Artificial Intelligence in the Philippine Educational Context: Circumspection and Future Inquiries

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Abstract- There is no turning back, as the utilization of Artificial Intelligence (AI) into the Philippine educational system has catapulted scholarly discourses on the line. This paper argues on academic concerns and challenges of AI in education (AIED), the initial footholds for data center hubs, potential offerings for enhanced learning experiences, data-driven decision-making, and foreseen opportunities. However, AIED requires a robust technological infrastructure and adequate computing resources aligned with policy frameworks, such as addressing data privacy concerns, the digital divide, and the need for ongoing faculty training and development. This literature review reflects on collaborations between educators and policymakers, focusing on aspects of teaching and learning while leveraging AI benefits, provided that social and ethical implications are carefully established or reconfigured.

Index Terms- Artificial Intelligence in Education (AIED), Artificial Intelligence, Literature review, Philippine education.

I. INTRODUCTION

Intelligence is known to be a power, and, indeed, having such a high level of it has sustained humanity's top position in many fields. Through intelligence we have built innumerable legacies – from a simple wheel to mighty ancient civilizations, from ancient civilizations to the age of renaissance, from the age of renaissance to the age of technological warfare, and now, to the age of unprecedented technology brought by intellectuals who made many breakthroughs and a plethora of unimaginable things even creating a new kind of intelligence that is figuratively similar – in some ways better at brute fast pace – to the intelligence possessed by humans, the Artificial Intelligence (AI), which opined a meta term, the "gift of intelligence from intelligence" per se.

The fourth wave of technology paved the emergence of AI which brought many changes with human activities even replacing humans themselves in automated tasks. Some factories, for instance, use AI instead of human workforce. Many fields had been taken by AI – including education. As thrilling as AI's takeover may sound, does it signify the dawn of a new age and the end of human intelligence? If not, where might all these transformations and unprecedented advancements ultimately lead?

Before diving into the discussion of this paper, we provide a handful AI jargons here are selected items synthesized from Miao, et al. (2021):

Algorithm: A series of computations or set of rules given to an AI, neural network, or machine to help it learn on its own.

Neural Network: A computational model inspired by the structure and function of biological neural networks, used in AI to process and recognize patterns in data.

Machine Learning: A subset of AI that focuses on the development of algorithms and models that allow machines to learn and adapt without being explicitly programmed.

Natural Language Processing (NLP): A branch of AI research that deals with the interaction between computers and human language, enabling machines to understand, interpret, and generate human-like text or speech.

Educational Data Mining: The application of AI techniques such as machine learning, data mining, and pattern recognition to analyse data from educational settings, providing insights and recommendations to improve learning experiences.

 http://dx.doi.org/10.29322/IJSRP.13.05.2023.p.5-11

Adaptive Learning: AI-driven educational technology that personalizes learning experiences by analysing individual student performance and adjusting content, pace, and feedback accordingly.

Intelligent Tutoring Systems (ITS): AI-powered software programs designed to provide personalized instruction, guidance, and feedback to students, simulating the experience of one-on-one tutoring.

Learning Analytics: The measurement, collection, analysis, and reporting of data about learners and their contexts to understand and optimize learning experiences and environments.

Of the terms presented though not exhaustive present adage of AI verse, by interdisciplinary nature AI involves computer science, mathematics, psychology, education, and other disciplines. As a result, different disciplines may define AI in education differently, which can lead to a lack of consensus (Luger, 2009; Taeihagh, A. 2021).

II. Circumspection

As mentioned earlier, the emergence of AI had already made its way on many fields, including education. Undoubtedly, AI is helpful in the education sector especially when paired with a high-quality learning material which will help materials and instructions (Lee & Koh, 2020). As the Philippine government's catapulted the National AI Roadmap and the establishment of the National Centre for AI Research (N-CAIR), demonstrate the country's commitment to embracing AI technology as strategic directions which expected the education to tailor its curricula.

But AI is not a lone-wide-term it conjuncts array of technologies, take for example stepping up for the smart campuses, in the Philippines, universities and colleges are starting to adopt the smart campus concept, leveraging next-generation digital infrastructure technologies such as cloud access control, machine learning, artificial intelligence, big data, and Internet of Things (IoT) to improve operational efficiency and create convenient experiences for students and faculty. Some universities in the Philippines have already begun implementing smart campus approaches, such as the Mariano Marcos State University, which received a grant of PHP24.9 million from the Commission on Higher Education to boost its information technology infrastructure, and the University of Northern Philippines, which has started to implement smart classroom approaches to strengthen the quality and access of learning resources to its students (PNA, 2021; PIA, 2021). Smart campus technologies offer several benefits infused with AI, such as enhancing campus safety, improving user experiences, and personalizing learning and living environments for students.

AI is everywhere. Popular list of various digital tools and resources that teachers and students can use in the academe, including e-learning platforms, digital pinboards, collaborative tools, and lesson planning apps. Additionally, Google and other search engines have become a widely used tool for research by both teachers and students, with 94 percent of teachers reporting that their students equate "research" with using Google (Scijournal, 2022). Other digital tools and resources include flashcard generators and educational quiz apps like Quizlet, citation generators, plagiarism checkers, copywriting tools and even virtual assistants like these digital tools and resources provide a vast amount of information and enable students and teachers to collaborate and work together in new and innovative ways, transforming the traditional methods of teaching and learning.

AI-driven systems can analyze students' progress, identify their strengths and weaknesses, and suggest appropriate learning materials and activities tailored to their needs. This would help educators design more effective learning paths. Grammarly as AI assistant, for instance, when paired with good tools and teaching materials, may be used by teachers in teaching grammar to higher education especially since it also provides suggestions as to why something must be changed. Such explanations provided by AIs give teachers a good insight of what he/she can teach to students and, at the same time, provides students with knowledge that they can also use in the future or in the next activities to come. Another common AI tool to combat plagiarism scanning used by students is the QuillBot which is available on the market that highlights paraphrasing prowess and other its functions to help writers furnish contents (Fitria, 2021). However, not all the time AI is celebrated as it can also be abused by some. For instance, just last January 18, several students at the University of the Philippines Diliman were put under investigation after allegedly using an AI in submitted academic requirements. Instances such as these make AI in education a “double-edged sword” as it generates and posits both benefit and threat to the current educational system, and a weapon that may be misused in the wrong hands (Hagendorff, T., 2020). Counter actions could be readapting assessment, like what Prof. Dr. Roumiana Peytcheva-Forsyth spoke the about the opportunities and challenges of e-assessment and the TeSLA project, which aims to prevent and detect online cheating and promote academic integrity. Her presentation in virtual conference held by ICODeL (2021) emphasized the issue of cheating in online assessments and the results of the TeSLA project as a baseline model.

Triggering sociological imagination that despite possible circumstances that may arise from the use of AI – whether perceived an opium or not, the Philippine education system, surprisingly, can benefit from the emergence of AI to make classroom instruction better. One of the key areas where AI can be beneficial in the Philippine educational context is through the adjustment of curricula

http://dx.doi.org/10.29322/IJSRP.13.05.2023.p.5-11

and the implementation of personalized learning experiences. However, a report published by the World Economic Forum (WEF) in 2020 stated that the Philippines ranked 56th out of 100 countries in terms of digital skills readiness. The report highlighted that while the Philippines has a large pool of young and digitally connected population, there is a need to improve digital literacy and skills to enable the country to fully harness the benefits of the digital economy. Also the emergence of AI as an alternative to instruction and even studying means that existing approaches may already be obsolete (Taeihagh, A., 2021). With that knowledge in mind, the curriculum must be updated to accommodate the growing technology.

On the part of school administration, AI may also help teachers and school heads in reducing their workloads. Since AI can also be utilized to automate administrative tasks, such as grading assignments, tracking student progress, and managing schedules. This would enable educators to focus more on teaching and engaging with students, enhancing the overall learning experience. The premises were indicated as education goals found in the Basic Education Development Program (BEDP) 2030 program of the Department of Education (DepEd) that will be used as predictive models making AI to facilitate data-driven decision-making in schools by providing insights and recommendations based on collected data, helping institutions make more informed decisions regarding resource allocation, curriculum development, and student support programs.

And speaking of upholding work efficiency, the Philippine government has recognized the potential of AI in various industries, including education. In 2021, the Department of Trade and Industry (DTI) launched the National AI Roadmap, which aims to identify opportunities and challenges that AI presents to Philippine industries by 2024. It involves four (4) important dimensions to determine our readiness for AI which includes (1) digitalization and infrastructure, (2) research and development, (3) Workforce Development and (4) tasks. The program is also set to help small businesses and MSMEs. Additionally, plans to establish a National Center for AI Research (N-CAIR) are underway to encourage the development of new technologies and support the private sector.

Last March 2023, Tau Leng and other experts met with Dr. Enrico C. Paringit[1] at the AI Pinas Research and Development Conference to discuss the Philippines' potential to become an AI data hub. He mentioned developing AI applications for the country, focusing on areas such as energy and utilities, innovative scientific technologies, and other sectors leading a beacon of digitalization.

Despite a game changer move the use of AI technology can come with high costs associated with installation, maintenance, and repair. This can create a financial barrier for some institutions, such as schools, to benefit from AI. While well-funded schools may be in a better position to afford these expenses, there are potential strategies to reduce maintenance costs and improve budgeting for these expenses (Vampugani & Swathi, 2018).

Another premise is the AI skills gap which turned into a significant challenge that needs to be addressed by both the education sector and industry. Reports indicate that there is a sizable skills gap in high-growth technology fields like AI, which calls for a whole-society approach to bridge the gap (Guey, 2021). The World Economic Forum estimates that more than half of all employees will require significant reskilling by 2022. Companies can take measures such as creating courses to support learning among existing employees and collaborating with educational institutions to produce a workforce that satisfies their needs. There needs to be more dialogue and channelling between industry and the education sector to bridge the AI skills gap and produce a workforce that satisfies the needs of industry.

While the prospects of AI integration in the Philippine industry are promising it is noteworthy where the progress initially lies, and the deterministic movement goes to the educational context. Still, hanging on the hype are the privacy concerns, data security, and the potential for widening the digital divide which tend to be overlooked must be initially addressed explicitly (Holmes, et al. 2021; Potgieter, 2020). Just very recently, in fact, Italy became the first Western country to block the hype of ChatGPT over privacy concerns. Privacy is delicate for users, and the emergence of AI is something we cannot foretell for developers.

The big data age surely needs ethic-fit-context to bound what and how we delimit AI. This was evident on the UNESCO (2019) about encouraging education to have concerted policy over ethical issues. There are established ethical guidelines for the use of artificial intelligence (AI) in schools. The European Union's Directorate-General for Education, Youth, Sport and Culture has published "Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators which address how AI is used in schools with the aim of supporting teachers and students in their teaching and learning as well as supporting administrative tasks (Porayska & Rajendran, 2019). In the United States, researchers at Michigan State University's College of Education have explored the ethics of using AI in K-12 education and published a paper on the topic in AI and Ethics. Another underpinning is the principles unfolded by the Université de Montréal dated in 2018.

Furthermore, the role of AI in educational perennials[2] could be carefully defined to ensure that the human aspect of teaching and learning, like critical and creative thinking remains central to the process.

[1] The current Executive Director of the Department of Science and Technology-Philippine Council for Industry, Energy, and Emerging Technology Research and Development (DOST-PCIEERD).

 http://dx.doi.org/10.29322/IJSRP.13.05.2023.p.5-11

III. Future inquiries

The implications of AI in the Philippine education can be analyzed from different related studies and literature categorically focusing on potential benefits, challenges, and considerations for successful implementation:

Potential benefits	1. Enhanced learning experiences: AI-powered tools like personalized learning systems, intelligent tutoring, and adaptive learning assessments can cater to individual student needs, enabling more effective and engaging learning experiences. (Van Der Vorst & Jelicic, 2019; Luckin, 2017; Walkington, C., & Bernacki, M. L. 2020;) 2. Improved efficiency: AI can help automate administrative tasks, such as student enrollment, grading, and record-keeping, freeing up faculty and staff to focus on more critical aspects of education. (Atoum, et al. 2017; Wang, T., & Cheng, E. C. K., 2022). 3. Data-driven decision-making: AI can provide valuable insights into student performance and learning patterns, enabling educators to make informed decisions, directly assess outputs and improve curriculum design, teaching methods, and resource allocation (BEDP 2030; Jia & He, 2022; Rahim et al., 2018;) 4. Access and equity: AI has the potential to improve access to education for remote or underprivileged communities, through technologies like online learning platforms, language translation tools, and virtual classrooms. (Berendt, et al. 2020)
Challenges	1. Infrastructure and resources: Implementing AI in education requires a robust technological infrastructure, high-speed internet, and adequate computing resources, which may be lacking in some areas (Helbing, D. 2019). 2. Data privacy concerns: The use of AI in education involves collecting and processing large amounts of student data, raising concerns about data privacy and security. (Cath, 2018; Taeihagh, A., 2021) 3. Digital divide: Unequal access to technology and digital literacy may widen existing socio-economic disparities, as students from disadvantaged backgrounds may not have the necessary resources to benefit from AI-driven education. (Helbing, D., 2019; Miao, 2021). 4. Faculty training and development: Ensuring that educators are well-equipped to integrate AI into their teaching methods requires ongoing professional development and support. (Fahimirad, M., & Kotamjani, S. S., 2018)
Considerations for successful implementation	1. Collaboration: Engaging stakeholders, including educators, administrators, students, and policymakers, in the development and implementation of AI-driven initiatives is crucial for their success. (ILO, 2020; Borenstein, J., & Howard, A. 2021) 2. Ethical considerations: Addressing ethical issues related to AI, such as fairness, transparency, and accountability, is critical in ensuring that AI-driven education aligns with the values of the education system. (Ashok, et al. 2022; Nguyen, et al. 2022) 3. Continuous evaluation: Regular monitoring and evaluation of AI initiatives can help identify areas for improvement, assess their impact, and guide future investments in AI for education in the Philippines. (BEDP 2030 of DepEd) 4. Providing comprehensible contextual materials. AI is vast universe of technicalities, without contextual materials, difficulty of understanding the potentials and risks will arise. (Popenici, S. A. D., & Kerr, S. 2017; Reiss, 2021).

AI is no more a recounting science fiction pursuit but a reality to be dealt with multifaction. It is acknowledged, too, that educators do not wish to be replaced by virtual humans. However, the concept of developing virtual human guides and facilitators to be utilized in educational and therapeutic settings holds great potential. This area of development aims to create virtual characters that possess human-like qualities, allowing them to think, act, react, and interact in a natural manner. These virtual humans are designed to respond to both verbal and nonverbal communication, with the goal being to create characters that are difficult to distinguish from real humans. While this technology is not yet a reality as of writing this paper but, it is an exciting area of development that holds promise for the future.

IV. Conclusion

The integration of AI in the Philippine educational context offers a multitude of opportunities for enhancing the overall learning experience. Among these precursor factors are the development of new assessment methods, new upskilling, and the intensification of assessment software, which can provide more precise and timely feedback to both students and educators. This may also drive curriculum designers into figuring out something about the matter and may, inferentially, lean the education culture in the

[2] The components that constitute fundamental to education like the curriculum and instruction, learning sciences and assessment, new literacies, multiliteracies, and fluencies, professional and leadership development, educational leadership and governance, knowledge mobilization and analytics, and education resources.

http://dx.doi.org/10.29322/IJSRP.13.05.2023.p.5-11

country either spectrum of good or for worse. But these AI-driven tools are seen as augmenting educators at large, particularly to better understand students' learning progress and tailor teaching strategies accordingly. With all the possibilities articulated, we think that the only thing that summarizes the concerns is digital ethics. As AI technologies become increasingly integrated into education ecosystems, it is vital to establish ethical guidelines that govern the use of these technologies. Also, the widening of the digital divide and exacerbating existing inequalities must not only be acknowledged but also must be addressed. Thus, this paper put forward educators and policymakers for an academic dialogue ensuring that the human aspect of teaching and learning remains central to the process, because in relevance, technology continues to play a prominent role in education.

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 http://dx.doi.org/10.29322/IJSRP.13.05.2023.p.5-11