 07033671074
[3]Federal College of Education (Tech), Omoku, Rivers State
christianidibia@yahoo.com 08064345649

Abstract

The study philosophically discussed the prospects and challenges of artificial intelligence for effective teaching and learning in primary schools in Rivers State using the philosophical tools of speculation, analysis and prescription. The integration of artificial intelligence in primary school education in the State and Nigeria in extension no doubt, raises some pertinent concerns about the quality of education, nature of learning, role of teachers, availability of facilities and the ethical considerations involved with the transformation. The study thus looked at artificial intelligence, education, teaching effectiveness, learning effectiveness as well as prospects and challenges of using AI in teaching and learning process and showed that artificial intelligence is increasingly gaining more ground in the State with its patronisers including the Ministry of Education and Nigerian Educational Research and Development Council (NERDC) among others. It also highlighted its prospects such as personalised learning as well as its challenges including the inadequate preparedness of teachers in teaching and learning outcomes. The study concluded that by leveraging AI-powered tools and platforms, teachers can personalise learning experiences, enhance learners' engagement and optimise teaching methodologies to meet diverse learning styles. It was thus recommended among others that there should be professional development and training programmes organised by both government and school heads to enable teachers build their capacity for effectively integrating AI tools and resources into the primary school curriculum, for the development of the students and society in general.

Keywords: Artificial Intelligence, Effective Teaching, Learning, Prospects, Primary Schools.

Introduction

The quest for an improved society, brigaded by man's philosophical spirit of inquiry may be responsible for his insatiable quest to make life easier and better on a daily basis, even in education. That is, the invention and innovation of new ways of handling life issues does not mean that the society should continue working or satisfied with what it considers to be the standard. Breaking barriers and challenging conventional wisdom require innovative and continual thinking, disrupting traditional approaches and pioneering new solutions. Rather than incrementally improving existing methods, true innovation may lie in challenging the status quo. For example, instead of optimising horse, camel and donkey's speed, the inventor of the automobile transformed transportation, presenting unparalleled efficiency and capacity. Likewise, instead of using the postal offices in sending messages, the use of phones has made communication easier among people, drawing the world closer to one's door step. The innovative spirit in humans, can be nurtured from the primary level of education.

Primary school education encompasses the overall social, physical and intellectual development and education of children which they receive in primary schools. The Federal Government of Nigeria (FGN, 2014) defined primary school education as the education given in an educational institution to children prior to their entering into secondary school. It is a formal education provided for children after nursery or kindergarten school, during which the curriculum enables them to acquire social skills and develop physically and intellectually as a foundation for life and which prepares them for secondary education. Among the essence of primary school education is to ensure a smooth

transition from home to school, inculcate social norms in the learner, inculcate in him the spirit of enquiry and creativity through the exploration of nature, environment, art, music and playing with toys, among others as well as develop a sense of co-operation and team – spirit with people (Eddy, 2010). In contemporary times interestingly, Artificial intelligence (AI) is being utilised in facilitating primary school education in the society.

The introduction of artificial intelligence in today's world offers new possibilities and challenges to the teaching-learning process in schools. AI is a promising new tool that can be applied to enhance teaching and learning processes at the various level of education, including that of primary schools and is construed as 'man-made thinking power', where artificial implies 'man-made' and intelligence means 'thinking power' (Choudhury, 2022).

Given the potential to customise lessons, enhance learning opportunities and present caregivers and preschoolers with cutting-edge tools and resources, AI has the ability to completely transform the educational landscape in terms of both teaching and learning effectiveness. Its applications have the potential to significantly alter primary school education by providing learners with more accessible, efficient and interesting learning opportunities. Also, the natural language processing (NLP) in education has the promise of utilising AI to improve teaching and learning in primary schools in Rivers State. AI systems can comprehend, interpret and produce human language by utilising natural language processing (NLP) methods in research (Bassey & Owushi, 2023).

The ability of AI to transform the teaching and learning process is revolutionising the education sector, enabling machines to execute tasks that ordinarily require human intelligence. AI's ability to improve education has generated immense interest, drawing epistemologists to explore its applications (Mondal, 2020). In Rivers State and Nigeria by extension, government agencies, research centres and educational institutions are spearheading AI integration initiatives, with key players comprising the Federal Ministry of Education, National Information Technology Development Agency (NTTDA) and Nigeria Education Research and Development Council (NERDC) among others. These efforts have led to AI applications in Rivers State primary schools such as student performance prediction, multimedia learning platforms, module learning and software modeling.

In view of primary education in Nigeria, embracing AI's transformative power requires a holistic approach which addresses its prospects and challenges. The prospects include fostering AI literacy, enhancing critical thinking and ensuring that educators are equipped to integrate AI into their teaching practice while its challenges include teacher preparedness, ethical considerations and equity as schools consider integrating AI into their pedagogical methods (Nwagwu, 2010). By doing so, the society can improve educational outcomes, enhance teaching methods and prepare learners for an increasingly technology-driven world. Ultimately, a balanced approach to AI in primary school education will empower education stakeholders in the State and Nigeria in extension to harness AI's potential while safeguarding human values and promoting development in the society. The study therefore, attempts to offer insights for utilising AI to improve educational outcomes in primary schools while managing its complexities inherent in its deployment, within the framework of primary school mission and goals.

Concept of Artificial Intelligence

Artificial Intelligence (AI) connotes a wide range of technologies that under-pines / enhances many products and services which people use on daily basis. It includes chatbots that offer real-time customer care and applications which suggest TV series. AI is a technology that, when applied alone or in conjunction with other technologies, enables computers and other machines to mimic human

intelligence and problem-solving abilities. Hence, tasks that would essentially require human intelligence or intervention can now be completed by it (Coursera Staff, 2024).

According to Copeland (2024), artificial intelligence is the ability of a digital computer or computer-controlled robot to perform tasks normally associated with intelligent beings. It is frequently applied in developing systems endowed with the intellectual processes that are characteristic of humans, such as the ability to reason, discover meaning, generalise or learn from former experiences. It is also the production of computer systems that can perform tasks that typically require human intelligence.

Likewise, Glover (2024) viewed artificial intelligence as the theory and development of computer systems capable of handling tasks that historically entailed human intelligence, such as recognising speech, identifying patterns and making decisions. It is an umbrella term which encompasses a wide variety of technologies, including machine learning, deep learning and natural language processing (NLP) as well as enables machines to match or improve upon, the potentials of the human mind.

According to Coursera Staff (2024), Artificial Intelligence (AI) became developed as an academic discipline in the 1950s. Its emergence was systemic for learners' ability to interpret, learn and achieve specific tasks from data presentation. It implies analytical, human-inspired intelligence because of the features it contains, together with the exhibited outputs that involve cognitive, emotional and social academic display of knowledge. In recent developments, several platforms have popularised the mainstream usage of AI as part of daily processes that are used in several institutions (Okeke, 2017). This has shown the improved outcomes of AI as a powerful tool to increase efficiency, quality of learning and technological influence in primary schools

Artificial intelligence (AI) helps in the simulation of human intelligence processes through machines, such as computer systems (Laskowski, 2024). It applies multiple technologies that equip machines to sense, comprehend, plan, act and learn with human-like levels of intelligence. Essentially, AI systems perceive environments, recognise objects, contribute to decision-making, solve complex problems, learn from past experiences and imitate patterns. In some areas, AI can render tasks better than humans. Some applications of AI include expert systems, natural language processing, speech recognition and machine vision.

Concept of Education

The concept of education has been defined by many educationists in different ways as a result of its multi-purpose functions. Scholars such as Okoh (2003), Osaat (2006) and Elechi (2015) have asserted that education is etymologically derived from two Latin words (a) educere; which means to "bring out" and used by philosophers such as Socrates, Plato and Rousseau; as well as (b) educare; which means "to mould" and utilized by philosophers such as Aristotle, Locke and Pestalozzi. In consideration of the second option as educare, Peters in Emenu (2015:240) argues that:

i) Education implies the transmission of what is worthwhile to those who become committed to it.

ii) Education must involve knowledge and understanding and some sort of cognitive perspective which is not inert.

iii) Education at least rules out some procedures of transmission on the ground that they lack willingness and voluntariness on the part of the learner.

From the three criteria above, the first two criteria deal with the end of education while the last discusses methods. Hence, education empowers men and women with the minimum skills necessary for them to take their place in society and to extend their knowledge. Likewise, it helps in the process of

socialisation. In this context, Peters (1979) opined education as an initiation into the cultural practices of a given society. Through it, the people get to know more about their heritage and beliefs. As such, Durkheim in Okoh (2003:16) said, "education is the systematic socialisation of the younger generation by which the latter learn religious and moral beliefs of their nationality on the collective opinion of all kinds". In this manner, the individual is helped to attain the development of his potentialities and their maximum activation when necessary, according to right reason for self-fulfillment.

According to Oputa and Njoku (2024), education is a means to a healthy living, facilitating man's happiness in the process. It helps to eliminate ignorance and liberally criticises people's values, attitudes, plans and redirects societal goals and pursuits. In line with these views, John Locke asserted that education helps in the development and maintenance of a good society (Omoregbe, 2012). Hence, education helps in the emancipation and enlightenment of people and societal experiences. It frees individuals from misconceptions, errors and irrational assumptions of daily life and enlarges their experiences in the society. The stronger the people are through education, the stronger a given nation.

Concept of Teaching Effectiveness

Teaching effectiveness implies the potential of teachers to teach in such a manner that they attain success and bring about the desired change in the learners' behaviour. Hawthorne (2022) explained that teaching effectiveness constitutes the knowledge, strategies, processes and behaviours of teachers that lead to good learning outcomes; which further demonstrates both the quality of teaching and teachers' capability. Consequently, teaching effectiveness requires teachers to continually enhance practice by adopting an evaluative mindset. It is informed by the growth-focused evaluations of teaching practice, indicators of learning and wellness of a school culture (Goel, 2023).

According to Jupp (2009), teaching effectiveness helps a teacher to produce gains on learners' achievement scores, taking into account the baseline measure of learners' prior attainment and other characteristics of their intake. It equally demonstrates the practical outputs (qualitative and quantitative) of teaching. These outputs are calculated by value-added assessments, which measure how much a teacher improves a pupil's learning or other rigorous measures. Likewise, they are qualitative observations of a teacher's classroom performance by a head teacher or peer who understands the classroom practices that improve learner's achievement (Copeland, 2024).

Teaching effectiveness shows how learners are able to reproduce what they have learnt. Where they are able to do this, one can say that the teaching has been effective. With this, learners are able to practice on their own and become better in their studies. At the primary education level, this is very essential in order to develop the cognitive, affective and psychomotor aspects of pupils.

Concept of Learning Effectiveness

In the process of designing learning programmes, their effectiveness is very vital. The ability of learners to retain and access information over long periods of time is an indication of an effective learning process. Learning effectiveness thus implies how a learning programme is capable to achieve its intended learning outcomes and produce the desired results. It focuses on the quality of learning and the application of that learning to impact performance. An effective programme does that by keeping learners engaged, motivated and participative (Goel, 2023).

The emphasis on learning as an ongoing continuum is crucial for setting expectations around learning outcomes and designing learning experiences that build on one another (Adams et al, 2020). On several occasions, learning effectiveness shows up as a change in behaviour, critical thinking abilities and the

application of new knowledge to new situations. It enables learners to completely understand what they have learnt and apply them in live situations.

Moreover, effective learning emphasises the understanding, intelligence, perseverance and quality of learning. It involves creating a comfortable and conducive learning environment, providing essential facilities and resources and incorporating research components into the educational curriculum. It is equally known by the ability to generate positive feelings and favourable attitudes towards learning, which in turn promotes active engagement and proactive behaviour in learning situations (Davey, 2023).

The Prospects of Artificial Intelligence for Effective Teaching and Learning in Primary Schools

The prospects of artificial intelligence (AI) enhancing the effectiveness of teaching and learning in primary schools include:

1. Personalised Learning

AI-powered adaptive learning systems can direct educational experiences to the individual needs and learning styles of pupils. In the context of primary education, AI algorithms can analyse pupils ' strengths, weaknesses and learning patterns to provide personalised learning pathways. For instance, AI- driven platforms can offer customised quizzes, simulations, and interactive exercises based on pupils ' proficiency levels and learning objectives. By meeting each pupil's pace and learning preference, AI facilitates a deeper understanding and retention of education concepts (Okeke, 2017).

2. Natural Language Processing (NLP) in Primary Education

Natural Language Processing (NLP) technologies enable AI systems to comprehend, interpret and generate human language wonderfully. For example, NLP powered chatbots and virtual assistants can interact with learners in natural language, answering questions, explaining concepts and providing further resources. They can equally offer on-demand support outside the classroom, serving as personalised tutors accessible anytime and anywhere (Aina, 2023). Moreover, NLP algorithms can analyse pupils' written responses to open-ended questions, providing automated feedback on their reasoning and communication skills. This advancement has the potential to promote communication between AI-powered systems and pupils, resulting to better authentic and engaging interactions.

3. Intelligent Tutoring Systems (ITS)

Intelligent Tutoring Systems (ITS) are AI-based platforms which are designed to offer personalised guidance and feedback to pupils, mimicking the role of human tutors. ITS can offer real-time assistance and explanations, identify misconceptions and suggest relevant resources for further study (Adams et al, 2020). These systems can engage pupils in interactive problem-solving activities, simulations, and virtual experiments, fostering active learning and critical thinking skills. Also, ITS can monitor pupils' progress over time, enabling teachers to intervene when necessary and adjust instructional strategies correctly.

Challenges of Artificial Intelligence to Teaching and Learning in Primary Schools

Some of the challenges of artificial intelligence to teaching and learning in primary schools include:

1. Limited Ease of Accessibility:

Despite the enormous benefits AI offers, the permanent integration of AI in education may lead to limitations for some learners. In developed countries, issues such as smartphones, other forms of gadgets and internet connections which promote the activities of artificial intelligence are easily accessible.

However, in developing countries, this certainly is not the case. Socio-economic status and geographical location can serve as limitations in the adoption of AI in education (Awofiranye, 2024).

2. Inadequate Preparedness of Teachers

The integration of AI into the educational system shows that caregivers will need to be adequately trained and prepared for its purpose to be actualised. Giving adequate training and support for teachers is essential for the successful implementation of AI in education. Sadly, this may require some funds which are hardly available. Due to the high technology that AI attracts; continual practice is required to help teachers understand how it works as well as its application in classroom setting. Presently, many teachers lack training in this area.

3. Ethical Issues:

Another challenge in utilising AI in the educational system concerns ethics and transparency in the collection and use of information. The integration of artificial intelligence in education raises ethical concerns as it depends on data to function effectively (Holmes et al, 2019). Thus, issues such as personal data, data privacy and ownership as well as confidentiality need transparency, and ethics. These factors have to be carefully considered to avoid breach of trust or damage / disdain to one's belief or right.

Human Capital Theory by Adams Smith (1776), developed by Gary Becker (1964)

Adams Smith in 1776 postulated the human capital theory which was later developed by Gary Becker in 1964. The theory stipulates that man's ability to perform different tasks is dependent on the skills and knowledge inbuilt in him and external forces such as education, training and incentives which help to improve his qualities. Human capital theory connotes the combined stock of competencies, knowledge, social and personal attributes embedded in an intrinsic measure of economic value. It considers people as economic units who are important in an economy.

The primary concept of human capital theory is that investments in people can be ascertained dependent on the economic value that they are able to contribute to the society. Owhondah (2018) states that, in every society, there is the dire need for growth; hence, human capital theory establishes that there is a major connection between the growth in the stock of a nation's human resources and the growth of national output. It is thus beneficial that societies, which want to achieve a specific level of socio-economic manpower resources, invest in their human resources. The scholar further noted that the educational system should be able to produce the right type of manpower (graduates) in the right proportion and values for national development.

This theory assumes that skills and competences achieved by people (e.g. pupils) are factors of production such as machine and environment. This proposal of human capital theory acknowledges that human resources are invaluable assets to a society that tend to enhance its productive capacity, which follows that human capital forms the ingredients that enable all other resources to survive. Consequently, this can only be functional when pupils are optimally developed and utilised. The theory also takes into cognisance the efforts of teachers in a system of education such as primary schools, making use of AI in the course of actualising quality education, which involves proper AI programming and communication, care and time. At the end, pupils who have passed through effective teaching are qualified as part of capital resources that can be appropriately utilised.

This theory is further relevant to present study as it relates to the proper development of pupils using contemporary technologies such as AI softwares in computers and machines by teachers in schools for a better society. Consequently, human resources will be effective when teachers are allowed to

intelligently and morally guide their pupils using AI prescribed technologies such as the natural language processing (NLP). This helps in ensuring quality outputs in institutions of learning which benefits the society.

Conclusion

The integration of artificial intelligence in primary school education holds immense promise for revolutionising teaching and learning processes. By leveraging AI powered tools and platforms, educators can personalise learning experiences, enhance learners' engagement and teaching methodologies for better teaching and learning outcomes. As much as there are prospects and challenges involved with the integration of AI in teaching and learning in primary school education, the benefits outweigh the risks. By responsibly embracing AI technologies and proactively addressing challenges, educators can unlock new possibilities for facilitating the quality and effectiveness of primary school education in their localities, ultimately empowering learners to thrive in an increasingly digital and technologically interconnected world. Among the prospects of AI in primary school education are personalised learning, natural language processing and intelligent tutoring systems while its challenges include limited ease of accessibility, inadequate preparedness of teachers and ethical issues.

Recommendations

i. Professional development and training programmes should be provided for educators to build their capacity for effectively integrating AI tools and resources into primary school instruction, assessment and curriculum development.
ii. There should be development of a comprehensive AI integration strategy by government, aligned with the goals and priorities of primary school education in Rivers State, encompassing infrastructure development, capacity building and stakeholder engagement.
iii. Primary schools in Rivers State should establish partnerships with AI technology providers, educational institutions and government agencies to access funds, technical expertise and support for implementing AI programmes.

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