THE NEXUS BETWEEN AI AND EDUCATION

Research Paper

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Abstract

The qualitative research paper explores the nexus between Artificial Intelligence (AI) and education through a literature review and a case study. The literature review provides a theoretical understanding of the nexus, and the case study provides an understanding of the developing country`s participants perspective. Triangulation was used to incorporate and relate the theory from the literature review with the case study`s semi-structured interview, which was analysed through thematic analysis.

Keywords: : Qualitative, Innovative, Artificial Intelligence, Education.

1 Introduction

The nexus of AI in education has become a big researched field, therefore exploring the different aspects related to AI in education and the different perspectives, help us better understand the nexus of AI in education. As technology advances and we are moving into an AI influenced world, it would be valuable for many fields to adjust to the global movements. Technology, AI, and global innovative thinking have shifted the educational paradigm. Understanding the perspectives of the key stakeholders, the students, on the nexus between the potential of AI in education in a developing country, could introduce the visionary view on the following topic. This research paper made use of a qualitative method, where we incorporate a combination of semi-structured interviews and a literature review to understand the theoretical nexus and the perspectives on the nexus in a developing country and globally.

2 Literature review

2.1 Defining and the evolution of Artificial Intelligence in Education

Chen et al. (2020) and Kooli (2023) Stated that AI has been part of the academic sector since 1956, when a programming language, called Lisp, was launched. In the 1970s, AI was seen as an advanced technology with expert systems. (Roll and Wylie, 2016; ieeexplore.ieee.org, n.d.) In the 1990s. AI developed a human like conversational chatbot, using NLP technologies. An example of NLP technology used in education is ChatGPT. In 2010 AI reappeared with self learning systems, robot applications, smart hubs and intelligent data analytics.

AI is defined as a field and theory, where machines that learn from data and are being trained by the data by building their algorithms by mimicking and solving human cognitive processes and cognitive challenges associated with human intelligence by following a theoretical framework. AI are used in the administration, teaching and learning and to follow the evolution of education, AI algorithms use deep learning and data mining for more personalised education which is crucial in a constantly evolving world. AI driven education follows a statistical model and cognitive learning theory for more value and efficiency. In a world where AI is incorporated into education, one can expect instant, interactive and personalised education in a virtual environment, using data analysis and prediction to promote personal success. (Chen, Chen and Lin, 2020; Roll and Wylie, 2016; ieeexplore.ieee.org, n.d.)

2.2 AI in a developing country

There are many challenges in the educational field in developing countries, that affect students' academic success. (Wilfred, 2014) looked at South Africa as an example, as a developing country, we can see how these challenges affect their education now and how it will affect their educational field in the future. To fully understand and solve the challenges of the educational systems, we should understand the root causes. Developing countries have three main challenges that correlate directly with the challenges of their education, including insufficient datasets, questionable quality data, and noneconomic expenses such as privacy loss. These challenges stem from low job stability for educators, students' lack of motivation, high numbers of substance abuse and dropout rates, the learning centre accessibility and shortage of resources. (Kshetri, 2020)Keeping these challenges and the root causes of the challenges in mind, AI looks promising for education in a developing country`s context. AI can solve many of their challenges, especially the accessibility of education. Accessibility in many aspects. If we look at South Africa, they have eleven official languages, that paired with a lack of resources and educators, could be a good way of incorporating AI in their education, being able to translate and tutor the content in their desired language, an ITS to teach braille has been developed as well allowing blind students to have an adaptable braille display keyboard in their educational journeys. This will directly affect the students understanding and academic success. (Laere & van Braak, 2017) (Remain, 2019) Students who live in rural areas where there is no educational centre nearby or do not have access to transport, would benefit from AI driven education as it can be accessed in an online environment most suited for them at a lower cost than traditional schooling. AI is developing slower in developing countries but continuously addressing economic and social concerns, which helps their productivity and resource challenges as the AI algorithms continuously build on traditional knowledge. (Kshetri, 2020)

2.3 How is Ai being used in education today

Education is associated with evaluation and the use of AI in education is used in the assessment, evaluation and feedback process. The feedback is immediate, which can benefit the students with assistance as they are busy with work and the educators can help the students immediately with personalised feedback. AI acts as a cognitive coach by tracking and observing the thinking and questioning skills of the students, where deep analytical insights into student performances can be seen and visually demonstrated to educators. AI can therefore observe the insights and personalise the education to achieve their career goals. AI can help educators as well, by instant personalised feedback, multiple choice marking and evaluating students writing with thorough feedback on the content, spelling, grammar and writing style, as well as progress from previous assignments. The

teacher is not required to supervise students in exams anymore, as AI can proctor the exams, by automatic ID verification, accessing students' data and inhibiting copy, print, and download restrictions. This creates a lockdown that prevents students from cheating while ensuring the identity of the student. AI can help set up examinations and evaluate them, and in turn, identify the students who are at risk of failing, and be able to provide personalised assistance to achieve their goals while prioritising students based on their risk level as well as their dropout prediction. (Ahmad et al., 2020) AI in education makes use of Intelligent Tutoring Systems and Intelligent Learning Environments, where ITS mimics a human tutor and adapts the teaching contents based on the student's progress, interests and goals, and then combines that with adaptive educational hypermedia systems, which offers an adaptive learning model, with interactive lessons. The use of AI in education can change the traditional educational system, but it can also fit into the existing system. (Remain, 2019) Even though, many fear that AI will create a dependence thereof others argue that AI learning systems will improve students' independent learning abilities. To further improve students' educational journeys, AI communicate in human-like, natural language, and can recognise speech and their emotions, which detects any emotional difficulties and flags suspected suicidal students. (Chen, Chen and Lin, 2020)

2.4 How can AI solve educational challenges

AI driven education can solve many present educational challenges, as AI driven education is built on traditional models and can fill the current gaps. Three of the main challenges, which AI can solve is the Accessibility, affordability and adaptability challenges. AI education can be hosted on multiple platforms and devices and in multiple languages. When students are educated in their first language, their understanding is improved and therefore their success rate. AI being able to work with many different sensors and input tools, make AI in education accessible to different learning difficulties and special needs, such as braille for visually impaired students. This means that students can access education from anywhere, on any device, with their challenges and in their first language. The education itself will be personalised for the student's needs, their ages and their goals. AI in education enables inclusive and affordable, quality education, as it is worldwide accessible, with a wide range of subjects it can teach, at the student level and desired pace. (Ahmad et al., 2020; Remain, 2019)

2.5 Benefits of AI in education

The use of AI in education has many benefits, some of which are highlighted time after time. The three benefits which are highlighted are efficiency, accessibility and personalisation. AI can process and detect patterns and relationships in research and education a lot faster and easier than humans, avoiding any human error. The time saved can therefore be used on other tasks. AI can detect patterns in students learning and their abilities and give personalized recommendations and tasks to help achieve their personal goals. AI can detect and interpret students' emotions, facial expressions and track their data, and base their education on their collected data with their career goals. AI can create personalised courses, which support their goals while providing 24/7 instant access and human-like responses on demand, in students' preferred language. Students have online access to AI education, from anywhere in the world, making education more accessible and inclusive, with better quality education at a lower cost. Student has 24/7 access to their AI tutors, who can provide them assistance instantly, which will positively impact their efficiency, engagement and motivation in their studies. When using AI as a teacher assistant, AI has been found to support the interaction and relationships between educators and students, which improves the communication of the students to the teachers,

and therefore the overall learning experience for all parties involved. (Kooli, 2023) The success of a school is often related to the success of the students, and with the use of AI in education, one can predict students' futures, by predicting the most suitable career paths and the likeliness of their employment at graduation. This can be beneficial when done in advance, for students to see where they can improve, to better their chances to be employed at graduation. AI in education can close the gap, where human teachers cannot fulfil their duties, due to lack of motivation, sick leave, maternity leave etc. AI can consistently produce education at a consistent quality, where external factors can influence human educators. This gives AI the possibility to take over the role of the educator, however, when used in combination with the educator, it can allow educators to focus more time on areas that go beyond AI learning. AI can address any learning difficulty, as soon as it is detected, so that it does not affect or impact further studies, this will be very beneficial in younger ages and students with special needs, adapting learning content to their needs. (Ahmad et al., 2020)

2.6 Challenges and threats with AI in education

AI has many benefits and has the potential to transform the educational system, however, it also has challenges and could potentially create threats within the educational system. AI cannot extract and interpret data like humans, which means that it cannot always fully understand all insights of the data, AI can only be “trained” with data to predict and improve the student`s education in ways that humans insightfully and interpret would have been preferred for more insightful understanding. If students do not understand AI-taught work content, it can only rearrange the content, in the hope that the student understands it better, however, the rearrangements of educational content do not cause better understanding or better outcomes, resulting in a lack of understanding or clarity in the content. Keeping in mind that the educational context is an environment where any risks which affect the students should be avoided, however, due to how AI is operated in the degree to which it is trained with data, the amount and quality of data directly affect the capabilities of AI`s predictions and conclusions, which creates a high-risk environment for biased data, where there might be lack of precise algorithms. Education is associated with evaluation testing, to determine students understanding or lack thereof within a specific learning field, where the use of AI place evaluation at risk. On the one hand, AI can be used to answer questions, taking the whole point of evaluation away, causing an unfair advantage to students who use AI in assessment to those who do not, and taking the reliability and validity away from the results. This directly impacts the academic progress and knowledge-acquiring processes of the student and their ability to apply what they have learned. On the other hand, students' data privacy is at risk, when education is personalised and should be handled very carefully. The main challenge facing the use of AI is its limitation of quality and inclusive data-trained algorithms rather than the risk of AI negatively affecting society. That can be said, as AI algorithms could potentially consist of biased data with discrimination and propaganda, which can affect students' education and research results by creating an environment of discrimination and inequality. Teachers around the world, especially in developing countries are not prepared or are being trained for an AI-driven education, creating a risk of being replaced by AI, rather than being trained to use AI as a tool in the educational field. Overall, the challenges are experienced globally, where standard policies on ethics, accountability, transparency, and security should be formulated, to prevent AI from affecting students' academic progress and knowledge-acquiring processes, causing a generation of students dependent on AI assistance to effectively think critically and creatively. (Ahmad et al., 2020; Kooli, 2023)

2.7 Ethical considerations of using Ai in education

Even though the use of AI in education has a lot of potential and benefits within the educational field, ethical use can be a challenge due to the different perceptions of ethical use, especially in education. When making use of AI within education and partaking in personalised learning, students are required to provide AI access to their data, to effectively track, predict and personalise their learning, which in turn inhibits any privacy of the student's data. AI in education is dependent on the data of the students, for the best educational results, however, there should be ways in which solely educational data is collected, and personal data is dismissed, as students' "private" personal data can affect their futures due to the lack of privacy. (Ahmad et al., 2020) Kooli (2023) Suggests that the use of AI should never replace human researchers, only assist them, which relates directly to the educators in the educational system. Even though many educators are fearful of losing their work, and view AI as a threat, they should rather view AI as a teacher's assistant that will help them in their work for more accuracy, reliability and ethics. Teachers should use AI as an aid rather than students solely relying on AI, due to the limitation of students in understanding some AI algorithms, and teachers' ability to assist AI`s human understanding shortfalls. AI consists of pre-programmed algorithms, which means that AI lacks imaginative creativity, is biased and has errors, which all affect the responses, and therefore the validity and reliability as well. There is no transparency on where the responses are generated, which further raises ethical, accountability and accuracy concerns. Due to the lack of transparency and the concern of where and by whom responses are generated, AI can negatively affect the opinions of people, which was based on possible manipulative AI generated propaganda or discrimination.

3 Methodology

3.1 Research Design

The research design follows a qualitative approach, incorporating a literature review and a case study to fully understand the nexus between AI in education and the perspectives thereof in a developing country.

3.2 Participants

The perceptions of university students, in a developing country, on AI in education will be recorded to understand the perceptions of participants who are currently facing the nexus as their daily reality. The sample size is five (n=5) university students, between the ages of 20-25 years old.

3.3 Data Collection

Data Collection will be conducted through a literature review on the nexus of AI in education and a case study involving semi-structured interviews of five university students in a developing country.

3.4 Data Analysis

Data will be analysed using triangulation of the literature review and the thematic analysis of the case study`s semi-structured interviews. This will create a better understanding of the topic`s themes and patterns while increasing the trustworthiness, transferability and dependability of the results.

3.5 Results

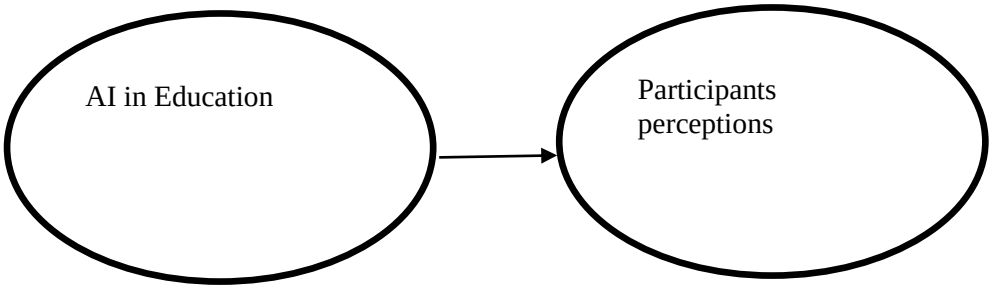

Figure 1.

In Figure 1, above the independent and dependent variables of the nexus of AI in education in the context of a developing country are visually demonstrated. Where AI in education is the independent variable and the participant's perceptions are the dependent variable, as the case study is dependent on the perceptions of the participant on the AI in education concept. In Table 1 below, we further explore the nexus based on the perception of AI in education in a developing country context, through thematic analysis.

Participants	Use of AI in Education	Personal perception of AI use in education	Perceived potential positive effect	Perceived potential negative effect	Perceived potential positive effect in developing country.
1	Yes	Positive	Time efficiency and enhanced learning	Ethical use	Low cost and high reward
2	Yes	Positive	Better understanding of difficult concepts with simplified/personalised explanation	Lack of knowledge on ethical use	Global educational standard
3	Yes	Positive	Enhanced education quality and cost efficiency	Plagiarism concerns	Better educational quality at a lower cost
4	No	Neutral	Accessibility with on demand education	Cheating	Accessibility with on demand education
5	Yes	Positive	Dropout reduction and prevention	AI dependence	Dropout reduction and prevention

Table 1. Participant perceptions of AI in Education within a developing country

The overall impression we observed in the semi-structured interviews, was a positive expression of the use of AI in education. 80% of participants use AI in their studies, whereas 20% do not, however, 20% are not against the use thereof, but rather have a neutral feeling towards it. 80% of participants are concerned about academic integrity and ethical use in the educational context and 20% are concerned about the possible dependence on AI to solve problems and to think critically. The participants indicated that they see the potential benefits and possibilities as overall greater than the potential challenges, emphasising a very positive potential impact in a developing country. 40% of participants stated the potential cost-effectiveness, as it would be less expensive than traditional schooling`s school fees, uniforms, transport, and extra classes, however, the educational content quality would be more consistent. This could indicate that for a more cost-effective education, one can receive a better quality education. 20% perceive overall improvement in the quality of education and another 20% perceive more accessibility to education. The remaining 20% predict lower dropout rates.

4 Discussion

The qualitative research paper made use of triangulation by using both, a literature review about AI in education and perceptions of students studying in a developing country. The literature review aimed to understand the theory of the topic and the case study was to establish the key stakeholder's perspectives on the topic, being the students in a developing country. By combining the knowledge from the literature review with the understanding from the interview's perceptions, a deeper understanding of AI in education within a developing country and globally, can be achieved. The overall perceptions, which were collected in the literature review and interview were positive about the use of AI in education. Developing countries are especially optimistic about the potential of AI in their educational system, due to their perceived potential positive effects outweigh their perceived potential negative effects. The interview participant`s perception complements and aligns with the literature review knowledge, where there is a perceived need for a more AI driven personalised educational system and the desire for education to be globally accessible and inclusive, with a better quality at a lower cost.

5 Limitations

The case study has a sample size of five participants, which could limit the generalisability of the results. Due to the small sample size, the data may become saturated and affect, how in-depth our results will be.

6 Ethical considerations

Ethical considerations were performed during the entire case study. The participant's overall safety, rights and privacy were adhered to, throughout the study. Informed consent was obtained after providing the participants with information about the study. Participants were guaranteed that the data collected, would be confidential and anonymous and that their participation was voluntary, allowing them to withdraw at any stage of the study**.**

7 Further research

The research findings would benefit from further research, to gain a deeper understanding of this subject. Further research would obtain a bigger and broader sample over a longer timeframe. This will allow the researcher to determine more in-depth perceptions over a period. Another opportunity for further research is to conduct the same study on a sample of students from a developing country and compare it to students from a developed country to determine the nexus of AI in education on a global scale. This will determine if the perception of nexus differs in a developing country than in a developed country and in turn determine unique opportunities and challenges per educational system.

8 Conclusion

The qualitative research study explored the nexus of AI in education and the perspectives of the nexus, from a developing country's perspective. We performed a literature review to understand the theoretical context and semi-structured interviews to understand the perspectives. Overall we observed a positive outlook on AI in education, with many perceived benefits, and the benefits outweigh the challenges and threats, especially in a developing country. This concludes that the literature aligns with the case study.

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