The Effects of Integrated Adaptive Artificial Intelligence eLearning system for Enhanced & Flexible Teaching & Learning Process – A Review

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Abstract –Innovative and smart educational technologies have transformed the methods of teaching and learning. With advancements of artificial intelligence, higher education has begun to adopt new technologies. This study intends to predict the role of artificial intelligence in the future nature of education in a world with an adaptive integrated multimodal learning system. The effective application of artificial intelligence methods is considered as a means of improving the quality of teaching and learning. Also, the challenges faced by students in adopting artificial intelligence in terms of students' support, teaching, learning, and administration are discussed. The implications for further research are suggested several alternative teaching approaches were proposed, but they seem not to fulfil successfully the needs of the 21st century students. Students nowadays are raised in a digital world and they learn and react differently. Students start to use computers before they first attend formal education, while computer games have become a part of their everyday life. We studied a possible future for designing next generation adaptive learning systems based on artificial intelligence in learning and teaching methods. The analysis of learner and teaching assessment is essential in the production of high quality personalized and flexible eLearning services. In this paper we are integrating the scope, functionality and challenges of artificial intelligence for enhanced and flexible learning in higher education scenario.

Index Terms - Adaptive learning, Computer programming, Education, Artificial intelligence, Learning science, Data science, Machine learning, Deep learning.

1. INTRODUCTION

Students and teaching community have been growing up in a highly digital world, where they learn and react very differently during the learning process in comparison to students not having knowledge with the information and communication technology. Traditionally adaptive and artificial intelligence eLearning systems are not independent from the content they adapt. This is due to the fact that the deeper the intellectual strategies and axes of adaptive technology are embedded the more tied to the specific area and learning objects they become. By integrating the mechanisms that provide the adaptive effects with artificial intelligence that is being operated on many adaptive applications achieve high levels of adjustment through manipulating the learning mechanics. The multi-model, metadata-driven approach, which aims to alleviate many the issues described above, is the methodology used in the process that makes learning methods simple. The system should be cost-effective to build, maintain, and support, accurate in its assessment of learner characteristics and learner knowledge state. Also it should be efficient in carrying out decisions and recommendations, such as identifying optimal instructional resources and activities for each learner at each moment in time. Artificial intelligence is currently progressing at an accelerated pace, and this already impacts on the profound nature of services within higher education. This transformation significantly made efficient modification on the quality of services and workforce and dynamic time within the college or university. Machine learning is software that make predictions, identify patterns, and apply those recently discovered patterns to circumstances that were not covered by their primary design. The current study aims to analyze the applications of artificial intelligence in teaching and learning. This conceptual review paper groups articles according to concepts and themes of integrating AI into education. It identifies the current 'understanding' of application of AI in current educational systems, discusses not only the advantages of AI applications but also the challenges of integrating AI into education. It provides a snapshot of future role of AI in educational system.

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1. ARTIFICIAL INTELLIGENCE (AI)

What is AI? In a nutshell, it's a branch of computer science that creates "intelligent" machines to work and react something like the human brain. Examples are computer programs and computerized machines like robots. Using the power of engineering and machine learning technology, these machines can process data, patterns, and models in order to perceive, reason, plan, solve problems, make predictions, and manipulate objects. One of the main benefits is that by automating complex and time-consuming tasks, artificial intelligence frees up time that would be spent on them.

2. IMPACTS OF AI IN EDUCATION

- ✓ Artificial Intelligence (AI) is all about computer systems that emulate human behavior**.**

AI in the wide ranging sense refers to computer systems that undertake tasks usually thought to require human expertise. Apple's "Siri" voice assistant, Amazon's shopping recommendations, Uber ride sharing, and Google translate are examples of how AI has entered our daily lives. It is now having an impact on higher education too.

- ✓ AI is paving the way for customized, adaptive learning

The long evasive objective of designing learning systems to adapt to individual student capability, needs, and prior knowledge is now achievable with AI. These AI oriented adaptive learning systems build on a student's prior learning to shape pathways for current learning and provide guidance on future learning directions and thus makes the teaching and learning process more flexible and fast.

- ✓ AI is enabling guiding systems that strengthen the student experiences and creativity.

AI is now enabling higher education institutions to provide full time individual assistance to students to help them navigate the problems of the campus life and enhance their campus experience. Computer systems allow students to ask questions using natural language and receive an immediate response about such topics as campus services, their grades, class schedules, and course requirements for graduation. Furthermore, these AI systems learn over time from questions asked, so that their accuracy improves.

- ✓ AI is being used for student assessment and grading

AI is used for assessing student's academic and curricular activities by understanding the problems of written text and speech. For example, essay and assignment assessment requires only examples of strong and weak papers rated by a human to be entered. Also, spoken language can be assessed on many linguistic and semantic dimensions, including elegance, vocabulary usage, pronunciation, modulation and accent.

- ✓ AI can intensify the capability of students with disabilities

Learning analytics and techniques involve the measurement, collection, analysis, and reporting of data about learners and the contexts in which learning takes place, with the aim of improving the teaching and learning environment. AI is enabling learning analytics to detail what is happening (descriptive), why it is happening (diagnostic), predictive (what will happen), and prescriptive (what needs to happen).

- ✓ AI may causes ethical, social, moral, and privacy concerns.

AI systems require access to large amounts of data, including private and sensitive student and faculty privileged information, depending upon the application. Therefore, its usage raises an unlimited amount of ethical, moral, and privacy concerns, which must be addressed. Some of them are data security, consent to use personal data, who is able to access the data, possible misdiagnosis of students' learning, and latent bias and conventional systems in AI algorithms.

- ✓ AI is challenging to implement in higher education

Apart from the need to address the ethical, moral, and privacy concerns raised above, institutions attempting to implement and build up AI systems face innumerable challenges. These include problems regarding,

- Who will lead and promote an AI initiative?

- Who will be responsible for developing and observe AI policies and practices?
- What role faculty will have in system design and implementation?
- Who understands the assumptions inherent in the design of AI algorithms other than system developers?
- What are the legal implications of faulty student diagnosis or advising?
- How necessary technical support staff will be recruited and retained?

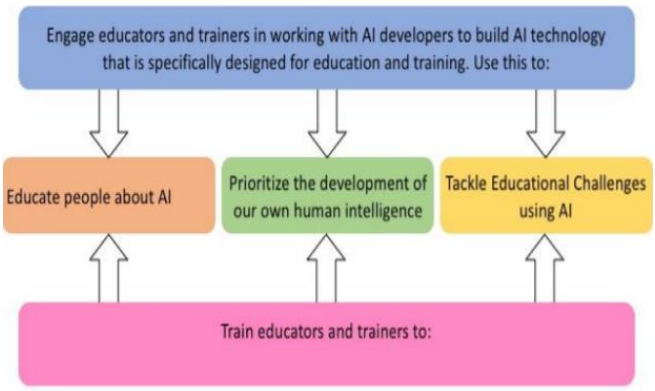
AI is transforming other aspects of academic life. Although teaching, learning, and student advising are the leading AI applications in higher education, the technology is making inroads into many other aspects of life in the academy. These applications, for example, are transforming libraries, communication with students, academic research, textbook creation, and external outreach.

✓ AI and the future of higher education

Although there is an abundance of unanswered questions about AI's role and how it will be managed, there is little doubt that the technology is inevitably linked to the future of higher education. Advanced and innovative applications will continue to be developed and explored, more programs and courses will include AI and related topics, and existing curricula will be adapted to provide students with the skills needed in a world where many jobs will be taken over by machines and new careers will emerge.

3. ARTIFICIAL INTELLIGENCE : FUTURE COMPONENT OF TEACHING & LEARNING PROCESS

The application of AI in education has resulted in significant progress in theory and practice in the current century. There are so many different procedures and scenarios for integrating AI to educational processes with a special focus being blended online learning and distance education. Also the integration of AI in educational processes requires various policy development under educational rules and regulations, if the researchers wish to avoid impound their efforts to statistically significant results. Adaptive learning is another important AI oriented learning.



An intelligent approach to AI for Education and Training

Here AI is used to match students with learning pathways that are appropriate for their needs, learning style, and features. The algorithm adapts in real time to each interaction with the student. Content can be added or removed and the difficulty level can be varied so that students can learn at their own methods and atmosphere. Some major companies have invested heavily in this area, offering digital learning platforms and tools that allow teaching community to personalize and enrich their courses. The main objective is to produce a learning pathway that evolves continuously according to the learner's performance, needs, skills, interest level, and other characteristics.

➢ Automation of Administrative Functions

AI has great possibilities in automating and expediting administrative functions and tasks for both educational institutions like colleges and universities as well as teachers. Admissions processes can also be streamlined and improved, reducing the workload for high volume admissions offices. Automating the process of paperwork and support for students with common admissions questions via chat box and interactive website materials can improve the process for both administrators and future students grading and evaluating assignments, essays and offering importance to student responses is where educators spend the most time. AI can automate the grading process in examinations in order to allow education policy makers to spend more time with students.

➢ Smart Content

"Smart" content is just another name for dynamic content. If that term sounds more familiar to you, it's probably

because you're aware that there are "static" and "dynamic" websites. Smart content really starts to demonstrate its power when it utilizes AI-powered automation to optimize for conversions in real-time. Advanced machine learning algorithms mean that one's content can optimize itself automatically with each user visit, learning from the actions of each previous visitor. The concept of smart content is a hot topic now as robots can create digital content with the same degree of grammatical power as their human counterparts, and this technology has finally reached the classroom. AI can produce educational smart contents as

- **Digital lessons.** Digital learning interfaces with the customization options, digital textbooks, study guides, compact lessons, and much more can be generated with the help of AI.
- **Information visualization.** Contemporary ways of perceiving information, such as visualization, simulation, web-based study environments can be powered by AI.
- **Learning content updates.** Besides, AI helps generate and update the content of the lessons keeping the information up-to-date and customizing it for different learning curves.

AI can help digitize textbooks or create customizable learning digital interfaces that apply to students of all age ranges and grades. One such system called Cram101 uses AI to condense the content in textbooks into a more digestible study guide with chapter summaries, practice tests and flashcards. Another platform called Netex Learning allows lecturers and professors to design a digital curriculum and content across a variety of devices, including video, audio and an online assistant. Virtual content such as digital lectures and video conferences are also a reality now thanks to AI.

- Smart Tutors and Personalization

AI can act as a smart tutor by more than liquidizing a lecture into flashcards and study guides as it can also tutor a student based on the difficulties they're having with class material. Earlier, students had a limited window of time in which they could see their teachers, especially office hours or hoping they answer their emails. There are now smart tutoring systems such as Carnegie Learning that use data from specific students in order to give them feedback and work with them directly. While this AI application is still in its early stages, it will soon be able to work as a full-fledged digital teaching assistant that helps a student with their educational needs in just about any area of need. Also, these platforms will soon be able to adapt to a wide variety of learning styles in order to help every educator and student.

- Virtual Lectures and Learning Environment

A more digital learning environment is also becoming a reality with smart virtual environments and platforms. These platforms uses AI, 3-D gaming and computer animation to create real virtual characters and social interactions. With the development of augmented and virtual reality, and the benefits of bringing these into the classroom for students to have a more immersive learning experience and to see places and explore things that otherwise they would not, AI can be a enormous benefit for this. Through AI, resources could be found instantly based on student responses, or for the entire classroom to experience. Capabilities such as these are not something that will be limited by the time and place of the classroom setting. AI could show students want they want to explore, find ways to bring the content to life instantly.

- Teachers' Support

In addition to helping with grading, AI will also provide support for teachers in other ways. Some of the routine task can be managed by AI, as well as communication with students. For example, one University professor successfully used an AI Chat box to communicate with students as a teaching assistant all semester without students knowing they were not talking to a human. While AI may not ever be able to truly replace human grading and valuation, it's getting pretty close. It's now possible for professors and evaluators to automate grading for nearly all kinds of multiple choice and single word answer type testing and automated grading of student. Currently essay type questions grading software is still in its development pace and not quite up to par, yet it can improve over the coming years, allowing teachers to focus more on in-class activities and student interaction than grading. When a large number of students are found to submit the wrong answer to a homework assignment, the system alerts the teacher and gives future students a customized message that offers hints to the correct answer.

Teachers may not always be aware of gaps in their lectures and educational materials that can leave students confused about certain concepts. Artificial intelligence offers a way to solve that problem. Coursera, a massive open online course provider, is already putting this into practice founded in 2012 by Stanford University computer science professors Andrew Ng and Daphne Koller. Coursera works with universities and other organizations to offer online courses, certifications, and degrees in a variety of subjects.

- Students' Communication

The Students and teaching community will be able to communicate instantly with one another as well as to connect with other forms of AI around the world. Students instantly communicate within a group, helping each student to expand their own personal learning networks, with personalized and more authentic connections that will meet the students' interests and needs at any given moment. Think of the benefits for being able to converse with AI or a virtual peer, who has been located based on an assessment of student needs and error analyses.

AI systems find the information that we see and find on a daily basis. For example Google adapts results to users based on location, Amazon makes recommendations based on previous purchases, Siri adapts to your needs and commands, and nearly all web ads are geared toward your interests and shopping preferences. These kinds of intelligent systems play a big role in how we interact with information in our personal and professional lives, and could just change how we find and use information in schools and academia as well. AI-based systems have already radically changed how we interact with information and with newer and more integrated technology with the advancement of ICT. Students in the future may have vastly different experiences doing research and looking up facts than the students of today.

- Catering to the Needs of Variety of Students

In addition to acting as a personalized learning companion, AI will also be able to help students with special needs by adapting materials to lead them to success. For instance, studies are already showing positive results for AI teaching ASD students' social skills. Smart data gathering, powered by intelligent computer systems, is already making changes to how colleges interact with prospective and current students. From recruiting to helping students choose the best courses, intelligent computer systems are helping make every part of the college experience more closely tailored to student needs and goals.

Data mining systems are already playing an integral role in current higher education scenario, but artificial intelligence could further modify higher education through technological advancement. Initiatives are already underway at some institutions to offer students, AI-oriented training that can ease the transition between college and high school. In future the college selection process may end up a lot like Amazon or Netflix, with a system that recommends the best schools and programs for student interests.

- Allow Teachers to Act as Learning Motivators

AI can change the role of teachers in the classroom by providing students with basic information and support. Teachers will move into the role of classroom coordinator or learning motivator. Google Assistant, Apple Siri or Amazon Alexa and getting it to answer some of the questions that come up in a lesson would be a fairly simple task for many computing teachers.

- Provide Personalized Help

When students need to strengthen skills or master ideas before an assessment, AI will be able to provide students with the additional tools they need for success. In future, visual, effective and dynamic learning channels outside the classroom will become not only more universal but capable of supporting a range of learning styles, all while addressing common questions and concerns students have that cannot be readily addressed by teachers or parents. Students in Massive Open Online Courses (MOOCs), online learning classes and blended class experiences will be able to benefit from customized, individualized learning paths in ways that until recently would not have been possible.

- Dynamic Scheduling and Predictive Analysis

AI can understand student's habits and propose the most efficient study schedule for them by using predictive

computing. This is a benefit for the customer service agent, medical professional, or anyone who does a repetitive tasks, a machine won't get bored, tired or need a break and should the machine encounter a problem or question out of its programming a human will be contacted to step in.

4. CHALLENGES

The AI project development environment is quite different. Mainly development is about identifying data sources and then gathering content, cleansing it and administering it. Such an approach requires different skills and mindsets, as well as different methodologies. Also AI-powered intellectual systems have to be trained in a particular domain. Some of the major drawbacks AI powered education are,

High Cost of AI Technology: AI education comes at a high price. As new technology emerges from time to time, budgets will have to increase to cover the expenses to match the current requirements. Besides the installation of AI software, educational institutions will also need to consider the cost of maintenance of the software.

Vulnerable to Cyber Attacks: Artificial intelligence software is highly vulnerable to cyber-attacks because if it's full time connectivity to the internet world. Also it contains a ton of data, hackers are constantly devising ways to attack. Image and secret data having an entire database of student, teacher, parents, and administrator information hacked into.

Little to no Room for Flexibility: Analytical AI robotics cannot flexibly develop a student's mind as a teacher. While educators can prefer multiple problem-solving methods, AI doesn't have alternative teaching methods. Other main challenges faced by AI guided learning are,

- The slow ICT infrastructure rate is affecting the adoption of the AI technology in the emerging economies, as the deployment of AI-enabled solutions require technological advancement to generate accurate outcome. This may restrain the growth of the AI in education market especially in developing countries.

- To train machine learning and deep learning algorithms one needs massive and clean data sets, with minimum biases. Also it's very important that data privacy issues may arises when it comes to harvesting personal data, particularly in light of the General Data Protection Regulation act.

- According to studies 20% of all business content will be produced by machines. While there is evidence that AI is capable of creating certain kinds of content that is virtually indistinguishable from human content in terms of clarity and accuracy, machine produced content is substantially more boring and less pleasant to read according to one study.

It's easy and flexible to use a complex collection of AI-driven components collaborating to create fully automated, perfectly personalized customer experiences. But that system will be susceptible to frequent failures as one or another component finds itself facing conditions it wasn't trained to handle.

5. CONCLUSION

Application of artificial intelligence in teaching and learning process has brought about several beneficial changes. From classroom interactions, coursework learning, and admin processes, AI makes it all better. And the advantages keep improving and increasing as new AI technologies emerge. The increasing adoption of the AI technology for various applications in the education sector and growing need for multilingual translators integrated with the AI technology are expected to drive the growth of the AI in education market.

Artificial intelligence is the most fascinating of technological advancements of our time in the area of education process. From creating advanced data-collecting algorithms to providing detailed and customized student feedback, AI can overcome all other systems in the learning process. AI can quickly interpret a student's needs and design an appropriate assessment and grading. It can show students mastery, repeat lessons as needed and quickly design a personalized learning plan for each student. AI could provide teachers with a virtual teaching assistant. But more than just teachers and students, it can be a way to support parents by involving them in the learning environment of students and providing them with the information they need to help their students be successful

when they're not in the classroom. The future likely holds a lot of possibilities for AI. This paper highlighted the potential impacts of AI in education, some worldwide case-studies, issues and challenges associated with the global teaching and learning process.

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