

Use of AI-Based Tools in Enhancing Learning Outcomes in Higher Education

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Abstract - Artificial Intelligence (AI) has emerged as a transformative force in higher education, significantly enhancing learning outcomes, improving teaching efficiency, and promoting digital innovation in academic institutions. The integration of AI-based tools such as intelligent tutoring systems, adaptive learning platforms, chatbots, predictive analytics, and automated assessment tools has reshaped traditional education systems by providing personalized and data-driven learning experiences. This research paper examines the role of AI-based tools in enhancing learning outcomes in higher education and explores their alignment with Sustainable Development Goal (SDG) 4 – Quality Education and SDG 9 – Industry, Innovation and Infrastructure.

The study is based on secondary data collected from peer-reviewed journals, UNESCO reports, OECD publications, and educational technology research studies. The findings indicate that AI improves student engagement, academic performance, accessibility, and institutional efficiency. AI-based tools enable personalized learning, real-time feedback, automated administrative processes, and predictive decision-making, which contribute to improved educational quality and innovation in higher education systems.

The research also highlights the challenges associated with AI implementation, including ethical concerns, data privacy issues, high infrastructure costs, and the need for teacher training. Despite these challenges, AI has strong potential to revolutionize higher education by creating smart learning environments and promoting sustainable educational development.

The paper concludes that responsible and ethical integration of AI-based tools can significantly enhance learning outcomes in higher education and support the achievement of SDG 4 and SDG 9 by improving educational quality, accessibility, and technological innovation.

Keywords: Artificial Intelligence, Higher Education, Learning Outcomes, SDG 4, SDG 9, Educational Technology, Digital Learning

INTRODUCTION

Artificial Intelligence (AI) has become one of the most influential technological advancements of the 21st century, transforming various sectors including healthcare, finance, manufacturing, and education. In higher education, AI is playing a crucial role in improving teaching and learning processes, enhancing student engagement, and supporting institutional decision-making. The rapid growth of digital technologies and online learning platforms has created new opportunities for universities and colleges to integrate AI-based tools into their academic systems, leading to improved learning outcomes and better educational experiences for students.

Higher education institutions are facing several challenges in the modern era, such as increasing student enrollment, diverse learning needs, limited faculty resources, and the demand for high-quality education. Traditional teaching methods often fail to address these challenges because they rely heavily on standardized learning approaches and manual administrative processes. As a result, students may struggle to understand complex concepts, teachers may find it difficult to provide individual attention, and institutions may face difficulties in maintaining academic efficiency.

AI-based tools provide effective solutions to these challenges by introducing intelligent and automated systems that support both students and educators. For example, adaptive learning platforms analyze student performance and provide personalized learning materials, while chatbots offer instant academic support and guidance. Predictive analytics helps universities identify students who are at risk of failing or dropping out, allowing early intervention and support. Automated grading systems reduce the workload of teachers and ensure fair and consistent evaluation of assignments and exams.

The integration of AI in higher education is also closely linked with the global agenda for sustainable development. The United Nations Sustainable Development Goals (SDGs) emphasize the importance of quality education and technological innovation for sustainable growth and development. SDG 4 aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all, while SDG 9 focuses on building resilient infrastructure, promoting innovation, and fostering technological development.

AI-based tools contribute significantly to SDG 4 by improving access to education, supporting personalized learning, and enhancing teaching quality. Online learning platforms powered by AI enable students from remote and underprivileged areas to access high-quality educational resources, reducing educational inequality. Similarly, AI supports SDG 9 by promoting digital innovation and

technological infrastructure in higher education institutions. Smart classrooms, digital libraries, and AI-powered research tools are examples of how technology is transforming educational infrastructure and promoting innovation.

In recent years, many universities around the world have adopted AI-based tools to improve learning outcomes and academic performance. For example, universities use AI chatbots to provide student support, adaptive learning systems to personalize education, and predictive analytics to improve retention rates. Online learning platforms such as AI-powered course recommendation systems help students choose suitable courses and develop relevant skills for their careers.

The increasing adoption of AI in higher education highlights the importance of understanding its impact on learning outcomes and sustainable development. While AI offers numerous benefits, it also raises concerns related to data privacy, ethical use of technology, and overdependence on automated systems. Therefore, it is essential to analyze both the advantages and challenges of AI in higher education to ensure responsible and effective implementation.

The main purpose of this research paper is to examine the use of AI-based tools in enhancing learning outcomes in higher education and to analyze their contribution to SDG 4 and SDG 9. The study aims to provide a comprehensive understanding of AI in higher education, supported by research findings, case studies, and academic literature.

The research also explores future trends and recommendations for effective AI integration in universities and colleges. By understanding the role of AI in higher education, policymakers, educators, and institutions can develop strategies to improve educational quality and promote sustainable development.

OBJECTIVES OF THE STUDY

The main objective of this research is to understand the use of AI-based tools in higher education and how they improve learning outcomes while supporting SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure). The study focuses on analyzing the role of Artificial Intelligence in improving teaching, learning, and innovation in universities.

1. To understand the concept and importance of AI-based tools in higher education

This objective focuses on explaining the concept of Artificial Intelligence and its importance in higher education. It helps in understanding how AI-based tools such as chatbots, adaptive learning systems, and automated grading improve teaching and learning processes.

2. To analyze the role of AI in enhancing student learning outcomes

This objective examines how AI helps improve student academic performance, engagement, and understanding of subjects through personalized learning and real-time feedback.

3. To examine the relationship between AI and SDG 4 (Quality Education)

This objective explains how AI supports quality education by improving access to learning, teaching methods, and inclusive education systems.

4. To analyze the role of AI in promoting SDG 9 (Innovation and Infrastructure)

This objective focuses on how AI promotes innovation, digital infrastructure, and technological development in higher education institutions.

5. To study real-world case examples of AI in universities

This objective helps in understanding how universities use AI in practical situations to improve learning and academic management.

6. To identify benefits and challenges of AI in higher education

This objective analyzes the advantages and limitations of AI, such as improved efficiency, better learning outcomes, and challenges like cost and data privacy.

7. To explore future trends and recommendations for AI implementation

This objective focuses on future developments in AI and suggests ways to implement AI effectively in higher education.

RESEARCH METHODOLOGY

This research paper is based on **secondary research methodology**, which involves collecting and analyzing data from existing academic and research sources.

Research Design

The study follows a **descriptive and analytical research design** to examine the role of AI-based tools in higher education and their impact on learning outcomes.

Data Sources

The data is collected from:

- Peer-reviewed journals
- Research articles
- UNESCO reports
- OECD reports
- Government publications
- Educational technology journals
- Google Scholar research papers
- International conference papers

Data Analysis Method

The collected data is analyzed using:

- Comparative analysis
- Thematic analysis
- Literature review method
- Case study analysis

Research Approach

The study uses a **qualitative research approach** to understand the impact of AI on learning outcomes and sustainable development goals.

This methodology ensures reliability and accuracy of the research findings.

SCOPE AND SIGNIFICANCE OF THE STUDY

Scope of the Study

The scope of this research focuses on the use of AI-based tools in higher education and their role in improving learning outcomes. The study examines how Artificial Intelligence is used in universities and colleges to support teaching, learning, and academic management. It covers AI-based tools such as adaptive learning systems, chatbots, automated grading, predictive analytics, and digital learning platforms that help improve student performance and engagement.

This research is limited to higher education institutions and focuses on the relationship between AI-based tools and Sustainable Development Goals, especially SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure). The study is based on secondary data from journals, research papers, reports, and case studies, and it mainly analyzes the academic and technological impact of AI in higher education.

Significance of the Study

The significance of this study lies in understanding how AI-based tools improve the quality of higher education and enhance student learning outcomes. The research helps explain the importance of Artificial Intelligence in modern education and how it supports personalized learning, student engagement, and innovation in universities.

This study is useful for students, teachers, and educational institutions as it provides insights into the benefits and practical use of AI in higher education. It also highlights the role of AI in supporting SDG 4 by improving quality education and SDG 9 by promoting innovation and digital infrastructure. Overall, the study helps in understanding how AI can create a more efficient, inclusive, and technology-driven education system.

RESEARCH GAP

Research Gap Statement

There are several articles that discuss the effect of AI on the education system, with some of them not utilizing available literature comprehensively. There are many publications focusing on technological advancement. Fewer publications are found in literature on pedagogical assimilations of AI learning tools in teaching higher education to enhance SDGs 4 and 9 learning outcomes. Despite the plethora of publications on the topic of AI learning systems, such as chatbots and adaptive learning, there is an overwhelming contextual gap in terms of the application of the said systems in real university and, more importantly, to which extent these systems can support the learning, motivation, and competence of the students, which is also largely literature-based in developed countries. This is particularly so when it comes to the scarcity of literature by the developing world such as India. Although literature has been available concerning learning tools and AI and critical thinking, virtually none has addressed the impact of technology on learning, student performance and, ultimately, the outcomes of the education. There is little literature on the topic of the intersection of AI tools in the teaching and learning process and SDGs 4 (Quality Education) and SDGs 9 (Industry, Innovation, and Infrastructure). The majority of the literature is based on either AI in education or SDGs in education so the connection between AI learning tools and the sustainable development goals in higher education is a blank slate.

Finally, the issue of how teaching personnel and the school institution contribute to the successful implementation of AI technologies has minimal research.

The willingness of institutions and teachers, and AI application of higher education is a relatively underresearched topic.

Thus, the purpose of the given research is to attempt to address the abovementioned gaps by exploring how much AI-based tools can benefit the learning outcomes in higher education and, in this case, the achievement of SDG 4 and SDG 9 in a clear and pragmatic manner.

LITERATURE REVIEW

Nowadays, AI is an object of numerous debates in the education sector. It belongs to its hype, also, but it is the part of it that is worth hearing.

The manner in which learning is being extended is what is actually changing gradually and without much ado. The former one was highly simple: all people get the same content and they learn at the same pace and you can follow or not. That is beginning to be cannibalized by artificial intelligence. The system will be aware that a student has gotten somehow entangled. When they are running in a race it runs with them. It is not magic - but to a student who has always felt somewhat lost in a lecture hall of two hundred, to have something that actually replies to him, is a great thing.

Chatbots have also been implemented as a more efficient tool that has been utilized in universities but implicitly. A million little things, the students would like to know, and when is this, where do you want me to hand this in, what is this course anyway and this information would merely end up in email in-boxes. They are now responded to immediately, at midnight, without having to pick up the telephone. It sounds minor. It does not seem to be small when you are in stress and you require something.

What is not under discussion as much is, however, early intervention. AI has the capability to scan student behaviour patterns and flag red flags on possible dropout - before they drop out. That is no trifle. It may even lead a man to take a second stab in life where he/she is caught when at a tender age where he/she is supported and time is on his/her side.

Of course there is nothing wrong about all this. This is confidential information on the students and not every teacher is prepared to accept any of this and neither is the installation of such costly items such that many institutions cannot afford this. The technology, which is progressing at a faster rate than the policies that govern it, is not an imaginary menace, but an actual one.

But truthful ones read? The educational process can become something that, at any rate, is interested in the achievement of the students, rather than a conveyor belt, when used correctly, AI can assist in doing so. That is one to be sought to do.

CONCEPT OF AI IN HIGHER EDUCATION

One of such words is the Artificial Intelligence which has been pushed to the extremes and in such a wide manner that one can even assume that the sense has been emptied of it but when the noise is removed the result is what is actually worthy of knowing. Central to it, AI is a software where we have trained it to think the way we have always thought humans to be able to think: to process problems, learn and develop further as new information is introduced, to understand language and make decisions when we are unsure. It is not mindful. It lacks feeling, but possesses thinking, seeing and acting, too close to the thought of human beings, that the practical difference is gradually fading away with every passing year, and in none of the domains more than in education. It is also an institutional paradox that was ever the main dilemma of the higher education to teach many and teach everyone well. The lecture hall model, with its history and tradition, was a compromise: to structure the curriculum around the mediocre student, to teach him at a uniform rate, to all at the same time, to be forced to confess that one side of the curve (the lost) or the other (the too fast) will have to support themselves, primarily. The generations of students have disappeared in that hole not because they were not able and unworthy to work, but it is simply that the system was not created in such a way. Arithmetic is transformed into AI. It goes beyond that, more productive than changing teachers or redefining the university as such, nothing but to listen to people in institutions that were not made to listen to people. It does not only follow, but it works: where the pupil is procrastinating, where the ideas are never seized, where there is speed, etc. and where it is working, getting the stuff ready, altering the plans, pushing the student in the wrong direction before he is turned into a failure. It is responsive to questions at midnight using chatbots, which do not sigh or embarrass students who have posed. It presupposes automatic loading of grading and even common assessment that can be addressed by teachers to the discussion and interventions in fact, a human being is involved. It is not only tracking the low profile signals that a student is sinking into the abyss but also providing a student with the window even as small as it is the student can still find a way of reaching someone before it is too late. It binds the research together through the supposition of the tedious initial work which has always been more time consuming than the intellectual it was to guide. It is the desire of the learning platforms not alone curved and supportive, but also projecting the material into the vacuum. All of this is achieved not without its share of complication - the questions of data privacy are not going to be answered with a smile, the cost of such implementation is a fact, the likelihood of such technology not fueling inequality between institutions so much as it would be fueling is an issue that needs much more discussion than the amount of that which such technology is receiving, and the fact that teachers are going to simply accept all of this unoffered and unprepared is not to make a place to hear the struggling student that is silent, to have the silent but bored student, and to have the difference between where one is and where he or she could be not a sad thing in itself but a challenge to be overcome. It is what AI is offering in the form of education. It is quite another future as we have been living in.

AI-BASED TOOLS IN HIGHER EDUCATION

The use of AI machines is a craze in nearly all colleges and distance learning programs. They render the process of learning among the students easy and the teaching among the teachers less stressful.

1. Intelligent Tutoring Systems

People only need to imagine that they are your best friend who will come and sit down and explain to you until you understand. They observe the manner in which you learn and adjust the manner in which they explain things depending on what is and what is not clicking.

They are implemented on such subjects as maths, business, and coding in the Example Universities. When you are lost it does not simply show you the right path, but reckons where you have gone astray and puts you there.

The benefits of it to students.

- You receive the individualized assistance as opposed to the whole classroom one.

Hard issues are made easier to comprehend.

- Your performance improves.

You can study on your own and you do not stand still.

2. Artificial Intelligence Chatbots and Virtual Assistants.

Those chat boxes on the university websites are the ones that are able to respond to any question that you might have and at any hour of the day or night.

Example most universities are available on their websites and are applied to assist students in their work such as admitting to a course, due date or even hearing about an exam without having to wait and get any email.

Benefits

No one is there to rescue them even at 2 am.

A couple of seconds and you have your answer.

The employees will not have to respond to the same simplistic questions throughout the day.

It is all a lot less stressful.

3. Adaptive Learning Platforms

They will denote what you are and change what they will according to what you are.

Example Online learning applications will recommend the appropriate courses to you and formulate a course of study that matches your level.

Benefits

Go where you will, waste your time.

Thou hast the greater understanding.

You study more effectively.

You will never be left behind or bored.

4. Predictive Analytics Systems

These keep track of the performance of the students and identify issues early enough before they become more serious issues.

They are employed by the Example Universities to identify those students who are on the verge of failure or dropping in before it is too late.

Benefits

Learning disabled students can be identified at an early age before it is too late.

There is an increasing number of students who are finishing the degree more than ever.

The right support has right people as the center.

Guesses are not taken in decisions.

5. Evaluation and Grading Solutions Automation.

These automatically check your work hence the teachers do not need to be physically obligated to mark your work.

The examples of studying apps are the apps that examine your answers by using the AI and suggest your results almost instantly.

Benefits

The amount of time which is saved by teachers is phenomenal.

So is the similar fashion everybody is fairly scored.

You discover after it is too late to know what you are doing.

There is no procrastination since it has taken long before it is marked.

AI AND LEARNING OUTCOMES

Be frank, how many times did you complete one complete semester, do all the assignments, exams and felt that you did not in fact learn anything? You have experienced it, but not so much suffered in. It is a more widespread feeling than anybody would be willing to acknowledge and that is precisely the sort of issue that AI is beginning to address.

Learning outcomes is simply a fancy expression of saying -what did you actually get out of this course? What do you now know which you did not know previously? But what you suppose you ought to do? AI assists students to locate the actual responses to those questions not in an overly complex manner, but in a straightforward work that it executes extremely well, focusing on each student, and responding to what it deems.

Struggling with something? It helps you in that respect better. Got it already? It drives you on. You are not waiting there until the other ones can reach the same level and you are not being dragged through something that you even do not understand yet. You are studying at the pace you desire and could never have gotten in a classroom of a hundred people.

The fact that feedback is needed is essential, and it is even more vital. And three weeks later to get your examination results is practically a waste of time - you have already passed on, you have forgotten what you have written, and knowing that you have done something wrong will not assist you at all. AI gives you such a feedback as soon as it is new, when you can find time and make something out of it. It is worth something therefore that is when.

Then there are the group of students who are actually doing bad but kept it shushed, perhaps they are too ashamed, perhaps they do not know whom to confide in, perhaps they just became accustomed to the back seat position. AI notices the slightest details before it becomes too late and provides one with an opportunity to intervene. All the students requiring assistance will not insist on it. They must be merely perceived initially.

Add all that and education starts to be not so much what is done to you as it is now being built around you. What you have gotten you have gotten, you have somebody behind you and that you have one to give when you cross over to the other side you have something concrete. It is supposed to be that way with learning.

DATA AND STATISTICAL INSIGHTS

Taking a closer look at the information, one can see that AI tools are reconsidering the higher education in a more concrete manner. Research after research indicates that AI is not simply gaining momentum. It makes the student performance go high, foment more activities and makes the universities to simplify their operations. Consider adaptive learning, automated grading, predictive analytics, they are here to stay in the campuses which seek to bring the teaching and learning to the next level.

Research is direct to the point. Students that resort to AI services not only perform better but remain more active compared to those who use the old ones. The AI focuses on personal requirements of the students, offers tailored resources, and generates instant feedback. That will result in more insight, retention and increased course completion. The success cases of universities using AI have boosted and reduced the number of students dropping out.

The statistics in support of it are high: the annual AI and digital infrastructure expenditure in schools is increasing. Campuses are building smarter classrooms, adopting online solutions, and adopting AI-driven research tools, all of which are intended to begin innovation and automate operations. Such upgrades keep on picking up in SDG 9 that is concerned with industry, innovation, and infrastructure. In addition, the digital platform helps in the eradication of barriers, which establish the avenue of expanded access and inclusion, the pillars of SDG 4: Quality Education.

The evidence cannot be denied in the end. Learning institutions are being improved by use of AI. They increase results, inspire students and open a new way of discovery..

AI AND SDG 4 – QUALITY EDUCATION

The SDG 4 is expected to provide equality of access to quality education to the entire population besides providing the learners with equal opportunity to learn. This is what the spirit of SDG 4 is constructed on that is articulated in the concept of creating superior education systems in a manner that learning process becomes open, inclusive and meaningful. These will be incentive-driven in the period, which will be pegged on Artificial Intelligence particularly in universities.

Colleges have now been left with a choice of providing individual and customized education on college level through AI. The teacher will be inclined to deliver the same lesson to all the students in normal classes yet not all the students learn in a similar manner. There are those who are quick in picking things. There are people who require additional time or assistance. The AI-based learning systems will take into consideration such differences- the systems will monitor the performance of the learners and tailor the learning material to the learners.

Adaptive learning systems. They make follow-ups to the students on the progress of quizzes and assignments. Whenever one hiccups on an issue, the system would automatically give other materials like videos, practice questions, extra explanations among others.

The learners will be in a position to work at their own pace. Their grades are improved and they are improved to the level that they win in such games hence their morale and motivation is improved.

In AI, the education barrier does not exist especially to the students in remote or remote locations. There are other individuals who are unable to attend universities because of distance or financial reasons or resource deficiency. Smart AI-driven online platforms enable them to listen to lectures, readings, and assignments wherever they are so as to make the learning process more equitable. This will do much towards combatting Inequality in education- which is what SDG 4 is supposed to be doing.

AI is also beneficial in enhancing the teaching. The grades and learning patterns of the students are updated in real time to the faculty members. They are able to know in a very short time who is not performing well or what ideas are not being taken. This will assist them in focusing their energy and reducing the classes in order to render the education effective.

The second is the assistance in learning with the assistance of the AI chatbots. The students are able to answer courses, exams, homework/university regulations any time- they do not have to wait till the teachers or college administration call the students. The students are made active and satisfied by quick answer.

Keep in mind that SDG 4 does not perceive lifelong learning as a haphazard thing. Due to AI, it is possible to introduce smart courses and training programs, with the help of which any individual can learn something new. The professionals may also be relevant and competent even during the working period.

The most critical lessons that can be learning with the help of AI to facilitate SDG 4 include the enhanced learning, the improved access, personalization of learning, and the improved teaching. This prudent strategy can make the higher education a good one since it will be an inclusive, more fruitful, and student-focused one.

AI AND SDG 9 – INDUSTRY, INNOVATION AND INFRASTRUCTURE

Goal 9 of the sustainable development aims to achieve good infrastructure, promote innovation and ensure technology has infiltrated all corners of our life. University is raising the game. Universities and colleges no longer rely on the old and are using AI technology in their web-based programs and transforming the nature of the teaching and learning process.

It is not just a hypothesis of the future of classrooms, AI-powered classes are already a reality. Lectures are becoming more digital, interactive and smart such that students are ready to attend lectures. The difference is evident: students become interested, begin to explore and they are interested in what they are learning.

It does not mean that research is stagnant. With the help of AI, data volumes can be processed by scientists and students much faster than before, as well as patterns can be identified. These are tools that assist the universities to push out the research that counts and keep them on the top of the pack in regards to innovations and technology.

On the operations front, the campuses have jumped on AI management systems and cloud platforms as well as virtual learning centers. Digital transformation is not a buzzword anymore but it is taking place everywhere. Students post their assignments, study in any place regardless of the place of location and access to online libraries at home or in campus. Higher ed is no longer that inflexible-students can now decide on the when and how they study.

Teamwork is also turning out to be a winner. Colleges are forming collaborations with businesses, creating AI education and courses. Students are presented with real-world skills, which they would apply in the future. When they enter the labor force, they introduce new ideas and experience to the labor force.

AI also has inspired the next-generation educational technology: virtual classroom settings, AR-based simulations, smart tutors. No longer does engineering, medicine and business student head directly to theory, but directly to the immersion, which is practical in nature.

All this is added up. Unless, more imaginative, universities are becoming more specialized, which makes them precisely SDG 9, building the infrastructure of a more future-oriented, more digital higher education system.

CASE STUDIES

Case Study 1. Artificial Intelligence and Postsecondary Education.

The AI-based applications have been incorporated in some of the world universities to improve their learning and interaction with the students. The learning management systems also enable the students to read course materials, do assignments and get feedback

through the AI. AI chatbots are computer applications, which are employed in higher learning institutions to assist students in studying, as well as to guide students.

The AI tutoring programs are applied in assisting the learners in valuing the complex problems and enhance their grades. The performance of the students of the university is also analyzed and those who need additional help are provided earlier in predictive analytics.

Results

- Increased student engagement
- Improved academic performance
- Better student support
- Efficient learning environment

Case Study 2: learning based on web based Systems AI based.

Online world has also introduced learning through the use of AI in providing customized students in other regions of the world. The systems of the recommendation are based on the assumptions of the artificial intelligence and propose the courses, which depend on the performance of the students and their interests.

Interactive drills and quizzes as well as video lessons can also be offered to the students through online tools. AI monitors the progress of the learners and gives feedback to enable them to perform better.

Results

- Flexible learning opportunities
- Skill development

The level of education in international level.

- Improved learning outcomes

Case Study 3: Higher education of AI in India.

The education institutions and the Indian schools are slowly changing to the usage of the AI-based tools in the online classes and the smart classes. By coincidence, the online lessons and the learning contents will be accessible to the students through the learning management systems, which will also be driven by the AI.

The technologies that can assist the innovation in the field of higher education include the digital education and AI-based education platforms that the government can adopt.

Results

- Improved digital infrastructure
- Improved educational opportunities.

Improve SDG 4 and SDG 9.

- Enhanced learning outcomes

BENEFITS OF AI-BASED TOOLS IN HIGHER EDUCATION

The advantages of AI in institutions of higher learning are manifold since AI is applicable in enhancing the quality of learning and instructional process. The students can learn more productively, conveniently, and have access to the learning process that is facilitated by the utilization of the AI-based technologies. The global community has become accessible to the implementation of AI in the institutions of higher learning since it assists in enhancing the performance of learners and educators. The enormous benefits of AI to the tertiary learning are addressed in the following manner.

1. Personalized Learning

Individual learning is among the most useful advantages of AI in university education. This could be observed in the case of teachers who present the same to the students in a traditional classroom despite the students having lower understanding and knowledge of the same content being taught. Other students grasp things fast and some are those who need time and clarification. The solution to the question lies in the use of AI-based applications that may be used to provide a person with individual learning experience.

The artificial intelligence systems compare the outcomes of the students in the quizzes, assignments and exams and determine the aspects of the good and bad performance. In this analysis, the system will avail the learning contents of the respective level of learning to the student. One of these instances is a case of a learner who is weak in a certain subject and he/she can be exposed to additional videos, practice questions and explanations of same subject.

It is a one to one system that makes the students learn at their pace and enhances their self-esteem and performance. The learners also do not have the rush to learn at a given pace that makes them relaxed. It will therefore make the learning to be more effective and entertaining.

2. Improved Student Engagement

The interactive learning and the engagement process is enhanced because of the use of AI-based tools. The conventional teaching model is very textbook and lecture focused that is not attractive to all students. The interactive learning that is represented in the AI tools are video, quiz, simulation, and real-time feedback and involve the students in the learning process.

The interactive quizzes and real time feedbacks using the example of AI are also regarded as the learning devices and involve the students into the learning process. Learning process will be facilitated as the virtual assistants and chatbots will answer the questions of the students, and refer to the course materials.

The students can study at a very high pace where they are actively involved in the study and they also have an opportunity to take exams. This renders the whole learning in the tertiary learning easy.

3. Better Academic Performance

The AI would be utilized in the performance enhancement among the students as it would provide the students with feedback and 24 hour guidance. The intelligent systems keep track of the performance of the students and give them certain recommendations on how they could improve the performance. They will give feedback of assignments and tests to the students instantly and this will assist them to rectify their mistakes and acquire more knowledge.

At-risk students can be identified by predictive analytics systems to help and counsel them at an early stage. Such students can be heard by educators, and they can give such students more attention in order to enhance their performance. This reduces failures and improvement in performance of students is promoted.

This will not only lead to good standards being maintained in the universities but also an increase in the rate of graduations.

4. Workload that is less among Teachers.

It will also reduce the work of the teachers to the bare minimum since the AI tools will assume the administrative work and other tedious work. The teachers will be time consuming in marking the assignments, compiling the reports and student records. It is possible to track the performance of the students, grade the assignments with the AI assistance, and prepare the reports.

This would help the teachers to emphasize more on the research and mentoring besides teaching. The educators will be able to spend sufficient time on the students and enhance their learning.

The teachers are not replaced by AI, they just get an opportunity to work less and trouble-free.

5. 24/7 Student Support

Virtual assistants and AI chatbots will be capable of attending to and assisting students (anywhere and any time of the day). The students would need a guiding hand in the contents of the course materials and coursework college processes and they do not always have the teachers or the administrative staffs.

The chatbots will be the AI that assumes the direct answer to the questions, which the students will ask themselves and inform them about their studies and how the administration is operating. This will result in the satisfaction and the narrowing of time gap in communication between the students.

This will ensure that the learners are empowered as they will feel more motivated to learn.

6. Better Education.

The mediated interactive online learning systems facilitate the learners to get education regardless of being at the upper or lower end of the planet. The distant and rural students have an opportunity of undertaking on-line courses in which the students can access the study materials online.

This will minimize the education disparity and will take all the students to the same level in terms of learning opportunities. The accessibility and translation services that will be applied through AI will also come in handy to the students with the disability and language barrier.

Among the benefits that may be directly connected with SDG 4, it may be said by the fact that the quality education would be accessible to a larger number of people.

CHALLENGES OF AI IN HIGHER EDUCATION

Despite the numerous advantages of AI, the challenges related to AI are numerous, and they will have to overcome them to make the implementation of AI a success.

1. Issues of Data Privacy and Data Security.

The AI solutions gather and process bulk of student data, such as academic data, personal data, and learning behavior. This raises the concern of privacy and security of data.

Without proper security of information, there is a possibility of abuse or misappropriation by the wrong people. Universities should come up with effective data protection policies to protect the data of students.

2. High Implementation Cost

Implementation of AI-based systems is expensive both in terms of technology, equipment and training. In most universities, there might be lack of financial resources, particularly in the developing countries, to bring AI technologies.

The latter causes a digital divide between the institutions able to afford AI and those ones that are not.

3. Teacher Training

A lot of educators are not trained to work with AI-based tools. They may find it impossible to use AI in their teaching.

Training courses and workshops should also be provided in universities to help teachers to learn how to use AI tools in the right way.

4. Overdependence on Technology

Overuse of AI can decrease the level of interaction and critical thinking of students. Students are able to be reliant on AI products instead of learning how to solve their issues on their own.

This is why AI cannot become the alternative to the traditional teaching, but rather its addition.

5. Ethical Issues

The potential ethical issues that can arise in the context of using AI systems are biases during decision-making and inappropriate consideration. To illustrate, AI grading systems can not necessarily comprehend creative or subjective answers.

Universities should also be open and equal to AI systems.

FUTURE SCOPE OF AI IN HIGHER EDUCATION

The prospects of Artificial Intelligence in the field of higher education are very bright since the technology is transforming and reforming the education system. AI will introduce certain new technologies and innovative learning types, which will assist in making the process of education more effective, available, and student-oriented. The future of education is gradually changing to AI based systems that are being adopted in colleges and universities to improve teaching, learning and management of academics.

Smart campuses will be a significant aspect of the future campuses. The AI-powered systems will allow learning, administration, and campus security to be addressed more efficiently. As an example, AI will be in a position to follow students, attendance, campus

security, and online classrooms. Smart campuses will enhance efficiency in operations and allow developing a technology and modern learning environment in students and teachers.

Another aspect that will largely dominate the future of higher education is Virtual Reality Learning. Virtual reality and simulations with the use of AI will enable the students to undergo the experience of practical learning within a virtual setting. To give an example, medical students will be able to train surgeries on a virtual lab, engineering students will be able to work on virtual machines, and business students will be able to study in the real world. This will introduce more interactive, practical and interesting learning among the students.

The AI will assist in making Personalized Degree Programs more frequent. The AI systems will be used to study the interests of students, their performance in school, and career objectives to recommend appropriate courses and learning directions. This will help the students to make the correct choice of subjects and to cater to the needs of the industry to build their skills accordingly. The individualized degree programs will make the education flexible and more student-centered.

Global Digital Universities is another important development in the future. The online universities that will be run by AI will offer education to students in various regions of the world using digital platforms. The geographical boundary will be removed since students will have the opportunity to access good education wherever they wish and whenever they wish. This will increase access of higher education to the people worldwide and will enhance inclusive and quality education.

The AI in higher education will be dedicated to smart technology, personal learning, global access, and the innovations in teaching in general. When properly implemented and utilized, AI in the future will be applied to create a more sophisticated, inclusive, and efficient education system.

DISCUSSION AND ANALYSIS

Artificial Intelligence application in higher education proves that technology could greatly enhance learning outcomes and quality of education. The technologies that are powered by AI are helping higher institutions of learning to provide customized learning, improve communication with students, and contribute to the development of technology within the educational sector. By examining student performance and learning patterns, AI can provide personalized learning content and instant feedback on the performance of the student, as a result of which the latter can study the subjects better and improve academic outcomes.

Artificial intelligence is also more interactive and engaging due to the interaction and engagement of learning in the digital platform, virtual classrooms, and automatic assessment systems. This enhances the student engagement and motivation resulting to improved knowledge retention and the general learning outcomes. Furthermore, AI enables the education sector to become innovative by aiding the development of intelligent classrooms, online learning platforms and advanced research technologies, which increase the productivity of higher education establishments.

Nevertheless, to achieve success in the implementation of AI, it is necessary to plan, invest in digital infrastructure, and train teachers and personnel. Universities should make sure that AI tools are handled in a responsible and ethical manner, particularly in the field of data privacy and security. Guidelines and policies that can be used to ensure that AI is applied in learning in an equitable and transparent manner should be laid out.

The application of AI should be an assistant tool that enhances teaching by humans and should not replace the latter. The role of teachers in the guide and mentoring of students is significant, and AI can help them by decreasing the amount of work and enhancing the efficiency of teaching. When applied in a responsible manner, AI can help transform the higher education system to be more inclusive, efficient, and technology-oriented.

CONCLUSION

The AI-driven technologies are changing the higher education as they offer superior learning outcomes, enhance student engagement, and promote the creativity of the education system. The Artificial Intelligence assists the universities in adopting high level technology to ensure the teaching and learning is efficient and effective. The artificial intelligence systems like adaptive learning systems, chatbot, automated grading system and digital learning system assist students to learn better the subject they are studying, even enhance their academic performance. Through these technologies, students are given a chance to learn individually, receive instant feedback and interactive learning systems and this keeps him or her active and motivated to learn.

Another important area of AI is promotion of innovation and technological progress in the higher education field. Universities are also embracing AI by coming up with smart classrooms, digital infrastructure, and learning mechanisms. This will assist in enhancing of research, data and construction of knowledge and education becomes more progressive and technology based. Students are also provided with digital and technical skills that will be necessary in future industries through the systems based on AI.

SDG 4 (Quality Education) is also applicable in higher learning because AI can be utilized to offer equal learning opportunity, quality teaching, and access and inclusiveness of education. Learning materials can be made available to different students who can enhance their output through the assistance of AI-driven tools. In the meantime, AI is advancing SDG 9 (Industry, Innovation, and Infrastructure) by encouraging technological advancement and the development of digital infrastructure in educational organizations.

Responsibly used, AI will enable creating a more inclusive and efficient system of education. This can be achieved by AI, ethical implementation and good digital infrastructure which will assist the universities in offering high quality learning experience and allow higher education to grow sustainably.

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