INNOVATIVE EFFECTS OF ARTIFICIAL INTELLIGENCE ON TEACHER EDUCATION

EFEITOS INOVADORES DA INTELIGÊNCIA ARTIFICIAL NA FORMAÇÃO DE PROFESSORES

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ABSTRACT

The goal of this investigation was to see the impact of AI on teacher education. To have a better understanding of how it will impact teacher education in problem-solving, how it will aid in planning, and whether it will promote continuous learning in teacher education. The study allows instructors and students from tertiary institutions in The Turkish Republic of Northern Cyprus to express their views. Three primary research topics guided these investigations, and four semi-structured interview questions were developed to obtain thorough responses to these issues. The opinions of the participants were solicited in person. The findings showed that both students and lecturers were aware and comfortable with AI in educational systems, that AI has had significant effects on problem-solving in teacher education, and that AI is vital for facilitating planning in teacher education. Finally, it was emphasized that the application of AI in teacher education allows for continuous learning, which has benefits as well as drawbacks.

Keywords: Artificial intelligence, Effect of AI, Functions of AI, Current innovation on AI.

RESUMO

O objetivo desta investigação era ver o impacto da IA na formação de professores. Ter uma melhor compreensão de como isso afetará a formação de professores na resolução de problemas, como ajudará no planejamento e se promoverá a aprendizagem contínua na formação de professores. O estudo permite que instrutores e estudantes de instituições terciárias da República Turca do Norte de Chipre expressem as suas opiniões. Três tópicos primários de pesquisa orientaram essas investigações, e quatro perguntas de entrevista semiestruturadas foram desenvolvidas para obter respostas completas a essas questões. As opiniões dos participantes foram solicitadas pessoalmente. As conclusões mostraram que tanto os alunos como os docentes estavam conscientes e confortáveis com a IA nos sistemas educativos, que a IA teve efeitos significativos na resolução de problemas na formação de professores e que a IA é vital para facilitar o planeamento na formação de professores. Por fim, enfatizou-se que a aplicação da IA na formação de professores permite a aprendizagem contínua, o que traz vantagens e desvantagens.

Palavras-chave: Inteligência artificial, Efeito da IA, Funções da IA, Inovação atual em IA.

Introduction

We can speculate on what the future might have in store. For a complete understanding of the benefits and challenges that AI develops, we must first understand what artificial intelligence (AI) is now and what the future may hold when AI is broadly implemented in society. AI may enable novel approaches to learning, teaching, and educating, but it may also reshape society in ways that provide new challenges for institutions of learning. It might exacerbate skill gaps and polarize jobs, or it could level the playing field for educational opportunities. (Shiohira Kelly, 2021). The application of AI in education may result in new understandings of how learning takes place and may alter how learning is evaluated. According to UNDP, (2018), all human behavior is predicated on imagined futures. Because it has not yet happened, the future is unknown to us, but we can create it and make it happen by using the knowledge we currently have. The more we comprehend the past and the events that led to the present, the better.

It's a good idea to consider what AI might entail for learning, teaching, and education right now. The subject is difficult and there is a lot of hype. But it is significant, fascinating, and worth the effort.

AI has been at the top of policymakers' minds ever since Frey and Osborne5 projected in 2013 that nearly half of U.S. occupations were at a Simultaneously, there

has been a significant demand for employees with AI development expertise, resulting in seven-figure wages and sign-up fees, high risk of automation (RIGANO, 2019).

What is Artificial Intelligence

The preceding explanation, which has some limitations because it requires defining intelligence and is unnecessarily tautological, has been replaced with one that does not. The Rockefeller Foundation received the first official description of AI in a 1955 fundraising request. (Brundage et al., 2018). It was created with the "hypothesis that, in concept, every component of education or other aspects of intelligence can be so clearly described that a machine can be made to simulate it."

This previous definition quickly sparked heated debate. Early AI researchers defined human intelligence as the calculation of correct values, reducing intelligence and thought to the mechanical processing of logical arguments. This strategy raised severe concerns about AI's philosophical roots, yet it was historically consistent with efforts to codify mathematics using simple syntactic techniques and logical positivism. (RIGANO, 2019).

Functions of Artificial Intelligence

The functions and applications of AI technology are constantly evolving. Chan & Tsi, (2023)stated that the educational sector is developing creative methods to effectively implement AI for staff and students. AI should be used to produce a better student experience.

(1) . The University of Elon utilized artificial intelligence to assist students in monitoring previously completed courses and applying this information in course planning (Committee, 2023).

(2) . Students are reminded of important dates by AI. It also informs students about the courses needed to complete the program and the availability of those classes. It enables professors to upload class notes online, which students can view

(3) . AI can identify examples of classifications, concepts, or patterns. AI can employ inference, planning, and implementation to track the evolution of ideas as they

are implemented, detect environmental anomalies, and adjust their plans appropriately.

(4) . AI is employed in smart toys as well as computationally arranged educational and entertainment items. Williams et al.

(5) . AI employs a programmable, social robot to assist children in their exploration of AI ideas. It contributes to a better understanding of AI topics such as preparation, deductive reasoning, perceptions, and advanced learning. An instruction robot system is created to reproduce and modify incorrect behavior.

(6) . The robot controls the learner's attention and works to increase their level of concentration and comprehension of the lecture material by using their gaze, pointing gestures, and face identification. AI is the cornerstone of an intelligent tutor system helped by Natural Language Processing (NLP)

(7) . It supports the development of skills including conflict resolution, introspection, coming up with original questions, responding to probing questions, and decision-making. According to Aljohani et al.

(8) . They used Google Home Mini to communicate with learners and expected to improve physics student achievement and improve learning materials,®.

(9) . Created user models for learners using e-learning, often known as an intelligent tutoring system (ITS).

The Effect of Artificial Intelligence

AI can affect learning in formal education in a variety of ways. It could appear that AI should be used in as many educational contexts as possible because AI is currently high on the policy agenda. De Pauw et al.,(2011) Whenever an innovative technology is discovered, it might seem to create entirely new opportunities for addressing previous issues. This is particularly prevalent when the limitations of the technology and the obstacles in implementing it are typically not completely acknowledged. This results in a technological advance and happens early in the life process of general-purpose technologies. (US-EU Trade and Technology Council Inaugural Joint Statement, 2022)

Visionary corporate executives and managers realize the promise of new technology and the many ways it has the potential to impact the world. The excitement will wane when people recognize that AI will change the environment in which learning takes place and where it becomes socially significant, in addition to enhancing the effectiveness of current education (Darling-Hammond et al., 2020). Many contemporary educational methodologies meet the increasing needs of the industrial world. It is trivial to automate operations that simply institutionalize habitual behaviors. This often leads to frustration in a changing world because the remedies may be deemed worthless even before they are implemented.

Type of AI

Artificial intelligence history can be classified into three groups: data-driven, logic-driven, and knowledge-driven. The first of them is now known as artificial neural networks and machine learning, which may astonish some people because it is also the most traditional method for AI. (Reynolds et al., 2019).

Current innovation in AI

The contemporary interest in AI is the result of three contemporaneous innovations. To begin, increasingly specialized graphics processors were required for developing realistic computer games. When Nvidia, a PC graphics card manufacturer, published the CUDA programming interface for their Cards that enhance graphics, In 2007, it became possible to perform fast parallel programming at a reasonable cost. This enabled researchers to build neural network models with a large number of connected artificial neuronal layers and parameters for the network to learn.(Klionsky et al., 2016).

Second, the networking of computers and computer users has made enormous volumes of data accessible. Machine learning may now flourish in an environment that has been made possible by the digitization of pictures, videos, audio, and text. This has made it possible for AI researchers to review previous artificial neural network models and train them using enormous amounts of data (Klionsky et al., 2016).

Surprisingly, several of these massive data sources are sufficient. The challenging issues in AI, such as machine translation and object recognition from digital photos. Earlier it was thought that for computers to grasp language for many practical purposes, it is sufficient to scan millions of sentences to uncover word contexts before translators can translate text and speech from one language to another (Simon et al., 2023).

Word projection onto high-dimensional representational spaces retains significant contextual information to allow translating to be accomplished without linguistic skill. A common technique is to use the publicly available GloVe word representations, which were developed using text corpora comprising up to 840 billion tokens that are comparable to words that can be discovered in documents and internet material. (Libertad, 2021). These tokens have been translated into a vocabulary of more than 2 million words. The words have been converted into points in a 300-dimensional vector space using this data set and machine learning algorithms. The placement of the words and their geometric relationships in this space captures many aspects of word use and serves as a foundation for language translation. The effectiveness of such a purely statistical and data-based approach is remarkable given that it is unable to understand novel or imaginative uses of language (Wang et al., 2019).

Third, it is now possible to design and test neural networks using specific open-source machine-learning programming environments. Most current neural AI models train by gradually changing network weights based on how well the network accurately predicts events using the training data (Tuomi, 2018). One of the most important tasks in this kind of learning is the dissemination of information about the relative contributions of each neuron's activity to the network's accurate and faulty predictions. Miconi et al.,(2018) explained that when a neuron is connected to a false prediction, the weights of its incoming connections are decreased, which lowers the cell's activity. Even the most powerful traditional computers will have difficulty performing this work because there may be many layers of neurons and connections between them.

Importance of the study

This **s**tudy has been widely reproduced and improved, and it is now generally accepted that AI will cause significant changes in the labor market. Many abilities that were crucial in the past are being mechanized, and as AI is employed more and more, many jobs will either become obsolete or change. Artificial intelligence is quickly integrating itself into our daily lives (Tuomi, 2018). To create more efficient diagnostic techniques, scientists and researchers are constructing novel ways in computer modeling, machine learning, probability statistics, and decision theory. Without the need to even touch the vacuum cleaner, AI can complete simple jobs like brewing coffee in the morning to difficult ones like sweeping the floor (Gould et al., 2019). Because of this, the application of AI to help human learning and knowledge will likely have the most impact. This indicates a basic idea of involving humans in the decision-making process when using AI in educational settings and for educational goals. Exploring AI's innovative effect is essential since it has an impact on teacher education.

Aim of the study

This study's main goal is to determine whether AI innovations have a positive impact on problem-solving abilities in teacher education. Additional goals include;
1. To determine whether innovation in AI in teacher education facilitates planning.
2. To determine whether innovation in AI enables continuous learning.

Problem Statements

Artificial intelligence (AI) is currently high on global political and academic agendas. Franke, (2021) emphasized that whenever a new technology is introduced, there is a lot of enthusiasm and criticism regarding its implications for society as a whole and the economy. Although the basis for AI has been in place for several decades, the latest advances in technology are hastening what AI can perform. The consequences for instruction, learning, and education are investigated in this work. It aims to provide an in-depth examination and prospective viewpoint on significant AI developments as a platform for educated conversations about the future of these

industries. (Cooney, 2012). This has often led experts to believe that professions requiring intelligence comparable to that of a person are immune to automation. The conclusion for educational policy may be that instruction should concentrate on cognitive tasks that are not routine and are frequently referred to as present-day abilities (Chang & Huynh, 2016). Frey and Osborne disagreed with the task-biased model that was utilized by Osborne and Frey. They contend that present technology constraints should be used to study the impact of AI and robotics. Fast-evolving AI is now capable of carrying out activities that were previously thought to require human understanding. Frey and Osborne contend that it is crucial to find out from professionals what it is that computers cannot perform. For this reason, the researcher decided to conduct this study to determine whether artificial intelligence affected teacher education.

Research Question

The researcher posed the following question to have a better knowledge of this study:

1 Does innovation in AI affect problem-solving in teacher education?
2 Can innovation in AI facilitate planning in teacher education?
3 Does innovation in AI enable continuous learning in teacher education?

Methodology

Research approach

A qualitative descriptive survey method was employed in this investigation. Since this research aimed to determine the state of the scenario as it transpired during the inquiry, this method was deemed adequate. Therefore, it appears that public research is highly beneficial.

Procedure and method for gathering data

The study's sample included twenty participants, who are university lecturers, and students. Fifteen students and five lectures. Individual participant

opinions were gathered. After each participant had been surveyed, the results were based on what the respondents had to say.

Data collection tools

The development of these open-ended interview questions was influenced by the main research question and study objectives. Two demographic questions and four interview questions are included in the two parts of the questions. which were employed to learn what lecturers and students thought about the innovative effects of artificial intelligence on teacher education.

Validity and Reliability

To ensure the validity and reliability of the study, the investigator kept the responses of the participants and their information private throughout the data collection process. No names, dates of birth, or other details that could be used to identify a specific person were sought. To guarantee the legitimacy of the investigation, the investigator followed several important procedures. According to Mohajan, (2017), the validity of a qualitative investigation is determined by the accuracy of the data interpretation.

Results

A descriptive research approach, one of the methodologies for analyzing qualitative data, was used to generate and assess the material. The comments from the interviews were specifically used for building the comprehensive model. Each interview question's response from a respondent was classified into a set of related themes such as L2 and S5 for easy analysis (Taherdoost, 2021). After carefully translating the responses, the authors decided on the patterns that emerged from the responses.

Table 1 – Demographic Information

Variables	F	%
Gender		
Male	12	60
Female	8	40
Occupation		
Lecturer	8	40
Student	12	60
Total	**20**	**100**

Table 1 shows that the majority of the participants were male which was (60%) followed by female which was (40%). Moreover (60%) of the participants were students (and 40%) were lecturers.

Table 2 – Participants' definition of AI

AI definition is categorized as:	F	%
A branch of computer science that develops machine systems that can demonstrate characteristics related to human intelligence.	8	40%
Artificial intelligence is the imitation of human cognitive functions by computers, especially computing technologies.	7	35%
An approach of teaching a computer, a machine controlled by a computer, or software to function critically and creatively in the manner of a human being's mind.	5	25%
Total	**20**	**100**

In Table 2, the definition of AI was categorized into three, the first category was(40%) the second was (35%), (and 25%) was the last category of the AI definition respectively.

Artificial intelligence is the imitation of human cognitive functions by computers, especially computing technologies.L4

A branch of computer science that develops machine systems that can demonstrate characteristics related to human intelligence.S10.

Table 3 – Participants opinion on AI effects on problem-solving in teacher education

Participant's opinions were mainly yes with various effects:	F	%
AI can assist instructors in developing specialized lesson plans and tests that are in line with each learner's particular abilities and constraints	10	50%
By analyzing data on learners' performance and choices.	6	30%
It makes students feel more motivated and have a more satisfying educational experience.	4	20%
Total	20	100

Table 3 analyzes the effects of AI on problem-solving in teachers' education. (50%) of the participants explained that AI can assist instructors in developing specialized lesson plans and tests that are in line with each learner's particular abilities and constraints,(30%) agreed that AI helps in analyzing data on learners' performance and choices while (20%) of them stated that AI makes students feel more motivated and have a more satisfying educational experience.

By analyzing data on learners' performance and needs S7

It makes learners feel more motivated and have a more satisfying educational experience L2

Table 4 – Participants thought about how AI helps in facilitating planning in teachers' education

AI facilitates planning in teacher education in the following ways:	F	%
Actual Time Lesson Modification to Address Learners' Needs	5	25%
Ensure instructors have essential technological assistance.	4	20%
Save time, and make better plans for learning	5	25%
Encourage interaction and communication between teachers and students' needs	6	30%
Total	20	100

In Table 4, the participants gave their opinions on how AI helps in facilitating planning in teacher education, (25%) stated that it facilitates Actual Time Lesson Modification to Address Learners' Needs, (20%) claimed that it Ensure instructors have essential technological assistance, (25%) also said it save time and make better plans for learning, lastly (30%) of the participants opined that it encourages interaction and communication between teachers and students needs

Encourage interaction and communication between teachers and learners' needs L5

Ensure instructors have essential technological assistance S13

Table 5 – Participants' perspectives on how AI will enable continuous learning in teacher education

All the participants gave positive responses on how AI will enable continuous learning	F	%
By examining vast amounts of data, AI can pinpoint specific learning requirements, provide immediate feedback, and customize training to each learner's choices and abilities. This individualized method promotes student engagement, motivation, and subject matter mastery. The application of AI in continuous learning presents several problems in addition to its many benefits. Data privacy, the digital divide, algorithmic prejudice, and the need for knowledge of AI are a few of these.	20	100%
Total	**20**	**100**

Table 5 illustrates that all the participants' responses were positive on how AI will encourage continuous learning in teacher education. As was seen above (100%) of the participants agree with the point mentioned above. l Moreover some participants listed several problems in addition to its benefits.

This individualized method promotes student engagement, motivation, and subject matter mastery, which can aid continuous learning S8.

AI can pinpoint specific learning requirements, provide immediate feedback, and customize training to each learner's choices and abilities to encourage continuous learning L1.

The application of AI in continuous learning presents several problems in addition to its many benefits. Data privacy, the digital divide, algorithmic prejudice, and the need for knowledge of AI are a few of these L3

Discussion and Conclusion

This study's goal was to determine the effect of AI on teacher education. To better understand how it will impact teacher education in problem-solving, how it helps to facilitate planning, and whether it supports continuous learning in teacher education. The study allows lecturers and students from tertiary institutions to voice their opinions. These investigations were led by three key research questions, and four semi-structured interview questions were created to elicit thorough responses to these questions. The answers provided by the participants to these interview questions were used to arrive at the conclusions that will be covered in this section. It is important to understand that artificial intelligence (AI) is an extensive field of computer science centered on constructing intelligent machines that can perform activities that normally require human intelligence. Whilst there are many AI methodologies, it is a multidisciplinary science, and current advances in machine learning and advanced learning are driving a paradigm shift in practically every aspect of the computer industry. (Oosthuizen, 2022).

The results show that every participant is aware of the use of AI in education, and they all contributed more accurate information and definitions of AI to the inquiry. This demonstrates that both students and instructors are aware of and comfortable with AI in educational systems. In light of these facts, in my view, education students should prioritize learning about AI to improve their studies and prepare them for the globalization of technology and the modern world, this result was supported by (Damian Farrow, Joseph Baker et Al., 2018)

Responses from participants revealed how AI has impacted problem-solving in teacher education. Based on these findings, it is clear that AI has had a significant impact on problem-solving in teacher education. By analyzing data on learners' performance and choices, AI helps instructors create specialized lesson plans and

assessments that are in line with each learner's unique abilities and constraints. As a result of this, AI should be encouraged in teacher education (Reimers et al., 2020).

Findings indicate that AI facilitates planning in teacher education by fostering interaction and communication between teachers and students' needs, saving time and creating better learning plans, ensuring instructors have essential technological support, and modifying time allotted for lessons to take into account learners' needs. As a result of this finding, AI is essential for streamlining planning in teacher education, Abed,(2021) agreed in his investigation with this result.

In conclusion, knowing whether AI will enable continuous learning in teacher education is a desirable thing. The results demonstrated that AI can enable continuous learning. By analyzing enormous volumes of data, AI can identify particular learning needs, deliver quick feedback, and tailor instruction to the preferences and skills of each student. This tailored approach encourages student motivation, engagement, and subject matter mastery. The contributors also mentioned additional issues that arise from the application of AI in continuous learning in addition to its many advantages, including data privacy, the digital divide, algorithmic bias, and the requirement for AI expertise. Therefore, it should be mentioned that the use of AI in teacher education permits continual learning, with its benefits and drawbacks as supported by (Bird et al., 2020).

Recommendations

The following sources are suggested by the researcher for a deeper comprehension of this research theme:
1) To comprehend the implications of AI on teacher education, comparable studies should be carried out in other nations.
2) More respondents and schools should be contacted if the study is conducted again in The Republic of Northern Cyprus to support the study's main concept.
3) A more advanced quantitative approach should be employed if the same study will be conducted by a different researcher.

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