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Enhancing university teaching and learning through integration of artificial intelligence in information and communication technology

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Abstract: This study examines the impact of Artificial Intelligence (AI) integrated into Information and Communications Technology (ICT) in higher education to improve teaching and learning outcomes. Through the analysis of case studies, the study delves into how AI influences teaching, learning, and overall educational processes. It examines the role of AI in higher education, its potential areas for improvement, and the challenges campus planners face in adopting AI within the ICT framework. AI integration in educational settings aims to develop adaptive learning systems tailored to individual student needs, fostering engagement and clarity in understanding. AI facilitates personalized learning paths and resources based on comprehensive data analysis, moving away from generic instructional materials. Real-time feedback from AI-powered assessment tools aids in continuous learning and lightens the workload for teachers, enhancing teaching quality. Additionally, AI-driven ICT solutions offer analytical tools for data-informed decision-making by administrators, optimizing educational outcomes. However, the integration of AI in higher education poses challenges such as ethical concerns, data privacy issues, and the necessity of faculty training. Overcoming these challenges requires careful planning, policy development, and collaboration between educators, technologists, and policymakers.

Keywords: *AI-powered systems, Artificial Intelligence (AI), Information and communications technology (ICT), Teaching and learning.*

1. Introduction

Artificial Intelligence (AI) has the potential to make significant contributions to education systems. Currently, Generative AI has come into the picture arising from the AI domain which has created enough curiosity among the educators to make automated educational progress in higher education. At this moment a large number of researchers have been investigating this particular research area to evaluate the implications of AI tools in enhancing teaching and learning [1]. However, still there is enough gap present in the education system to implement AI technologies. Therefore, it can be stated that in the coming decades, if higher education institutes adopt proper data management processes, and consider proper data collection policies, this particular area of application would gain significant expansion in the education system. According to Tegmark [2] human cognitive skills need to be upgraded to such an extent where people can meet the intelligence quotient of Artificial General Intelligence to attain maximum productivity [1]. Past researchers have extensively researched this particular topic. However, the contribution of the algorithm, tools and techniques of AI in education systems has been avoided. To understand the effectiveness of the AI tools and technologies in enhancing the University's teaching and learning all these particular points have been considered in this paper.

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2. Related Work

Artificial Intelligence, or AI, has developed because of the increased use of information and communication technology over time, according to Pisica, et al. [3]. AI is defined as the process of identifying new environmental concerns and developing sustainable solutions specific to that condition. In the education sector, AI and web intelligence have also created several areas to increase efficiency, reduce global warming, develop smarter content, and understand successful education in the business management system [3]. Similarly, in the context of Armond, et al. [4] the adaptation of coots or collaborative robots enables round-the-clock creation in the study. AI also implements human reasoning, which has benefited in the research and development process of the ICT industry in higher education by producing rich information. Researchers are also using AI algorithms more and more to schedule classes on time and provide appropriate learning modules without having to manually complete every task [5]. It becomes difficult to apply AI-enabled teaching and learning in the various universities due to this technology. AI tools and technologies are a special mix of systems that provide improved efficiency in the ICT sector by artificially replicating human cognitive capacities. Together with machine learning technologies, the combined AI was also able to identify patterns in the data that were similar and different. The AI tools' supervised model improves the process of developing algorithms to learn the data and generates specific expressions in the conclusion [6].

In the context of López-Chila, et al. [7] AI applications play a crucial role for improving the educational process. Additionally, it enables them to experiment with new situations to improve their abilities as educators and learners to create unique, customised experiences. However, the synthesis of AI algorithms also provides a thorough understanding of the state-of-the-art and may potentially direct future studies at the nexus of AI and higher education. On the other hand, as discussed by Kamalov, et al. [8] artificial intelligence has also rapidly become a transformative force. The application of AI has led to several innovations and advancements that have improved many aspects of human life. The developments in AI have also greatly benefited education, which is essential to the advancement of society and personal growth. Additionally, AI transformed education by bridging barriers and promoting an inclusive and productive learning environment. Therefore, based on the analysis, it can be said that the algorithms improve the quality of teaching and learning in universities generally.

Based on the above Figure 1 the market growth of AI within the education market has been incorporated in this figure. The AI market has recently grown 100 billion U.S dollars to create a positive impact on the education sector [9].

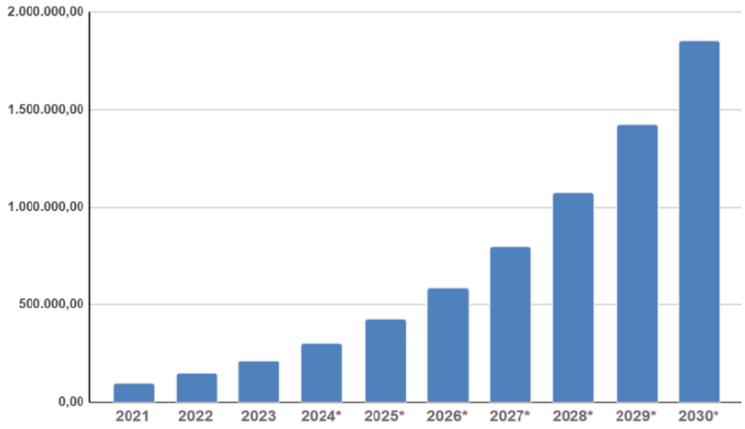

Figure 1.
Global market size of AI in education.

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According to Gligorea, et al. [10] to provide individualized learning routes for each student, AI-driven platforms may evaluate student performance data, learning preferences, and aptitude levels. These platforms can improve understanding and retention while accommodating a range of learning styles and skill levels by customizing information delivery and pacing to meet individual needs. This flexibility keeps engagement levels at their peak by ensuring that pupils are suitably challenged and preventing boredom or dissatisfaction. Targeted interventions to quickly address areas of weakness or misunderstanding are another benefit of adaptive learning. On the other hand, Kamalov, et al. [8] also stated that personalized learning is feasible. AI methods, such as reinforcement learning is also applied to dynamically learn about individual needs and adjust the learning process accordingly. As for individualized instruction, intelligent tutoring systems are unique in that they actively involve students and offer insights based on how well people succeed in class. Here AI is beneficial from another angle--by providing a range of metrics and feedback students can use it for dialogue with their teachers. From this, it is possible to conclude that individualized learning technologies and AI-based methods promote a combination of both disciplines. That is to say, hands-on learning enhances student involvement.

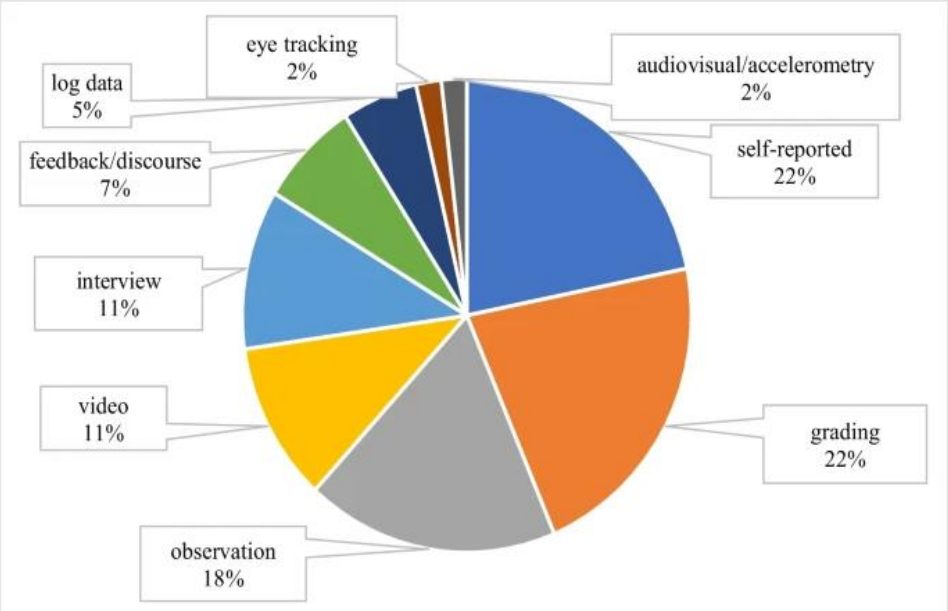

Figure 2.
The promises of artificial intelligence for teachers [11].

The above figure depicts the promises and challenges of Artificial Intelligence for Teachers. From Figure 2, it is seen that the teachers must have the ability to grade their skills by utilizing AI in teaching and learning experiences at the university. It is also important for the teachers to observe the effectiveness of the online environment within the teaching and learning experiences in the university.

A recent study by Elmunsyah, et al. [12] found that learning management systems (LMS) are becoming popular, especially for educational purposes. The same study also found that the teachers as they carry out their teaching tasks can be released effectively for online program management. The LMS platform processes, stores, and transports learning resources by data from the Internet. Dispelling the myth that it means expensive, mass-produced textbooks. With this method, educators and students can change the level of instruction to suit their own needs. Similarly, Queiroga, et al. [13] pointed out that many modern educational systems use VLEs (Virtual Learning Environments) to supplement traditional class activities. Especially Ruiz-Rojas, et al. [14] suffering from having so many responsibilities added to

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it without any increase in resources or staff, the modernization of the education system is imperative that might make it possible.

In modern university instruction, one way that ICT promotes good teaching is by making it possible to create participatory learning environments geared for cooperation. Learning management systems (LMS), for instance, provide educators with a means of distributing course materials, assignments and tests in digital formats that can be accessed by students at anytime from anywhere. Such accessibility is not only convenient for all types of learners; it also promotes active rather than passive involvement of students in class and even, more meaningfully, across geographical barriers dividing the educational process. At the same time, ICT provides teachers with tools for customized learning experiences. By means of AI learning algorithms that analyse students' performance data, adaptive learning technologies give individualized learning paths to those whose strengths may lie in different areas of study or whose weaknesses are in still others. Thus, not only does this approach heighten students' understanding and memory retention-it also helps to nurture self-motivated learners, men and women capable of independent study at their own speed.

Moreover, ICT can enable university administration more effectively. For example, in the university course registration system for student enrolments and academic records management as well those things I mentioned above have been almost completely replaced by electronic means of input and output. Because of this paperwork processing operation has been drastically simplified, which lightens administrative burdens. This also frees up time for university staff to lay suitable groundwork and services targeted towards greater productivity in student learning. In addition, intelligent use between teachers and students of ICT not only improves teaching and administration but it encourages research. All along the line from sophisticated digital libraries and online databases to field trips for browsing old documents on microfilm, study aids create an environment in which cross-discipline dialogue is possible. This type of connectivity fosters innovation and academic exchanges between scholars, propelling the university into the ranks of learning known far and wide. However, linking ICT to university education also has its issues. Whether it is digital division of access to technology between teachers & pupils as well as students' concerns about data privacy or cyber security, higher education institutions have many similar problems too. Looking to the future, the further transformation of ICT promises sweeping changes in higher education. Emerging technologies such as virtual reality (VR), artificial intelligence (AI) in education, and blockchain for credentialing have the potential to overturn pedagogical approaches at their very foundations, raise standards of learning and make universities more competitive globally.

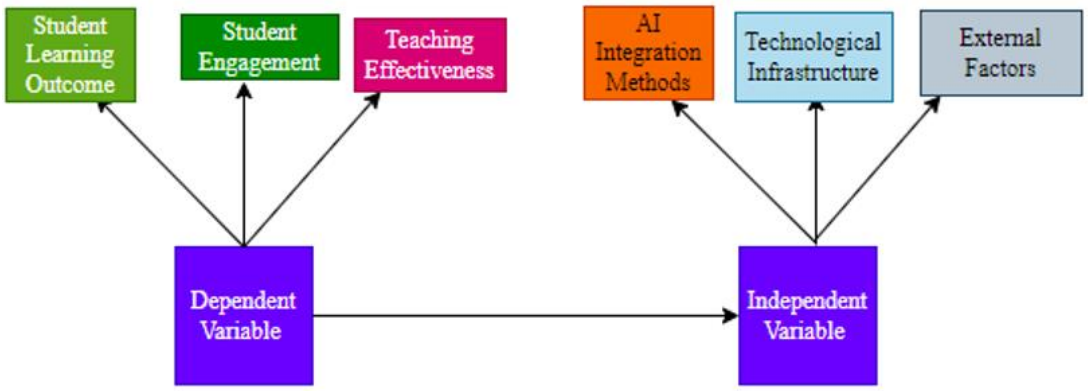

Figure 3.
Conceptual framework.

Cognitive Load Theory speaks to the innate complexity of educational activities and resources. When incorporating AI into ICT for teaching and learning, CLT recommends that AI tools should deliver learning content in a way that is compatible with students' cognitive capacities and past knowledge in

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order to adaptively change the intrinsic cognitive load [15]. To successfully control internal cognitive load, AI-driven solutions can scaffold complicated concepts, dynamically change the difficulty level of learning tasks, and provide personalized feedback.

3. Research Methodology

Research Methodology is referred to as one of the most important sections of a research study. It forms the basic framework that will guide a researcher to carry out a research study in an organized manner [16]. The importance of "research methodology" lies in the fact that it reinforces the data analysis in conducted research. It is made up of various elements such as "research onion", "research philosophy", "data collection technique", "time horizon" of the research and so on. In this chapter, all the elements will be explained in the context of the present study. Also, the ethical considerations undertaken at the time of carrying out this study will be discussed.

According to Saunders, et al. [17] research onion model, components such as "research philosophy", "research approach", "research choice" and so on collaboratively give rise to an organized "research methodology" which directs a researcher toward the completion. The layers of the research onion, when viewed from the exterior, show a thorough examination of the research procedure. Therefore, it is crucial to discuss the above-mentioned components of research onion in a detailed manner. As a result, this chapter will cover the choices and discussions surrounding the study's decisions.

Research philosophy is referred to as offering theories concerning the aspects of reality that are a part of the present research study and also how these aspects are justified in the context of the current research topic [18]. There are several types of research philosophies such as "interpretivism", "positivism" and others. The research philosophy of interpretivism has been chosen to accomplish the goals of the study after an evaluation of the investigation's particular objectives. The research philosophy of interpretivism helps find social phenomena that are challenging to describe or measure [19]. The concept of "interpretivism" is helpful for the researchers to evaluate to what extent the teachers, students, and administrators realize the worth of AI technology in terms of its integration with ICT for teaching as well as learning. Therefore, this strategy has helped to analyse the extent of understanding of the impact of AI implementation by teachers and students in the education sector. One of the major reasons for the application of "interpretivism" philosophy is to evaluate the impact factor qualitatively. This is because emotions such as "understanding an impact" can be assessed most appropriately in a qualitative way. On the other hand, philosophies such as "positivism" analyse the data quantitatively. Hence, "interpretivism" has been chosen as the most suitable research philosophy.

3.1. Research Design

Research design is defined as an outline to plan the processes involved in research by drafting the progress pathway of a research study in alignment with its "research questions" [19]. There are various kinds of "research design" such as "exploratory", "descriptive" and so on. For this study, a descriptive research strategy has been selected. According to Rojo-Ramos, et al. [20] the descriptive research design is one of the types of "research methodology" that is used to portray traits, behaviours, or events as they occur in real life. Therefore, with the implementation of this research design in this study, the factors that are crucial in reinforcing the implementation of AI in ICT along with interpreting its value in the educational sector can be discussed in detail. Also, it helps to conduct an in-depth analysis of a circumstance which in turn has aided the systematic evaluation of the articles at the times of literature review which in the later course of the study has helped to do an elaborate and critical data analysis. If some other "research design" had been chosen, it would not have been possible to do such an in-depth as well as critical analysis of data.

3.2. Research Approach

To gain a deeper comprehension of the subject, inductive research methodologies have been chosen. When generalizations or hypotheses are drawn from particular facts or observations, this is known as the

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inductive approach. Researchers can gather data in a variety of methods with this approach, which allows them to develop original hypotheses and concepts based on the phenomenon they have observed [21]. Because inductive research is a useful method for investigating novel occurrences and formulating hypotheses based on actual observations. Because AI is evolving so quickly, it is critical to employ inductive inquiry to find fresh insights and emerging patterns in teaching and learning as AI becomes more and more integrated into ICT. Pre-existing theories are tested using actual data in deductive research [22]. The inductive research approach is important to frame the themes at the times of data analysis thereby helping to evaluate the articles for the purpose of article analysis. Thus this "research approach" has been selected over other research approaches.

3.3. Research Choice

The research involved a qualitative research component. This would seem to suggest that the term "mono-qualitative research option" means researching only with qualitative methods of any kind as utilized above. If done according to qualitative approaches, the question of what effect integration AI into teaching and learning has is vast for study. Taking qualitative research methods, such as focus groups, interviews and observations can help researchers get a comprehensive understanding of how educators, students and other stakeholders in AI-enhanced educational settings view things, what their experiences are like, and what they do. The integration of AI and ICT into teaching and learning has many implications that affect technology, pedagogy and society. The workings of any object or mechanism might be captured inadequately by purely quantitative research methods, alone pinpointing their numbers and subject areas and sequences. If a mono-quantitative approach excludes insights from qualitative methods into the experiences, perceptions, and behaviours of educators and students on the other hand, it would probably not yield any real understanding about what influences teaching and what effects come from learning.

3.4. Research Time Horizon

For this study, a cross-sectional time horizon has been chosen. A cross-sectional time horizon is a word used in research methodology to describe a type of data collection wherein, particularly in longitudinal investigations, information is acquired from a sample of participants at one specific point in time. Cross-sectional studies provide a summary of the information that was collected at a specific point in time Vidal-Tomás [23]. However, the results of integrating AI into teaching and learning are likely to vary over time as new technologies are released, pedagogical approaches evolve, and teachers and students grow more accustomed to using AI-enhanced resources.

3.5. Data Collection Method

The method of collecting secondary data that has been selected will be used to include this research. Researchers can monitor shifts and advancements in the application of AI in learning environments by utilising secondary data sources, which offers insightful historical information [24]. Scholars can obtain data on artificial intelligence (AI), pedagogy, and student outcomes from a variety of secondary sources, including scholarly publications, conference proceedings, official government publications, and educational databases.

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Table 1.
Data sources criteria.

Inclusion criteria	Exclusion criteria
Publications and journals showcasing the use of machine learning in integrating artificial intelligence in information and communications technology on enhancing university teaching and learning.	Papers without any mention of using machine learning methods.
Publications and periodicals that discuss the use of machine learning in the impact of AI platforms in teaching and learning.	Journal articles and articles that don't use machine learning as an impact of AI platforms in teaching and learning.
Recent articles published during the last five years have been used to ensure currency.	Prior to 2018, no articles were included.

3.6. Data Analysis

In this research, Qualitative data analysis was adopted. Researchers, in trying to shed light on such data phenomenon, carefully sift raw to find relationships between it, anomalies, and other parts of the context Bryda and Costa [25]. During the process of qualitative data analysis, the theory builder creates or alter theoretical frameworks based on findings that can help shift existing knowledge into new forms to illuminate different direction in one field entirely. This procedure leads to further theoretical perception and learning in any one subject of study. After analysis to the entire discussion, it can be said that the impact of integrating artificial intelligence (AI) with information and communications technology (ICT) on improving university teaching and learning has been supported using the interpretivism philosophy, inductive methodology, exploratory design, and secondary qualitative data collection method. Thus, in this chapter, "research philosophy", "research approach", "research choice" and other components of research methodology have been stated and discussed in alignment with the requirements of the present study.

4. Results

The study's conclusion is based on a thorough analysis of how AI affects teaching and learning preferences at universities. The methodology draws upon a range of data sources, including prior research findings from studies, useful evaluations of current literature, and significant insights from user input. The sources provided a solid and comprehensive framework for examining how modern university teaching and learning are evolving and for identifying strategies for improving research. This comprehensive strategy aids in comprehending the opportunities and problems in the field of education. To data analysis, eleven research articles were being considered.

4.1. Impact of AI on Improving Teaching and Learning

It is observed from the study of Pisica, et al. [3] that AI has enhanced the usage of communications as well as information. Similarly, the outcomes of the study of Armond, et al. [4] have shown that AI has emerged to be a very useful tool in terms of the educational sector as it helps to integrate the usage of cobots (collaborative robots) with respect to clock creation in education. From the study of Atlas [5] it is seen that AI algorithms are being used more frequently nowadays in comparison to earlier days in terms of scheduling the timings of the classes. Also, AI is being observed to be implemented in the offering of learning courses.

4.2. Evaluation of AI Algorithms for Improving University Teaching And Learning

The study of López-Chila, et al. [7] shows that the applications that are based on AI algorithms are contributing to the improvement of the education system significantly by means of curating the learning modules according to the needs of the students as well as the teachers. The findings of Kamalov, et al. [8] also show a resemblance with the findings of the above-mentioned study. It defines "artificial intelligence" as a "transformative force". The importance of AI in education is prominent as it has helped to remove the constraints of education such as unequal access to educational resources and bring in an inclusive as

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well as developmental learning environment. Among all the trends of AI, Thormundsson [9] has identified "chatbots", "mobile applications" and "image-generating AI" to be the most improved AI in recent years.

4.3. Influence of AI Driven Technologies for Reinforcement Learning Process

As per the study of Gligorea, et al. [10] it is observed that with the implementation of AI driven learning platforms it is possible to customise the learning procedures according to the individual learning requirements of the students. It is also observed that with the help of AI, the learning procedures can also be customised as per the learning choices and the aptitude grades of the individual students. Therefore, AI can be observed to incorporate the introduction of new innovative learning techniques into the learning procedure. Simultaneously, Kamalov, et al. [8] showed that with the application of AI will enable the education system to make the learning process "personalised". The findings also show that the AI integration into the learning system will lead to increase in the retention or the active engagement of the students.

4.4. Benefits of AI Tools and Applications in Education

One of the most widely used tools in the education sector that is being driven by AI is the "Learning Management Systems (LMS)". From the research of Elmunsyah, et al. [12] it has been observed that the LMS has been proved to be very useful from the perspective of the teachers as it enables them to execute their responsibilities concerning teaching in the most alluring way. Also, it helps the teachers to express their teachings in a detailed manner so that the quality of teaching can be improved, and the interest of the students can be increased. In addition, the outcomes of the study of Queiroga, et al. [13] projects that the integration of AI will aid the betterment of the teaching environment inside the classroom as AI helps to develop "virtual learning environment (VLEs)". This helps to retain the focus of the students at the time of learning. The findings of Ruiz-Rojas, et al. [14] have shown that AI holds the capacity to create "personalised learning experience" in the context of teaching and learning experiences.

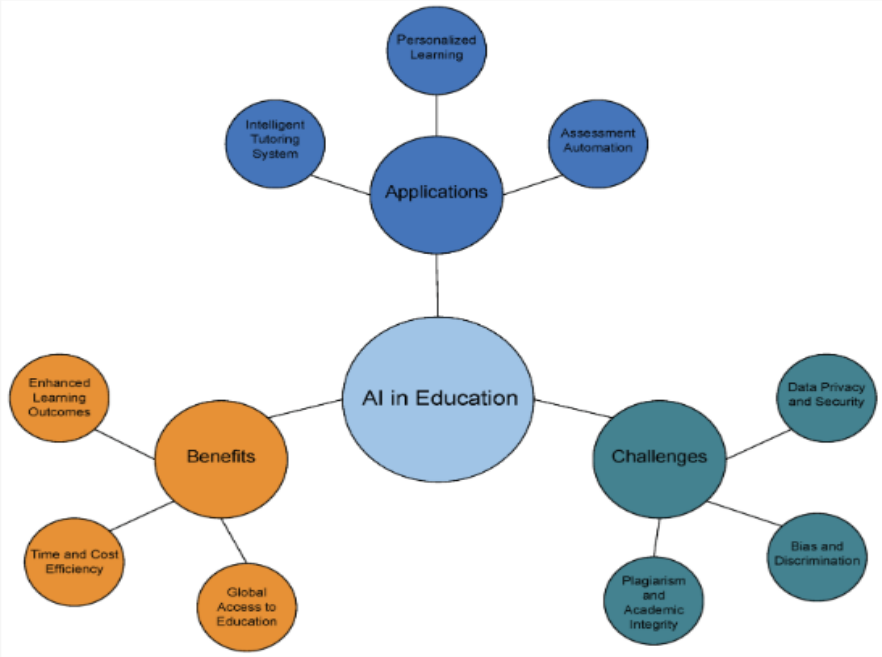

Figure 4.
Multifaceted impact of AI in education [12].

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Table 2.
Data findings table.

Source	Findings
Pisica, et al. [3]	Analyses the impact of AI implementation in higher education
Armond, et al. [4]	Reviews the existing literature concerning ethics of research and integrity of research
Kamalov, et al. [8]	Analyses the new era of AI in the context of education as a sustainable revolution
Thormundsson [9]	States the market size of AI across the globe
Gligorea, et al. [10]	Reviews the learning procedures with the utilisation of AI
Queiroga, et al. [13]	Analyses the utilisation of VLE data for educational policies development
Ruiz-Rojas, et al. [14]	Assesses educational empowerment with generative AI tools.

4.5. Interpretation of Findings

From Pisica, et al. [3] it is found that several human-like cognitive processes and adaptive behaviors are possessed by AI, which enhances teachers' capacity to communicate with college students in higher education systems. On the other hand, research facilities have contributed to the widespread use of cobots, or collaborative robots, which allow for 24/7 research and development. Additionally, AI enhances human reasoning, which has produced rich knowledge that has aided the ICT industry's research and development processes in higher education. It is also found that tools and technologies for artificial intelligence (AI) are a unique combination of systems that increase productivity in the ICT industry by mimicking human cognitive abilities. The integrated AI was also able to recognize similar and dissimilar patterns in the data when used in conjunction with machine learning technologies. The supervised model of the AI tools enhances the process of creating algorithms to learn the data and produces certain expressions at the end.

Additionally, the synthesis of AI algorithms offers a comprehensive grasp of the state-of-the-art and could guide future research at the intersection of AI and higher education. Creating an algorithm that could successfully evolve and adapt to different settings while also learning from the provided data was the aim of AI as machine learning. However, as discussed by Kamalov, et al. [8] artificial intelligence has also quickly emerged as a game-changer in several sectors, including education. The use of AI has also produced several breakthroughs and developments that have enhanced many facets of human existence. AI technology can also provide pupils with thorough feedback, which will help them recognize their areas of strength. ICT has facilitated international collaboration between professors, organizations, and students, contributing to the globalization of education. As a result, curricula are now more globally oriented, resulting in more intellectual and cultural exchange. Universities trying to develop AI-enabled learning and teaching are facing significant challenges since, despite the technology's current availability, many instructors still struggle to integrate AI techniques in the classroom. Because AI tools and technologies artificially duplicate human cognitive capacities, they offer a unique combination of systems to boost efficiency in the ICT sector. It has been identified throughout the research analysis that AI-enabled education systems may have certain types of challenges in higher education. As artificial intelligence has been continually disrupting the industry, world and system in every single industry, it has been developing a significant number of challenges for the education system. One of the biggest cons of AI-enabled learning is it has been dehumanizing the learning process which is very much essential. The nuanced approach to learning that a human teacher may offer to the students gets disvalued in the AI-based learning process. The OpenAI-based software ChatGPT 4.0 has become one of the latest software published in the market which the students have been finding quite interesting for their higher studies.

With AI growing scalable to the entire student body, individualized education is becoming possible. Utilizing artificial intelligence (AI) techniques like reinforcement learning, it is possible to dynamically ascertain the requirements of every learner and adjust the learning process in response. Intelligent tutoring systems that actively engage students and offer insightful feedback can be developed in connection to personalized education. Another important aspect of AI is the automated evaluation process. Computer vision and natural language processing systems can be integrated to grade assignments,

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examinations, and quizzes automatically. Automated grading will reduce a lot of teachers' workloads and give them more time to engage with pupils.

4.6. Comparison

Students now learn in a vastly dynamic environment thanks to creative assessment creation and adaptive learning techniques made possible by AI-based learning. Nonetheless, a number of scholars, instructors, and students have discovered that ChatGPT might produce skewed search results that could reinforce false beliefs about the subject of the study. While through the use of information and communication technology, students can more easily overcome geographical barriers to better support their future academic progress. ICT is beneficial to non-traditional students as well because it provides essential learning resources. By utilising information and communication technologies, non-traditional students also enhance their prospects for future growth (Balaban, Rienties, and Winne, 2023). Conversely, students find it simpler to interact with one another through online discussion boards and platforms with the aid of knowledge and communication. More opportunities in the field of education as well as for future advancements may result from this for the students. To increase opportunities in the education sector, ICT tools examine a wide range of data. Based on the analysis it is determined that these artificial intelligence (AI)-based software and systems are bringing about a lot of good changes in education by personalising instruction, generating more automated assessment schedules, and doing more effective research on study subjects. Nonetheless, instructors must prioritise a more cooperative strategy and exercise creativity when developing possibilities for pupils to learn assimilation. In light of the difficulties associated with AI-based learning, they must promote a positive learning atmosphere.

5. Discussion

The Global Education 2030 agenda aim to promote sustainable learning and education for every learner in the world by ensuring lifelong learning opportunities [26]. To develop this effectiveness within the education system, the Artificial Intelligence (AI) enabled tools and algorithms have enough contribution. Information technology is the driving resource for educational development in society. To enhance educational productivity in society, technological adaptation needs to be the prime concern among educators and learners. The new revolution of AI tools, big data and machine learning algorithms has enough potential to bring effective learning development to the University teaching process [27]. To become a facilitative tutor in this age of information and communication technologies adapting to AI-enabled learning has become very crucial for creating sustainable learning environments. As per the reports presented in Horizon 2019, regarding AI application-enabled teaching and learning, there would be massive development in the education sectors and higher studies implementing the AI tools and technologies [28]. The application of AI in research and teaching has been researched for many years. The learning analytics tools have enough potential to build a successful learning environment for educators and students in the higher education systems. As this advanced technology requires a high amount of data processing for analysing the patterns, and trends, it requires much more data management process without any risks of data breaching and data leakage. The Institute for Ethical AI in Education, UK has been continually working to sustain ethical governance in education [28]. AI is not a single technology, machine learning, natural language processing, neural networks, and data mining come under this term. In the post-pandemic situation, online teaching and learning have become necessary. Universities around the world have been implementing different tools such as Google Classroom, Google 365, and ZOOM platforms to enhance more seamless education delivery to students. To maintain transparency within the education system, universities have already developed their very own ICT centres and LMS platforms [29]. AI can help educators to provide proper accurate help to the students as per the student feedback. Blending cognitive psychology, and analysing the learning modulus, these AI tools deliver effective learning models to the students. Creating tailored learning experiences among the students these technologies are providing ample opportunities for the university students regularly. According to Hwang, et al. [30] artificial intelligence with machine learning tools and learning analytics

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Vol. 9, No. 1: 1345-1357, 2025
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have enormous potential to predict the students' performance and identify the students who are unable to learn properly in the classroom settings. As online learning has become a necessity in the education sector, this aspect of the AI-based learning approach has become a crucial advantage for students. Explainable AI is one of the new additions to the AI-based learning systems in education sectors. With high interpretability, neural networks and deep learning within the explainable AI are delivering pathbreaking solutions in education sectors. The education sectors have been gradually utilising the cobot tool to enhance the learning process. To automate the complex research processes, and to maximise the efficiency of the available resources, these cobots have been making significant developments in the Universities' learning and teaching processes. Seamless integration of artificial intelligence rapidly enhances the consistency and quality of education services. Collaborative learning and teaching is very important in peer-to-peer learning in the University setting. The AI tools help to transcend the traditional teacher-student relationship. For higher studies in the university, students evaluating the regular performance of each student is significantly important. For providing real-time feedback according to the student's progress, a collaborative learning approach using cobots is innovated by the researchers. Educational games, AI-enabled research platforms, and knowledge-sharing networks provide individualised support to learners. It depicts that there is enough prospect of artificial intelligence to create a sustainable education system in the world. However, there are still multiple reasons behind the gap present in the application of AI-based teaching and learning among the University teaching methods in this ICT-driven technological era.

6. Challenges

AI literacy has been facing various challenges due to the current situation in the education sector. Although ICT sectors have been ever-evolving, educational institutes have been slow to adapt these AI-driven tools and technologies in their learning and testing processes. Many educational institutes strictly adhere to the law that any type of AI-enabled teaching or practice of AI utilisation needs to be restricted within the university settings [31]. Such decisions made by educational institutes are creating adverse results in the learning processes. Many educational institutions believe that such implementation may replace the teachers. In such situations, they are completely ignoring the relevance of this advanced technology in providing quality education and seamless development of students' knowledge using vast amounts of data prediction models and algorithmic calculations. Many universities are still struggling to adapt to such innovative technological upgrades within the educational systems. Lack of technical literacy and lack of trust in providing quality education using this technology is making such a challenging situation within the university settings. Data privacy issues, data leakage, and data hacking are simultaneously creating critical risks for these universities. It is making them concerned about the actual effectiveness of ensuring AI-enabled teaching and learning. Although this process dehumanises the learning process, there are ample opportunities and advantages of using this particular process of learning and teaching. Integrating AI in the classroom requires proper monitoring and controlling. Many universities and educators are lacking to meet the demands of AI-enabled teaching and learning due to a lack of coordination and collaboration among the University stakeholders. This digital knowledge processing requires proper rigorous testing to enable effective data management and processing. To distribute such AI_enabled learning educators need to be more alert. It has been identified by researchers that such ineffectiveness is causing extremely chaotic situations among educators in providing quality education. As a result, universities are still doubtful about the proper utilisation of AI in the education sectors in this current ICT industry's emergence in the world.

7. Conclusion

There are a series of key findings throughout the research. AI (Artificial Intelligence) is making inevitable changes in the education system. Information and communication technology with their effectiveness in creating AI-enabled learning and teaching processes are making significant contributions

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in the education sectors. With algorithmic analysis, machine learning-enabled prediction models, and digital assistance 24/7 through proper utilization of the AI tools deliver errorless services in the market. According to the 2021/2022 reports, there are almost 2.86 million students enrolled in different universities in the United Kingdom who are doing their higher studies, researching, and innovating new things. It suggests that there is enough scope for AI tools to innovate learning and teaching practices. To meet sustainable educational development and literacy, rapid technological intervention and innovation in the educational sectors have become one of the most necessary processes at this moment. AI-based teaching may help the teachers to understand when and how the students are learning the subjects. To effectively utilize this advanced technology the teachers, need to have proper knowledge about the technical skills and abilities. As the application of AI is still under the experimentation process, teachers are lacking their literacy in acquiring proper knowledge in AI-based learning and teaching. Hence it can be stated that teachers need to be empowered with proper skills and knowledge in this field if the educational development using artificial intelligence is of prime importance in the current situation in the education sector. One of the most widely used tools in the education sector that is being driven by AI is the "Learning Management Systems (LMS)". From the research of Elmunsyah, et al. [12] it has been observed that the LMS has been proved to be very useful from the perspective of the teachers as it enables them to execute their responsibilities concerning teaching in the most alluring way. Also, it helps the teachers to express their teachings in a detailed manner so that the quality of teaching can be improved, and the interest of the students can be increased. In addition, the outcomes of the study of Queiroga, et al. [13] projects that the integration of AI will aid the betterment of the teaching environment inside the classroom as AI helps to develop "virtual learning environment (VLEs)". This helps to retain the focus of the students at the time of learning. The findings of Ruiz-Rojas, et al. [14] have shown that AI holds the capacity to create "personalised learning experience" in the context of teaching and learning experiences.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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