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**Leveraging Artificial Intelligence in On-Line Learning Environments and Assessment for  
Both Students and Educators**

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### **Abstract**

This paper addresses the pressing need for innovative strategies to keep students actively involved in their on-line learning journey. It majorly focuses on leveraging Artificial Intelligence in on-line learning environments. The study intends to find out the Positive roles of Artificial Intelligence in on-line learning and its benefits to students and educators, cases of using Artificial Intelligence in education and the key areas that serve as pillars of impactful eLearning. Through a deep dive into the role of AI in education, this paper equips readers with the knowledge and tools needed to create dynamic and engaging on-line learning environments. Whether you want to improve student participation or enhance learning outcomes, this study offers practical insights and strategies to revolutionize on-line education. As technology continues to advance, the potential for AI in education remains boundless, promising even more innovative and effective ways of learning.

*Keywords:* Artificial Intelligence, personalisation, automated Assessment, customised training

## **Leveraging Artificial Intelligence in On-Line Learning Environments and Assessment for Both Students and Educators**

In recent years, educational methods have incorporated technology, resulting in novel ways to increase student engagement. The integration of Artificial Intelligence (AI) has transformed every aspect of human lives, re-shaping the way they communicate, learn and work unlike traditional education models that often follow a linear curriculum that does not account for diverse learning styles and paces. The digital age has ushered in a transformation in education, with on-line courses becoming a popular means for individuals to acquire new skills and knowledge (Nischaim, 2024). AI-powered platforms use machine-learning algorithms to analyze students' performance data and provide customized learning paths, automated assessments, and targeted interventions. On-line learning platforms are web-based systems that support teaching and learning by providing digital learning resources, communication tools, and evaluation capabilities. These platforms can be synchronous or asynchronous to be accessed in real-time or at the student's convenience. Some popular examples of on-line learning platforms include Moodle, Blackboard, and Google (Faridi & Shaheen, 2024). This approach has been proven effective in improving student retention, engagement, and academic performance (Bisaria, Singh & Shrinidhi, 2025). Integrating AI with education promises a future in which learning is not just personalized, but also intensely engaging, dynamic, and ever-changing. Integrating AI literacy into curricula, ensures that students develop critical thinking and ethical awareness when using AI tools (Bisaria, Singh and Shrinidhi, (2025). The transition from chalkboards to digital whiteboards, printed textbooks to e-books and face-to-face teaching to on-line learning has paved the way for AI-driven innovations. The shift toward digital education and EdTech innovations has accelerated, particularly with the rise of on-line learning, MOOCs (Massive Open On-line Courses), and AI-powered virtual classrooms (Bisaria, Singh & Shrinidhi, 2025). On November 30, 2022, the launch of ChatGPT marked a significant milestone in the evolution of Artificial Intelligence (Lennox & Ooi. 2023). More so, AI has transformed administrative processes within educational

institutions through grading systems, virtual teaching assistants, student support; allowing educators to focus on interactive teaching rather than repetitive administrative tasks. Universities and schools have increasingly adopted AI-based plagiarism detection, attendance tracking, and automated scheduling systems; demonstrating the growing role of AI in education management (Bisaria, Singh & Shrinidhi, 2025). Learners who interacted with AI-driven adaptive learning platforms demonstrated greater retention of content, as AI personalized the learning experience based on their individual progress and areas of difficulty (Hussain & Shah, 2025). This is because the ability to receive instant data-driven feedback facilitated a deeper understanding of the subject matter, particularly for students participating remotely (Bisaria, Singh & Shrinidhi, 2025).

From the foregoing, it shows that integration of AI improved many aspects of the learning experience, but many studies' results highlighted several challenges. One major concern was the issue of digital equity, as students in regions with limited access to high-speed internet or technological devices faced significant barriers in fully participating in the learning process. Not only that there is a huge gap in the grades or scores they get in their coursework and that of their final examination couple with the occurrence of security incidents such as data leakage, tampering, and misuse, which may cause serious damage to students' personal rights and interests, privacy and security, as well as physical and mental health (Zhong, 2024). Although AI holds the potential to democratize learning, disparities in access to digital resources remain a critical concern as this affect many students particularly those from disadvantaged backgrounds who are more likely to experience technical difficulties, which may hinder their ability to participate fully in blended synchronous learning sessions (Bisaria, Singh & Shrinidhi, 2025).

Understanding the critical role of AI in this process is critical for parents, teachers, and educational administrators who wish to create an inclusive and fair learning environment. UNESCO cited in Birla & Brainiacs, (2024) views that Artificial Intelligence is dedicated to assisting Member States in realizing the promise of AI technologies for attaining the Education 2030 Agenda. This shows that with the use of AI tools and methodologies, teachers can tailor educational pathways to suit

their students' individual needs, respond to differences in teaching style and provide prompt feedback so that they are more engaged and comprehended. (Kaur, Budhraj, Pahuja, Nayyar, and Saluja, 2024). This paper addresses the pressing need for innovative strategies to keep students actively involved in their on-line learning journey. The study intends to find out the positive roles of Artificial Intelligence in on-line learning and its benefits to students and educators, this paper equips readers with the knowledge and tools needed to create dynamic and engaging on-line learning environments.

Embracing AI in e-Learning might just be the best move but those in charge of education sectors may not take it serious despite the benefits to be derived from integration of Artificial Intelligence into our education system for both the teachers and students. Those in the education sector agree, according to a study by IDC, 99.4% of 509 higher education institutions say AI will be instrumental to their institution's competitiveness in the next 3 years. Several challenges were found facing the application of AI in on-line learning environment, where results of some studies show that students in some regions with limited access to high-speed internet or technological devices faced significant barriers to fully participating in the learning process, particularly those from dis-advantaged backgrounds are more likely to experience technical difficulties, which hindered their ability to participate fully in blended synchronous learning sessions. This issue underscores the need for broader efforts to ensure equitable access to technology to prevent exacerbating existing educational inequalities.

### **Method**

This study used a qualitative method with a literature review approach to investigate into leveraging Artificial Intelligence in on-line learning environments and assessment. This originated from the medical sciences; a Systematic Review (SR) is a type of secondary study that aims to combine, evaluate and synthesize the results of independent studies. A question is used to define the data collection strategies (Cordeiro, Oliveira, Rentería & Guimarães, 2007: cited in Rodrigues, 2024). The literature review was conducted to collect and analyse information from

various credible academic sources, including educational journals, books, research reports and other publications relevant to the topic of positive roles of Artificial Intelligence in on-line learning, Definition and types of on-line learning platforms and educational apps, cases of using it in education, pillars of impactful e-Learning experiences and challenges were considered. The main focus of the review was to understand the basic concepts and importance of leveraging AI in on-line learning environment, identify best practices that have been applied in various contexts and explore the challenges and opportunities faced in its implementation, especially in culturally diverse settings. The literature review process began with a search for relevant keywords such as "Artificial Intelligence ", "Use of Artificial Intelligence in on-line learning environment ", "Method of AI application in on-line learning environment" and "Challenges of AI application in on-line learning education". This search was conducted through major academic databases such as Google Scholar.

### **What are the Positive roles of Artificial Intelligence in on-line learning and its benefits to students and educators?**

#### **i. Enhancing the Learning Experience through Personalisation**

One of the key areas where AI has made a significant impact in on-line learning is through personalization. Traditional educational approaches often struggle to meet the diverse needs of individual learners. However, with AI-driven algorithms, educational platforms can now analyse students' learning styles, progress, and interests to create personalized learning paths by tailoring the educational experience to individual needs, fosters better engagement, knowledge retention, and overall student satisfaction (Blewitt, 2023). AI-powered virtual reality and augmented reality experiences provide students with immersive and interactive learning environments, enabling them to explore complex concepts and apply their knowledge in practical scenarios. It makes it possible for individual student to ask questions in natural language and receive prompt and accurate responses; creating a more intuitive and efficient communication to enhances the overall learning experience (Blewitt, (2023)

**ii. Artificial Intelligence has ability to improve learning efficiency and effectiveness.**

Another significant advantage of AI in on-line learning is its ability to improve efficiency and effectiveness. AI technologies enhance efficiency by automating various aspects of the learning process. For instance, AI-powered content creation tools can rapidly generate learning materials based on learning objectives, lecture notes, and more. This automation enables educators to create and update content more efficiently, ensuring that learners have access to up-to-date and relevant materials. Also, AI-enabled data analytics and predictive models can provide valuable insights into students' learning patterns and progress. Educators can leverage this information to make data-informed decisions, personalize instruction further, and identify areas where students may need additional support (Blewitt, (2023)

**iii. Artificial Intelligence is capable of addressing Challenges in E-Learning and Beyond**

The experiential learning approach of AI enhances learners' engagement, promotes critical thinking, and prepares students for real-world challenges. AI not only enhances the learning experience but also prepares students for the job market. With AI-powered tools, learners can optimize their job search process, including writing cover letters and tailoring their resumes. AI-driven systems can analyse job market trends and provide personalized recommendations, helping students make informed decisions and stand out in a competitive job market. This integration of AI creates a seamless transition from education to career, equipping students with valuable skills and knowledge that align with industry demands (Blewitt, 2023).

**iv. The way Artificial Intelligence Changed On-line Learning's Future**

As technology continues to advance the future of AI in on-line learning as it looks promising. AI will continue to evolve and offer educators powerful tools to create engaging content more efficiently. By harnessing the power of AI, we can unlock new possibilities and create a more effective and inclusive learning environment for learners worldwide (Blewitt, (2023).

**Definition and types of on-line learning platforms and educational apps**

Educational websites and applications are on-line resources that have changed how teachers and

students teach and learn. These tools create a flexible, accessible, and dynamic learning environment tailored to fulfil individual learners' requirements (Faridi & Shaheen, 2024). Educational apps are mobile applications designed to enhance learning and provide an engaging and interactive experience for students who use these apps for various educational purposes, including practicing new skills, reinforcing classroom lessons, and accessing educational resources. Some popular educational apps for teachers include Kahoot, Quizlet, Edmodo, and Byjus. (<https://www.forbes.com/advisor/education/on-line-learning-platforms>; cited in Faridi & Shaheen, 2024). on-line learning platforms and educational apps boost teacher efficacy, pedagogical abilities, understanding of the subject, and student engagement. Participants listed platforms with variable frequency of use, including Moodle, MOOC, Khan Academy, Edmodo, Byjus, Google Classroom, Quizlet, etc (Faridi & Shaheen, 2024). Different on-line learning platforms and educational apps cater to various learning needs. Here are some common types;

**i. Learning Management Systems (LMS):** The early adoption of Learning Management Systems (LMS) introduced automation in course delivery, grading, and students' progress tracking (Bisaria, Singh & Shrinidhi, 2025). These are on-line platforms used by schools and educational institutions to manage and deliver courses and educational content.

**ii. Massive Open On-line Courses (MOOCs):** These on-line courses are available to anyone with an internet connection and allow students to learn at their own pace. On this front, Singapore's Ministry of Education is leading the way with its launch of an AI-enabled adaptive learning system. This project is part of the country's National Artificial Intelligence Strategy and an implementation of the EdTech Masterplan 2030 vision. The system was initially rolled out in June 2023 and included three topics for Primary 5 Mathematics (Lennox & Ooi. (2023).

**iii. Educational Games:** These apps and platforms use gaming mechanics to engage students and help them learn through play. These game modes were played by over 70 million users in 2023 (Joshi & Joshi, 2024).

iv. **Adaptive Learning Platforms:** These platforms use Artificial Intelligence to personalise learning experiences for individual students based on their learning styles and performance.



**Figure 1**

*User and system to update user model and adaptation component using interface environment.*

*Source (Davison et al., 2009)*

v. **Virtual Reality (VR) and Augmented Reality (AR) Platforms:** These platforms use immersive technologies to create a virtual learning environment that enhances the learning experience. (<https://www.learnworlds.com/on-line-learning-platforms/>) The on-line learning platforms and educational apps have revolutionized how teachers teach and students learn, providing various options and resources to enhance the educational experience.

### **What are the Cases of Using Artificial Intelligence in Education?**

1. **Tutoring systems:** AI-driven teaching systems use complicated computations to give pupils individualized retentive knowledge, skills and real-time feedback. For example, the use of Virtual Reality Learning (VR) in a simulator class where logistics students feel that they are in a natural work environment and live the experience before getting the actual job (Alghaithi, Slimi, Kalbani & Ben 2022; cited in Arbab, Dhuhli, Krishnan & Crisostomo, 2024). Also, the use of Intelligent Tutoring Systems (ITS) offer a powerful supplement to traditional classroom instruction. These AI-driven systems provide one-on-one tutoring, adapting to the needs and progress of each student. ITS are available 24/7, offering continuous support (Lennox & Ooi, 2023).

2. **Automated assessment and grading:** The automated grading and assessment platforms improve teaching quality, encourage equitable evaluation, and foster successful student-teacher engagement. Automated grading systems can handle multiple-choice tests, essays, and even complex assignments, providing instant feedback to students. AI evaluates their replies, detects areas of difficulty, and customizes explanations to improve understanding (Birla & Brainiacs, 2024). It also, simplifies the grading process by assessing student work and providing timely and uniform judgments. Furthermore, its efficiency enables timely feedback, which improves the learning process (Birla & Brainiacs, 2024). What needs to do is just to provide the LMS with the grading criteria data, and the rest will be done by integrated AI models. (Bansal, Chakir, Ngah, Rabby, & Jain (2024). In Singaporean schools, the implementation of AI-powered automated marking systems for English Language assignments was launched in 2022 by the Ministry of Education. Besides saving teachers' time in grading grammar and spelling, the system also collects information about the most common mistakes so that teachers can focus on these topics that most students find challenging (Lennox & Ooi. (2023).

3. **Enhance Classroom Engagement:** Engaging students in the classroom is vital for effective learning. AI tools can significantly enhance engagement by making lessons more interactive and immersive. Technologies such as Augmented Reality (AR) and Virtual Reality (VR) bring subjects to life, allowing students to experience and explore concepts in a dynamic way. For example, Minecraft's AI-powered tutorials cater to individual learning needs; providing targeted support. Through Collaborative Learning, students work together to solve problems; promoting teamwork and critical thinking (Joshi & Joshi, (2024). Also looking at Kahoot! facilitates personalized and interactive learning experiences; it works by leveraging AI to provide real-time insights, adaptive learning paths, and creative assessments it's AI-driven tools, such as the Question Generator and PDF-to-Kahoot converter, simplify content creation by enabling educators to generate quizzes and lessons effortlessly. These tools analyze existing material to create gamified experiences tailored to learning objectives (Joshi & Joshi, (2024). Another recent

development in AI, particularly through platforms like Microsoft Azure Open AI services, have enabled Kahoot! to redefine digital education (Joshi & Joshi, (2024). Indeed, these technologies not only make learning more practical and enjoyable, but they also help students retain information better (Lennox & Ooi. (2023).

4. **Prioritise Professional Development for Teachers:** To fully leverage AI in education, it is crucial to invest in professional development for teachers. In particular, educators need to be equipped with the knowledge and skills to effectively use AI tools in their classrooms. This involves providing access to comprehensive training programmes, including workshops, on-line courses, and hands-on sessions (Lennox & Ooi. (2023). For example, Adobe Express is a design platform powered by Artificial Intelligence, which enables users to create a variety of digital media, including posters, videos, and infographics. The AI functionalities offer automatic design recommendations, layout selections, and multimedia suggestions, making it possible for novice users to achieve professional-quality results. For educators, Adobe Express provides a means to develop dynamic and visually engaging assessment materials that go beyond the limitations of standard tests and quizzes (Joshi & Joshi, (2024). Base on this, there is ongoing support to ensure teachers can continually improve their use of AI technology. It is evident in Singapore where the National Institute of Education (NIE) announced in 2022 that AI topics will become part of teacher training by 2026, such that educators can access AI Singapore's self-paced micro-courses on AI implementation in the education sector. With these curated AI practicums, teachers can gain the confidence and competence needed to incorporate AI into their classroom activities (Birla & Brainiacs, 2024).

5. **Virtual Assistants:** AI-powered chatbots and virtual assistants are critical for improving students' learning experiences. These sophisticated devices provide immediate assistance, guiding children through homework assignments, answering questions, and providing vital feedback. These technologies provide help beyond conventional class schedules by being available around the clock and responding to students' needs at all times (Birla & Brainiacs, 2024). Tutors and

educators aren't always available when students need assistance due to the differences in time zones. AI software isn't confined by the limitations of time and space, allowing students to interact with its interface whenever necessary without feeling awkward or insecure about asking for help. LMS solutions imbued with the power of AI help learners with quick and accurate answers thanks to the power of natural language processing and sentiment analysis. This streamlines the education process as there's no need to spend hours searching for answers on-line.

**6. Interactive games:** AI can help interactive and instructional games provide interesting learning experiences (Birla & Brainiacs, 2024). For example, Generative Adversarial Networks (GANs), which have revolutionized how game levels and content are created. These sophisticated neural networks work in tandem - one generating content while the other discriminates quality - creating increasingly refined and playable game environments. While GANs show immense potential in level generation (Joshi & Joshi, (2024). Likewise, features like "Tallest Tower" and "Robot Run" incorporate team-based gameplay and competition to maintain learner interest while reinforcing educational goals).

**7. Customised training:** Using AI, educational systems may provide each student with a tailored learning experience. One of the perks of integrating AI into a learning management system is the endless opportunity for content creation. This it helps to create absolutely custom educational materials based on the skill sets and learning preferences of different individuals. With the power of AI, it's also possible to generate text, image, audio, and video content (Joshi & Joshi, (2024).

**8. Automated Tasks:** Aside from tailored instruction, AI performs important services such as homework assessment, exam grading, research paper organisation, reporting administration, and even the generation of presentations and annotations (Birla & Brainiacs, 2024). For example, **AI LLMs** collect and process massive amounts of student data. They pick up information on scores, issues, study challenges, and overall progress. This data is invaluable to organizations using the LMSs, as AI picks up insights' unseen to the human eye. The technology also helps educators

identify potential opportunities and risks in each learner (Joshi & Joshi, 2024).

**9. Monitoring:** Artificial Intelligence plays an essential tool in managing on-line tests, preventing cheating and fostering equity. By using sophisticated monitoring and verification methods, it lessens the workload for teachers, allowing them to concentrate on the calibre of the assessments. It supports the integrity of the evaluation process by providing pupils with a safe and fair testing environment (Birla & Brainiacs, 2024).

**What are the key areas that serve as pillars of impactful e-learning experiences?**

**i. Data analytics**

Data analytics is the cornerstone of effective on-line learning. By harnessing data from learners' interactions, educators can gain valuable insights into learners' behaviour, preferences, and performance. With tools like Microsoft Power, educators can visualize data and share insights across their organization; enabling them to make informed decisions that enhance the overall learning experience (Birch, 2024).

**ii. Design and development;** The design of e-Learning content is equally critical. Well-designed courses are engaging, interactive, and tailored to meet the needs of diverse learners. Platforms like Articulate 360 offer powerful tools that enable educators to create exceptional learning experiences. Features like Articulate Rise 360 allow for the creation of visually stunning courses, while Articulate Storyline enables the development of interactive and engaging content (Birch, 2024).

**iii. Learning platforms:** The choice of a learning platform or Learning Management System (LMS) is another crucial factor in the success of on-line learning initiatives. A robust learning platform provides a centralized and streamlined approach to learning, making it easier for learners to access content and track their progress (Birch, 2024)

**iv. Artificial Intelligence (AI):** AI is revolutionizing the field of on-line learning by enabling personalised and adaptive learning experiences. AI-powered tools can analyze vast amounts of data to provide insights into learner behaviour and preferences. This information can then be used

to tailor learning experiences to individual learners, ensuring that they receive the right content at the right time (Birch, 2024).

### **Challenge of Current AI Assessments**

There is a higher tendency of students to plagiarize in their course work assessments, especially take-home essay-based course works. Some resort to the use of generative AI tools such as ChatGPT, Grammarly and DALL-E amongst others unethically to produce contents they are required to produce through research. This becomes a problem in that it affects the essence and principles of assessment. By so doing teachers and lecturers are not able to effectively assess student's true performance and efforts, strengths and weaknesses to enable the teachers assist and grade them accordingly. Mostly, there is a huge gap in the grades or scores they get in their coursework and that of their final examination. The AI system's answer is nothing more than an algorithm based on accumulated data, yet students typically expect the AI system to be accurate. More so, data, as an important information asset, inevitably faces a series of serious data privacy and security challenges in all aspects of collection, storage, transmission, analysis and application. The massive learning behavior data generated by students in the learning process, as well as sensitive data such as personal identity information and academic performance, must be protected in the most stringent and thorough manner to prevent the occurrence of security incidents such as data leakage, tampering, and misuse, which may cause serious damage to students' personal rights and interests, privacy and security, as well as physical and mental health (Zhong, X., (2024).

### **Mitigation Approaches Using AI to Fight AI**

Applications such as Turnitin and GPT Zero are utilized by institutions like Lancaster University and Princeton University respectively to check for plagiarism and the use of ChatGPT to unethically generate content. These AI tools rely on complex algorithm and pattern recognition to detect plagiarism. They are mostly integrated into learning management systems used in higher education institutions (Kuzminyk, Nawaz, Shenzhang, Ghita, Raphae .and Xiao, 2024). In Lancaster University Ghana, most of the coursework of the students is submitted via Moodle and

plagiarism is checked in the Moodle software. Once students know that their works will be detected when they plagiarize or copy and paste contents for submission using generative AI tools, and the implications of their actions, they will be discouraged from using such tools unethically (Kuzminyk, Nawaz, Shenzhang, Ghita, Raphae .and Xiao, 2024).

### **Conclusion**

The study highlights Positive roles of Artificial Intelligence in on-line learning and its benefits to students and educators starting from enhancing the learning experience through personalisation, improving learning efficiency and effectiveness, addressing Challenges in E-Learning and Beyond even the way it changed On-line Learning's Future. The cases of using Artificial Intelligence in education Tutoring systems, Automated assessment and grading, Enhance Classroom Engagement, Prioritise Professional Development for Teachers Virtual assistants, Interactive games, Customised training, Automated tasks and Monitoring. The key areas that serve as pillars of impactful e-Learning experiences like data analytics, design and development, learning platforms, including AI in On-line Learning Platforms, were all considered. The study offers practical insights and strategies to revolutionize on-line education.

### **Recommendations**

To prevent a lot of academic mal-practices while leveraging AI in an on-line environment particularly in assessment, it is important to encourage students to do their work themselves be it assignment, test and examination and subsequently device AI tool to detect any form of mal-practice that may likely come up in any form of assessment, where necessary, the activities should be carried out within the location or restricted learning environment.

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