

# Enhancing Student Engagement: Harnessing “AIED”’s Power in Hybrid Education—A Review Analysis

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**Abstract:** Hybrid learning is a complex combination of face-to-face and online learning. This model combines the use of multimedia materials with traditional classroom work. Virtual hybrid learning is employed alongside face-to-face methods. That aims to investigate using Artificial Intelligence (AI) to increase student engagement in hybrid learning settings. Educators are confronted with contemporary issues in maintaining their students’ interest and motivation as the popularity of online and hybrid education continues to grow, where many educational institutions are adopting this model due to its flexibility, student-teacher engagement, and peer-to-peer interaction. AI will help students communicate, collaborate, and receive real-time feedback, all of which are challenges in education. This article examines the advantages and disadvantages of hybrid education and the optimal approaches for incorporating Artificial Intelligence (AI) in educational settings. The research findings suggest that using AI can revolutionize hybrid education, as it enhances both student and instructor autonomy while fostering a more engaging and interactive learning environment.

**Keywords:** AIED; interactive learning; hybrid education; online teaching; student engagement



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## 1. Introduction

### 1.1. A Review of the Thematic Area Introduction

The growing popularity of online education has brought the issue of determining how well it works into the spotlight. Researchers consider several elements; nonetheless, the preparation of students for online learning has yet to be the focus of systematic research in domestic science. The digitization of society and education as a prominent trend, supported by the transition to remote education in conjunction with the COVID-19 epidemic, drives the broad implementation of different formats for online learning worldwide. To meet the problems of the crisis, Zancajo, A.; Verger, A.; Bolea, P., argued that fundamental policy adjustments are necessary [1]. The policy proposed by Moorhouse and Wong, recognizes the transformative impact of digital tools on academic activities. They argue that using these tools, such as synchronous interaction platforms and asynchronous educational work, learning management systems, online courses, and various Internet resources and services, has led to a departure from traditional academic practices. Instead, they advocate for promoting new educational activities within the digital realm, specifically the Internet. This policy encourages educators and institutions to embrace and leverage these digital tools to facilitate innovative learning forms and adapt to the evolving educational landscape shaped by technological advancements [2].

#### *What is the Hybrid Education Model?*

Hybrid education includes synchronous and asynchronous teaching modes for online and offline students in mixed classes. Hybrid learning relies on student autonomy in planning and acquiring students’ education. Hybrid learning lets students choose their

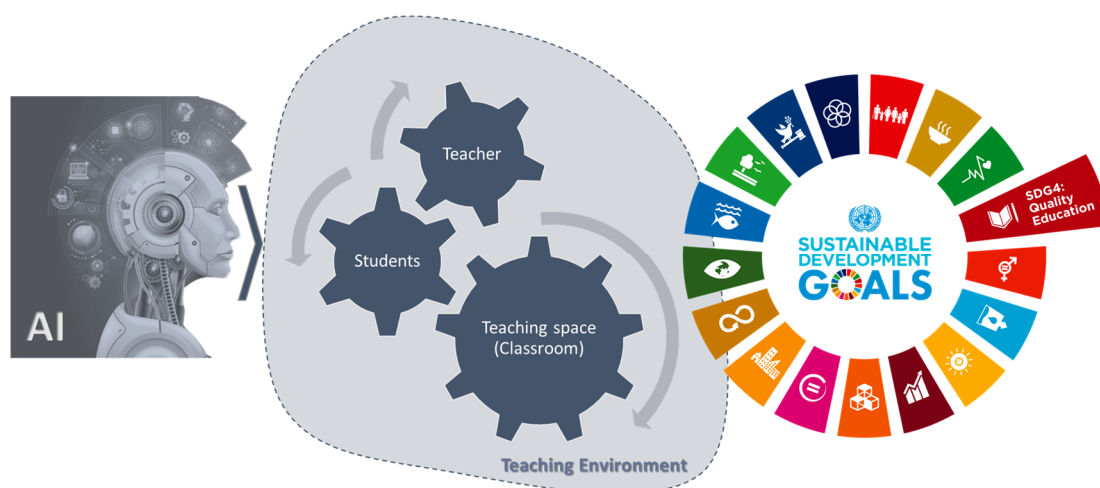
learning model and technique. Hybrid education, sometimes called blended learning, mixes online and face-to-face training. It uses in-person and online learning to maximize advantages. Hybrid education combines classroom and online instruction. This customizes learning to students' needs and preferences. Students learn vital digital literacy and technological abilities—hybrid education benefits from technology. Online learning systems provide videos, interactive modules, simulations, and evaluations. Students can self-study and revise with these tools. Hybrid education encourages active learning and student interaction. Quizzes, polls, and discussion boards on online platforms stimulate student involvement and community. Digital media allow teachers to assess student progress and give immediate feedback, enabling tailored education and assistance. Hybrid education can also meet more students' requirements. It benefits students with varied learning methods, competence levels, or physical restrictions. Hybrid education allows teachers to modify instruction, adapt the curriculum to student requirements, and give extra support.

Quality education is essential to the 2030 UN sustainable development goal. It seeks quality, inclusive education for all. These digital innovations have transformed schooling. They provide knowledge, co-create information, mentor, and assess. As a result, education technology has simplified student life [3]. Tan, S. affirms that Artificial Intelligence in Education (AIEd) is a developing area in educational technology that is anticipated to influence the teaching and learning process significantly. Even though the "AIEd" has existed for over 30 years, educators are still to be unsure how to scale its pedagogical advantages and how it might favorably affect the teaching and learning process [4]. This paper also aims to debunk the myths surrounding Artificial Intelligence (AI), its effects on society, and how to use AI to enhance education. García-Peñalvo, F. J., affirms that the first step is clarifying the notion of (AI) to distinguish it from human intelligence. With this knowledge, a framework that outlines how AI may improve teaching and learning generally—the open learner model by design—can be used [5] (See Figure 1). In recent years, the field of education has experienced a notable surge in the adoption of digital technologies, leading to numerous transformative advancements. Skoll CAI (Computer Assisted Instruction), the first intelligent learning system, was presented to the educational community in the United States in the 1970s by Dr. Alan M. Collins and Jaime Carbonell. AI has been used in education ever since [6]. Even if we have not seen humanoid teachers in the classroom, several projects leveraging computer technology will substantially change the education industry. The following are some ways AI can bring education to the next level. AI creates a unique environment where students can try new ideas without fear of ridicule accordingly:

- AI educators' development proposals have broader implications beyond student learning.
- Students can learn from their errors, and AI systems can do so.
- AI serves as an excellent tool for supporting personalized instruction.
- Students benefit from a customized learning trajectory considering their past performances and unique requirements.

According to Guerrero R., et al., AI can help instructors and students communicate better. This lets them obtain immediate feedback on their exercises and assignments [7].

The concept of failing or already knowing the solution is unbearable for many students, even though trial and error are essential components of the educational process. Students can access a novel approach to experiment with and gain knowledge through (AI). Krenn, M., et al. assert that a natural question arises with the increased available computational power and advancements in artificial intelligence. This question is as follows: how can advanced computational systems, specifically (AI), contribute to new scientific understanding or gain it autonomously? [8].

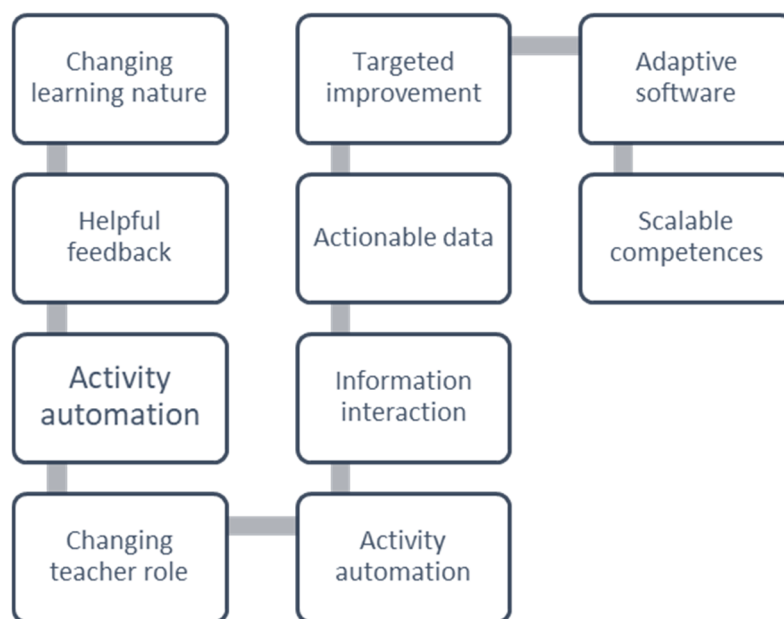


**Figure 1.** Teaching environment in the connection between AI and the Sustainable Development Goals (SDGs).

### 1.2. AIED Motivation and Hybrid Education

According to Zheng, diverse student preparedness, varied learning styles, and individual interests necessitate an adapted pedagogical approach [9]. A primary rationale for incorporating AI in hybrid education is to provide students with personalized and adaptable learning experiences. Wei, X., et al. posit that AI technology can be utilized to devise personalized online learning resource recommendation schemes, thereby assisting students in accessing the most relevant online learning materials while reducing the risks associated with exploration [10]. Through AI, students can receive tailored recommendations for learning resources, customized feedback, and progress monitoring that aligns with their specific learning needs and preferences. Another motive behind integrating AI in hybrid education is to enhance the efficiency and effectiveness of the learning process. Certain instructional aspects, such as grading and assessment, can be automated by AI, thereby liberating instructors' time to concentrate on more individualized and engaging forms of instruction. Dhara et al. contend that AI facilitates the analysis of student course participation and interests. This will assist the school in grouping students according to their performance levels and identifying the most talented and success-prone individuals and the relatively weaker ones. With this identification, it is possible to take extra care of students to increase their performance [11]. Furthermore, AI can assist in identifying student data and performance trends, allowing teachers to detect areas where pupils may be failing and intervene before the problem becomes more serious. AI can help overcome educational access gaps by giving students more freedom and accessibility. Students may learn quickly and independently with hybrid education, which combines in-person and online learning. Chatbots and virtual assistants powered by AI can help support and guide students who may not have access to traditional classroom settings. By facilitating cross-cultural and cross-linguistic communication, AI can broaden the reach and breadth of education. Students from various language backgrounds may connect and study together with the support of AI-powered translation technologies, breaking down barriers and establishing a more inclusive and varied learning environment. Wael Alharbi believes that recent (AI) breakthroughs have cleared the path for enhanced and, in many cases, wholly new and novel electronic writing tools. These writing assistance systems help authors and students throughout and after the writing process by providing human-like sentence completion recommendations and text production [12]. AI contributes to a personalized, adaptable, efficient, accessible, and inclusive student learning experience. Students may receive specialized recommendations, customized feedback, and progress monitoring with the aid of AI, while teachers can focus on more individualized and exciting training. More-

over, AI can assist in bridging educational access barriers and facilitate cross-cultural and cross-linguistic communication (See Figure 2).



**Figure 2.** AI's substantial role in Education, see Figure 1.

Schiff D. believes that, as with earlier educational technologies, Artificial Intelligence in Education (AIED) threatens to disrupt the status quo, with proponents highlighting the potential for efficiency and democratization and skeptics warning of industrialization and alienation in the teaching spaces [13]. On the other hand, teachers will always play an essential part in the educational process; their specific functions may shift due to technological advances related to intelligent computing systems. For example, it may soon be possible for AI systems to substitute professors with core course content. They could also be configured to provide specialized knowledge and act as a forum where students can seek answers to their inquiries and discuss topics of interest. AI will take over the role of the instructor as a facilitator. Educators are pivotal in guiding AI-driven learning, fostering interpersonal connections, and supporting students encountering challenges. Ahmad et al. assert that the influence of AI extends to various domains of society, including the educational landscape. Certain nations, such as Singapore, have been motivated by technological advancements to intensify technology integration within educational environments [14]. AI can collaborate with educators and students to develop curricula specifically tailored to meet their requirements and provide feedback on the effectiveness of the class. However, preparing students to collaborate with AI remains a challenging goal. As AI technologies are new to learning activities, there need to be more studies that inform how to design learning when AI is introduced as a collaborative learning agent in classrooms. After in-depth interviews with ten leading Korean teachers in AI in Education (AIED), Kim, J., Lee, H., and Cho, Y.H. concluded that teachers perceived capacity and subject-matter knowledge building as the optimal learning goals for teaching. This was discovered through a study. In addition, active learning may be fostered through multidisciplinary education, authentic problem-solving, creative assignments, and performance evaluations that focus on process orientation and teamwork [15]. Khan I. et al. believe that one of the most critical challenges that instructors face is the systematic monitoring of the academic progress that students are making in each course. When identifying students who require adequate academic progress, teachers can offer additional support to those facing difficulties. The truth of the matter is that contemporary educational institutions have the propensity to collect massive volumes of data about their students from a variety of different sources. Nonetheless, the institutes are always looking for new ways to use the data to bolster their reputations and

enhance the quality of education [16]. In addition, AI systems monitor students' progress and warn teachers if there is an issue with a student's performance. These AI systems allow students to acquire the assistance they require. They also assist teachers in identifying areas in which they may improve the education they provide for students. Cameras, Petros, and Sylvester Arnab, conclude that teachers need a better understanding of how (AI) may enhance their roles as catalysts in designing, visualizing, and orchestrating AI-enabled teaching and learning. This, in turn, will help to spread AI systems that render computational representations based on meaningful data-driven inferences of the pedagogy, domain, and learner models [17].

Nevertheless, these programs have the potential to enhance their capacity to foster higher-order thinking skills and nurture creativity, going beyond the foundational aspects of education. However, it is envisaged that AI-based instructors will be capable of fulfilling these objectives. Moreover, the rapid pace of technological advancement has translated the notion of advanced learning systems from the realm of science fiction to the realm of practical implementation.

It can be tough to grade students' assignments and examinations. This consumes a significant amount of time, which may instead have been spent interacting with students, getting ready for class, or working on professional development. Although (AI) might not yet be able to replace human grading fully, it is getting closer all the time. With (AI), educators can automate the grading process for practically all available choices and fill in the blanks. Kandula Neha states that while (AI) may never be able to replace human grading completely, it is getting quite close. Fill-in-the-blank tests and automatic grading of student work may need to catch up. In addition, academics can change scoring for almost any type of multiple choice [18]. While the concept of grade value using function approximation approaches has been studied in traditional classroom settings, the influence of virtual teaching spaces on the grading of engineering students is still being explored [19].

## 2. Methodology, Materials

To conduct a comprehensive analysis of the latest trends in Artificial Intelligence in Education (AIEd), a meticulous compilation of significant articles and pertinent materials on educational technology was undertaken, where each article aims to investigate how artificial intelligence (AI) and other new technologies, such as chatbots, can be utilized to improve teaching strategies in hybrid educational settings. The review read and examined important studies and scholarly papers to obtain thorough insights. It was determined to undertake an exhaustive search of academic databases, such as Scopus, Web of Science, and Google Scholar. These are some of the search phrases that were utilized: "hybrid education," "artificial intelligence in education," "chatbots in education," "AI-enabled learning," and "virtual reality in education." To guarantee that the most current developments in the area were considered, the search was restricted to publications published within the previous five years. Articles that highlighted the use of artificial intelligence, chatbots, or virtual reality in hybrid education, as well as their influence on learning techniques and the results of students, were included as one of the inclusion criteria. Articles that focused primarily on unrelated subjects or did not give considerable insights into the study objectives were deemed ineligible because they met the exclusion criteria. The papers that were included went through an exhaustive vetting procedure so that relevant information could be extracted. The primary ideas that emerged from the research were broken down into subtopics, such as applying Artificial Intelligence (AI) to customized learning, using chatbots as educational assistants, and incorporating virtual reality into hybrid educational settings. The review's findings were structured and presented based on these subtopics, which served as the bases. In addition, a comprehensive study and synthesis of the available research were carried out to identify recurring patterns, current trends, and areas where more investigation is needed. This research aimed to offer a complete overview of the present status of AI-enabled learning methods in hybrid education and emphasize the potential benefits and obstacles connected with deploying these techniques. The review



has limitations, such as relying on previous research, which could consider only some of the most current developments in the field. In addition, the review's focus was restricted to publications published in academic journals, which may have meant that the pertinent gray literature and unpublished research should have been considered. Despite its limits, this systematic study gives valuable insights into using artificial intelligence and new technologies in hybrid educational settings. The findings add to a better understanding of the potential for these technologies to enhance learning approaches and suggest avenues for future study in this sector, which is quickly advancing (See Figure 3).



**Figure 3.** The study working process and systematic approach.

The articles were chosen based on their applicability to online education, hybrid education, and Artificial Intelligence (AI) in education. The essays examine various aspects of these topics, such as the impact of digital tools on academic practices, the potential benefits and challenges of AI in education, the use of chatbots and intelligent tutoring systems, and the incorporation of Virtual Reality (VR) and Augmented Reality (AR) in hybrid education. The information in the articles was analyzed qualitatively, as the text contains a variety of perspectives, arguments, and proposals related to the topic. The authors of the themes provide their views, theories, and empirical evidence to support their claims. The analysis may involve reviewing the existing literature, conducting case studies, and drawing conclusions based on available data and research results. The article's information analysis gleaned insights into the potential benefits and challenges of online education, hybrid education, and the use of AI, chatbots, VR, and AR in education. The commentaries explain the current state of research and its possible implications for teaching and learning practices. The article's conclusions were probably arrived at by combining the presented information with the author's interpretations and opinions. The authors may have derived decisions based on the article's findings and discussions. In addition, they have considered the broader implications and future directions for education research and practice.

### 3. Adaptive Learning Platforms

According to Costa, R. S., Tan, Q., Pivot, F., Zhang, X., and Wang, H., education technology promotes several learning-related processes. Online learning is growing in popularity. Learning analytics, which compiles learners' online learning videos, provides instant profiling of learners' learning behaviors, styles, and performance. It supports and promotes educational research, the creation of educational software applications, and on-line education methods that lead to personalized and adaptive learning [20]. Adaptive learning is a method that allows teachers and students to personalize the learning process to the needs of a particular student. Today, adaptive learning usually means adaptive educational systems—technologies that interact with the student in real time and offer him one or another type of individual support. The design is based on data about the student. Gómez-P. et al. believe that the extensive use of information and communication technology in education, particularly in learning management systems, produces much data on students' and instructors' academic activities. These data are notable not just for their volume and diversity, but also for how closely they relate to the actions and output of

the educational actors [21]. Platforms use data analytics and machine learning algorithms to keep track of each student's progress and tailor the learning experience, depending on the student's requirements. For example, the system can modify the content, pace, and difficulty level of the course material to accommodate each student's unique learning style and level of performance. The automated modules encompass the complete lifecycle of educational content, from creating instructional materials to organizing the learning process and ultimately enabling participants in the course to engage with the educational materials through an intelligent platform. According to Finogeev et al., the smart medium should comprise systems for presenting training materials, managing the learning process, and managing content. Additionally, it should include a web system, a knowledge assessment system, a learning activity management system, standards, and an analytical system tailored to the needs of employers. This comprehensive system provides support throughout the entire lifecycle of specialized training, encompassing electronic educational resources and personalized educational programs [22]. The capability of the system to assess the level of students' prior knowledge of the subject matter covered in the class and automatically adapt the instructional strategy to the specific requirements of each student is one of its most essential features. According to theories of assessment system preparation, students can improve their knowledge performance by paying particular attention to important information and processing it in ways appropriate to the type of elements included in the system, according to Alzahrani, F. K., and Alhalafawy, W. S., However, more detail has to be added to study the circumstances in which students adjust their tactics to meet the demands of activities related to preparing for assessment systems [23]. Zhong, Z., affirms that it requires expounding on how to guide students to make full use of rich online teaching resources for independent learning and communication, realize the hybrid teaching mode of combining online and offline learning, and complementing in-class and after-class learning, as well as the process of reform, exploration, and practice.

The current knowledge, motivation, and learning pace influence students' educational experiences. In an adaptive learning system, if a student consistently demonstrates mastery by completing multiple tasks without errors, the system will present them with more challenging and complex tasks. On the other hand, if many things could have been improved in the solution, the student would have to repeat what students have performed or practiced on more manageable tasks. The adaptation model considers what and how to alter for a specific student and is used to construct adaptive learning. There are two primary sources of information for this:

- The domain model contains information on the researched issue, such as topics, projects, links, etc. The system enables you to connect several discipline components and create a flow between them.
- The student model includes the student's existing knowledge, learning style (including any errors he makes and how quickly he completes assignments), and personal traits (preferences and degree of motivation).

Adaptation items might vary. Pearson classifies [24].

**Content:** where student comments drive material adaptation. Mistakes offer suggestions or break down skills. It alters learning speed. The system may suggest contacting the teacher. Scaffolding is the most complicated adaptation technique (see Figure 4).

**Testing:** If a student replies appropriately, the next question is more complicated. Mistakes are easy. Pearson's researchers separate testing into "practical" and "level" (a test is offered after a particular module or several blocks—that is, it stands apart) (See Figure 5) [24].

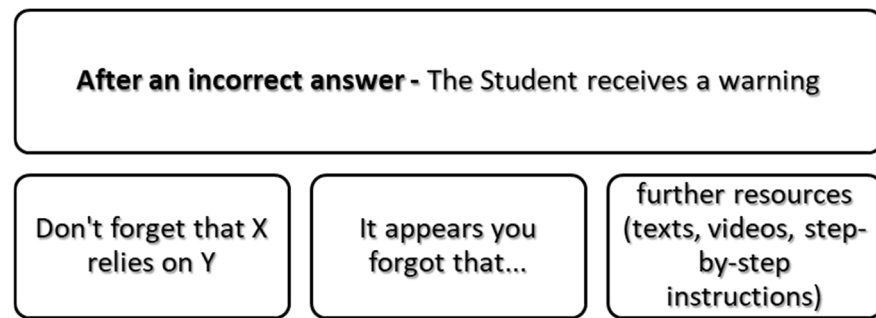


Figure 4. A content model (based on [24]).

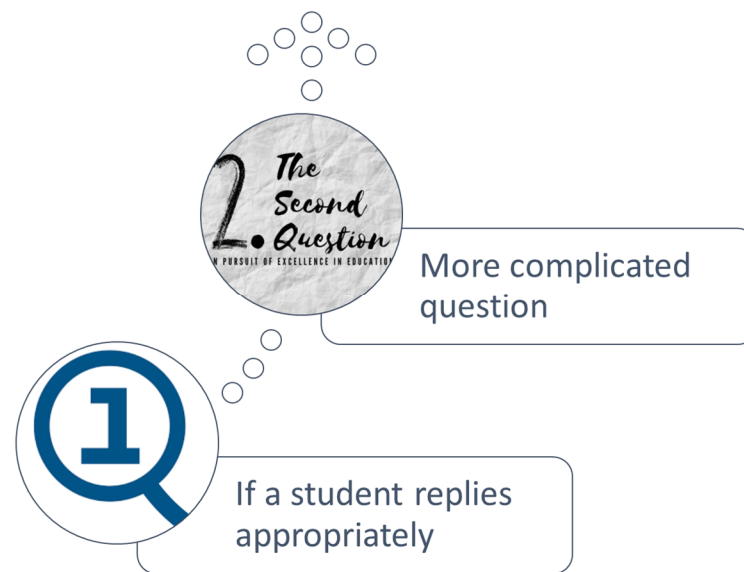


Figure 5. A testing model (based on [24]).

**Material submission order:** It is the most complicated. First, the learner records answers, tries, and processes other data while using the learning material. Then, the system analyzes this data and provides the student with relevant content.

#### 4. Transforming Education: Leveraging AI, AR, and VR for Enhanced Learning Methodologies

AIED (Artificial Intelligence in Education) researchers ways to utilize AI to improve learning and education. AI models have revolutionized teaching and learning in AIED in recent years. AI algorithms may analyze student performance and behavior data to discover learning styles and preferences and customize educational content. This improves learning and student results. Intelligent tutoring systems are another educational use of AI. These systems employ AI models to provide students with individualized feedback and help them understand challenging subjects at their speed. In addition, these systems boost learning by adapting to student demands using machine learning algorithms. Yet, according to Deeva G. et al., real-time feedback from teachers or supervisors is essential for students' development as learners. Unfortunately, providing real-time feedback on a one-to-one basis is often impossible due to a lack of available resources. However, thanks to recent technical developments, several computer tutoring systems have been developed; these systems can automatically help students in various settings and at multiple times by producing tailored feedback [25]. AIED's use of AI models to evaluate massive datasets and learn more about student learning is fascinating. Analyzing student behavior, performance, and engagement data using AI models can help build new teaching approaches and materials [26–28].

- Chatbots and learning activities.

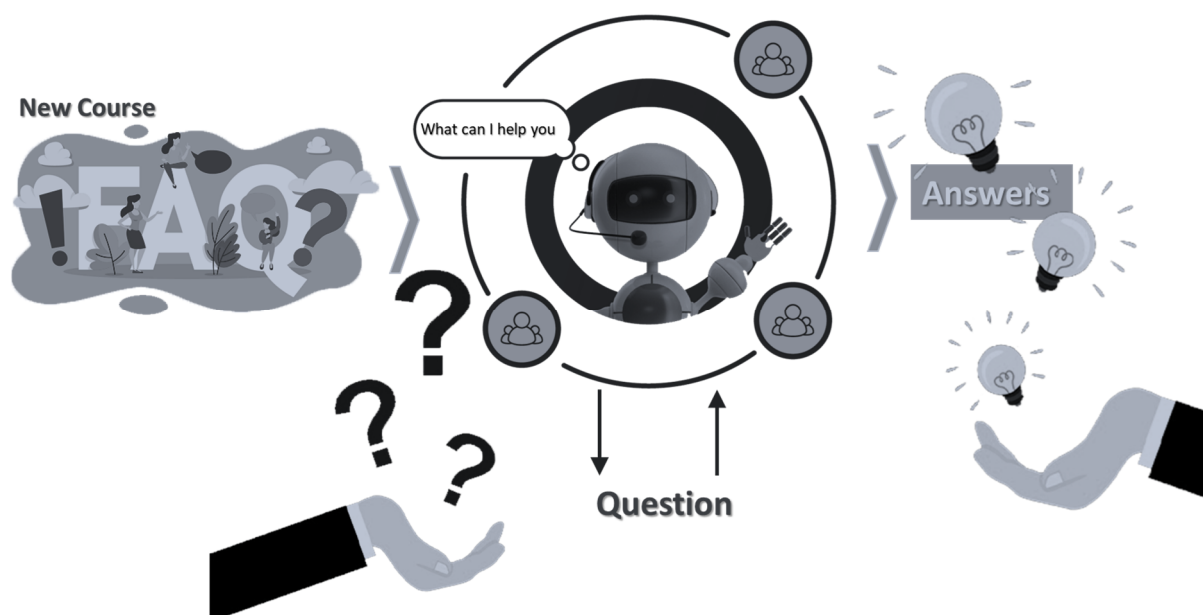


These AI-powered assistants may aid students with simple inquiries relating to the course, such as clarifying a topic or helping them discover a particular resource. Chatbots' primary value lies in their capacity to understand and respond to user intent [29]. A chatbot is a conversational interface that facilitates productive interactions between people and businesses. Computer-aided learning systems enable this shift in understanding by providing students with a dynamic classroom setting. However, today's students are fine with these kinds of classroom setups. New technology systems may do several things to help students learn, including introducing context for the task at hand, supplying the learner with templates or step-by-step instructions, and restricting the learner's interactions with the learning environment to minimize problem space significantly. Systems such as these may keep an eye on and organize the learning process so that the proper guidance and feedback can be given at the right time. The chatbot then uses this recognition to parse out the requested information. To provide the correct response, however, you must first understand the user's question [30].

Created as an alternative to or in addition to traditional user interfaces, such as apps and websites, chatbots let users communicate with the service in real-time. These bots are computer programs that can understand human language and respond to students' inquiries. Not all responses are written words; sometimes, they are concrete actions, such as sharing a video in response to a student's request, displaying a photo, making a purchase, scheduling an appointment, etc. As a result, chatbots have the potential to contribute to the field of education significantly. It is only possible to obtain this service even at the priciest schools in the world. Chatbots can be used to teach introductory courses [31]. The idea is to have chatbots serve as virtual advisors for students and, in doing so, learn to cater their advice to everyone's skill level. They modify their study habits to fit their individual needs. However, the current trend calls for chatbots to take on the role of vertical tutors, conversing with each student. As a result, they can talk to them face-to-face and learn more about the problems that need fixing. Chatbots are a type of virtual assistant. It is also possible to build chatbots to offer feedback to students on their written work, such as quizzes or assignments [32]. The use of sophisticated (AI) technologies in learning environments is one of the most recent challenges for educators and education officials, according to Mageira et al., Conversational AI enables AI chatbots and other cutting-edge Information and Communication Technologies (ICT) tools. Chatbots focus on conversation and discourse to simulate human-like agent interaction patterns—educational AI chatbots for Content and Language Integrated Learning [33]. Chatbots must be able to read emotions and respond appropriately during conversations.

- Chatbots and Education

Kuhail, M.A. et al. thought that messaging platforms had altered education by helping students obtain responses faster. Teachers cannot help during extracurriculars and only have time for select students. Chatbots offer a convenient way to connect with students around the clock, ensuring constant accessibility and ease of use, thereby saving valuable time for educators and online course instructors [34]. Now, let us explore the advantages of integrating an educational chatbot. When each class tends to ask similar questions, having a FAQ section within the chatbot's menu becomes essential. The chatbot will notify students about schedule changes, unplanned webinars, internships, etc. It will also help you manage the educational process, ensuring students obtain suitable material on time, and support them with issues. Online learning chatbots can remind students of deadlines and assignments. This keeps them moving. Nonetheless, there is a need for more research that investigates the evidence-based chatbot–learner interaction design strategies that have recently been implemented in educational settings (See Figure 6).



**Figure 6.** The interaction of a chatbot in the educational environment.

- Chatbots and engagement

Creating a convenient and helpful chatbot is an opportunity to dispel potential students' doubts about the online university. With the help of the bot, students will receive answers to all questions, and you will be able to meet their expectations and improve the quality of your services. As a result, the percentage of those who drop out of training halfway will decrease. Emailing professors is different from messaging them. Educational bots and family and friend conversations bring you closer. Keep in touch with students to boost engagement. Lee, YF., Hwang, GJ., and Chen, PY affirm that chatbots simplify student feedback and data collection. The work on the program is based on their top questions, which require getting comments on the online course platform, lesson grades, and class impressions to improve learning [35]. Chatbots encourage student engagement by enhancing students' comprehension of the course's final product. The chatbot will read this, provide the students with information on the components and resources of the system, and assist them in making decisions if they have trouble understanding something.

#### 4.1. ChatGPT in the Teaching Space and Learning Activities

ChatGPT is a pre-trained language model that interacts with users conversationally. This chatbot was developed by Open AI and created in a dialogue format for interacting with users. Bharati Rathore explained that Open AI, including chatbots, can significantly enhance human lives. Chatbots automate various operations and procedures, improving communication, productivity, and usability. OpenAI's Chat Generative Pre-Trained Transformer (ChatGPT) has transformed AI-human communication. ChatGPT allows natural language processing and automated text synthesis, which might improve how we communicate and interact with machines [36]. ChatGPT was launched in November 2022, but its popularity and usage have skyrocketed quickly. This platform brings together millions of libraries, including books, websites, and other materials full of resources to answer the user's queries. This tool is becoming extremely popular due to its ease of use, interactivity, and efficiency in solving many user problems. Halaweh, M. affirms that, since the debut of ChatGPT for public usage, educators have highlighted numerous worries regarding its incorporation into educational contexts. ChatGPT intends to give a case in favor of introducing ChatGPT into education and to assist educators with tactics and approaches to ensure the responsible and successful deployment of ChatGPT in teaching or research [37]. In a word, it saves student time, energy, and resources that students could use for research,

education, or learning. ChatGPT allows users to read many files efficiently for educational and research purposes.

It provides a platform for users to ask questions, translate text from one language to another, solve math problems, answer questions, and learn. When students engage in individual learning endeavors, such as studying for the Certified Public Accountant (CPA) certification, awarded to individuals who exhibit competence in accounting and financial management, ChatGPT allows them to learn at their preferred speed while accessing abundant learning materials. Moreover, ChatGPT facilitates condensing extensive files into well-structured paragraphs, thereby enhancing readability and comprehension for students. How ChatGPT is employed at universities today is the primary unanswered question regarding the new practice. AI will soon be taken for granted. Hence, students may create plenty of problems that prevent using AI in the solution. Hargreaves and Stuart answer that ChatGPT is a sophisticated large-language model capable of providing answers at a high level that would pass muster with most existing plagiarism detection systems. Online exams in higher education have faced criticism, primarily due to concerns regarding the potential rise in cheating incidents. However, Hargreaves and Stuart (2023) propose strategies teachers can employ to guide students in developing responsible and ethical technology usage skills. It is futile to resist or disregard the influence of ChatGPT and similar AI technologies on the evolving landscape of course delivery methods. Presently, student evaluation and grading systems are implemented by educational institutions [38]. Alternatively, students can employ AI in university settings to learn new skills or to facilitate their work. So, it is about university professors and administrators who try to move with the times rather than against them.

The GPT-4 algorithm is used by ChatGPT, which is just the most recent version with a user-friendly interface; where Liu, Z. et al. confirm that the development of large language models (LLM), such as ChatGPT and GPT-4, has shown great promise in processing text data in the different domains with zero-shot in-context learning, particularly in the task of privacy protection [39]. Although most people have only recently learned about this technology, some teachers and supervisors have been experimenting with it successfully for the past few years [40]. Making writing more difficult is the aim, not making it more approachable. In other words, such trials force us to reformulate or reassess our notions about writing, preventing us from taking them for granted. The students must be active in the process, even though it takes extra work. Throughout the years, technology has changed schooling in countless ways. Unfortunately, although technology has increased students' and instructors' access to resources, it has also increased disparities and distractions in the teaching space. However, technology in learning activities is here to stay, for better or worse, and new technology is continually being introduced. For example, students can strengthen their editing skills through ChatGPT as part of the learning process. While some may argue that AI hasn't made any real strides in the last several years, George, A. S., and George, A. H., argued that the field had expanded thanks to the development of numerous new applications and technology considerably [41].

ChatGPT is a tool that uses (AI) to generate texts based on the user's requirements. It is like having a student's writing assistant, except instead of correcting grammar and spelling, it can create sentences and paragraphs for students. ChatGPT is excellent for writing essays and other things. However, according to Abid Haleem and Mohd Javaid, it has limitations where the bot answers inquiries with relevant, persuasive topics. The technique indicates that the software analyzes and generates text using deep learning. In addition, Internet data helps the model "understand" natural language [42]. The (AI) known as ChatGPT possesses the potential to bring about fundamental shifts in the educational system. However, sadly, the industry has yet to determine whether this change will be for the better or, the worse; its benefits will eventually exceed the drawbacks, and AI will play an increasingly important role in the evolution of education. However, teachers and school principals fear students can write their assignments and papers using only ChatGPT and claim that the AI work is their own. This raises issues of ethics and plagiarism, especially since we still need to

prove that the work was performed by the AI and not by the student. On the other hand, ChatGPT might be an effective method for developing genuine evaluations. Nonetheless, it would still be the teacher's responsibility to devise and carry out the review in a manner that is meaningful and pertinent to the students in their class. Its operation is based on deep learning, i.e., on the ability of the program to adapt more precisely—starting from the information that has been entered into it (already by order of big data) and a complex of errors (in part caused and) overcome—the requirements that were formulated.

#### 4.2. Examining Concerns and Drawbacks of Implementing ChatGPT in Education

One of the most significant downsides this research has brought to light is the need for more human support when the chatbot cannot answer complex or personal inquiries or when students prefer human interaction. According to Černý, Michal, one of the most significant downsides this research has brought to light is the need for more human support when the chatbot cannot answer complex or personal inquiries or when students prefer human interaction. Furthermore, students interacting with a program devoid of (AI) anticipate similar psychological and communicative responses to those of a natural person, infer the program's characteristics from the conversation, and are surprised when the chatbot cannot comprehend their needs or provide adequate assistance [43]. Despite these drawbacks, the utilization of software in educational settings entails significant limitations, encompassing numerous other disadvantages, such as:

- Absence of context: ChatGPT is clever but tends to misinterpret context, which results in inaccurate output.
- Students (and some professors) cannot be without their phones, as we have previously witnessed. In addition, humans become increasingly dependent on technology as it develops.
- ChatGPT's data is sourced from the Internet. Thus, accuracy cannot be guaranteed [44].
- A lack of critical thinking: one of the most important skills children may learn is thinking critically. They will not need to think for themselves if they constantly have solutions.
- Lack of creativity: ChatGPT can generate whole essays. If a student hires ChatGPT to create their report, this is plagiarism and a lack of fresh ideas. One of the most significant issues with ChatGPT is that plagiarism checkers are rushing to keep up [45].
- Potential bias: because ChatGPT is trained on data, the machine will also be prejudiced if the data is biased.

In conclusion, teachers and supervisors have expressed concerns regarding implementing chatbots, such as ChatGPT, in educational settings. These apprehensions include threats to the established norms of education and the potential benefits of enhancing student creativity and engagement. Teachers and supervisors have raised valid concerns regarding using ChatGPT by students. Specifically, problems include the potential for students to exploit the bot by supplying raw data for an essay or speech generation. Moreover, students who rely overly on the bot for grammar, spelling, and language structure may require additional training. The most significant worry is that students may become excessively dependent on the bot for research, argumentation, and citation purposes. However, given that technological advancement is inevitable and ongoing, it is crucial to examine how ChatGPT could be leveraged to improve a range of competencies that are likely essential for future employment prospects, rather than focusing solely on students' apprehension towards it.

#### 4.3. Smart Tutoring Systems: Enhancing Learning through VR and AR

According to Liu, M. and Yu, D., the proliferation of e-learning platforms has made educational resources more accessible, interactive, and applicable to students who are not restricted by geographic or temporal constraints. Yet, as the number of users expands and the volume of data grows, the present e-learning systems confront technical and pedagogical obstacles [46]. These systems give students tailored training based on the student's

performance and their preferred method of learning through AI algorithms. Technology can also change the learning route to assist in accomplishing their educational objectives. For example, software that automatically grades students' work allows teachers to grade students' homework and examinations in a timely and accurately. In addition, the program provides a means for students to receive feedback on their work, encompassing error corrections and performance improvement suggestions. In addition, these technologies may generate immersive learning experiences for students, allowing them to engage with virtual settings and objects. These experiences can be created using virtual reality (VR) and augmented reality (AR) [47]. By enabling students to perceive and interact with three-dimensional models, Virtual Reality (VR) and Augmented Reality (AR) can facilitate learning complex subjects, such as anatomy and engineering. Using AI technologies in the classroom can increase student engagement, tailor the learning experience, and offer instructors helpful information regarding their students' performance.

#### 4.4. Virtual Reality VR in Hybrid Education

According to Lege, R., and Bonner, E., Virtual Reality (VR) has made considerable inroads into the professional and consumer sectors. As a kind of technology, virtual reality (VR) has continued to advance, which has led to an increase in the sector's general applicability. Yet, because of the lightning-fast pace at which technology is growing, education needs assistance to keep up with the most recent developments, shifting affordances, and pedagogical applications [48].

The rapid development of technology could not but affect the educational process. Additionally, although VR (virtual reality) technologies are no longer new, they have recently been used in education. Over the past few years, the prices of modern VR devices designed for teaching and professional use have decreased significantly, making them more affordable. Current commercially accessible VR devices are expanding options and expectations in higher education, and Daz P. et al. argue that VR may enable engaging and successful learning [49]. Immersive technologies form the basis of virtual reality education, providing a simulated environment that enhances students' ability to see and comprehend their physical surroundings. In other words, they put the user squarely in the middle of the action. Using an immersive approach has several positive aspects.

- **Visibility:** a building's blueprint, structure, installations, etc., may all be studied in minute detail in a virtual environment in a way that would be impossible or extremely time-consuming in the physical world.
- **Focus:** in digital experiences, it can present challenges to grasping the physical world's impact fully. However, by directing undivided attention, individuals can enhance their retention of the information they read.
- **Involvement:** the learning environment may be precisely planned and managed. With VR, students may participate in the building process, see extraordinary happenings in the working process, and find novel approaches to solving challenging challenges.
- **Safety:** complex operations, transportation management practices, and other forms of experimentation may all be safely carried out in virtual reality. The student will not endanger himself or anybody else, no matter how dire the situation becomes.
- **Effectiveness:** existing research suggests that virtual reality (VR) teaching is at least 10% more successful than traditional teaching [50].

#### The Disadvantage of the Model

According to Farra, S. L. et al., the adoption of virtual reality technology may be slowed down because of the high initial expenses and the need for more clarity on the returns that can be expected on that investment [51], where virtual reality software development is expensive. Completing this procedure takes a lot of time, energy, and resources. Moreover, everyone has a different virtual reality experience. After only a short time, it might cause dizziness, nausea, and confusion in some people. These are the limitations imposed by the human body. This issue, however, has been nearly resolved in most new devices and



will soon be conquered. Nevertheless, many contemporaries perceive virtual reality as far and inaccessible to the average user. Others are sure that VR is a technology exclusively for games. Both are wrong. Researchers have investigated the advantages and uses of virtual reality (VR) in various settings, as stated by Radianti, J., Majchrzak, T. A., Fromm, J., and Wohlgenannt, I. Virtual reality has much-untapped potential, and researchers have recently been interested in its educational applications [52]. It allows you to see the world's historical buildings "in full growth" and consider them from all sides. In the history of architecture, for example, Egyptian pyramids, the historical cities with historical buildings, and Fallingwater houses designed by Frank Lloyd Wright—all the most unique objects—are closer than ever.

#### 4.5. Augmented Reality (AR) in Hybrid Education

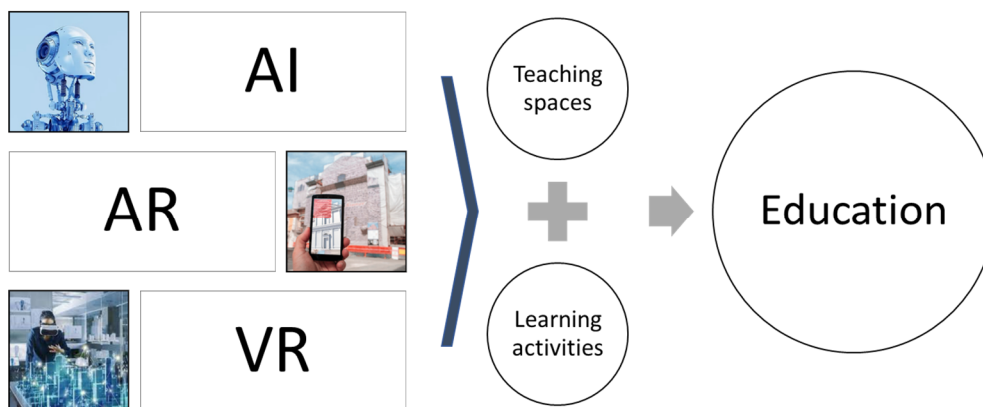
Augmented Reality (AR) in educational settings can alter how we teach and learn. Augmented Reality (AR) in the context of hybrid education combines traditional classroom learning with online components, presents novel opportunities to improve the educational experience, and bridges the divide between physical and virtual learning environments.

##### 4.5.1. Augmented Reality in the Actual Education System

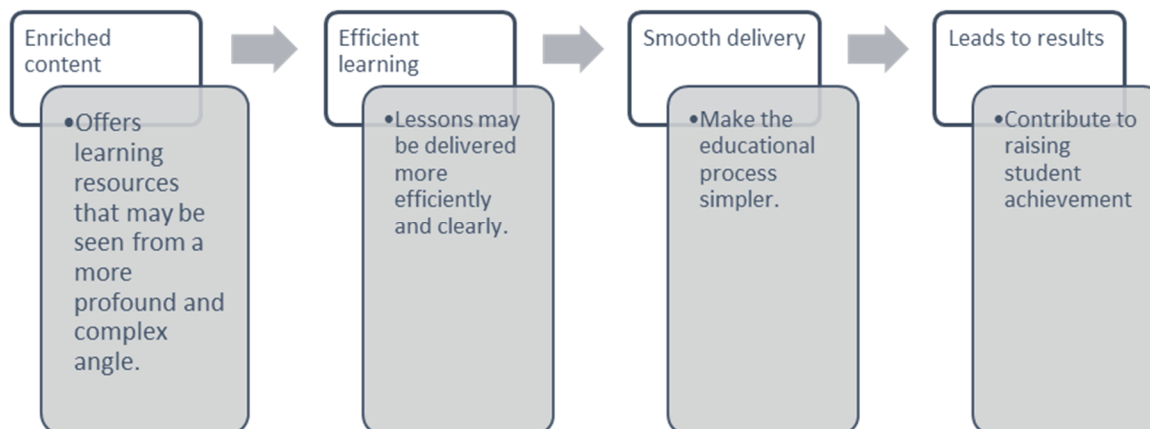
Artificial Intelligence (AI) and Augmented Reality (AR) are two technologies that have the potential to change how we teach and learn entirely. According to Jeevan S. D. et al., merging AR and AI is the next important step in the following years as more academia recognizes the value of their use [53]. Seo, K., et al. affirms that the practical support (AI) powered by AR systems for hybrid learning and teaching includes work automation for teachers, personalization of student learning, and adaptive assessment power. Learner-instructor contact significantly influences students' happiness and learning results in hybrid learning. To discover any gaps, obstacles, or hurdles limiting AI systems from realizing their full potential and endangering the safety of these interactions, it is crucial to understand how students and instructors perceive the effects of AI systems on their interactions [54]. Although AI may tailor lessons and offer insights into students' learning habits, AR can provide an immersive and engaging learning experience. Developing intelligent AR apps is one way to include AI and AR in teaching. These programs can employ AI to recognize objects and provide data and feedback based on student activity. According to Yongjun Xu, et al., AI systems have demonstrated high performance in object-detecting tasks. At the same time, AR technologies change how we interact with others and do business. Therefore, it is vital to suggest a new framework for enhancing students' learning experiences using electrical engineering lab equipment by combining the above technologies, given the rising popularity of online and hybrid learning [55]. For instance, an app may employ augmented reality to show a model of a virtual human heart, and (AI) might then offer tailored feedback based on how the learner interacted with the model. Moreover, the software may monitor the student's development, pinpoint their weak points, and offer advice for growth (see Figure 7).

They are driven by the rapid development and deployment of (AI) technology in education and language students' needs during the COVID-19 epidemic. The rapid advancement of (AI) has made the widespread implementation of augmented reality (AR) and (AI) in the field of education more accessible. The current educational 4.0 trend, which refers to technology-based teaching and learning techniques influenced by industry automation and digitization, impacts the advancement of (AI) in educational settings [56]. Another way to incorporate (AR) and AI into education is to develop adaptive learning systems. These systems use AI to tailor the educational experience based on the learner's choices, speed, and learning style. AR technology can create personalized, immersive learning experiences for students. An (AR) system could show information differently, depending on the student's preferred learning method. For example, diagrams and graphics might be provided for visual learners, while audio explanations could be provided for aural learners. Collaborative learning environments may also be developed using (AR) and

(AI). For instance, (AR) might offer a virtual communal area where students can collaborate on projects and homework. AI can make cooperation easier by locating students with matching abilities and interests and recommending groups. Interactive learning addition, interactive encourages collaboration, and problem-solving skills may also be made using (AR) (See Figure 8). In conclusion, combining AR and (AI) can revolutionize how we educate people. We can deliver individualized and immersive learning experiences tailored to each student's needs by developing intelligent augmented reality (AR) apps, adaptive learning systems, and collaborative learning environments. We may anticipate seeing even more cutting-edge AR and (AI) applications in education as these technologies advance.



**Figure 7.** The interaction between AI, AR, and VR in education.



**Figure 8.** Augmented reality (AR) benefits educational systems.

#### 4.5.2. The Benefit of (AR) Teaching and Learning Approaches

According to Almusaed, A., Almssad, A., & Cortez, M. R, teachers must use their specialized education expertise more frequently to solve practical problems. Universities are responsible for cultivating theory, observation, teaching, and presentation skills. This necessitated the development of forward-thinking educators with solid communication skills [57]. On the other hand, it is undeniable that (AR) technology is benefiting academic issues. Learning activities in hybrid education help in a variety of ways. Although a sizable body of empirical evidence indicates that augmented reality improves student learning results, it has yet to be extensively used in the educational system [58]. Today, and for a good reason, (AR) is rapidly gaining popularity. It has several applications, including product and scenario testing, enhanced learning, and training. All of this takes place in cyberspace, where no resources are wasted. The dissemination of this advancement within the education sector is witnessed as the utilization of augmented reality in academic

settings continues to proliferate. Undoubtedly, increased reality technology captures students' attention; however, its implementation in universities holds benefits beyond mere student engagement, where other alternatives exist:

- Teachers can increase their available teaching strategies.

For hybrid and face-to-face learning, (AR) can give instructional information that is more engaging and simpler to grasp. According to Cabero-A. et al., (AR) is a young technology that is starting to impact teaching space instruction significantly. Augmented reality and mobile technologies are one of the best combinations for enabling universal and practical learning [59]. For instance, teachers might use augmented reality (AR) to demonstrate the inside of the structure vividly and actively. Aside from that, (AR) can be utilized to explain the material generally abstracted visually. Moreover, (AR) allows students to reflect while they study. Students can investigate how things operate on their own by watching interactive explanations. This would be especially useful for researching how building components work.

- Ensure that everyone has access to education (face-to-face, online)

Distance learners can need assistance to complete the learning process alongside their peers. Augmented reality (AR) fixes these problems, facilitating online students' learning. Nevertheless, Eldokhny, A. A., and Darwish, believe that, to satisfy the demand for 21st-century abilities, teachers must be prepared to use all augmented reality patterns in traditional online distant learning. More study on online distance learning is needed to use augmented reality with another sample and other information. However, in general, pandemic periods are an excellent time to employ augmented reality or one of its (fixed, animated) patterns to study via online distance learning [60]. For instance, an online student might utilize the app to change the text size, adjust the contrast of on-screen items, or listen to audio commentary.

- AR can expand the teaching area to more students.

Applications for (AR) can expand students' access to educational opportunities. Additionally, educational programs will be available to those who, for various reasons, cannot attend university. The experience of learning in a physical classroom can be partially replaced by (AR). The use of (AR) technology has the potential to increase accessibility in the school. Fernández, B., and colleagues believe that AR possesses a high level of motivational power and has the potential to increase students' interest and involvement in tasks and support students with educational needs [61].

- Boost student interest and motivation.

One of the main issues in the modern world is the need for more motivation among students to learn. There are several justifications for this. Elements other than a study that affect students' focus include an inadequate description of the study's topic, lack of interest on the part of the students, and insufficient study time. Apps for augmented reality (AR) offer another way to address these issues. In addition, learning content for (AR) is more exciting than that for conventional schooling. According to Papanastasiou, G., Drigas, A., Skianis, C., Lytras, and Papanastasiou, E., technological advancements, such as virtual reality (VR) and augmented reality (AR), enhance digital literacy, creative thinking, communication, collaboration, and problem-solving skills, which together make up the so-called twenty-first-century skills required to transform information rather than receive it [62]. Furthermore, (AR), which adds additional depth and clarity, helps keep students interested in the subject even if they are more interested in something else.

- Reducing interruptions

Keeping students' attention is a constant struggle for teachers. Among students, there are many sources of disruption, including but not limited to the following: students who don't care to learn, whose attention wanders, and who swiftly lose interest in the study despite their continued academic progress. Distraction-free classrooms are essential for

learning. Unfortunately, one of the things that make it hard to focus is using a smartphone. According to Urbina C. et al., mobile devices and augmented reality are potent technological advancements with many applications and significant potential for engineering education. Maintaining students' interest and involvement in the classroom and inspiring them to self-learn are two issues that modern education often tackles. However, there is a way to change this, involving (AR) [63]. However, augmented reality (AR) technology transforms smartphones from distractions to aids in the teaching space. Therefore, (AR) apps on students' mobile devices can be valuable for maintaining their attention and focus during class.

- Effective and engaging learning activities

More than words alone are needed for education. Specifically, it would be challenging to instruct on topics such as chemistry, mathematics, and the history of building through the medium of words alone. Nevertheless, with (AR), you may provide explanations using engaging digital resources. You can make learning easier for students by revealing the workings of a process or providing them with the means to affect those workings directly. (AR) technology could modernize education by allowing students to explore and discover independently, replacing the old teacher-explained approach.

## 5. AI's Advantage to Students and Teachers

The education industry is no exception to the rule, with ML and AI significant catalysts for development and progress across all sectors. By 2021, over half of all LMSs will have integrated (AI) features, per the eLearning Industry [64]. Although AI-driven solutions have been available in the EdTech sector for some time, widespread adoption has been delayed. According to Luckin, R.; Cukurova, M.; Kent, C.; du Boulay, B., the nature of AI readiness training differs from merely learning about (AI). Instead, AI Ready acknowledges the diversity of professions, workplaces, and industries for whom (AI) has the potential to affect. (AI) Ready for Lawyers, for example, may be founded on the same concepts as AI Readiness for Educators. On the other hand, the specifics will be contextualized differently [65]. Unfortunately, because of the epidemic, traditional classrooms had to be abandoned, and teachers were forced to turn to online education. 86% of teachers believe technology should be an integral teaching space element. (AI) can enhance the educational experience for students and faculty alike. A student's ultimate objective is getting credentials attesting to their competence. (AI) can facilitate this by making learning more efficient. (AI) may profoundly affect students' educational experience by reducing their access to the appropriate courses, enabling their interactions with instructors, and freeing up their time to focus on other elements of their lives.

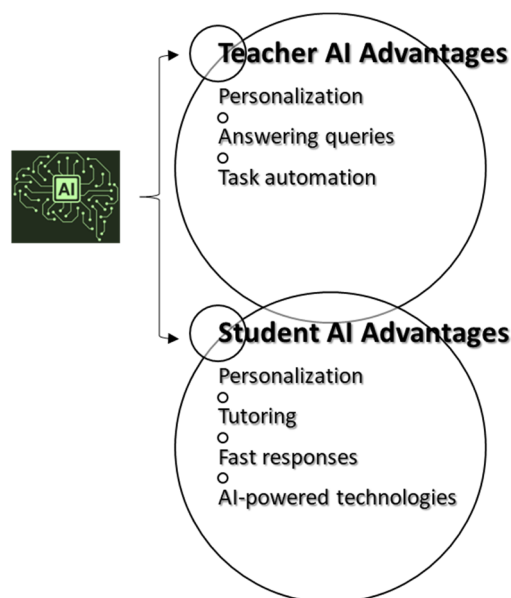
### 5.1. AI's Advantages to Students

Students want a degree to prove their knowledge. (AI) can streamline instruction to assist students in accomplishing this aim. According to Munir, H.; Vogel, B.; Jacobsson, AI may improve students' education by offering access to the proper courses, increasing teacher interactions, and freeing time to focus on other things. Personalization is a significant education trend. (AI) lets students customize learning programs to their tastes and experiences. AI may adjust to students' knowledge, pace, and goals to maximize learning [66]. AI-powered systems may assess students' learning histories, detect shortcomings, and recommend courses to improve, offering various options for personalized learning. Illustratively, within the realm of tutoring, students frequently necessitate additional assistance beyond the confines of the classroom, while a considerable number of professors encounter time constraints. AI, instructors, and chatbots are ideal in these situations. Sage K. et al. believed that (AI) systems efficiently support online education and learning, including individualized instruction, regular activities for teachers, and adaptive testing. However, the influence of (AI) systems on culture, norms, and expectations of interactions between students and instructors still needs to be determined, despite the potential for AI being attractive [67]. In addition, (AI) tools can help students develop

outside of the teaching space. Daily repetitious queries assault teachers and professors. Support automation and conversational intelligence can answer students' most common questions in seconds. This saves instructors time and helps students find solutions faster. AI-powered technologies allow students to learn 24/7, which lets students experiment without waiting for an educator. Exchange students can receive high-quality education without travel or living costs [68].

### 5.2. AI's Advantages to Teachers

With their long to-do lists, most teachers admit to needing help managing their time. AI can automate jobs, analyze student performance, and close the educational gap, saving instructors time. According to Celik, Dindar, Muukkonen, and colleagues, AI gives instructors chances for better lesson preparation, execution, and evaluation. For example, AI may help teachers define and familiarize themselves with students' requirements. We also discovered that professors play various roles in advancing AI technologies [69]. In personalization, where AI can tailor learning courses for instructors and students, teachers can tailor their studies to target the most prevalent knowledge gaps and problem areas. (AI) is the power of change, concentrating on the requirements and desires of the student, claim Tapalova, O. and Zhiyenbayeva, N. The study investigates the use of Artificial Intelligence in Education (AIED) to create systems of individualized instruction for students [70]. Queries were answered where AI-powered chatbots could answer generic and repeated student questions without academic involvement. Task automation, where AI can automate routine jobs, including administrative labor, grading papers, detecting learning patterns, answering general queries, and more, was developed [71] (See Figure 9).



**Figure 9.** Shows the advantage of the (AI) learning process.

## 6. Enhancing Student Engagement in Hybrid Education: The Impact of AI

According to Singh, J., Steele, K., and Singh, L, it was argued that the 2019 coronavirus disease (COVID-19) pandemic has altered the education structure. The global health crisis has prompted universities worldwide to reevaluate their teaching strategies, encouraging them to consider online, hybrid, and blended formats [72]. A hybrid curriculum, combining online and classroom-based learning has recently gained popularity. However, capturing students' attention in this setting can take time, especially regarding digital elements. Here is where (AI) can drastically alter how we include students in hybrid courses. The authors of the review article "Enhancing Student Engagement: Leveraging AI's Potential in Hybrid Education" investigate the possibilities of (AI) in this context. The report also delves into



how AI may improve hybrid classrooms by customizing lessons, giving immediate feedback, and facilitating collaboration. AI's capacity to personalize training for each student is a significant advantage in diverse settings. Aditi Bhutoria, stated that the next generation of educational changes would take a quantum leap forward, guided by big data analysis and (AI) [73]. For example, (AI) algorithms may examine student information and tailor education plans to everyone's needs, interests, and learning styles. In addition, allowing people to set learning goals and pace can increase student engagement and motivation [57]. (AI) will deliver insightful critiques to students when paired with personalized training. For example, using (AI), evaluation systems may quickly evaluate student answers and offer constructive criticism, allowing for correcting errors and developing deeper comprehension. In addition, students who are having difficulty might benefit from this type of feedback since it will enable teachers to better tailor their efforts to the individual's needs. According to Shubham Joshi et al. (AI) will generate new teaching and learning solutions that will be evaluated in various circumstances. As a result, educational technology can help students attain and manage their academic goals more effectively [74]. AI's timely assistance is another way to boost student engagement. Chatbots fueled by AI might save frustration and bring students back to work faster by providing instantaneous responses to student questions. Chatbots, as stated by Han, J.W., Park, J. and Lee, H. allow students to study anywhere at any time. As a result of the reduced anxiety and increased retention that students feel when conversing with a chatbot, self-directed learning is enhanced. In addition, it allows users to contribute real-time feedback through dialogues while learning and provides individualized information in response to user input [75]. Moreover, these chatbots may offer direction and assistance, easing the way through complex material and tasks for students.

Lastly, Jarrahi, M. H., Lutz, C. and Newlands, G. believed there should be more agreement on what (AI) systems should and should not embrace. Even with the diversity of views and backgrounds, a lack of conceptual clarity may stymie the formation of common ground around the notion among (AI) researchers, practitioners, and users, paving the path for misinterpretation and misuse of the concept [76]. The article's authors are forthright enough to note that there may be hazards to implementing AI in hybrid education. AI might, for example, replace human touch, an important aspect of learning. Data privacy and security concerns are essential in this process, where AI algorithms exploit student data to provide personalized training. On the other hand, the use of AI in hybrid learning settings has the potential to increase student engagement and overall academic achievement significantly. For example, the AI performance prediction model is extensively used to identify at-risk students likely to fail, build student-centered learning paths, and improve instructional design and development, according to Ouyang, F. et al. However, most existing (AI) prediction models concentrate on creating and enhancing AI algorithm accuracy rather than using AI models to offer students real-time and continuous feedback and improve students' learning quality [77]. However, the risks of (AI) must be balanced against the advantages of individualized instruction, immediate criticism, and prompt aid. As a result, we may expect to see a rise in the application of AI to hybrid courses of study in the years ahead.

Table 1 provides a comprehensive summary of the critical literature, investigative domains, and indispensable technologies projected to play a vital role in shaping the open educational system.

**Table 1.** Exploring the Role of AIED in Hybrid Education: A Summary of Technologies Required for the Future Education System.

Topic	Research Subject Area	Focusing Area	References
AIED within hybrid education	AIED (Artificial Intelligent in Education)	Enhancing Students' engagement	[3,12,16,21,45,68,72]
		Online learning	[1,2,5–7,10,18–20,49,52,53,55,67]
		Personalized learning	[2,4,9,10,20,62,65,67]
		Adaptive learning	[6,7,17,20,22,25,27,31,33,49,62]
		Interactive learning	[4,7,16,20,26,29,30,43,60,62]
		Learning analytics	[4,5,15,16,24,37,70,72]
		Educational technology	[4,10,13,14,17,19,21,31,44,54,55,57–60,63,69]
		Blended learning	[2,14,23]
		Student-centered learning	[10,11,22,25,56]
		Active learning	[9,12,18–20,22,30,38]
		Digital learning	[1–3,9,19,22,28,52,58–61,66,69]
		Virtual teaching space	[3,9,11–13,60]
		Pedagogical interaction	[12,15,16,22,32,34,38,40,70]
Hybrid Education		[9–12,14,16,18,19,25,43,44,48–50,67,71]	

According to this study and analysis of its potential in hybrid teaching spaces, students' learning experiences, attention spans, and academic performance can all benefit from using AIED technology. AIED systems are dynamic, intelligent, and interactive, tailoring instruction to each learner. By giving immediate feedback and assistance, adjusting to the student's learning speed, and providing a wide range of learning possibilities, AIED technology can increase student motivation, engagement, and confidence. However, there are obstacles to integrating AIED in hybrid education, including the need for suitable infrastructure, sufficient teacher training, and the avoidance of potential data privacy breaches and ethical considerations. To maximize their advantages while addressing potential obstacles and concerns, the assessment emphasizes the need for careful consideration throughout the design and deployment of AIED systems.

## 7. Conclusions

Although most AI studies have been undertaken in the STEM fields, increasing AIED users has necessitated interdisciplinary approaches. Student engagement and the caliber of their education can benefit from using Artificial Intelligence (AI) technologies in hybrid education settings. The use of Artificial Intelligence (AI) in the classroom is bound to change as technology develops. However, studies using AI in classrooms have shown a weak connection to theoretical frameworks or teaching strategies, especially at the university level. The essay focuses on the rising demand for online courses and the need to study how to best prepare students for these courses. Hybrid education, which mixes online and in-person teaching methods, is introduced, and the potential of Artificial Intelligence (AI) to improve education is highlighted. The work also provides an in-depth review of the current state of Artificial Intelligence (AI) in the classroom, including the applications of chatbots and VR. Artificial Intelligence (AI) helps bright, self-driven pupils. Artificial Intelligence (AI)-powered technology, such as chatbots, intelligent tutoring systems, and tailored learning platforms, can help students stay motivated and engaged in their studies. Still, it is essential to understand the role of the teacher in mediating and facilitating learning using AI in the classroom. These resources may also provide helpful information for teachers. However, that (AI) technology must be deployed in conjunction with sound pedagogy and a human touch to achieve the most significant impact. Intelligent computers mimic

human interaction with the outside world by doing tasks, such as speech recognition and analyzing a variety of potential routes to a desired outcome. AI's scientific foundation in the classroom is the effort to make explicit by computing what is usually left unstated. Teachers are also responsible for reflecting on the ethical challenges presented by contemporary issues, such as data privacy and the elimination of algorithmic prejudice.

This all highlights the possible advantages and disadvantages of using AI, chatbots, VR, and AR in hybrid classrooms. The revolutionary impacts of AI, AR, and VR on educational approaches are discussed and analyzed in this essay. It emphasizes the importance of learning analytics and adaptive learning platforms in facilitating individualized instruction—discussion of chatbots as instructional aides center on their potential to increase student participation and reaction time. The book also presents ChatGPT, an AI-driven chatbot that improves user engagement and communication. Concerns regarding context misunderstanding, reliance on technology, possible prejudice, and a lack of critical thinking and creativity are discussed, along with the benefits of using ChatGPT in the classroom. Consequently, the ethical frameworks of fairness and social justice are linked to the legal frameworks of data privacy and antidiscrimination to build a groundwork for pertinent organizational variables. Therefore, the elements of these frameworks form the basis of valuable structures. Providing everyone with access to high-quality education and encouraging them to continue their education throughout their lives is goal 4 of the Sustainable Development Agenda, and (AI) has the potential to address some of the biggest challenges in education today, innovate teaching and learning practices, and ultimately accelerate progress toward this goal. Let us assume that, with some careful forethought and execution, we can use it to radically alter the trajectory of students' involvement in their education. These rapid technological advancements, however, come with many risks and worries that policy dialogues and regulatory frameworks have, thus far, left behind. This article highlights the potential of artificial intelligence, chatbots, virtual reality, and augmented reality to improve learning methodologies and encourages additional investigation into these areas. It recognizes the risks and limitations of new technologies but stresses the necessity to investigate their potential for enhancing skills crucial to the future labor market.

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