

Chapter 8

AI-Based Online/eLearning Platforms



8.1 What Is an AI-Based eLearning Platform?

An AI-based eLearning platform is a machine or system that can carry out many tasks requiring human intellect. It continues to be able to develop answers for problems relating to humans, such as speech recognition, translations between languages, decision-making, and many other things (Neelakandan 2019).

An artificial intelligence engine is even built into our mobile devices to help analyze our texting behaviors and generate plausible ideas (Neelakandan 2019). Although most learning organizations still do not use the AI-based eLearning platform as their standard learning strategy, it is still essential.

Despite its limited utility, artificial intelligence is moving in the right direction to improve the efficacy of eLearning instruction. An AI-based eLearning platform can shape the industry's future and positively impact its growth.

8.2 Why Use AI in eLearning?

Some typical problems with the conventional training model include the following (SHIFTelearning 2022):

- *Too much content and long:* Long-form modules make up most traditional learning programs. Additionally, it takes too many hours to create an hour's worth of this training material. People are easily overwhelmed by this!
- *Lack of personalized experiences:* Because it takes time to create content, eLearning courses frequently lack customization and are too general to meet the unique needs of each employee.
- *Do not track the program's effectiveness:* Traditional training ROI calculations need laborious data gathering and entry procedures.

- *The demands and aspirations of the digital workforce are not met by it:* Training is now an ongoing activity rather than a one-time or biannual initiative. According to a LinkedIn Learning report, millennials and Gen Z workers want to self-manage their learning experiences.

Artificial intelligence can solve many problems in training and eLearning courses.

8.3 How Are ML and AI Enhancing Online Learning?

An enormous amount of people are taking classes online. Furthermore, face-to-face training boosts knowledge retention rates by 25–60% compared to face-to-face training. Machine learning (ML) and artificial intelligence (AI) are significant contributors to the success and efficacy of online learning.

One size fits all is a thing of the past. Learning has become more individualized and adaptable because of ML and AI (Ray 2019).

Each student has a unique educational background and set of cognitive skills. Giving them case studies and examples they can most easily relate to is critical for them to learn more effectively.

With a Learning Management System (LMS) with machine learning capabilities, such a high level of personalization is possible.

Leveraging Big Data Personalized adaptive learning is a potent tool for retaining today's workforce. AI offers insights based on the vast quantity of data it has gathered and examined, which makes it easier to create personalized learning programs more quickly than before (Ray 2019). Thanks to these insights and data, online learning platforms can better comprehend student behaviors and anticipate needs by proposing and positioning content based on prior behavior.

Personalized and Adaptive Learning Along with personalization, AI and ML help to improve course content and delivery (Ray 2019). A cloud-based LMS online course is not a one-time task. Based on the input you receive from the students, you may need to change the course material. Feedback can come from qualitative student surveys or comments and quantitative information like test scores, ratings, and other course metrics that the LMS gives the students.

Gamification Businesses like BYJU'S, Collegify, and QuoDeck are doing fantastically well. Gamification is a significant additional aspect that makes straightforward tasks easier, from documentation to client engagement (Ray 2019).

For SMEs, startups, and educational institutions, QuoDeck's DIY LMS is a product that offers cutting-edge technology at a reasonable price. It is designed on a mobile and game-based SaaS platform. The platform can be implemented in a company with a staff size ranging from 30 to 1000 employees working in various conditions.

To find trends, correlations, and other insights, QuoDeck uses a multivariate model that includes clickstream data, time spent on the system, distribution of course utilization, and devices used, among many other characteristics.

AI and ML have significantly increased employee learning customization, partner resource allocation, and course efficiency for QuoDeck workers. The business plans to use AI and ML techniques to offer learners a pre-designed course based on their profiles before they start their e-Learning experience.

While offering self-paced SAT/ACT preparation classes, Collegify also developed several intriguing features that interest users.

Students can choose avatars as part of a “gamified” work-and-reward strategy that appeals to the target age group and promotes steady progress. According to our methodology, which balances performance with a challenge while avoiding overstimulation, this includes gradually releasing the content.

The content is organized into progressively more challenging tiers, and the AI is programmed to adapt to each student’s unique learning and performance trends in real-time. This flexibility helps students maximize their time on the platform while allowing educators, mentors, and parents to provide the most helpful guidance possible.

BYJU’S also utilizes data, ML, and AI to provide individualized instruction. Instead of relying solely on theoretical frameworks, the emphasis is on providing a visual and contextual framework for education. Students benefit from this since they understand when, how, and how much they should study. Its method of instruction can be adapted to suit the individual student’s needs. There is no need to memorize anything anymore; review the material on your phones or tablets as much as necessary till you understand it.

Everyone who has access to the Internet today makes use of online education.

8.4 Benefits of Using AI and ML in eLearning

The followings are some of the most salient benefits (as shown in Fig. 8.1) for using AI and ML in eLearning (Kurkina 2022):

- *Adaptive learning*: Some people learn best by reading text, some learn best by watching videos, and others learn best by listening to audio recordings. AI-driven analytics enables course complexity level adjustment and content personalization for learners. Learners’ motivation and engagement are considerably increased when their instruction is customized to their preferences, improving learning outcomes.
- *Advanced analytics*: Only using test outcomes to gauge student participation is challenging. The instructor learns very little from it, which takes time. Contrarily, analytics backed by AI can evaluate the amount of time spent completing the test, the number of tries, and other performance-related aspects. This can be used to

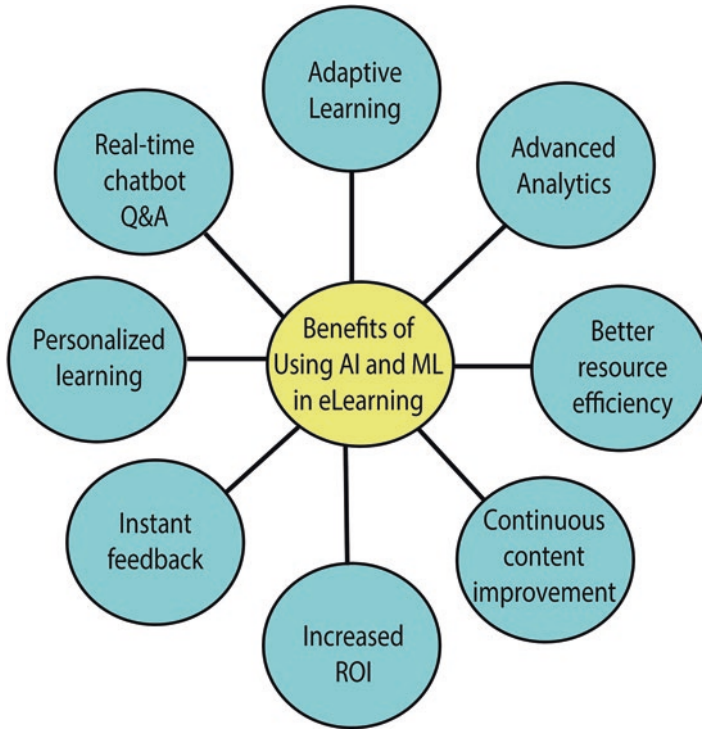


Fig. 8.1 Benefits of using AI and ML in eLearning

assess a student's progress, pinpoint any flaws in the course material, and decide how to enhance it.

- *Better resource efficiency:* With AI-based eLearning systems, managing and updating the content takes minimal human labor. eLearning systems use fewer system resources when they are deployed in the cloud. They also guarantee improved training effectiveness, which results in learners reaching company objectives more quickly and requiring less time to learn new skills.
- *Continuous content improvement:* Identifying patterns of successful and unsuccessful learning outcomes is possible by analyzing the data on student performance gathered throughout the course's duration. This makes changing the course's content possible, swapping out more difficult-to-understand elements for simpler ones, etc. In order to increase learning outcomes, educators may maintain the currency and usefulness of their course materials while also giving their students long-lasting, satisfying customer experiences.
- *Increased ROI:* The ROI evaluation of eLearning effectiveness is most heavily influenced by time gains. Your staff can use their newly gained talents more quickly the less time they spend training. As a result, the eLearning system pays for itself far quicker than you would have anticipated and increases the productivity and adaptability of your entire organization.

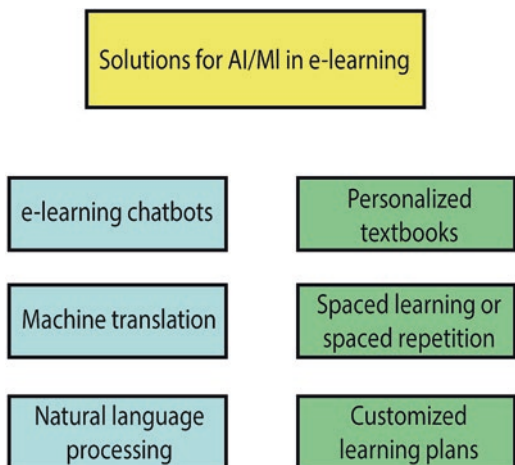
- *Instant feedback*: By combining the factors above, it is possible to give each user individualized real-time feedback. As a result, each learner views comments like this as a personalized development plan that highlights his or her strengths and areas for progress rather than as a form of public intimidation.
- *Personalized learning*: Every training group in the present era consists of persons from various backgrounds and with gaps in their expertise. Each student can have a unique learning path created for them by using AI solutions in eLearning and analyzing the responses to determine their level of topic mastery. While some students will need to go through the fundamentals, more seasoned students can speed through them by answering tests to demonstrate their proficiency.
- *Real-time chatbot Q&A*: Many students find it difficult to understand certain concepts fully. Being able to replay watching the videos or listening to the audio till they figure everything out is a benefit of pre-recorded content. However, many people refrain from asking their “stupid” questions during live webinars and other training sessions. This problem is also resolved by AI-powered chatbots, which allow students to ask as many queries as they like without interfering with the lecturer and receive in-depth responses as often as necessary.

8.5 Solutions for AI/ML in Online Education

AI/ML will deliver the following solution (Kurkina 2022) for online education (see Fig. 8.2).

- *eLearning chatbots*: Chatbots can be set up to respond to questions about the course, give detailed comments on each learner’s development, and deliver analytics on possible course material updates.
- *Machine translation*: By employing machine translation, users can better understand the language, grasp its grammatical quirks, learn proper sentence construction, and expand their vocabulary.

Fig. 8.2 Solutions for AI/ML in eLearning



- *Natural language processing:* By using AI technologies to convert speech into text, enable voice recognition, and enable translations, educators may now instruct students anywhere in the world, greatly enhancing the potential of eLearning as a teaching tool.
- *Personalized textbooks:* The learning outcomes are considerably improved, and rewarding experiences are created when the eLearning materials are customized to each student's unique training preferences.
- *Spaced learning or spaced repetition:* Most language learning software employs this method. To promote greater topic comprehension, the system continuously provides the terms the learner could have problems recalling based on an analysis of their progress.
- *Customized learning plans:* Applying AI in eLearning guarantees that instructors may create varied, in-depth, and focused learning programs because of detailed analytics on individual learner progress and course-wide statistics. This makes it simpler to update or reuse the current eLearning content.

8.6 Various Ways AI-Based eLearning Platform Can Shape Online Learning

Today's eLearning is benefiting more from artificial intelligence. These five strategies (Neelakandan 2019) will help us mold online learning and improve its effectiveness. The way training is provided at work will likewise alter due to AI.

- *Real-Time Questioning:* Many students encounter obstacles when seeking clarity on a particular subject during learning. While some students are brave enough to ask questions during their studies, others are not. However, introducing AI into your learning program may give students an excellent way to get an explanation whenever and however they choose. A vital function of an AI-based eLearning platform is its capacity to serve as a tutor and offer solutions to problems as they arise. With AI, students may ask questions about unclear material and receive prompt responses.
- *Generate Fresh Learning Content:* Creating course content is one of the aspects of eLearning that takes much time for SMEs and eLearning experts. Suppose properly trained AI systems can extract useful information and transform it into intelligent material for digital learning. This enables professionals to concentrate more on designing a fun digital learning environment for their students. One of the most challenging aspects of digital learning is creating eLearning courses because it takes various abilities. The ongoing development of AI can assist in bringing all the necessary abilities together to offer an excellent eLearning course.
- *Natural Language Processing:* How often have your students asked to speak to your learning program in their native tongue? A machine with artificial intelligence could make this a reality for you. Natural language processing is artificial intelligence's fundamental component (or sub-field). It focuses on making it pos-

sible for systems to process human language rapidly and effectively. Therefore, by incorporating AI into your eLearning program, students can communicate with the system and ask questions in the dialect/style of their choice. This will save time, contribute to creating effective and exciting eLearning, and make learning more accessible.

- *Personalized Tutoring Session:* eLearning has been a considerable benefit for educators due to the ability to develop content that can be shared with various learners. In a perfect world, it would be nearly impossible for a teacher to meet every student’s needs simultaneously. Of course, corporate training frequently uses this one-size-fits-all strategy. It is not the most excellent strategy because different learning styles should be considered before providing content to diverse audiences. Artificial intelligence is essential for identifying a learner’s learning style and reviewing a learner’s prior performance. AI modifies the updated course materials to provide the individualized instruction that today’s students need.
- *Gamification:* To engage and inspire learners to learn new information, gamification is a crucial strategy employed in online learning. Tactical game design for online training materials is simple with AI. Processing much data is helpful because it allows for the behavior of learners to be predicted and for them to be informed about how their learning is going.

8.7 Different Ways That AI Is Being Used in eLearning

This section has included six applications (Denton 2022) of artificial intelligence in the eLearning sector (see Fig. 8.3).

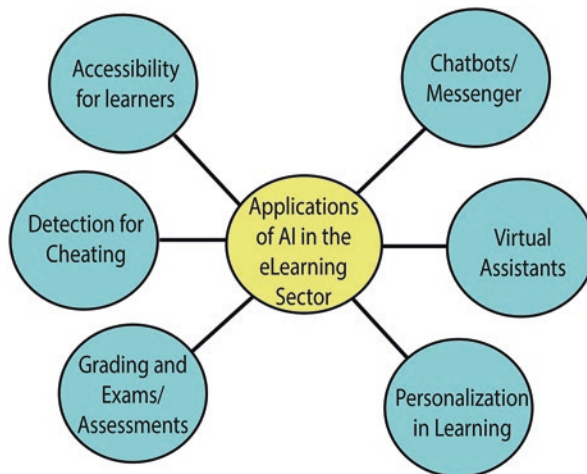


Fig. 8.3 Applications of AI in the eLearning sector

- *Accessibility for learners:* The way that the eLearning sector has improved accessibility for distance learning for virtually everyone, everywhere, at any time, is one of the most beneficial consequences on students' education and learning experience. It is no longer confined to a physical classroom or corporate training session. Anyone with Internet access can immediately start mobile learning on almost any subject by logging on to their computer or mobile device. The phrase "continuous learning" describes the process of learning over time. A never-ending thirst for knowledge drives continuous learners, and the steady flow of information exposes them to a dynamic educational lifestyle. Nowadays, many companies provide programs for lifelong learners, including webinars, podcasts, digital publications, training modules, workshops, or sessions on specific subjects.
- Additionally, many colleges offer a variety of online courses or massive open online courses (MOOCs) that enable students to take courses while maintaining their employment or family responsibilities. This eLearning industry opens up new opportunities for teachers to create content and for students to access eLearning resources. The demand for ongoing education has only grown due to technological advancements and automation. For instance, it is predicted that automation will result in the loss of ten million US jobs during the following 5 years. Professionals need to engage in this type of constant learning now more than ever, and AI can make it possible in a manner that conventional training just cannot. Users are more likely to remember material in a mobile learning environment by offering a more customized learning path based on a learner's abilities or industry-specific information they may require access to at any time.
- *Chatbots/messenger:* Without constantly needing a human instructor, chatbots enable students to ask questions or request explanations in natural language. This has considerable advantages regarding cost-effectiveness and gives companies access to markets worldwide that frequently cannot afford to hire a full-time trainer. There are several ways to include chatbots in eLearning programs. They can send brief messages from the company group chat about a particular subject of interest to a learner or instantly respond to frequently asked inquiries for learners. In addition, they can offer a "genuine" experience by having a live discussion on the website where the eLearning software is installed. Chatbots can also be used as a tool for evaluation. AI can swiftly determine whether a student's written responses are valid or incorrect, allowing instructors and mentors to offer feedback before the learner continues with this new information or skill set. This allows for significant time savings and guarantees that students will always have access to the required materials.
- *Virtual assistants (VAs):* Learners can also communicate with a virtual assistant, mentor, or trainer using artificial intelligence. A virtual assistant can support educators and students by responding to inquiries often directed to a professor. These are similar to chatbots, but there is still some differentiation. They can aid in planning and explaining how the course materials function within a particular subject. This is more common in the corporate sector than in academia or educa-

tion, but as advances in machine learning and natural language processing advance, we will see its application transition from business-oriented to educational. Digital technologies are evolving, so they can now automatically grade tests. This saves time, resources, and money for educators/trainers, students, and businesses. They can assist students in navigating the course material and serve as a motivating mentor for them when they encounter difficulties. Although most are still in the beta stages, virtual tutors are also available.

- *Personalization in learning:* One of the fascinating aspects of AI is that as they acquire data and improve their efficiency through machine learning, they learn how to react to user interactions. Based on the users' preferences and preferred learning techniques, artificial intelligence in eLearning develops customized courses for each user. These courses can constantly modify depending on how a student responds to the material, providing extra assistance where needed and omitting anything that would not be considered "relevant content." This is known as adaptive learning, accomplished by employing machine learning algorithms. Adaptive learning, sometimes called adaptive teaching, is a teaching strategy that combines artificial intelligence and computer algorithms to manage interactions with students and deliver resources and learning activities specifically tailored to meet their individual needs. Individuals may "test out" some training during professional development or corporate training to ensure they are interested in innovative material. Then, taking into account the student's responses to the questions, tasks, and experiences, the learning management system adjusts the display of the online learning material. The goal of adaptive learning systems is to change the learner's role from that of a passive receiver of knowledge to that of a participant in the educational process. While business training for corporations is another common application of adaptive learning systems, education is their primary field.
- *Grading and exams/assessments:* Reading and grading several examinations and evaluations is a professor's or teacher's most essential and time-consuming job. To ensure the student has complete comprehension, teachers must analyze the quality and the content. AIs have stepped up to the plate in this situation and have developed into quite effective graders of longer, more challenging exams. Google's neural matching program is now a leading illustration of how computers can decipher the questions and solutions hidden in written exam assessments. In the ensuing years, this will only get more honed.
- *Detection for cheating:* Contrary to other forms of cheating, many plagiarism detection methods and programs do not require artificial intelligence. An illustration of this is when AI can extrapolate from a dataset of submitted assignments to determine whether a particular student or another person completed an assignment by comparing similarities in a sample of a student's writing to those in other submissions.

8.8 Types of AI in Online Education

The education system underwent significant modifications as a result of the Industrial Revolution. As factory occupations displaced agrarian jobs, math and reading abilities became more crucial. The focus of public education changed to a factory model, where students would acquire the skills necessary to work in those factories. A comparable seismic shift in how we teach and learn might be brought about by the upcoming artificial intelligence (AI) revolution.

Education has centered on specialization—learning more about less—since the middle of the twentieth century. That particular knowledge, however, becomes obsolete more quickly in a world where automation is on the rise. Students will come from a broader range of backgrounds and age groups as time passes. They must pick up new talents and revise old ones throughout various occupations. Online education will eventually be accessible to anyone, and AI may help make that happen.

Online education has dramatically benefited from AI, even if just indirectly. The nation's leading AI labs gave rise to well-known online learning platforms like Udacity, edX, and Coursera. As AI-powered modules are now becoming available in every field of education, that association might develop into a strong bond.

Online course delivery (Garrett 2018) has already increased graduation rates, decreased costs, and decreased inequality. Due to the AI revolution, online learning could become even more innovative, quicker, and less expensive. It has already begun.

The following are the three primary types of AI used in online education (OnlineEducation 2022):

1. *Adaptive Learning*: Adaptive learning is learning software tailored to each student separately. As a result, concepts are presented in the sequence that each student finds to be the most understandable and may be finished at their own pace. They might be introduced in a much more detailed manner as they progress. Currently, adaptive learning models work best when a sizable group of students must study the same content, allowing for the simultaneous collection of comparable data. With artificial intelligence, apps like Cram101 from Content Technologies can distill a textbook into a study guide that includes chapter summaries, practice exams, and flashcards. A portion of the high school curriculum is already being distributed simultaneously to thousands of schools through the Brazilian adaptive learning firm Geekie. Overall, adaptive learning tools will continue to improve learning by making it more efficient, intelligent, and personalized.
2. *Intelligent Tutoring Systems*: AI-powered solutions specifically designed for each student's needs and talents are intelligent tutoring systems. The Carnegie Learning product MATHiaU simulates a human coach's capacity to give feedback, rephrase inquiries, and thoroughly assess a student's progress. MATHiaU focuses on remedial math classes for college students, which, when pursued conventionally, cost \$6.7 billion with only a 33% success rate. Intelligent tutoring systems can significantly reduce that expense while also increasing success rates. The writing tool Bartleby, created by Barnes & Noble Education, has an

AI-powered writing module that checks papers for plagiarism, corrects grammar, spelling, and punctuation, and even assigns a rough score. When implemented correctly, these solutions reposition teachers more toward a mentoring position rather than replacing them.

3. *Virtual Facilitators*: Imagine if chatbots and video games had a child, but the objective was to progress a user's education rather than to achieve a high score or to solve a customer service issue. Virtual facilitators will soon become a reality in this manner. USC's Institute gives a head start for Creative Technologies. They have already produced prototypes for virtual counseling for the US Army and are skilled at building AI-powered 3D settings and lifelike virtual personalities. Captivating Virtual Instruction for Training (CVIT) is a project that combines virtual tutors, augmented reality, and live classrooms. In the meantime, Jill Watson serves as a virtual teaching assistant for IBM's Watson. Jill was first introduced at Georgia Tech in a course named "Knowledge-Based Artificial Intelligence." She participates in an online discussion forum with other human teaching assistants to respond to student inquiries. By responding more swiftly, she frequently does better than her human colleagues. Students at Georgia Tech in 2016 could not identify which teaching assistants were AI programs.

8.9 How Is AI Revolutionizing the eLearning Industry?

Businesses are becoming increasingly aware of the possibility of adopting AI for learning and development. Here are the ways artificial intelligence is changing the eLearning sector (SHIFTelearning 2022):

Provide the appropriate information to the individual at the appropriate time through personalized learning paths. The modern workforce expects personalization; it is no longer merely a desire. Your employees want material where they play the main character in a tailored experience.

Rather than using a one-size-fits-all approach, eLearning solutions based on artificial intelligence can customize the material for each learner.

"Personalized" or "adaptive" learning is a data-driven strategy that continuously monitors each student's performance. It is more time efficient and motivates students to learn when each student has a customized learning path with pertinent topics. Machine learning algorithms forecast outcomes and modify information to each student's skills and preferences. As a result, until a student has thoroughly learned the subject, the platform will continue to adjust the content and difficulty levels based on their progress.

For instance, the employee requires a variety of viewpoints on the subject being studied to understand it, especially for complex subjects.

To build an internal combustion engine in mechanical engineering, a student must comprehend how the engine functions and its components interact. They must examine many models in order to gain a thorough understanding of how each one differs from the others while adhering to the same rules and serving the same purposes.

This procedure is not sequential and differs for every student. One student might learn something more quickly by seeing a video and putting it into practice, another would find it simpler to see a visual blueprint, and another might comprehend it by thoroughly explaining how it operates.

Similar principles apply to learning other subjects: it takes more than one approach to understand a concept correctly, and each student will require a distinctive combination of approaches depending on their learning style.

The content is general and not tailored to each student's interests when using traditional training. There is just one learning path, and the teacher or course author determines the same arrangement of content for all students.

Integrating eLearning platforms and onboarding artificial intelligence can make corporate development systems more effective. Content is modified, and individual learners receive personalized learning paths and recommendations based on their roles, interests, and past actions on eLearning platforms.

The result is a dynamic, adaptable, personalized, and successful training strategy that helps each employee become the director of their learning and adjust as a living organism to their needs.

Advanced Analytics for Better Decision-Making Instructors and/or training leaders frequently run into two issues while evaluating the performance of their learners: they take a long time, and the data is not sufficiently detailed.

It is feasible to swiftly analyze enormous volumes of data and uncover patterns and trends to enhance and continually improve learning experiences by utilizing an artificial intelligence-based eLearning platform.

Content analytics primarily refers to eLearning platforms that use machine learning and AI to enhance learning modules. This allows corporate leaders to manage and produce eLearning content using sophisticated data analytics to gather crucial information about student progress and comprehension.

Using artificial intelligence, instructors and L&D leaders can get comprehensive data about each student's performance, areas of strength, areas of weakness, and attendance issues. This simplifies deciding, optimizing, and taking action before the learner loses interest and abandons the course.

Faster eLearning Course Creation Creating courses has historically been one of the most time-consuming chores for subject matter experts and instructional design specialists. Fortunately, using AI to eLearning helps create courses that are considerably easier to create, quicker to develop, and more agile without compromising quality.

A fantastic example of how artificial intelligence improves eLearning production is the automatic translation and localization feature, which offers more speed and efficiency.

It is not easy to translate eLearning content while utilizing conventional development techniques. Making the same information accessible in several languages becomes considerably more time-consuming and expensive when considering the content that must be developed!

However, with AI, it is now possible to create multilingual content for multinational corporations facing the challenge of developing helpful content for branches in multiple countries or for the situation where companies work with remote teams that speak different languages, which is becoming more common.

By using an authoring tool like SHIFT, businesses may speed up the development of projects that call for material in many languages by cutting the time required for translation services of an eLearning program from months to only days.

Chatbots and virtual tutors to support learners as part of increased engagement. Assessments can be completed quickly, and questions from staff or students are handled in real time through artificial intelligence, which speeds up and customizes the learning experience.

It can be portrayed as a clever chatbot that reads and replies to the employees' conversational text messages and inquiries. An illustration would be a chatbot that "decides" what questions to ask a student depending on the student's initial responses, such as adding questions in areas where the student has given the most inaccurate answers or moving up a level when the student consistently inputs the correct answers. Another frequent usage is to provide straightforward answers: the AI algorithm may be provided with the fundamental knowledge that, for instance, a new contributor may need.

Virtual assistants, like chatbots, can support both students and teachers by responding to inquiries that might otherwise be directed to the teacher or by guiding students through course content in a more approachable manner.

Additionally, chatbot-enabled eLearning platforms act as a "guide" for students, assisting them at every step of the process. For instance, they might propose different learning resources based on a user's profile and areas of interest, saving the time and effort required to find these resources manually.

8.10 AI's Impact on eLearning

An overview of how AI interacts with and affects eLearning (Lawton 2020) (Hogle 2022) is given in this section.

Off-the-Shelf AI Technology Some eLearning authoring tools and platforms come with built-in AI-based technologies, which can be licensed within a software platform. AI tools based on Amazon (AWS), Google (GCP), IBM (Watson), and Microsoft (Azure) are widely used in eLearning and other online tools. L&D professionals do not need to build AI-based solutions if they use or develop eLearning platforms and authoring tools.

Where AI Shows Up in eLearning AI-based tools alter how people use technology, go about their daily lives, go shopping, discover information, and study. The tools and methods used by L&D professionals to produce and deliver eLearning content are also altered. A few crucial areas where AI is having an impact are (Hogle 2022):

- *Content creation and improvement:* The creation of information for multilingual learner groups is made simpler, quicker, and more affordable through automated translation. Grammar and spelling checkers may make information easier to read. AI-based systems may provide transcripts, closed captions, and alt text for video footage.
- *Getting the right content to learners:* According to learners' interests, performance, job roles, or past training, AI-based systems may automatically tag information and power recommendation engines. In adaptive training, tailored content is sent to each student based on performance and mastery objectives.
- *Gathering and analyzing data:* The effectiveness and quality of training can be enhanced by L&D teams using predictive analytics that analyzes learner data. Data on training history and performance could be mapped to job performance data to identify skill or knowledge deficiencies. Alternatively, it may analyze staff and customer communications to find common points of confusion and develop or enhance training in those areas.

How AI Supports L&D Teams Pattern recognition is a specialty of AI. Massive amounts of data may be analyzed swiftly by an AI tool, which can then spot patterns and connections that human analysts would probably miss or be unable to uncover due to the sheer volume of data they must process.

Routine chores can be automated by AI tools, freeing up human L&D professionals to concentrate on their more creative work. The L&D staff can concentrate on creating content or reviewing the results to identify which assessment questions want improvement and which subjects require more or better information. It is possible to automate these operations to generate daily or weekly reports rather than spending hours each week registering learners, reminding them to finish training, and determining who is and is not making progress.

8.11 How AI Is Transforming eLearning?

AI is revolutionizing education and opening up new opportunities. By 2025, the AI market is expected to be worth \$190.61 billion, altering a variety of sectors, including e-learning (Ivanov 2020). We may utilize e-learning systems (LMSs, LXPs, LAPs, etc.) to a greater extent by integrating AI technology. In other ways (Ivanov 2020), AI fundamentally alters the e-learning sector.

Define Learner's Pathways Each time a person interacts with the technology, AI can collect and evaluate personal data about them. Thus, the learner's courses through the educational process may be more effectively defined. In response to the queries asked by the user, AI technology can:

- Identify the learner's next degree of achievement.
- Get him or her to that stage by giving them or the relevant content.
- Use the information to trigger the relevant course materials, making the education process more tailored to the individual.

Personalized Tutoring Session There is no denying that no one learning method works for everyone. Each learner has a different learning style, speed, and set of skills. Why not customize education when we can now obtain individualized entertainment and shopping?

AI technology can tailor tutoring sessions to the learners' needs, much like Amazon or Netflix, and tailor content, recommendations, and adverts based on the user's choices, likes, and previously purchased or viewed movies. As a result, AI integrated into an e-learning solution can:

- Keep track of the student's prior performance
- Determine where each learner's proficiency is lacking
- Utilize the information to customize learning by alerting the instructional materials accordingly

Content Analytics Online education entails a vast library of unavailable materials, including texts, papers, media, audio, photos, etc. Most data is typically unstructured, making it difficult for teachers and administrators to handle it effectively. Teachers and students can benefit from the course materials because of AI's ability to handle and analyze big datasets rapidly and effectively.

Thus, the technology can identify patterns and trends, gather information about the learner's unique learning preferences, pace, and gaps, and then highlight those to the user for further interpretation and decision-making.

More Targeted Marketing Many companies gather more user data than necessary and know how to exploit it. Big data can be burdensome for businesses because it needs to be maintained securely. Additionally, businesses cannot provide focused marketing since they cannot adequately handle all the collected data.

First and foremost, AI can determine which data points are essential and pertinent and stop collecting extraneous user data. In addition, technology can evaluate data more quickly to offer marketing collateral and, more precisely, targeted advertising. Thus, the audience most interested in your online course will see your adverts.

AI-Based Virtual Assistance Virtual assistants are now widely used in both our personal and professional lives. They support us, provide information, offer advice on various topics, etc. As a result, AI-based chatbots are quick, efficient, and accurate helpers in various industries like retail, healthcare, etc. They can also be applied to education to offer real-time assistance.

Along with offering round-the-clock guidance, AI-based assistants may converse with users by comprehending human language via machine learning (ML) and natural language processing (NLP). Because of NLP, virtual assistants may track user behavior, offer extra learning resources, impart information from subject matter experts, provide feedback and assistance that is specifically customized to the user, and more. Thus, technology increases users' productivity and engagement.

Deeper Engagement with Virtual Reality (VR) Online education can advance thanks to a mix of VR and AI technology. You can build online training simulations and give consumers in-depth, real-life scenarios by combining different solutions. In this way, students can get fully immersed in a learning environment, study a subject in greater depth, practice, assess their comprehension of a subject, etc. Additionally, such interactivity can improve engagement and the user experience.

Automatic Grading Along with utilizing AI technology, the solution integration can also take advantage of solid automation features that simplify grading. It gives teachers more time to communicate with students, create materials for online classes, and other things. The solution's integration can speed up reviewing and grading the students' written work in many languages.

Real-Time Questioning AI responds to requests in a quick, precise, and effective manner. Sometimes it is critical to have answers right away without having to go to the teacher or look them up online, which would disrupt the learning process. AI-based systems can process user inquiries and provide real-time responses, including all necessary justifications and explanations. The resources are also revealed, learning assets are suggested, and the time and effort required to perform all that manually is eliminated when AI is integrated into eLearning courses.

8.12 Ways Artificial Intelligence Is Transformed eLearning

A crucial symbolic development in computing technology occurred in May 1997 when IBM's Deep Blue artificial intelligence defeated global chess champion Garry Kasparov (Greenemeier 2017). Using a brute force technique, Deep Blue could compute hundreds of potential moves quickly and select the ones that would most likely result in victory.

The ancient Chinese strategy game Go has recently been cracked by artificial intelligence. In contrast to the more structured game of Chess, Go is an open-ended game with few rules and a broad scope of play. After finding that brute-force algorithms were ineffective, the developers of AlphaGo turned to neural networks to enable the AI to learn strategy by playing millions of games against itself. In March 2016, AlphaGo bested the 18-time world champion Lee Sedol (Mozur 2017).

Grandmasters have been defeated in some of the oldest and most challenging games known to mankind, elevating the status of AI, but it has also been used for more valuable tasks. Artificial intelligence can identify some diseases earlier and more accurately than medical professionals (Kay 2017). While this was happening, a pair of chatbots that Facebook developed to conduct speedy negotiations developed a puzzling code language (LaFrance 2017) to communicate.

It is evident that because AI is a new technology, its full potential has not yet been realized. It is also evident that they will have numerous applications for online education as they advance and become more widely available. Here are a few examples (LearnDash Collaborator 2019a).

Artificial intelligence (AI) will assist educators in developing new, immersive environments for scenario-based learning. The complexity and number of alternatives rise exponentially as the scenario develops is currently one of the main obstacles to using branching scenarios in e-learning (LearnDash Collaborator 2018). Although students gain a lot from these circumstances, it can be challenging for teachers to create them.

However, AI might help educators by producing spontaneous responses to a scenario. It could consider more things and produce a more realistic atmosphere than following a pre-planned script. For instance, the scenario's conditions might alter if a learner responds slowly or if a particular scenario path leads back to a previous option; the scenario may remember the learner's responses and alter potential future choices.

With the advent of online education, teachers now have a significant advantage in producing lessons that can be distributed throughout tens of thousands of online courses. As a result, the instructor has more time to develop new course materials, promote their curriculum, or interact with students. Students will benefit from individualized tutoring sessions.

However, though automatically distributing content to many students simultaneously provides clear advantages for operating an online business, it can also leave students behind (LearnDash Collaborator 2019b). There are restrictions on how much one-on-one time a teacher can spend with each student, and as a course gets bigger, those restrictions are quickly reached.

Soon, artificial intelligence will not be able to take the job of an instructor, but it can ease the burden. For instance, if an AI can recognize early sickness symptoms, it may also recognize students ready to lag in their studies and choose the best method to support them. Or why not develop advanced chatbots to assist with language training because we are currently designing them to handle customer service calls?

Intelligent Automation Is on the Way We strive for more effective techniques to automate routine operations (Ferriman 2016). Multiple-choice tests and pre-programmed workflows already manage repetitive tasks like sending email reminders and grading them effectively. Some automation, meanwhile, is too complicated and has too many variables and circumstances for most people to design properly, and we have not yet created an AI that can grade term papers.

Even though it may sound unusual, the time may come when AIs can evaluate brief or lengthy responses to a quiz and compare them to crowdsourced data collected from the Internet to check for accuracy. This would enable professors to design more in-depth tests without being overburdened with grading tasks.

Less Invasive and More Targeted Marketing Many big data-focused businesses collect more data than they can use. They are more likely to regress to the mean and broadcast messages that appeal to the audience's lowest common denominator since they cannot make sense of this enormous amount of unsorted data. The idea that a more sophisticated AI could give better-targeted marketing and advertising materials without requiring much client personal information may seem counterintuitive, but it is accurate.

A more advanced AI could determine crucial information and stop gathering irrelevant data (LearnDash Collaborator 2019a). Perhaps it does not require access to my Facebook account (along with my complete friend list, their friend list, etc.) to understand that I would be interested in an online language lesson. YouTube might stop showing me adverts for drugs to treat rheumatoid arthritis if businesses knew how to tailor their advertising correctly. Although it may at first seem unsettling, this is a positive step.

8.13 Examples of AI Being Used in eLearning

Because we are accustomed to thinking of AI as potentially evil or terrifying, it can be challenging to write about it in the context of e-learning without feeling like you are participating in speculation, a task typically reserved for science fiction writers. However, whether we realize it or not, AI is becoming commonplace daily.

Because the current AI differs from the self-aware, human-passing androids that novelists like Isaac Asimov, Philip K. Dick, or Arthur C. Clarke led us to expect, this disconnect affects many of us more than it should. Instead, we now have powerful software tools that are excellent at identifying patterns and then modifying behavior in response to those patterns to produce a relatively constrained set of outcomes (LearnDash Collaborator 2020).

That may not sound as thrilling (or terrifying) as your average sci-fi book, but it does provide some intriguing use cases that can be used in online learning today.

Let us examine some companies (LearnDash Collaborator 2020) already utilizing them.

Duolingo The most well-known application of AI in education right now is undoubtedly Duolingo. They have been quite open about the research that went into developing their language learning software, to the point that their branding now incorporates the strides they have achieved in using machine learning to teach languages. Even a section of their website is devoted to their studies.

How do they use this research in their lessons? First, Duolingo's AI customizes lessons by tailoring them to the preferences and strengths of each learner. It will consider the vocabulary the students already know, the grammar concepts they struggle with, and the subjects they appear interested in.

The artificial intelligence (AI) behind Duolingo also uses natural language processing to provide chatbot experiences that let users practice communication in real time. It enables language students to develop their abilities and confidence before speaking in front of a live audience.

Thinkster Thinkster offers K–8 students individualized math tutoring using AI, similar to Duolingo. After the learners complete an evaluation test, the AI can tailor the questions depending on their prior knowledge and how they interact with the material.

The unique aspect of Thinkster’s strategy is how it mixes artificial intelligence with instruction from qualified math tutors. As a result, teachers spend more time concentrating on the content that students need. This indicates that personalization is taking place for more than just the students; it is also assisting in preparing tutors to provide more focused lesson feedback.

Querium Querium takes a different approach than the popular trend of using personalization in AI learning. This online tutoring program evaluates students’ steps to solve a STEM problem and gives them immediate feedback on what they are doing correctly or incorrectly. This safeguards the education of the students by protecting them from being exposed to the incorrect solution and relieves the burden of grading on the educators.

AI, in this context, is unique because it must comprehend learner input data that may not always take the same shape to deliver the appropriate feedback. This is a lot more difficult than just selecting a structured answer from a pre-made list and giving feedback, but it also enables more precise training.

Alta by Knewton Using high-quality learning resources chosen from its databases, Alta, a new product from Knewton, a name synonymous with higher education, employs adaptive learning to spot learner knowledge gaps.

In this case, the program functions as a study aid, spotting and filling knowledge gaps. When used differently, it can also assist companies in maintaining staff training to keep up with new skills or legal requirements.

In summary, there are four different kinds of AI in use today. Although there are more instances of online instructors using AI, they almost all fit into the categories (LearnDash Collaborator 2020) stated below:

- *Natural language processing*: used for both significant accessibility applications as well as language instruction. It tends to be flawed around young children or multilingual persons.
- *E-learning personalization*: modifying the curriculum to suit the needs and preferences of the learners.
- *Virtual tutoring*: Grading assistance to spot and fix student mistakes.
- *Adaptive learning*: actively locating and filling up knowledge gaps for learners.

A more prosperous learning environment powered by AI can be created by combining many of these. The more software can link these different sorts, the more they can do with them, even if AIs frequently need the training to reach a position where they can act intelligently.

8.14 The Future of eLearning

The training and development sector has seen a 47.5% growth in this technology over the last 4 years, and by 2025, it is anticipated that investments in artificial intelligence will total \$190.61 billion (SHIFTelearning 2022).

In the future, artificial intelligence will likely control many functions humans perform (SHIFTeLearning 2022). However, this should not cause fear because it will improve human training and enable them to handle more challenging jobs.

In order to save instructors' and employees' time and free them up to work on more essential duties, companies can deliver individualized learning at scale by utilizing the power of artificial intelligence. Additionally, because of the advantages like adaptive learning, advanced analytics, and time optimization during the creation process, employees will be more engaged and motivated in learning, leading to better outcomes and higher productivity.

8.15 Where Do You See the Future of AI in eLearning?

There are still issues to be solved, even though many educational institutions plan to or have already implemented AI in various activities. It is crucial to convey to students how AI will automate and carry out monotonous jobs. Preparing the students for this change is the most important.

However, roles always call for creative, cognitive, and emotional intelligence. AI and human skills should be combined for the most significant outcomes.

AI-based learning systems, for instance, might be very effective teaching tools for arithmetic and foreign languages (ColorWhistle 2023). An instructor would still be required to help students with concepts they did not fully grasp, such as subtleties and exceptions to rules.

While AI has much exciting potential to advance eLearning, its application is still in its infancy (ColorWhistle 2023). For implementation to be successful, more testing and investigation are needed.

We advise e-learning administrators and leaders to take the initiative and launch pilot projects to test AI in diverse contexts. Inform the students about using their data if you test it in real-time.

8.16 Potential Applications of AI in Remote Education

Self-improvement is ingrained in the process of AI-powered online education, which is still in its infancy (OnlineEducation 2022). Compared to human teachers, AI systems are more visible, making it simpler to audit and follow the thought processes that led to a teaching moment.

AI systems will have access to more data as more are implemented, but that data must be gathered ethically, securely, and openly. These tools will improve fluidity, naturalness, and efficiency over time. Students will learn more quickly than ever before and will increasingly be able to gain skills that will be useful to them in an automated future thanks to improved AI-enabled online education.

However, there are still pitfalls. All 109 public schools in Washington, DC, that are part of the IMPACT program implemented AI and machine learning techniques

in 2009 (OnlineEducation 2022). The goal was to evaluate teachers' effectiveness, offer thoughtful feedback, and raise the bar for education. It did not work out well. Many teachers voiced opposition. For better grades, some people manipulated the system. Due to flaws in the system, the results of roughly four dozen teachers were mistakenly downgraded. It was called a scandal by *The Washington Post*.

Future developments in AI education must put the demands of the users—teachers and students—first and foremost. Only 38% of instructors who participated in an Economist Intelligence Unit survey believed their training had prepared them to use digital technologies for instruction (OnlineEducation 2022). Additionally, more progress must be made to incorporate these advances into the current system.

Teachers, students, and AI developers still have much to learn about the future of AI-enabled education.

8.17 What Is AIaaS in eLearning?

It makes sense to question where you may get AI tools to save time and money by forgoing the need to create your own. Do not be alarmed by the advertisement for “AI as a Service” or “AIaaS”; even small educational institutions or learning and development professionals can get a license for AI tools and components (ColorWhistle 2023).

Although such tools may not be appropriate for every e-learning ecosystem, they may have alluring advantages, such as expanding your toolkit with common AI tasks (logic, decision-making).

Here are some of the popular tech companies' AIaaS tools and platforms (ColorWhistle 2023), most of which are cloud-based.

- *Microsoft Azure*: Building and managing AI applications like bot-based apps or image recognition can be done using cloud-based AI services.
- *IBM's Watson*: Services for managing and storing your data in the cloud and can be linked to your apps.
- *Google's TensorFlow*: An open-source, full-featured machine learning platform.
- *Amazon Web Services*: Provides a large selection of products and services on Amazon's cloud.

Other AIaaS platforms, such as DataRobot, Petuum, and H2O, demonstrate the industry's growth.

8.18 Conclusion

Many industries, including eLearning, are changing due to rising technology like AI. eLearning with AI benefits students, teachers, parents, and schools. It makes high-quality education more widely available and allows students to learn at their

own pace. AI-driven tools can assess essays, provide personalized resource recommendations, and respond to questions from students. Knowing when a student will leave school will enable institutions to provide them with the additional support they require. The use of AI in eLearning solutions benefits: make personalized learning pathways, personalize the online classes by distributing the proper materials to the right students, analyze the information to raise student interest, and automate and streamline the grading and learning processes.

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