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IMPACTS OF ARTIFICIAL INTELLIGENCE-BASED TUTORING SYSTEM IN ENHANCING LEARNING EXPERIENCE AND PERFORMANCE

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Abstract

This paper attempted to describe the concept and impact of Artificial intelligence based tutoring systems in enhancing learning experience and performance. As the world advances in Science and Technology in the fourth industrial Revolution (4IR), the application of Artificial intelligence (AI) and Intelligent Tutoring System are finding their way into educational terrains. Intelligent Tutoring System have been described as the Industrial Model of 21st Century. This paper also discussed the origination of Artificial Intelligence from Computer Assisted Instruction (CAI) and origination of Artificial Intelligent Tutoring System (AITS) from Artificial Intelligence (AI). It also discussed the modules of ITS, impact of Artificial Intelligence System to both teachers and students, impacts of Intelligent Tutoring System in enhancing learning experience, predicted demands for intelligent tutoring system and relevant findings on impact of intelligence tutoring system on performance. These is aimed at creating more awareness and encouraging application of the system for enhancing learning experience and improvement of performance. It was recommended among others that teachers and students should be train on efficient and effective use of the system for teaching and learning in school.

Keywords: AI- Artificial Intelligence, ITS- Intelligent Tutoring System, 4IR Fourth Industrial Revolution, CAI- Computer Assisted Instruction

Introduction

Since the advent of the Covid-19 Pandemic, the landscape of education has change significantly in how instructional content are currently presented to students all over the world. While online education, online learning or e-learning is not new. However in view of the education lockdown initiated by the Covid-19 Pandemic, it has now became a norm. While the Covid-19 Pandemic lasts, it is very hard for teaching and learning to return to physical classes permanently. Meanwhile the need to present personalize instructional contents to students and also ensure that their learning needs are meet while the Pandemic lasts, with little efforts from teachers gave rise to extensive use of information and communication technologies (ICTs) in education these days. The majority of these ICT models of instruction general fall under what is collectively known as computer Assisted Instruction (CAI) Awolabi & Adetunbi, (2021).

The utilization of CAI in supplementing conventional instruction is not new. CAI is an automated instructional Strategy in which computers are used in presenting instructional contents to students through an interactive process. Also Eyo, (2018) stated that CAI is a form of instructional strategy in which computers with predefine instructions are use to present instructional contents to students CAI has also been define as self-learning

strategy in which computer programs that are either online or offline are used to facilitate and improve instruction. Some of the characteristics of CAI include prompt feedback to students, a multiple user approach, self-pacing instruction adaptability and random access facilities among others. As the world advances in the 21st century, there have been developments in CAI which have led to the designing of Intelligent Computer Assisted Instruction (ICAI). However, with the development of more sophisticated computer programmes for use in education, there is a current shift to a more sophisticated machine known as Artificial Intelligence (AI) which is now being applied in education as progress deepens in the fourth Industrial revolution. Although, there are continuous discoveries on the roles of AI in enhancing learning, this paper attempt to present some of its discovered and applied impacts. Also considering the fact that easier learning strategy has more impact on performance prompted the need for the paper to create more awareness and encourage the use of AI for enhancing learning and performance.

Artificial Intelligence in Education

Artificial Intelligence is one of the essential driven forces of the 21st century as it is rapidly transforming almost all human endeavours. In this wise it will be naïve to conclude that, the technology will not have an impact on education, given the fact that the possibility are profound because there have been mind having developments in the evolution of AI and the remarkable role it has played in human lives (Holmes, Bialik & Fadel, 2019). AI can sometime be hard to define, since it takes various forms and also because the phrase serves as an umbrella term for different procedures and technologies (Frankish & Ransey, 2014), given this, it is define based on four general approaches by Awolabi & Adetumbi (2021) as system that act humanly, system that think humanly, system that act rationally or system that think rationally, it Could therefore be deduced from this definition, that the main objectives of AI is to understand model and produce humanoid or ideal intelligent behavior in artificial systems whereby different techniques are used. AI is the ability of a computer controlled device to perform task in human like manner, the human like qualities include reasoning, meaning making, generalization and learning from past experiences all of which are examples of mental process. Some demonstrations of these mental process in AI based machines include of 2016 Google deep minds Alpha "GO" which defeated one of the world most accomplished "Go" players, lee Se-Dol, who is a South-Korean Champion (Say-Hon, 2016) as the greatest proof of AI's human like thinking and skills, the result of this match shows that a true artificially intelligent system can learn on its own (Adams, 2017) as the world advance, the emergence and application of Artificial Intelligence in Education in particular has led to the application of a form of CAI, but in advanced form known as Intelligence Tutoring System (ITS). The Intelligent Tutoring Systems are Artificial Intelligence-based Computer programs that can imitate and perform the duties of human educator. As a form of Instructional Strategy in the 21st Century, Artificial Intelligence - based tutoring Systems are fact gaining ground as the world gradually transcends into the fourth Industrial Revolution (4IR).

Moreover, Albus, Vogt & Seufer (2021), posits that students learn by active selection, organization, and integration of information from auditory and visual aids; thus, a combination of both words and pictures is more effective in promoting deeper learning than the use of words alone. With the help of animated pictures, it is easy to show things that would otherwise need many words to describe; images are also used to improve

remembering, learning and comprehension. These indicated the need for application of AI in education for easier learning and for better performance

Artificial Intelligence-Based Tutoring Systems

Artificial Intelligence-based tutoring Systems are Computer Systems or programs design to imitate human tutors. They are mostly referred to as Intelligent Tutoring System (ITS) the term intelligent Tutoring System was introduced and was first used in the research community to mean Intelligent Computer Aided Instruction (ICAI). According to Abidin & Baharin (2020) computer based Instruction Systems using artificial Intelligence methods is presenting students with opportunities for self-directed, individualized learning through intelligent guidance and help ITSs an extension of computer Aided Instruction (CAI) are educational software use for learning without the intervention of human tutors. It consist of intelligence, feedback and adaptive behavior (Reva, 2000). Earlier, Brown and Sleeman (1982) stated that ITSs are computer programs that provide instructions to students in a similar manner as human tutors while also providing feedback to students.

The necessity for time and location independent learning has portrayed ITSs as an important teaching and learning program allowing students to learn at their own pace and receive adaptive feedback on their learning progress. According to Cao, Yang, Laid and Wu (2021) the increasing reputation of ITSs portends that computer based instruction integrated with artificial intelligence prominent research areas. According to Karachi, Piri, Akyuz and Bilgici (2018), a typical ITS has three components which are (i) Domain model which is made up of instructional topics, examination questions and the relationship among the instructional topics and question (ii) students model which stores information about students learning history which importantly includes the topics students viewed, their login and logout times, their duration of learning in the system, the answer they provided to the questions asked by the system and their scores (iii) the teaching models which employs the information stored in the student model to provide students with intelligent guidance and help where needed.

Barana, Fissore and Machisio (2018) noted that the characteristics and degrees of intelligence of one ITSs to another vary extensively and generally the system score domain independent, meaning that the teaching model in different domains. On the other hand, Raza (2020) posits that ITSs are made up of four modules, the interface module, the student modules and the tutor module.

The interface module provide the route through which students interact with the system while the domain modules is concern with how instructional contents will be presented in the ITS. In other words, the domain module stores and represents problems, exercises and learning content of the domain. The students module is concern with students progress and achievement during the use of the system and measuring students learning and performance, giving guidance and providing feedback as well. The last module which is the tutor module involves the pedagogical strategies for effective teaching in the ITS. (Raza, 2020).

Relevance Studies on Impact of Intelligence-Based Tutoring in Enhancing Performance

According to Ernest (2015) as an up to date model of teaching, ITSs could be valuable supplementary aids to improving learning. Also the need to continuously improve

students achievement has been the focus of several studies for many years. He also reported that the need to improve students achievement created the need for researchers to develop novel methods of instruction and motivation. As students are motivated to learn, the more involved they get in the learning process therefore, the use of computer technologies is one strategy which when utilize will improve achievement and motivation in education. Moreover, Idirisu, et al, (2019) reported that students find tutoring system effective and helpful for learning.

Impacts of Artificial Intelligence in Enhancing Learning Experiences

Artificial Intelligence (AI) is revolutionizing various aspect of our lives including education. It reshape the way education is delivered and unlock new possibilities, among the impacts for teachers and students, google (retrieved on 22/2/2024) are.

I. Personalized Learning:- Discuss how AI enables personalized learning experiences by adapting content, pacing and assessments to individual students needs. Explore the benefit of adaptive learning platforms that leverage AI algorithms to provide tailored instructions, allowing students to learn at their own pace and their specific areas of challenges or interest.

II. Data-Driven Insights:- Examine how AI can analyse vast amounts of educational data to generate valuable insights. Discuss the benefits of using AI algorithms to identify patterns, trends and areas for improvement in students performance, curriculum design and instructional strategies. Explore how data-driven insights can inform decision-making processes and help-educators optimize learning experiences.

III. Enhanced Collaboration and Communication:- Explore how AI powered tools and platforms facilitate collaboration and communication among students and educators. Discuss the impact of AI chart tools and virtual assistants that provide instant support, answer questions and guide students through their learning journeys. Highlight the benefits of AI powered platforms that enable seamless communication, allowing students and teachers to connect and collaborate regardless of geographical barriers.

IV. Intelligent content Creation: Discuss the role of AI in content creation, such as generating educational resources, assessments and interactive materials. Explore the potential of AI to analyse existing content, identify knowledge gaps and generate personalized learning materials to meet the diverse needs of students. Highlight the advantages of AI powered content creation in terms of efficiency, accuracy and customization.

Impacts of Artificial Intelligence-Based Tutoring System in Enhancing Learning Experience

Some of the impact according to google (retrieved on 22/2/2024) are

I. Provision of Human like learning experience: The system promote interaction as they utilize tutor that can collaborate with learners, engage in turn by turn conversations and adapt of discussions. Human teachers and learners a like have found AI tutors to be much more engaging and interactive.

II. Provision of Personalized Feedback: The system give relevant feedback in a way that motivate learners individually, monitor the relationship between students emotion and learning as well as encourage students when needed. This help student learns as they will be given feedback based on their learning styles, speed and needs.

III. Hosting Multimedia Learning: A part from providing personalized feedback, Artificial Intelligent Tutoring System Offer Variety of learning mediums while most online learning systems offer text and vedios, Intelligent tutoring systems offer text multimedia, simulation and even games. By delivering information this way, Artificial Intelligent tutors can provide information in a format that best suits the learner.

IV. Encouraging Self-Paced Learning: Unlike human teachers, AI tutors can keep close tabs on every single student, this mean that, their emotions, progress and style of learning will always be taken into consideration during interactions. The tutor can also track students progress and give timely feedback, so that students know where they stand in terms of understanding and applying the materials.

V. Constant Development to better Serve Learners: Usually, human teachers only teach one way of solving problems. Artificial Intelligence tutors can develop difference method of solving problems.

VI. Ethical Considerations: This involves the importance of transparency, privacy and security when implementing AI powered educational system. It explored the need for responsible AI development and the role of educators, policy makers and stakeholders in ensuring ethical practices in Artificial Intelligence Implementation.

Some Predicted Demands for Artificial Intelligence.

The demands for artificial intelligence is predicted to increase between 2023-2027 by 48% with the rise of technologies in AI its applications in education have grown, with existing potentials for personalizing learning dynamic evaluations and significant engagement in online wireless and hybrid learning environments (Maghsudi, et al, 2021). More importantly, following the lecturers shortage, experts have advocated for some teaching responsibilities to be replaced by artificial intelligence-assisted robots.

According to Global Industry Insights Inc, the artificial intelligent education sector will be approximately $20 billion in market shares by 2027 (Marinsek, et al., 2023). The industry's rise is encouraging as AI has the potential to relieve teachers' work loads across the world. Moreover according to World Economic Forum (WEF), a high percentage of business world will in cooperate technology like machine by 2025 (Leddy & Macreanor, 2023).

Conclusion

The paper concluded that, considering the need for more effective methods of teaching that are less time and cost challenging, intelligent tutoring system can be use to address the need. By harnessing the power of AI, there can be creation of more engaging, adaptive and effective learning environment that prepares students for the challenges of futures. The impacts stated and discussed are expected to go along way in enhancing

awareness and encourage application of the strategies for a easy learning and improvement of performance.

Recommendations

The following recommendations were made considering the impact of the system

I. There should be massive design, development and implementation of artificial intelligent based tutoring system because of its potentiality in enhancing learning and performance.

II. Education Stakeholders should empower programmers and software developers to go into mass production of the system on various subjects for use in schools.

III. Teachers and students should be train on efficient and effective use of the system for teaching and learning in school.

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