Insights into the Readiness of Tertiary Institutions in Deploying Artificial Intelligence to the Geography Curriculum in Nigeria

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Abstract
The deployment of complex artefacts such as Intelligent Computer Aided Instruction, drones, driverless vehicles and robots in human endeavours suggests that Artificial Intelligence (AI) in near future might become a big market place. To this end, this paper presented useful insights toward the preparedness of tertiary institutions in deploying AI for sustainable education in general and to the teaching and learning of Geography in Nigeria in particular. Attempt was made to define AI as distinct discipline, device, machine, systems and as program/application/software. Advantages and challenges of deploying AI in the teaching and learning process followed. Then, critical success factors in deploying to the Geography Curriculum. This study supports the creation of human-controlled as opposed to self-governing AI. The model to be adopted notwithstanding, geography lecturers will assume the roles of facilitators and give supports, while the role of AI will be that of an efficient assistant geography lecturer. Useful recommendations were offered to stakeholders in order to reap the benefits inherent in deploying AI to the Geography Curriculum in tertiary institutions in Nigeria.

Keywords: *Artificial Intelligence, Classroom Instruction, Curriculum, Geography, Tertiary Institution*

Introduction

The application of Artificial Intelligence (AI) for sustainable education appears to be virtually new in this developing part of the world. Yet, it has been in existence in the developed world since 1956, when Al was coined and founded by John McCarthy at the Massachusetts Institute of Technology. Perhaps, the haziness of AI could be as a result of several nomenclatures it was given. As reasoned by Boulay (ND) the field of Artificial Intelligence in Education (AIED) has been in existence for about 40 years and operated under various other names, the most common of which is Intelligent Tutoring Systems. However, with the advancement and recently the deployment of ubiquitous complex as well as complicated artefacts such as Intelligent Computer Aided Instructions, drones, driverless vehicles and robots (sex robots inclusive) in virtually all human endeavours might be suggested that AI in the next twenty years might become a big market place. The big question now is, what is AI?

Several attempts were made by scholars to define AI as a distinct academic discipline, device, machine, systems and as program/application/software.

- As a discipline, Beal (2017) defined AI as the branch of computer science concerned with making computers behave like humans.
- As a device and/or software, Athanasios & Rodi-Elein (2012) defined AI as agents that can be either in a physical form of the device (such as humanoid robots) or in software form with 'intellectual' capacity (such as a virtual avatar). It is usually defined as the study and development of intelligence agents that can perceive their environment and take actions that increase their possibilities of success (Russell & Norvig, 2003).
- Another scholar, Shukla & Jaiswal (2013) saw "AI as the study of ideas to bring into being machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention. In some books, authors defined AI as systems that combine sophisticated hardware and software with elaborate databases and knowledge-based processing models to demonstrate characteristics of effective human decision making.
- AI traditionally refers to an artificial creation of human-like intelligence that can learn, reason, plan, perceive or process natural language. These traits allow AI to bring immense socioeconomic opportunities, while also posing ethical and socio-economic challenges (Internet Society, 2017).

Arising from these definitions, AI, often referred to as Machine Intelligence (MI) can be defined as any devise, machine, computer, computer controlled robot, system or software that can reason, decide and perform specific task in a manner that is similar to human brains. It mimics human intelligence in solving a given problem.

Presently, AI is quite visible in almost all fields of human endeavours such as medicine, manufacturing, business, commerce, surveying, surveillance, military and para-military. This is in tandem with Shukla and Jaiswal (2013) position. According to them, Al has been used in a wide range of fields including medical diagnosis, stock trading, robot control, law, remote sensing, scientific discovery, industries, transportation, telecommunication, music, aviation, news, publishing & writing, games and toys.The greatest advances in AI occurred in the field of games playing, when an AI chess powered program (Deep Blue) defeated grand game masters including Kasparov, the then world chess champion in 1997. In Nigeria, attempt was also made at developing a software (named Awale) to play the traditional game often referred to as "Ayo Olopon" in the Yoruba land, Southwest, Nigeria. On 23rd January, 2018, it was reported that machine powered by AI programs built by Alibaba (an American company) and Microsoft performed better than humans in a high-level Stanford University (California) Reading Comprehension Test.

According to Beal (2017) Al areas of specialization include the following.

- Games playing: programming computers to play games against human opponents.
- Expert systems: programming computers to make decisions in real-life situations (for example, some expert systems help doctors diagnose diseases based on symptoms).
- Natural language: programming computers to understand natural human languages.
- Neural networks: Systems that simulate intelligence by attempting to reproduce the types of physical connections that occur in animal brains.
- Robotics: programming computers to *see*, *hear and react* to other sensory stimuli.

Advantages and Challenges of Artificial Intelligence
Like any other systems, AI has many advantages and challenges. According to Shukla & Jaiswal (2013), one great advantage of deploying AI in the teaching and learning process is

tireless performances of tasks unlike human beings. With AI, copying and duplication of task-performance become easier. Thus, AI can be utilized in the completion of repetitive and time-consuming tasks efficiently. Secondly, AI can endure the hostile environment of the interplanetary space. Intelligent robots can also do certain laborious, painstaking and dangerous tasks. For instance, robots can be programmed to explore space, to reach the Earth's nadirs, to dig for fuels and mining purposes. Thirdly, with an artificial mind, it is more about making logical and feasible decisions and lesser about giving into emotions. Sentiments are associated with moods that affect human efficiency. This is not the case with machines with AI. The disadvantages of deploying AI in the teaching learning are enormous. The first concern raises big questions about ethics and moral values of deploying AI in the teaching and learning process. Is it ethically correct to create replicas of human beings? Do our moral values allow us to recreate intelligence? The second concern is about the thinking that machines lack a creative mind. Human beings are emotional intellectuals, their feelings guide their thoughts. If robots begin replacing humans in every field, it may lead to unemployment. Lastly, there is the imminent risk of a loss of data, in certain cases, due to the malfunctioning of certain components. There is also a fear of robots superseding human beings. Ideally human beings should continue being the masters of machines. If things turn the other way round, the world will turn into chaos. Intelligent machines may prove to be smarter than us; they might enslave us and start ruling the world. Man's greedy creativity may endanger mankind.

Literature Review

The literature is replete with scholarly articles on AI. For instance, the Internet Society (2017) said AI is rapidly advancing technology that may soon have significant impacts on our everyday lives. While Athanasios & Rodi-Elein, (2012) asserted that the nature of technology has changed since a few years after. Artificial Intelligence in Education (AIE) was conceptualized as separate research community. AI techniques in education were claimed to create powerful learning environments and to increase positive interactive experiences for all students. Some of the most typical AI applications in the educational field involve knowledge representation, intelligent tutoring, natural language processing and autonomous agents. Kose & Arslan (2015) added "nowadays, artificial intelligence supported e-learning scenarios are widely employed by educational institutions in order to ensure better teaching and learning experiences along educational activities".
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Talking about deploying AI in tertiary institutions, Popenici & Kerr (2017) explored the phenomena of the emergence of the use of AI in teaching and learning in higher education. These scholars pinpointed some challenges for institutions of higher education and student learning in the adoption of these technologies for teaching, learning, student support and administration and explored further directions for research. Another authors, Murayama & Gong (2016) researched into utilizing the Deep Machine Learning (DML) to simulate and predict the mechanisms of urban expansion and evolution. The scholars concluded that DML is a powerful and robust tool in analyzing and predicting the statistical, geographical and multispectral optical big data. We can predict and simulate urban expansion and evolution (geographical big data) in more reasonable and scientific method with deep learning.

It is clear that employment of AI in education has given many advantages to teachers and researchers and enabled them to solve many teaching/learning oriented problems or unclear issues. Today, educational institutions often prefer designing AI supported e-learning scenarios and applying them in different courses or educational activities in order to improve teaching and learning experiences (Kose & Arslan, 2015). However, Internet Society, (2017) cautioned that Several issues must be considered when addressing AI, including, socio-economic

impacts; issues of transparency, bias and accountability; new uses for data, considerations of security and safety, ethical issues and how AI facilitates the creation of new ecosystems.

Critical Success Factors in Deploying AI to the Geography Curriculum in Tertiary Institutions in Nigeria

If Nigeria will not be left out in the crave for technology driven education, the following critical success factors in deploying AI to the Geography Curriculum in her tertiary institutions should be seriously considered.

   i. *Infrastructure:* the important infrastructure needed in deploying and utilizing AI in Nigeria relates to steady supply of power (electricity or solar energy) and telecommunication connectivity. As such they must be adequately addressed. Maintenance is also of relevance while deploying AI. Upgrading of the AI is another important factor. The systems itself, technology and data therein contained should be easily upgraded. Another closely related critical success factor to infrastructure is that of end-user's satisfaction about AI.

   ii. *End-users Satisfaction about the AI:* this concerns the aspect of end-users accepting the AI. End-users, in this study include the following. Lecturers who will now play the role of facilitators. Students preparing to write Unified Tertiary Matriculation Examination, polytechnic and monotechnic students, students at colleges of education and undergraduates as well as postgraduate students at universities in Nigeria studying Geography. School administrators such as principals, rectors, provosts and vice chancellors; geography curriculum planners and developers. Comments and observations of end-users about AI must be taken seriously and promptly attended to; hence, end-users may lose confidence and conclude that the AI is a ruse and may not use it, even when it is beneficial to them. This raises issues bordering on moral and ethics.

   iii. *Moral or Ethical Issues:* the issues surrounding ethical and moral issues of AI could be explained with these three schools of thought. The three distinct schools of thought concerning ethical and moral issues in the deployment of AI in the teaching and learning of Geography in higher institutions are as follow. (a) Positive School of Thought: this group of scholars is of the opinion that the society can develop by reaping the advantages, resources, products, services and possibilities offered by the AI. They support the creation of AI that can think and mimic human intelligence. (b) Permissive School of Thought: this group neither supports nor opposes deploying AI in the teaching and learning process. According to this group the AI may be created, but must not be autonomous. It should be controlled by humans. (c) Negative School of Thought: the scholars in this group are of the opinion that unemployment is pervasive and that larger proportion of the world's population are living in poverty, needless to create machines to compete for the few available jobs. This group vehemently oppose the creation and deployment of AI. This study supports the Permissive School of Thought, that is, there is no hype about creating and deploying AI. However, it must be subjected to human control.

   iv. *Content Development:* the language should not be too technical while, at the same time not sacrificing important geographical ideas, concepts and theories on the platter of simplicity. Mode of Instruction: the teaching strategies and methods must take into cognisance the peculiarity of students: Urban/rural, IQ and Age. Even, students with disabilities must be adequately considered. This is in tune with Gbadamosi (2010) who

averred that "for pupils with emotional and behavioural difficulties, (using AI powered) Computer-Assisted Instruction (CAI) can offer pupils a non-threatening or non-judgmental situation; allow pupils to be motivated and offer opportunities for success", Just as Oladapo (2016) asserted that critical thinking stimulate the interest and develop students' power of independent, unbiased, reflective and rational thinking. Oladapo & Ogundele (2017) also stated that "with geographical enquiry, students learn about and deepen their understanding of Geography; they can analyse, interpret and challenge data; thus trainee geographers can make sense of big ideas such as environmental sustainability, interdependence and globalization". Another important aspect of content development is local content. The larger percentage of teaching resources (realia inclusive), texts, illustrations, examples, graphics, animations, sounds and videos must be home borne, that is, geographical natural and artefacts found within and located in Nigeria. At this juncture, it is also pertinent to discuss the geography curricular as an important critical success factor while deploying AI.

v.   *Geography Curricular:* the input into AI systems must be in tandem with Geography curricular as prepared by the National Commission for Colleges of Education (NCCE), National Board for Technical Educational (NABTE), National Universities Commission (NUC) and National Education Research and Development Center (NERDC). These curricular must also be in tune with the significant themes of Geography. Aspects must relate to the variegated aspects of Geography. This include the following: Physical, Human, Regional, Environmental Studies, Mapping and GIS applications. The curricular must focus on how students can develop spatial descriptive, interpretative and analytical techniques. AI must be conceived and developed in such a manner that the curricular are fitted into it and not fixing the curricular into AI.

vi.   *Monetary Cost must be Affordable:* the monetary cost of developing, maintaining, upgrading and deploying and utilizing AI systems must not be prohibitive. Rather, it must be affordable. One way of reducing cost of procuring AI is to go for the 'clone type' as opposed to the expensive customized or branded type. The greatest advantage of clone type over the customized type is ease of upgrading. Another is the cheaper cost of maintenance.

Conclusion
This study supports the creation of human-controlled as opposed to self-governing AI. If AI systems were subjected to human control, this will dowse the tension of the possibility of AI overruling us. The model of AI to be adopted notwithstanding, the roles, responsibilities and duties of geography lecturers will not be eroded rather they are still active. They will assume the roles of facilitators and give supports. Amongst other things, they are to start, boot or upload/download the AI and to facilitate its regular and routine maintenance. Geography lecturers will also be responsible for upgrading where and when necessary and to ensure that there is no disconnect between instructions delivered by AI and available Geography texts. Accordingly, existing Geography textbooks, monographs, pamphlets and tutorial materials must be revised or be completely re-written. These texts should supplement the classroom instructions delivered by the AI. The role of AI will be that of an efficient assistant geography lecturers.

Recommendations

Despite the potential advantages of AI, stakeholders, governments, researchers and industries have significant role to play in order to reap the benefits inherent in deploying AI to the Geography Curriculum in tertiary institutions in Nigeria.

i. Research and industry should focus on designing and deploying AI that strictly adhere to the principles and standards of ethical considerations.

ii. Providers of AI must take into cognizance the peculiar characteristics of students. They should be able to interact, request and receive feedback as well as being able to engage AI in meaningful dialogue. It should be student focused. The end-users' safety and security should not be compromised.

iii. Humans must be in control: that is, Geography Lecturers could interrupt an activity or shutdown the systems ("off-switch"). This is important in AI systems design, especially where the risk to human life and safety are concerned. Autonomous AI systems should be monitored while in operation and updated or corrected when needed.

iv. Students should not be carried away with the AI interface. Rather they should be attentive and concentrate on the contents that it delivers.

v. Geography lecturers should be trained and re-trained about the utilisation, maintenance and upgrading of AI. Geography lectures should also be active in the revision and re-writing of Geography textbooks.

vi. Curriculum planners, developers, school administrators, geography lecturers, local inspectors of education, states and Federal Ministries of Education, NCCE, NABTE, NUC and NERDC should be actively involved in initiating, developing, deploying and monitoring of geography curricular which will serve as major input into the AI.

vii. The public, stakeholders and civil organisations should be made to understand AI-enabled teaching and learning and how they work. This is important in ensuring trust, acceptance and satisfaction about the technology.

References

Athanasios, S. D. & Rodi-Elein, I. 2012. "Artificial Intelligence in Special Education: a decade review".. *International Journal of Engineering Education,* 28(6), 1366–1372.

Beal, V. 2017. What is AI? Downloaded on 10th November 2017 from https://www.webopedia.com/author/vangie-beal

Boulay, B. (ND). Artificial Intelligence as an effective classroom assistant[1.] Downloaded on 22nd November, 2017 from B.du---Boulay@sussex.ac. uk

Gbadamosi, R. K. 2010. Effects of Computer Assisted Instruction (CAI) on the academic achievement of learning disabled pupils in selected primary schools in Ibarapa East Local Government area, Oyo state, Nigeria. An unpublished M. Ed dissertation submitted to the Department of Teacher Education (Educational Technology) University of Ibadan, Ibadan, Nigeria.

Internet Society, 2017. Artificial Intelligence and Machine Learning: Policy Paper. Downloaded on 22nd November, 2017 from Internetsociety.org

Kose, L. U. & Arslan, A. 2015. "E-learning experience with Artificial Intelligence supported software: an international application on English Language Courses". *GLOKALde,* 1(3), 6-74.

Lynn, B. 2018. Artificial Intelligence beats humans in major reading test. Downloaded on 25th January, 2018 from https://www.learningenglish.voanews.com

Murayama, Y. & Gong, H. (ND). Machine Learning in Geoscience.

Oladapo, O. S. 2016." Improving the teaching and learning of higher education Geography through geographical critical thinking", *Ibarapa International Journal of Multi-Disciplinary Research and Development*, 1(1), 145-152.

Oladapo, O. S. & Ogundele, A. T. 2017. Teaching and learning of higher education Geography through Geographical Enquiry" in Oke, T. D., Odule, C. Y. and Filani, J. B. (Eds.) in Issues in Teacher Education in Nigera. 145-158.

Popenici, S.A. D. & Kerr, S. 2017. Exploring the impact of Artificial Intelligence on teaching and learning in higher education. Downloaded on 22nd November from Research and Practice in Technology Enhanced Learning, 1-13.

Russell, S. J. and Norvig, P. 2003. *Artificial Intelligence: A Modern Approach* (2nd ed.), New Jersey,

Shukla S. S. and Jaiswal V. 2013. Applicability of Artificial Intelligence in Different Fields of Life. International Journal of Scientific Engineering and Research (IJSER) www.ijser.in, 1(1), (Online): 2347-3878.

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