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All correspondence should be directed to:

Editor

Prof. S. D. Osaat

Department of Educational Foundations

University of Port Harcourt, P.M.B 5323, Port Harcourt, Rivers State, Nigeria.

Sunday.osaat@uniport.edu.ng

osaatsundan@gmail.com

+234 803 673 1057

+234 703 440 6894

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Analysis of Artificial Intelligence and the Burden of Developing Critical Thinking Skills among Undergraduates in Nigerian Universities – Some Ethical Considerations adoption

Prof. C. P. Enemuo

Department of Educational Foundations
University of Nigeria, Nsukka
peter.enemuo@unn.edu.ng

Jordan C. Ogoke

Department of Educational Foundations
University of Nigeria, Nsukka
jordanchuks85@gmail.com

&

Nathaniel T. Igbangi

Department of Educational Foundations
Federal University of Kashere
nathanieligbangi@fukashere.edu.ng

Abstract

The centerpiece in the discourse unfolded in this paper is the advent and integration of Artificial Intelligence (AI) into our education landscape. This advanced technology has the ability to enhance man's capabilities irrespective of field of endeavour. Given the fact that: thrust upon man now is the citizenship of the twenty first century (otherwise the information age) and that quality citizenship demands that the future workforce of the age of which undergraduates form the fulcrum should be upbeat, a need has arisen that the universities (being at the apex of preparing this workforce) should hone in the requisite skills one of which is critical thinking needed to drive creativity which serves as the joystick and anchor in the quest for knowledge-based economy. But notable in this integration effort is the brazen error whereby instead of deploying the AI as an assistive tool it is related to as though the long-awaited solution provider. This has raked up in its wake, ethical issues besides over reliance on, a surrender of initiative to, the AI tools and consequent intellectual complacency; thus, raising fears about its safety, propriety and the likes. Using the analytic method approach in philosophy and using such questions like: what is AI, what is critical thinking skill and the likes, the researchers focusing on the leading variables of the study arrived at some finding/conclusions. One such finding is the evident lack of requisite quality personnel to drive the integration process. One consequent recommendation is a call for robust plan for the re-skilling and up-skilling of personnel already in the field and prospecting, with a corresponding retooling of their work environment for new and better services delivery.

Keywords: Artificial Intelligence (AI), Undergraduates, Critical thinking Skills and Ethical Consideration

Introduction

Globally, it is never in doubt that education is strongly held out as an instrument *par excellence* for driving national development and growth. The university institutions, no doubt also globally, are at the apex of any nation's intellectual development organ. They stand out at the forefront as the font and creator of knowledge, its collator, preserver and transmitter¹. With their jobs already well delineated and cut out, they owe it as a duty to hone the citizenry into a corps of analytic, constructively critical, independent-minded persons capable of holding their grounds against rigorous demand for the basis; interrogating inherited assumptions and doctrines. They thus can no longer be seen again as people given to sheepish conformism to the dictates of questionable authorities; all a proof of people liberated from the yoke of the past.² The universities, saddled with such onerous tasks and responsibilities have as their front-line targets the undergraduate students. They have assembled in the hope to be assisted by way of training in relevant skills acquisition relative to their circumstances to be able to navigate through the rigours of the present and future endeavours. The ability to effectively deliver on this all-important role in the current era would as a matter of necessity require the universities to leverage many relevant technological amenities, prominent among them and particularly singled out because of its character of contemporariness is the artificial intelligence, otherwise acronymned AI. Before proceeding further, let us pause and give ourselves a guided, constructive clarification of some of the key concepts and terminologies in use in this discourse. If for nothing else, it is at least to aid conceptualization, intelligibility and flow of thoughts. In this regard, the authors are mindful of such concepts and terms as AI, undergraduates, critical thinking skills and ethical considerations.

What is AI (Artificial Intelligence)? By way of Extension – its typology and Uses

Recently, AI has emerged as a major innovative and transformative force in the education landscape worldwide with indubitable prospects of challenging and changing radically the way we not only orchestrate our teaching/learning process but also the way we design and conduct even researches in education. Yet the question remains unanswered: what is AI – one may still ask?

In this regard, it must be pointed out that there is a marked absence of a commonly accepted definition of what AI stands for. Yet any inquirer that takes a critical and studied look at the gamut and ramifications of definitions on offer, would readily discover a common strand trending. For instance, scholars like Kaplan et al³ view artificial intelligence as sets of systems tools designed to have the capacity to perform varying sets of tasks ordinarily and typically requiring human intelligence. Seemingly flowing from the above line of thought Cena⁴ considers artificial intelligence to stand for any simulation of human intelligence process by machines encompassing performance of such tasks *inter alia* as learning, reasoning, problem-solving, estimating and decision making. Indeed, and contextually too, artificial intelligence is any form of simulation of the human intelligence and its processes using any device especially the computers. In this regard, the word 'simulate' is connotatively suggestive of imitation or the 'donning' of a veneer of appearance of something by something else; in this case, of human intelligence by something else. The phrase 'simulation of human intelligence and its process' in artificial intelligence definition goes to point at the intrinsic, latent profound possibilities and opportunities that abound with the advent of artificial intelligence as well as paint a picture of the enormous important roles that AI could play in the various sectors of human endeavour including teaching and learning.

The artificial intelligence, though capable of being involved in different fields and sectors of human enterprise, comes in different forms. Their classification is based on functions and capabilities noted Baires Dev Team⁵. These are the ‘reactive’, the limited memory’, ‘Theory of Mind’, Self-Aware’ ‘the Artificial Narrow Intelligence’, ‘Artificial General Intelligence’, and ‘Artificial Super Intelligence’ all artificial intelligence related tools.

By way of setting forth even if a cursory bird’s eye-view in function in the foregoing typology, while the ‘Reactive Artificial Intelligence’ by design performs specific tasks once fed with the needed datasets, even if and so long as the datasets do not vary in future, it yields similar results. This is because it is deficient in long term memory, the ‘Limited Memory’ artificial intelligence on its part seems better adapted for data configuration and analysis. Accordingly, it assists in decision making, though to the extent of the data it is fed with. The ‘Theory of Mind’ Artificial Intelligence machine proceeds, making use of datasets fed into it for purposes of decision making and intelligibly laying bare the processes in a way human beings can understand and follow. There is also the ‘self-aware’ artificial intelligence which both Coursera⁶ and Baires Dev. Editorial Team⁷ commonly view as starts off working on a cognition of itself first, picturing and figuring out how best of what may be required for an improvement leading to a better self. The “artificial narrow intelligence (ANI) AI, seems somewhat close to the reactive AI. This is because it works focusing on given datasets geared towards specific task assignment, ensuring that all fed into it is translated into attaining the purpose of that specific task assignment. For purposes of executing tasks involving reasoning, decoding abstract concepts and drawing conclusion from the insights offered and using same to perform fantastically complex tasks just as humans do, this is the domain of ‘artificial general intelligence (AGI). And quite unlike the AGI, the ‘artificial super intelligence’ AI machine operates in the domain of science fiction. Moving at a pace and doing things that transcend the human intelligence, it keeps the human mind reeling in wonder on the creative ingenuity of man.⁸ Even with the foregoing (quite a number one would say) we cannot pretend to lose sight of the one general and more popular (popular in the sense of its resonating appeal to people in the field of education) namely the ChatGPT and its associated tools. The ChatGPT (chat generative pre-trained transformer) AI tool is known for its versatility. It is in use in the military, all ramifications of science, agriculture, aviation, healthcare and the likes. In the field of education noted Ogbonnaya it can be used in curriculum design, lesson plan design, teaching, learning, research hypothesis formulation, data analysis and interpretation. It can assist in providing leads to relevant sources of information such as textbooks and literary materials⁹.

All these ramifications in typology and uses of AI notwithstanding and by whatever name called or labeled, they are all assistive tools. They do not by themselves generate the information they churn out. They rather use whatever datasets are fed into them and generate doses of information to help us do what we want to do. They thus help us to enhance our capabilities.

Recently in Nigeria, though AI integration into the education subsection of the economy remains a mute programme the prospects of going AI in teaching and learning have not gone unnoticed by institutions especially the universities. One important feature of AI is its ability to simplify the process of doing research, sifting through mass of educational resources and data available electronically. In addition, studies abound attesting to AI relevance in schools and the universities especially given the role it plays in providing flexible teaching and learning opportunities through the use of such innovative ChatGPT related tools as the Sakit learn, Tensorflow, Pytorch, the CNTK, Apache MxNet, Keras, Open NN, Auto N2, Open AI,

H₂O, Quintox, Grammary and the likes. Integrating AI into the education system, therefore, has all it takes to make education more accessible, inclusive and progressive, helping to bridge the gap in educational opportunities by providing even children in remote areas with access. All these innovative AI assistive tools are targeted at encouraging a more personalized learning for students irrespective of cadre.

But since our focus is on undergraduates, it has to be remarked that resort to these tools provides innovative teaching methods, as well as, promote information-driven insights about their learning behaviours and outcomes. There is no doubt that integrating a range of AI tools into teaching for the specific purpose of seamlessly navigating the complex process of learning marked the beginning of AI-assisted learning in universities. We shall pause at this juncture to give ourselves a contextual and abiding picture of who the major stakeholders/figures of this AI discourse is (are): undergraduate(s).

Who are Undergraduates? What is their Stake and Role in Education for National Development and Growth?

These are young persons and they constitute the greater percentage of any given population especially in developing and under-developed economies. Even the ancient Greek educational philosopher, Aristotle (C.384 – 322BC), in his educational reflections made it clear that the first arsenal in the armoury of governance must be education and the target of that education process is the youths. Accordingly, the education of the youths must take the front burner position and made a state priority. For him the type of education given to this class of persons is a mirror to the quality and type of society that the polity craves for and indeed has¹⁰. This educational idea as to the target of education – the youths – catches up with the picture of undergraduates in our time. There is need to have some insights into who are undergraduates and their individual learning nuances. Undergraduates are such young men (viewed generically so) involved in programmes that are on offer in any post-secondary education institution. Such post-secondary school institutions are better referred to as tertiary institutions. The duration of their programmes and the certificates awarded vary according to countries, institutions and even in number of years. In a country like Nigeria, undergraduates include students in post-secondary educational institutions besides the universities. Taking cognizance of the Nigerian tertiary institution paradigm, Okojie¹¹ views undergraduates as all enrolled in the universities, polytechnics, or the colleges of education pursuing a bachelor's degree or the Higher National Diploma (HND) or the Nigeria certificate in education (NCE) in various fields. On his part, Ugbagir¹² views undergraduates as individuals currently involved in known academic programmes either in a polytechnic, college or the university, leading to the award of a bachelors' degree, a diploma or a Nigeria certificate in education. Inferring from the foregoing, and for our context, is that undergraduates comprise all current students attending academic programmes leading to the award of the bachelor's degree or its equivalent irrespective of the number of years, which often ranges from two to five years. As a pathway to upward social mobility, strong emphasis is placed on the acquisition of university qualifications in Nigeria. Thus, any description of undergraduates is often characterized by their pursuit of tertiary education qualifications in various fields and skills considered essential for professional development as well as relevant to societal advancement. This is one of the major reasons why undergraduate experience is considered a very important stage of learning of the 21st century Nigeria. What is more, constituting more than half of Nigeria's population of two hundred million with age range of between 18 and 29¹³, the expectation is warranted that Nigerian Universities, like universities worldwide, ought to be seen leveraging on important educational innovations such as the AI to enhance learning and development of relevant skills acutely needed in the pursuit for relevance in the

information age foremost along this line is the critical thinking skill (CTS). What is critical thinking skill (CTS) one may ask?

Critical Thinking: What?

In a world characterized now as the information age with its concomitant cutting edge technologies, the quest for relevance and rightful place in the comity of nations pushing for attainment of knowledge economy is only assured to nations that have taken time and means to have critical thinking skill ingrained in the population assembled for that purpose of integration into the state workforce. Critical thinking is a part of the very relevant core skills required for relevance for the 21st century. It is among the central focus of policy makers and educators enamoured with patriotism and state concern noted Anan-Brew et al¹⁴.

The skill is considered very important as it can enable the undergraduate students to seamlessly wade through the inevitable emergent rigours of life in the information age while on campus as well as innovate in their respective future careers. In a technology–driven world with abundance of datasets, learners need not to only acquire knowledge but should also be able to creatively and critically interrogate, evaluate from different perspectives before applying it in diverse contexts¹⁵. Literature with stress on critical thinking demonstrate abundantly that critical thinking provokes and demands the in-depth cognitive involvement, disposition and rigorous commitment so that the mind can be guided in an infallible knowledge detached even from the physical world of reality¹⁶. Such is the attitudinal disposition needed and called for active and dexterous conceptualizing, analyzing and evaluating of information to logically and rationally reach an informed decision on problem situations.¹⁷.

Given that we live in a world characterized by dynamism and daunting challenges, the society has cause to see to it that critical thinking skills our undergraduates need to be able to generate novel smart ideas and find solution to new challenging situations become ingrained at this formative period. Thus, developing the skill in them is one of the very important roles of educational institutions like the universities. This forms a firm basis for the continual re-evaluation of learning in the universities for transformation both of the workforce in the making in particular and the society at large. We shall pause again to, even if briefly, present a bird's eye view of fears and worries about the integration and application of AI into our education pedagogy. This is by way of drawing attention to ethical considerations.

Fears and Worries of AI integration in Education Pedagogy: Ethical Considerations

Even with all the breakthroughs, the assurance of capability boosting and promises of more benefits to unfold following the integration of AI into our education pedagogy, the true sad fact constituting a ground of worry and fears giving rise to some concern that the advent of the AI does not denote a brave new world of similes and advantages absolutely to every person (natural and juristic) alike is active. The AI fundamentally and primarily is an assistive tool supposed to serve in the capacity of a backup, but from the way and manner of its engagement so far, people view and relate to it as if it was the long-awaited solution provider. This has resulted into evidence of massive abuse, a factor that has given rise to the need for norms and rules, a framework to regulate its use and engagement, otherwise ethical considerations.

Concern for a framework of principles and guidelines specifying what constitutes good morals, justice, fairness, duty and obligations towards stakeholders in the same orbit of AI operations is what we refer to hereon as ethical consideration. Leaning on experiences of yesteryears, the UNESCO as a body has drawn up ethical recommendations and guidelines to

serve as setting bounds to both service providers, consumers and all who form part of the stakeholders in this regard. The basic thrust is on the implications arising following the integration of the AI and its associated tools into all fields of human endeavour besides the educational fields, especially as and when such impinge on the need to protect intellectual property rights, data privacy, transparency in the algorithmic procedures and processes that may lead to importing of probative values/meanings into real time data¹⁸. Ignoring the inherent challenges, intrinsically adversarial, may scuttle the pursuit of critical thinking skill that is of utmost demand in the twenty first century workforce.

Discussion

Despite the many and varied significant strides one stands the chance of benefiting from sequel to the integration of AI into our educational pedagogy at the university level, the fact remains that such integration is also up against some daunting challenges capable of rendering all attempts nugatory. This is owing to the fact that AI seems to inadvertently present unintended face in the quest for development of critical thinking skill among undergraduates. By way of illustration, in the first instance, opportunities for developing critical thinking skill, an essential component of the university education, appear to be under attack by the very nature of the AI-driven educational tools.

The AI-driven educational platforms and tools are known to provide automated and ready solutions or feedbacks^{19 20}. One of the most visible problems that the above identified feature of AI-assisted learning presents is that, in most cases, it leads to a shallow engagement with learning resources because students incline to prioritize convenience over the needed rigorous intellectual engagement (a prerequisite for development of critical thinking skill). This can work to greatly reduce actual opportunities for undergraduates to grapple with the complex social and academic problems usually requiring or involving rigorous cognitive processing. This could lead to over-reliance on the AI systems since they can provide instant learning solutions and/or feedbacks.

Wherever and whenever the phenomenon of over-reliance sets in, it induces a great deal of intellectual complacency among undergraduates. This diminishes their level of active cognitive engagement in academic activities. This is all sequel to the convenience of automated answers or feedbacks that the AI learning tools readily provide. Over-reliance on AI learning tools is also capable of reducing any chances for these undergraduates to engage in the rigours of critical analysis and synthesis of information. This is because such reliance hands over the actual active cognition, reflection and analysis to the AI tool *per se*. And usually such process of 'land-over-takeover' proceeds without a moderating oversight. This condition is rather a threat than a recipe for developing critical thinking skills among undergraduates who constitute the fulcrum of the nation's future workforce.

Though hinted already, it forebears mention yet that the apparent lack of human oversight and interaction in AI system environment presents yet another significant potential problems with regard to the development of critical thinking skill. Human interaction is a known potent facilitator of critical thinking among learners. While capable of delivering content and evaluations as human personnel do, AI-assisted learning machine generally lacks the ability to engage in contextually meaningful rich dialogues that can stimulate and catalyse critical thinking. Rightly have Ogunleye and Olatunji expressed the view that AI-assisted learning provides limited opportunities for learners to practice and refine their critical thinking skill through interactive and iterative processes particularly because of the absence of human facilitators²¹. This is a pointer to the fact that the role of requisite quality personnel in challenging students with complex problems and fostering a collaborative learning

environment is irreplaceable. No doubt a possible over-reliance on the AI tools as further noted Ogunleye and Olatunji would surely weaken these essential educational interactive and iterative processes.

Conclusions

Artificial intelligence (AI) is now here with us. Its advent and integration into our educative process is certain to revolutionize and shape differently what, and how, we do things in education, an indication that an advanced technology has entered our educational landscape. This innovative tool, with all the significant strides already recorded and promises of more to unfold, is fraught with dangers and, so, calls for cautious safeguards.

Though an assistive tool with all that it takes to enhance man's capability (it can enhance man's productivity as it drives innovation), yet, it is known to trigger on over-reliance because of its ability to provide automated feedbacks and solution to problem situations.

Given the foregoing, it is known to lead to consequent intellectual complacency among undergraduates, thereby stifling the prospects of development of critical thinking skills. This reduction in cognitive engagement, a consequence of absence of human interaction and the likes characterizes the landscape of our effort to orchestrate AI-assisted learning. Timely though, now that the AI phenomenal inroad into our educational space is still nascent, important measures have to be put in place to obviate any obstacles likely to put a clog on the wheel of progress.

Recommendations

In the light of the foregoing insightful clarifications, the discussions built on them and the conclusions drawn up, the authors are compelled to recommend as follows:

- That in-built facility of the AI assistive tools being able to generate automated answers and feedbacks on any given line of prompt has made them a ready resort to even mere casual inquirers. Consequently, there is a noted use of information thus made available most often decidedly unconscionably and, in a manner, amounting to intellectual property violation, invasion of privacy (as occurs even with data sets on health matters, emotions, social relationships biometrics and the like(s) and with all the algorithmic bias most often at best described as opaque because lacking in transparency and accountability. In this regard, there is need for the governments through its various agencies (such as the Independent Corrupt Practices and Other Related Offences Commission armed with its extant National Ethics and Integrity Policy (NEIP)²² document, the National Orientation Agency (NOA), the judiciary, and other regulatory agencies (such as the NUC, WAEC and NECO to work in collaboration with industry stakeholders to work out and enforce a robust policy framework to ensure ethical protection of data privacy and rights.
- Dovetailed to the above is the fact that where infringement or violation has occurred, there must be in place too some framework for review and redress. This is in order to give vent to these hallowed global legal maxims: *ubi lex, ibi justitia* and *ubi jus, ibi remedium* [where there is law, there is justice; and where there is a right, there is a remedy] (when that right is infringed upon). Otherwise, there will be system distrust, a leeway to ethical breakdown.
- There is need for rapid production of skilled manpower to help our undergraduates at this preparatory stage for their joining the future workforce. The advent of the AI-assistive tools and their integration into our education landscape remains hitherto a muted programme of action. There is acute personnel inadequacy. This largely explains

the absence of human facilitators to provide the guide to ensure quality, intelligent interactive and iterative engagements of these undergraduates and the consequent over-reliance on, and surrender of initiative to, the tools. Governments at all levels and stakeholders in the domain of providing educational services at various levels are enjoined to strategize and collaborate to ensure a rapid reskilling, upskilling of the personnel both in the field already and in the making to set this integration on the right footing. This can be done through workshops, short emergency and long vacation programmes.

Flowing from the above is the need for the governments and stakeholders in the field of provision of educational services to ensure that the reskilling and upskilling initiatives should also be matched with retooling of their work environments with state-of-the-art equipment so that they can provide new and better services. In this way, they will promote not just better services delivery and ensure adherence to laid down rules and guidelines in handling the students but also join and remain focused in the task of promoting and supporting the development of critical thinking skills among undergraduates.

- Though it must be acknowledged that in practical ethical checks, some sharp practices may go undetected. But with the rapid programmes of reskilling and upskilling of personnel in the field, (what is more with the retooling of their work environment), while the students use the AI tools to run their assignments, this corps of new breed personnel can also use the appropriate AI tools to check those assignments. With consistency in this approach, the probability in the phenomenon of over-reliance will start diminishing and the rigour in detached cognitive engagement, (a potent facilitator of critical thinking) will be seen picking up again.

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