

## 4 Recent Progress in the Use of Artificial Intelligence Tools in Education

### Abstract

The use of artificial intelligent (AI) tools in education has had a significant impact on learning experiences and outcomes. This review looks at recent advances in artificial intelligence tools and their implications for future research and practice. The review article followed the PRISMA method. Relevant articles on AI in education, specifically those describing the integration of AI or machine learning in undergraduate was extracted from the Scopus database. The inclusion criteria focus on articles directly related to teaching and training in structured programs that published in 2019 to 2023. A total of twelve documents were recognized and subjected to hand identification for subsequent analysis. The result shows that cognitive tutors, which are interactive learning environments facilitated by intelligent tutoring systems, improve learning outcomes. The challenge of balancing instructional assistance and self-directed learning, on the other hand, is inherent in AI-driven tools. AI tools in higher education provide numerous advantages at the institutional, social, and instructional levels. Disruptive AI tools such as ChatGPT have emerged, but challenges include job displacement concerns and the need for constant adaptation. AI language learning tools are important in language acquisition processes because they provide personalized learning paths and interactive engagement. However, ethical considerations and competencies related to AI-based tools in education are assessed, with parallels drawn to healthcare guidelines. It emphasizes the importance of strong ethical frameworks, as well as the critical role of educators and professionals in responsible AI use, in order to maintain a symbiotic relationship between human expertise and technological advancement. Overall, this review summarizes recent advances in the use of artificial intelligence tools to revolutionize education, emphasizing the importance of ongoing research, cross-disciplinary collaboration, and careful implementation.

**Keywords:** Artificial Intelligence; Cognitive Tutors; Higher Education; AI Language Learning Tools; Ethical Considerations; Competencies for AI Tools; ChatGPT

### INTRODUCTION

Artificial intelligence (AI) is the field of research and the breakthroughs and developments that have resulted in computers, machines, and other objects with human-like intelligence defined by cognitive abilities, learning, adaptability, and decision-making abilities (Chen et al., 2020). Recently, AI has been widely applied in education, reshaping different parts of the learning process, and is regarded as a disruptive technology that is changing the educational landscape.

AI has been used in education in various forms and ways. AI began with computers and computer-related technologies such as the internet and the World Wide Web. This has given way to web-based and online intelligent education systems that offer individualized and adaptable learning experiences. AI has also been integrated into embedded computer systems, humanoid robots, and web-based chatbots, which can perform educational functions autonomously or collaboratively with instructors (Chen et al., 2020).

AI in education has yielded promising outcomes and benefits. Administrative duties like as grading assignments and managing student records have been facilitated by AI-powered systems, allowing instructors to focus more on tailored training and assistance (Chen et al., 2020). AI tools have also enabled curriculum and content customisation and personalisation, adapting to individual students' needs and improving their learning experiences. AI has also been used in intelligent tutoring systems, which provide tailored feedback and adaptive training to students, resulting in enhanced learning results (Azevedo et al., 2022).

However, the application of artificial intelligence in education brings ethical concerns and obstacles. When used in educational contexts, privacy and data security are critical concerns (Dignum, 2021). To offer equitable learning opportunities for all

students, bias and fairness in AI algorithms must be addressed (Yue et al., 2022). Furthermore, educators must gain competencies in understanding and efficiently utilizing AI tools in their teaching activities (De Gagne, 2023).

### Overview of the applications of AI in education

AI has gained significant attention in the field of education due to its potential to revolutionize the learning experience. AI refers to the use of technologies such as machine learning and natural language processing to analyze data, identify patterns, and make predictions, enabling educators to personalize learning for each student (Harry, 2023). The integration of AI in education has the potential to enhance the learning process, making it more personalized, engaging, and efficient. One of the key areas where AI has been applied in education is in the development of intelligent tutoring systems. These systems, known as Cognitive Tutors, provide interactive learning environments that adapt to the individual needs of students (Baker et al., 2010). Cognitive Tutors have been found to improve learning outcomes by providing personalized instruction and feedback.

AI has also been applied in medical and health informatics education. The integration of AI training into health informatics curricula has been recommended to meet the evolving needs of the healthcare industry (Doroudi, 2022). AI tools have been used to enhance education through innovative applications and personalized learning experiences. They have shown promise in improving education for individuals with neurodevelopmental disorders. AI has been used in a variety of applications in higher education. Universities have investigated the use of AI tools to increase enrollment, retention rates, and resource management (Lukianets & Lukianets, 2023). On institutional, social, and instructional levels, AI has the ability to assist institutions, students, and instructors.

AI language learning tools have also emerged as a significant application in education. These tools utilize AI algorithms to provide personalized learning experiences, reduce learning time, and introduce learners to different cultures (Firat, 2023). However, challenges such as the need for human interaction and the dependence on large amounts of data for training need to be considered when using AI language learning tools (Firat, 2023). The use of AI in education raises ethical considerations and the need for competencies among educators and healthcare professionals. Ethical guidelines have been developed to ensure the responsible use of AI in healthcare and education. Competencies for the use of AI-based tools by healthcare professionals have also been identified to ensure effective and ethical use (Akgun & Greenhow, 2022).

Overall, the use of AI tools in education has shown significant progress in recent years. From intelligent tutoring systems to AI language learning tools, AI has the potential to enhance the learning experience by providing personalized instruction, improving learning outcomes, and streamlining educational processes. However, challenges such as ethical considerations, data management, and the need for competencies need to be addressed to ensure the responsible and effective use of AI in education.

### Importance of AI tools in enhancing the learning experience

The integration of AI tools in education has the potential to significantly enhance the learning experience for students. AI tools, such as intelligent tutoring systems and language learning tools, offer personalized and adaptive learning experiences that cater to the individual needs and abilities of students (Koedinger & Aleven, 2007). This personalized approach allows students to learn at their own pace, receive immediate

feedback, and engage with the material in a way that is tailored to their learning style (Vall & Araya, 2023).

One of the key advantages of AI tools in education is their ability to provide personalized <sup>10</sup>instruction and support. Intelligent tutoring systems, such as Cognitive Tutors, offer step-by-step feedback, specific messages in response to common errors, and on-demand instructional hints (Koedinger & Aleven, 2007). These features help students navigate through challenging concepts and provide targeted support when needed (Koedinger & Aleven, 2007). The adaptive nature of AI tools allows them to identify areas where students are struggling and provide additional practice or resources to reinforce learning.

AI tools also have the potential to enhance the learning experience in specific domains, such as health informatics education. The integration of AI training has been recommended to keep up with the evolving needs of the healthcare industry (Sapci & Sapci, 2020). AI tools can provide innovative learning activities and personalized learning experiences for students, allowing them to develop the necessary competencies in a rapidly changing field. These tools can also be used to assess and improve students' clinical skills and decision-making abilities.

In language learning, AI tools offer numerous benefits. They can track learners' progress, adapt the learning material to their specific needs, and provide personalized learning experiences (Vall & Araya, 2023). This personalized approach can make language learning more engaging and efficient, as learners are exposed to material that is tailored to their learning styles and pace. AI language learning tools can also provide real-time feedback, helping learners identify areas for improvement and track their progress. Additionally, these tools can introduce learners to different cultures and provide a global perspective on language learning.

The use of AI tools in education is not without its challenges. Ethical considerations, such as data privacy and algorithmic bias, need to be addressed to ensure responsible and equitable use of AI tools (Nazaretsky, Ariely, et al., 2022). Teachers also need to be equipped with the necessary knowledge and skills to effectively integrate AI tools into their teaching practices (Nazaretsky, Cukurova, et al., 2022). Professional development programs that focus on AI education can help build teachers' trust in AI-powered educational technologies and enhance their ability to leverage these tools <sup>9</sup>in the classroom (Nazaretsky, Ariely, et al., 2022).

Overall, AI tools have the potential to greatly enhance the learning experience in education. The personalized and adaptive nature of these tools allows for tailored instruction and support, leading to improved learning outcomes. Whether in language learning, or other domains, AI tools offer innovative and engaging learning experiences that can benefit students and educators alike. However, it is important to address ethical considerations and provide adequate support and training for teachers to ensure the responsible and effective use of AI tools in education.

### **Purpose of the review article**

The purpose of this review article is to provide a comprehensive overview of the existing and emerging role of AI in education. The review aims to synthesize knowledge from the literature on the integration of AI in education, including its applications, challenges, and potential benefits. By examining the current state of AI training and the use of AI tools, this review article seeks to inform future directions and advancements in the field. The findings of this review article will contribute to the understanding of the potential benefits and limitations of AI in education. It will provide valuable insights for educators, curriculum developers, and policymakers in designing and implementing AI-based educational interventions. Furthermore, the

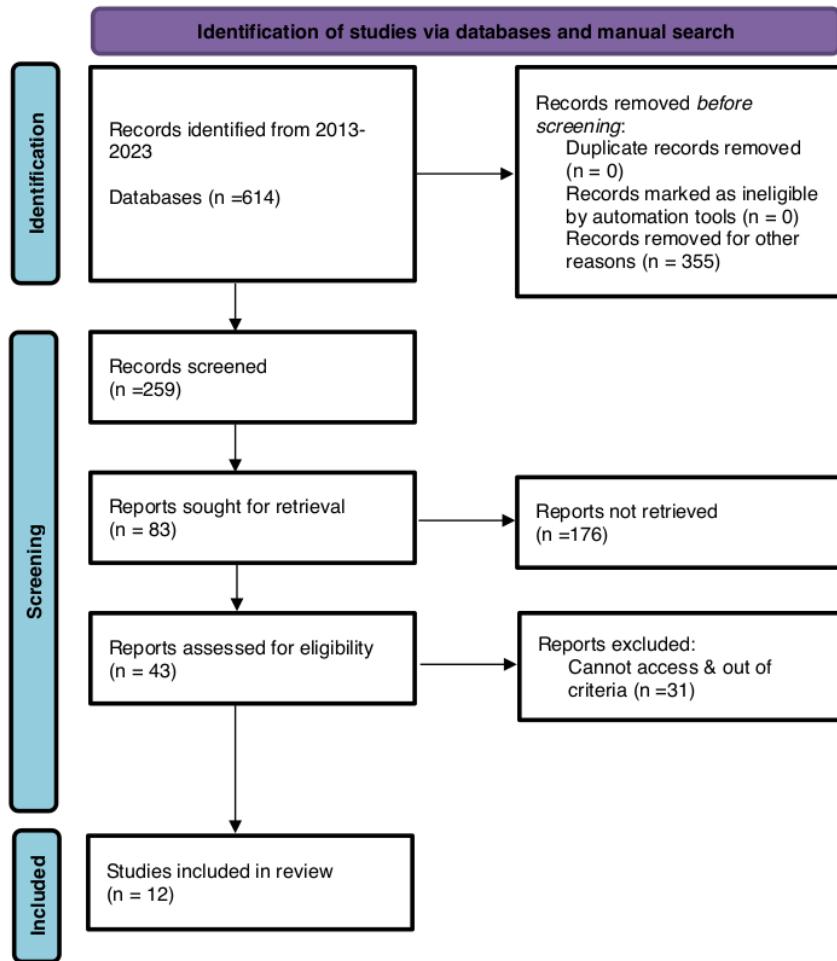
5 review article will identify gaps in the current literature and highlight areas for future research and development in the field of AI in education. In summary, the purpose of this review article is to provide a comprehensive overview of the existing and emerging role of AI in education. By synthesizing knowledge from the literature, the article aims to inform future directions and advancements in the integration of AI in education, while addressing the challenges and considerations associated with its implementation.

The primary research inquiry of this work pertains to the advancement of artificial intelligence technologies and the obstacles encountered during their integration within the education domain. The investigation of this research question is of utmost importance in order to clarify the research findings that are relevant to the specific inquiries outlined below:

1. What have been the observed patterns in the practical application of artificial intelligence in the educational context during the last five-year period?
2. What are the applications of artificial intelligence in practical learning systems in a broader sense?
3. In what ways is artificial intelligence utilized within the context of higher education?
4. What are the challenges faced in the implementation of artificial intelligence in the educational context?

## METHOD

The review article will follow a systematic approach, utilizing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses research methodology (Burney & Ahmad, 2022). Relevant articles on AI in education, specifically those describing the integration of AI or machine learning in undergraduate will be extracted from the Scopus database. The inclusion criteria focus on articles directly related to teaching and training in structured programs that published in 2019 to 2023. The initial search was performed by utilizing the keywords "artificial intelligence," "machine learning," and "education" within the given publication date range. This search yielded a total of 614 publications in the Scopus database, including several disciplines of study. During the search for reference sources, restrictions were imposed on the topic of study, specifically limited to social science, as well as on the publication type, which was restricted to articles. A total of 355 documents were excluded from the list for subsequent research, leaving 43 papers sourced from the Scopus database. During the concluding phase, a total of twelve documents were recognized and subjected to hand identification for subsequent analysis. Figure 1 provides a concise depiction of the identification and screening process, which is conducted via the Systematic Reviews and Meta-Analyses approach.



**Figure 1.** Research flow for reference identification based on Scopus database.

By analyzing the selected articles, the review article will provide insights into the current implementation of AI in education. It explores how AI is being used to support learning, assess students' progress, and enhance curriculum frameworks (Chan & Zary, 2019). Additionally, the review article addresses the challenges and considerations associated with the implementation of AI, such as assessing the effectiveness of AI, managing technical difficulties, and ensuring data integrity (Sapci & Sapci, 2020).

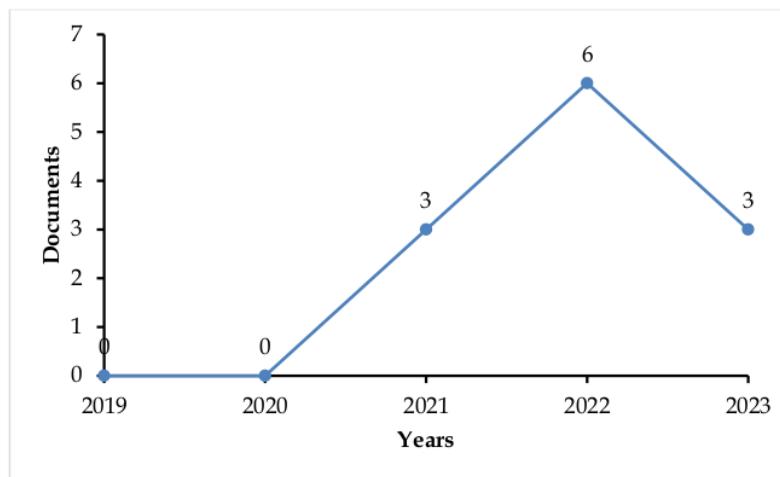
## RESULTS AND DISCUSSION

### Research Trends and Important Information from Included Articles

The integration of AI has witnessed a growing presence in educational settings, providing a multitude of advantages and prospects for both educators and learners. The field of education has witnessed the integration of AI in various applications. These applications encompass personalized learning platforms, automated assessment systems, facial recognition systems, intelligent tutoring systems, and educational chatbots (Adams & Chuah, 2022; Akgun & Greenhow, 2022). The primary objectives of these applications are to optimize students' educational experiences, offer tailored assistance, and boost the effectiveness of instructional practices.

A notable trend observed in the integration of AI in educational settings is the adoption of personalized learning platforms. These platforms employ artificial intelligence algorithms to deliver customized learning experiences for individual students. Through the analysis of students' learning data and preferences, AI algorithms have the capability to provide tailored recommendations and adaptable content, thereby facilitating effective learning and encouraging engagement (Zhang, 2022). This methodology has demonstrated encouraging outcomes in enhancing students' educational efficacy and motivation. The integration of AI into the context of practical learning within the classroom setting presents a multitude of prospects for augmenting the field of education.

The deployment of AI in education has witnessed the emergence of several notable trends, including personalized learning platforms, automated assessment systems, facial recognition systems, intelligent tutoring systems, and educational chatbots. These technologies have the capacity to enhance students' learning experiences, offer individualized support, and optimize instructional efficiency. Based on the previously mentioned description, research studies published in Scopus-indexed scientific journals that specifically examine the integration of AI in the learning process have demonstrated notable advancements within the last five years (Figure 2). The study provides a more detailed explanation of the significant findings derived from the research outcomes, which are presented in Table 1.



**Figure 2.** Research trends on artificial intelligence in practical learning (retrieved from Scopus on 27 September 2023).

Table 1. contribution and important information of the last five years studies

No	Year	Important information	Author/s
1	2022	This study includes empirical findings regarding the extent of AI literacy among teachers in China, and offers valuable insights into effective strategies for fostering AI literacy among primary and middle school educators. The present study conducted an analysis of survey data obtained from a sample of 1013 teachers, with the aim of evaluating their level of AI literacy across four distinct dimensions:	(Zhao et al., 2022)

No	Year	Important information	Author/s
2	2021	<p>Knowing and Understanding AI, Applying AI, Evaluating AI Application, and AI Ethics. There was a statistically significant and positive relationship between applying AI and the three aspects under investigation. Educators who demonstrated higher levels of competence in utilising AI were also more inclined to possess a deeper comprehension of AI, assess its practical implementations, and contemplate its ethical ramifications. The aforementioned findings indicate that to foster AI literacy among educators, it is crucial to prioritise the development of their capacity to effectively utilise AI within educational environments. The attainment of this objective can be facilitated by means of professional development initiatives and training sessions that equip educators with experiential learning opportunities and pragmatic insights into the utilisation of artificial intelligence technologies. By enhancing teachers' applying AI skills, they can gain a deeper comprehension of the prospective applications of AI in the field of education, assess its efficacy, and effectively tackle ethical concerns associated with its implementation. The research additionally emphasises the governmental responsibility in fostering AI literacy among educators. Based on the study conducted, it is recommended that the government should implement measures to actively encourage and assist the development of teachers' proficiency in AI literacy. This can be achieved by implementing policy efforts, allocating funds for professional development programmes, and incorporating AI education into the curriculum.</p> <p>The study was centred on examining the effects of the ALEKS (Assessment and Learning in Knowledge Spaces) adaptive system on students' perception and self-regulated learning skills. The researchers utilised the Adaptive Self-regulated Learning Questionnaire as an instrument to assess the alteration in students' scores pertaining to self-regulated learning capabilities prior to and subsequent to their utilisation of the ALEKS system. The findings indicated a statistically significant enhancement in students' self-regulated learning abilities subsequent to the implementation of the ALEKS system. The aforementioned discovery implies that the ALEKS adaptive system exerts a beneficial influence on students' capacity to self-regulate their learning. The system facilitates</p>	(Harati et al., 2021)

No	Year	Important information	Author/s
3	2023	<p>customised learning experiences by tailoring the content to match the unique knowledge spaces of individual students. This approach enables students to concentrate on areas requiring enhancement and advance at a self-determined rate. The implementation of a customised instructional method has the potential to augment students' ability to self-regulate, namely in areas such as establishing objectives, measuring progress, and adapting learning tactics. Furthermore, the investigation also assessed the students' assessment of the ALEKS system. The findings indicated that the students held a favourable impression of the system, suggesting that they perceived it as valuable and advantageous for their educational progress. The favourable perception mentioned has the potential to enhance students' motivation and active participation in the educational journey.</p> <p>This study examined the difficulties and barriers encountered while integrating the Internet of Things (IoT) into e-learning platforms inside higher education institutions in Saudi Arabia. It draws attention to the disparity in the adoption of IoT technology between emerging countries, such as Saudi Arabia, and developed nations. The objective of this study is to present a model for the implementation of IoT in e-learning within the specific context of developing nations. Additionally, this research offers suggestions for improving the acceptance of IoT in Higher Education Institutions. The study's findings validate the significance of perceived utility in the adoption of IoT for e-learning. The perceived utility of a system is subject to various elements, including the quality of its material, the level of assistance provided for learning, the degree of interactivity within the system, the effectiveness of instructional assessment, and the perceived level of convenience in using the system. This study examines the mediating effect of perceived ease of use and perceived utility on the adoption of e-learning systems in higher education. The study additionally underscores the significance of variables such as the quality of education, social impact, and perceived fun in shaping students' attitudes towards the utilization of e-learning systems and their level of satisfaction with them. Moreover, the research examines the acceptance behavior pertaining to the adoption of recommender systems in the context of e-learning inside Saudi</p>	(J. Ali et al., 2023)

No	Year	Important information	Author/s
4	2022	<p>Arabia. The primary subject matter of this article pertains to recommender systems, which serves as a reflection of the growing emphasis placed by the Saudi Arabian Ministry of Education on the provision of online educational services and the enhancement of learning outcomes through the utilization of e-learning technologies.</p> <p>This research investigates the perceptions of students on the utilization of AI in the process of selecting educational films on the YouTube platform. This research centers on the urban area of Al Ain and examines the inclinations and perspectives of students with regards to AI-related content available on the YouTube platform. The study's findings underscore the growing significance of online platforms, such as YouTube, as educational resources for both educators and learners. The writers acknowledge that social media platforms, such as YouTube, have undergone significant transformations and have had a positive impact on multiple facets of our lives, including the realm of education. Although social media is often linked to communication and pleasure, it also plays a substantial role as an educational platform. This study focuses on the analysis of individuals' impression of AI as portrayed in educational films available on the YouTube platform. Through the examination of the preferences and views of students residing in Al Ain City, the researchers have provided insights into the manner in which AI is seen within the realm of instructional content. This study holds significance as it offers significant insights into the efficacy and influence of AI-related educational videos available on the YouTube platform. This study makes a valuable contribution to the extant academic literature by presenting a case study centered on the city of Al Ain, wherein it investigates the perspectives of students within this specific geographical and sociocultural milieu. The adoption of a localized approach enables a more comprehensive comprehension of the perception of AI in educational videos, by considering the distinct traits and preferences of students residing in Al Ain City.</p>	(Farhi et al., 2022)
5	2021	<p>The study emphasizes the need for further research and development of guidelines and frameworks to address the concerns and challenges associated with the integration of social robots in educational settings. It provides insights into the attitudes and</p>	(Istenic et al., 2021)

No	Year	Important information	Author/s
6	2022	<p>concerns of pre-service teachers, which can inform the design and implementation of teacher education programs and policies related to the use of social robots in the classroom. The findings of the study reveal that pre-service teachers have mixed feelings and concerns about social robots in the classroom. Some pre-service teachers expressed concerns about the potential negative impact of social robots on human-human interactions and the role of teachers in the classroom. They were worried that social robots may replace human teachers and hinder the development of social and emotional skills in students. On the other hand, some pre-service teachers recognized the potential benefits of social robots in enhancing student engagement and motivation, as well as supporting individualized learning experiences. The study also highlights the importance of pre-service education in shaping teachers' beliefs and attitudes towards social robots. It suggests that teacher education programs should provide opportunities for pre-service teachers to explore and reflect on the potential benefits and challenges of integrating social robots in the classroom. This can help pre-service teachers develop a balanced perspective and make informed decisions about the use of social robots in their future teaching practices.</p> <p>The study's findings enhance the comprehension of the influence of bootstrap resampling in data pipelines for the prediction of student performance. This study emphasises the significance of quantifying the variability of predictions and offers valuable insights into the efficacy of bootstrap resampling as a technique for estimating uncertainty in predictions. The ramifications of these findings are relevant to the advancement of data-driven methodologies in educational environments and can provide insights for decision-making processes that aim to enhance student achievements. The study's findings demonstrate that bootstrap resampling is a reliable method for quantifying the diversity in forecasts of student performance. Bootstrap resampling is a reliable technique for assessing the statistical characteristics of predictions by producing several data sets that are statistically comparable to a small sample. The research showcases the use of bootstrap resampling in educational environments where precise forecasting of student performance is essential for informed decision-making. The research</p>	(Bertolini et al., 2022)

No	Year	Important information	Author/s
7	2022	<p>also emphasises the significance of using feature selection alongside cross-validation in data pipelines for predicting student achievement. The study underscores the importance of developing interpretable and actionable models that can assist faculty and stakeholders in promoting student success by examining key factors that influence predictions. These factors include grade point average, number of credits enrolled, and performance on concept inventory assessments. Additionally, the research examines the advantages of incorporating bootstrap resampling alongside other resampling techniques, such as relief attribute evaluation and Borda's method. This implies that by incorporating several approaches and information sources, the precision and dependability of forecasts can be improved.</p> <p>This study introduces a comprehensive methodology that integrates artificial intelligence, schema analysis, and emotion analysis in order to evaluate the effects of gamified video-based learning. The results of this study enhance our comprehension of the efficacy of video-based learning and offer valuable insights on the emotional encounters of learners throughout the learning journey. The research employed an emotion analysis system based on artificial intelligence to investigate the emotional valence of participants during the study and test phases of video-based learning. The present study conducted an analysis to assess the efficacy of video-based learning in relation to three key variables: recall accuracy, response time, and emotional valence. The study consisted of a sample of 16 young adult participants who were in good health. Half of the participants were exposed to video-based learning that was coherent with their existing schema, while the other half were subjected to video-based learning that was incongruent with their existing schema. The study's findings were assessed by a comprehensive analysis that incorporated both statistical and artificial intelligence methodologies. The study's results offer valuable insights on the effects of gamified video-based learning on the process of memory retrieval. The examination of emotional valence throughout the study and test phases provides insight into the emotional encounters of participants throughout the process of learning. This study enhances our comprehension of the efficacy of video-based</p>	(Vidanaralage et al., 2022)

No	Year	Important information	Author/s
8	2021	<p>learning in relation to the accuracy of recall and the time taken to respond. This statement underscores the capacity of AI-driven analysis to evaluate the influence of gamified video-based learning on cognitive processes.</p> <p>The study's findings provide significant insights. To begin with, the examination of the illustrations suggests that pupils exhibit favorable dispositions towards AI-supported educational settings. The illustrations portray students actively interacting with AI technologies and demonstrating their enthusiasm towards the possible advantages that AI can bring to the field of education. Additionally, the study discerns three primary themes that have arisen from the analysis, namely interaction, personalisation, and support. The aforementioned themes serve to underscore the primary elements that exert influence over students' inclinations towards AI-facilitated educational settings. Students place a high importance on interactive elements that facilitate active participation and cooperation, personalized learning opportunities that are customized to their specific requirements, and support mechanisms that offer guidance and aid. The research findings indicate that students hold the perception that AI functions as a tool capable of augmenting their educational encounters, rather than supplanting the role of human educators. The individuals acknowledge the significance of AI in offering supplementary resources, feedback, and assistance, while concurrently upholding the importance of human involvement in the realm of education.</p>	(Lai, 2021)
9	2022	<p>This study introduces a student assessment and recommendation system for e-learning in the context of big data, utilising artificial intelligence techniques. The AISAR system encompasses various components, namely score estimation, clustering, performance prediction, and recommendation. The AISAR system employs a recurrent neural network (RNN) to ascertain individual scores by considering factors such as student involvement and examination results. This methodology enables individualised evaluation and suggestion, considering the distinct learning patterns and academic achievements of each student. Through the utilisation of advanced big data analytics techniques, the system possesses the capability to examine substantial volumes of data produced by learners,</p>	(Bagunaid et al., 2022)

No	Year	Important information	Author/s
10	2023	<p>hence facilitating the provision of significant insights aimed at enhancing the learning process.</p> <p>This study introduces the CATDeM methodology, which seeks to include collaborative learning and computer-assisted translation technology into curricula focused on scientific and technical translation (STT). The article's findings provide evidence of the efficacy of the CATDeM technique in enhancing educational achievements within the domain of computer-assisted scientific translation. The findings of this study indicate that other institutions of higher education that provide computer-assisted translation courses can use this strategy by adhering to the recommended recommendations. The study additionally emphasizes the possible societal implications of the CATDeM approach, since it enables the development of novel thematic activities that capitalize on team-based learning, collaborative learning, and fieldwork-situated simulation. The research also offers significant insights into the development and implementation of a comprehensive curriculum for computer-assisted scientific translation. The significance of integrating collaborative and active learning practices, along with computer-assisted teaching technologies, in STT curricula is underscored. The CATDeM approach provides a comprehensive framework for the design and implementation of courses, which has the ability to improve learning outcomes and equip students with the necessary skills for the industry's requirements.</p>	(Zappatore, 2023)
11	2022	<p>This study examines the degrees of consciousness, acquaintance, and receptiveness among educators towards incorporating the AI landscape into their instructional practices. The research was carried out at 14 academic institutions specializing in business education, utilizing exploratory factor analysis as a statistical technique to uncover and determine the major characteristics associated with educators' perceptions of AI. The study's findings revealed the identification of four distinct components through the utilization of factor analysis. These factors were afterwards labeled according to the statistical measures of mean and standard deviation of their respective factor scores. These aspects offer valuable perspectives on the attitudes of educators towards AI and its potential advantages in the field of education. Although the reference did not explicitly</p>	(Walia & Kumar, 2022)

No	Year	Important information	Author/s
12	2023	<p>state the particular names of the elements, it can be inferred that these factors correspond to separate dimensions of educators' perceptions. This study holds significance as it provides insights into the present condition of educators' knowledge and inclination towards integrating AI into their instructional methods. Through the identification of these characteristics, the research offers a conceptual framework for comprehending the primary issues and potential obstacles that educators can encounter during the process of migrating to an AI environment. The ramifications of the study's findings are relevant to the incorporation of AI within educational environments. Educators have the ability to utilize the stated elements in order to evaluate their own attitudes towards AI and ascertain the potential advantages it can offer to their instructional practices. Furthermore, these findings might be utilized by educational institutions to formulate specific strategies and interventions aimed at facilitating educators' adoption of AI technologies.</p> <p>The primary objective of this study is to investigate the perspectives of educators and students regarding the utilization of ChatGPT in the field of education within the context of the digital age. The results of the study indicate that there is a generally favorable opinion among educators and students towards the utilization of ChatGPT in educational settings. The chatbot was considered as a valuable tool for delivering prompt feedback, addressing inquiries, and offering assistance to students. Educators have observed that the utilization of ChatGPT has the potential to alleviate their workload by addressing mundane inquiries, so allowing them to allocate their efforts towards more advanced and complex responsibilities. Nevertheless, the results also revealed certain apprehensions pertaining to the utilization of ChatGPT inside the realm of education. Concerns were expressed by participants regarding the veracity of information disseminated by the chatbot as well as the potential diminishment of interpersonal engagement with educators. The issue of privacy and data security was also identified as a prominent worry. The findings have the potential to assist educators and policymakers in making well-informed judgments on the utilization of ChatGPT within the realm of education.</p>	(Limna et al., 2023)

The utilization of AI as cognitive tutors in interactive learning environments has garnered considerable interest within the realm of education. These systems employ AI to deliver customized and interactive educational experiences for students. The utilization of AI inside educational tutoring systems has demonstrated encouraging findings in enhancing educational achievements and fostering student involvement (Goel & Joyner, 2017; Trincher, 2021).

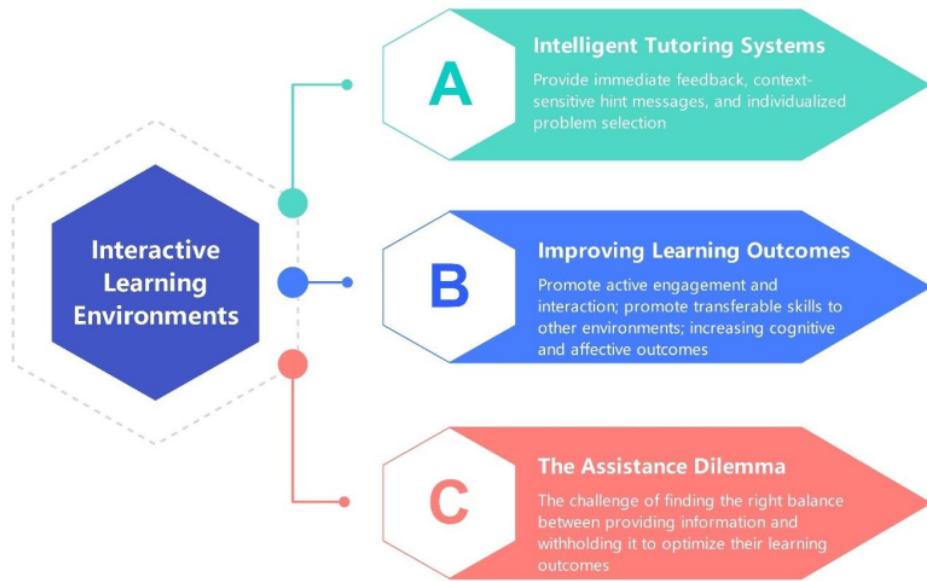
An instance of an AI tutoring system can be observed in the Virtual Operative Assistant, a platform specifically developed for the purpose of surgical simulation training (Fazlollahi et al., 2022). The Voice of America uses machine learning algorithms to categorize the performance of learners and offer feedback that is tailored towards achieving certain objectives within virtual reality simulations. The AI tutoring system in question adheres to the competence-based medical education approach, with the primary objective of assisting trainees in achieving proficiency in safety metrics, as well as evaluating metrics related to instrument movement and efficiency.

Intelligent tutoring systems have been designed and implemented for the purpose of instructing learners in many domains, such as dermatopathology and visual diagnostics, as evidenced by the work of Wells et al. (2021). These systems employ an encoded algorithmic knowledge base to impart problem-solving abilities and aid experts in discerning the cognitive processes that underlie diagnostic errors. The use of tailored instruction and feedback by Intelligent Tutoring Systems has the potential to increase the learning process and boost the accuracy of diagnostic assessments.

According to Trincher (2021), tutors that utilize AI possess the capacity to modify their instructional materials and strategies in order to accommodate the evolving cognitive requirements of individual learners. This adaptability facilitates the development of profound comprehension, motivation, and self-efficacy among students. According to Harry (2023), tutors possess the ability to consistently assess student performance and offer personalized feedback and advice, enabling individuals to advance at their individualized speed and fulfill their unique learning requirements.

The incorporation of AI into the field of education has additionally resulted in the emergence of immersive learning environments. The integration of virtual reality technology and AI-based tutoring software has the potential to establish immersive and dynamic learning environments for the development of practical skills in industrial settings (Korhonen et al., 2023). These settings afford learners with possibilities for practical application and enable them to participate in embodied learning methodologies, effectively resolving concerns related to timeliness, accuracy, and scalability.

Figure 2 shows the utilization of AI as Cognitive Tutors inside interactive learning environments has demonstrated significant promise in augmenting the field of education. These systems employ artificial intelligence algorithms in order to deliver individualized instruction, feedback, and advice to students. AI-based tutors have the potential to enhance learning outcomes, engagement, and diagnostic accuracy by accommodating individual learning demands and facilitating immersive learning experiences.



**Figure 2.** AI as Cognitive Tutors inside interactive learning environments.

#### *Overview of Cognitive Tutors as intelligent tutoring systems*

One of the key areas where AI has been applied in education is in the development of intelligent tutoring systems. These systems, known as Cognitive Tutors, provide interactive learning environments that adapt to the individual needs of students (Baker et al., 2010). Cognitive Tutors have been found to improve learning outcomes by providing personalized instruction and feedback. The effectiveness of Cognitive Tutors is attributed to their ability to provide immediate feedback, context-sensitive hint messages, and individualized problem selection. However, it is important to address the assistance dilemma in these systems, which involves finding the right balance between providing information and allowing students to struggle and learn from their mistakes.

In higher education, AI has been utilized in various practical applications. Universities worldwide have explored the use of AI tools to streamline enrollment, improve retention rates, and enhance resource management (Lukianets & Lukianets, 2023). AI has the potential to benefit institutions, students, and educators on institutional, social, and instructional levels. However, challenges and limitations, such as ethical considerations and data management, need to be addressed to ensure responsible and sustainable use of AI in higher education.

#### *Benefits of Cognitive Tutors in improving learning outcomes*

Cognitive Tutors, as intelligent tutoring systems, offer several benefits in improving learning outcomes. These benefits have been supported by empirical studies and evaluations. One of the key advantages of Cognitive Tutors is their ability to provide immediate and personalized feedback to students (J. R. Anderson et al., 1995). The tutors are designed to deliver short and directed error messages, which have been found to be effective in guiding students' learning process. This immediate feedback helps students identify and correct their mistakes, leading to improved learning outcomes. Cognitive Tutors also promote active engagement and interaction with the learning material. They provide a rich problem-solving environment and

offer step-by-step guidance, allowing students to actively participate in the learning process (Koedinger & Aleven, 2007). This active engagement has been shown to enhance students' understanding and retention of the material.

Research has demonstrated that students working with Cognitive Tutors can achieve at least the same level of proficiency as conventional instruction in a significantly shorter amount of time (J. R. Anderson et al., 1995). Best-case evaluations have shown that students can achieve the same level of proficiency in one-third of the time compared to traditional instruction. This efficiency in learning allows students to progress more quickly and efficiently through the curriculum. Furthermore, Cognitive Tutors have been found to promote transferable skills to other environments. Students who work with Cognitive Tutors display the ability to apply their knowledge and skills in different contexts, indicating the effectiveness of these tutors in promoting transfer of learning (J. R. Anderson et al., 1995). This transferability of skills is crucial for students to apply their knowledge in real-world situations.

In addition to the benefits of Cognitive Tutors themselves, the use of social robots as tutors has also shown positive outcomes. Social robots have been effective in increasing cognitive and affective outcomes in learners (Belpaeme et al., 2018). Their physical presence and interactive capabilities create a unique learning experience that traditional learning technologies may lack. The physical presence of social robots has been shown to promote social behaviors in learners, leading to improved engagement and learning gains. It is worth noting that the benefits of Cognitive Tutors are not limited to the domain of education. Near-peer tutoring, where more advanced students tutor their peers, has also been shown to have positive cognitive and social outcomes (Khaw & Raw, 2016). Peer tutors can adapt to the needs of their peers and modify their strategies to maximize learning (Khaw & Raw, 2016). The outcomes observed in near-peer tutoring are similar to those observed in human tutoring, indicating the effectiveness of peer tutoring in improving learning outcomes.

In summary, Cognitive Tutors as intelligent tutoring systems offer several benefits in improving learning outcomes. These benefits include immediate and personalized feedback, active engagement with the learning material, efficiency in learning, transferability of skills, and the potential for social robots as tutors. The use of Cognitive Tutors and peer tutoring approaches has shown positive cognitive and social outcomes, contributing to enhanced learning experiences for students.

#### *The assistance dilemma*

The assistance dilemma refers to the challenge of finding the right balance between providing information or assistance to students and withholding it to optimize their learning outcomes (Koedinger & Aleven, 2007). This dilemma has been a topic of interest in the field of instructional science, particularly in the context of Cognitive Tutors, which are interactive learning environments that provide tutorial guidance. Research has shown that different forms of interactivity and feedback can have varying effects on student learning (Koedinger & Aleven, 2007). Immediate feedback, where feedback is given immediately following a student's attempt at solving a step, is a common feature of Cognitive Tutors. However, there is a debate about whether immediate feedback is always beneficial or if it may hinder students' opportunities to learn from their own errors and develop error-detection skills.

The effectiveness of information withholding, such as delayed feedback or flagging errors without providing immediate feedback, has also been explored (Koedinger & Aleven, 2007). Some studies have suggested that withholding information can promote active problem-solving and metacognitive skills, as students

are encouraged to reflect on their own performance and identify errors independently (Salden et al., 2009). However, the effectiveness of information withholding may depend on various factors, including the complexity of the task and the learners' prior knowledge. The assistance dilemma is not limited to Cognitive Tutors but is a broader issue in instructional design and teaching practices. It is important to consider the balance between providing assistance and promoting independent learning to optimize students' learning outcomes (Salden et al., 2009). The challenge lies in determining when and to what extent to provide information or assistance to students to support their learning process effectively (Koedinger & Aleven, 2007).

Addressing the assistance dilemma requires further scientific investigation to identify specific conditions and parameters that guide the decision-making process regarding information giving and withholding in instructional environments (Koedinger & Aleven, 2007). This research can contribute to the development of guidelines and strategies for educators to navigate the assistance dilemma and create effective learning experiences for students. In summary, the assistance dilemma in balancing information giving and withholding is a fundamental challenge in instructional science, particularly in the context of Cognitive Tutors. Finding the right balance between providing assistance and promoting independent learning is crucial for optimizing students' learning outcomes. Further research is needed to determine the specific conditions and parameters that guide the decision-making process in instructional environments.

7

## AI Tools in Higher Education

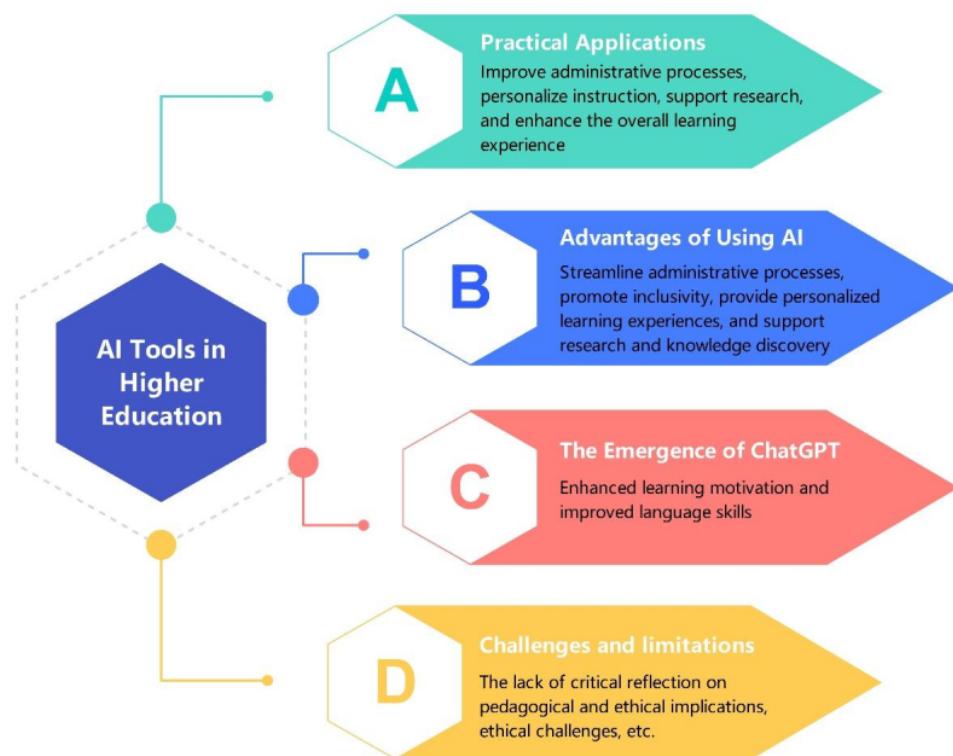
The utilization of AI tools within the realm of higher education has experienced a notable surge in prevalence, presenting the possibility of a transformative impact on the overall learning journey of students. AI tools have found application in mentorship programs. According to Köbis and Mehner (2021), the integration of AI in mentoring environments within the context of higher education has the potential to offer individualized assistance and encouragement to students, facilitating their navigation of both academic and professional trajectories. These systems have the capability to analyze student data and offer customized recommendations, hence enhancing the efficacy and efficiency of mentoring programs. In order to ensure the appropriate and ethical implementation of AI in mentoring, it is imperative to address ethical aspects such as confidentiality, transparency, and openness to experience.

AI tools possess the capacity to augment learning outcomes within the realm of higher education, specifically in health-related disciplines. Within the realm of health higher education, AI has the potential to enhance the learning process and yield improved outcomes, particularly in laboratory-based instructional settings (Sousa et al., 2021). These tools have the capability to offer virtual simulations, individualized feedback, and customized learning experiences, enabling students to engage in realistic and interactive practice and application of their information. The utilization of AI technology is an advantageous prospect for health higher education, as it offers a range of innovations and opportunities that can effectively boost student learning and engagement.

Additionally, artificial intelligence techniques have the potential to provide tailored instruction inside the realm of higher education. According to Hannan and Liu (2023), these systems possess the capability to examine student data, including learning preferences and performance, in order to deliver customized content and recommendations. AI technologies have the capability to adjust and accommodate individual learning demands, so facilitating personalized learning experiences that address the specific strengths and weaknesses of each student. The implementation of

a tailored strategy has the potential to enhance student engagement, motivation, and overall learning outcomes.

Nevertheless, it is crucial to acknowledge that the integration of AI techniques in the realm of higher education presents several obstacles and issues. In order to ensure responsible and equitable utilization of AI in educational environments, it is imperative to provide careful consideration to ethical considerations, including but not limited to data privacy, algorithmic bias, and the effects on human interaction (Köbis & Mehner, 2021). Furthermore, the successful use of AI tools necessitates adequate training and support for educators to proficiently employ these technologies and optimize their advantages within the educational context (Hannan & Liu, 2023). The review about utilization of artificial intelligence (AI) tools within the realm of higher education, the opportunities of its applications to improve educational achievements, and the challenges and its limitations in the practical applications (Figure 3) are further described in the current article.



**Figure 3.** Implementation of AI tools as learning environment in Higher Education.

#### *Practical applications of AI in tertiary education*

AI has shown great potential in transforming higher education by offering practical applications that enhance various aspects of the learning experience. These applications have been explored and implemented in universities worldwide, providing benefits on institutional, social, and instructional levels (Lukianets<sup>6</sup> & Lukianets, 2023). One practical application of AI in higher education is the use of AI-powered chatbots and virtual assistants. These tools can provide personalized support to students, assisting them with administrative tasks, answering frequently asked

questions, and guiding them through the university's resources and services (Adiguzel et al., 2023). AI chatbots can offer 24/7 support, reducing the burden on administrative staff and improving the overall student experience.

AI tools can also be utilized to enhance the teaching and learning process. Intelligent tutoring systems, such as Cognitive Tutors, provide personalized instruction and feedback to students, helping them improve their problem-solving skills and achieve better learning outcomes (Lukianets & Lukianets, 2023). These systems adapt to individual student needs, providing tailored instruction and support. Additionally, AI can be used to develop adaptive learning platforms that adjust the content and pace of instruction based on students' progress and performance. Another practical application of AI in higher education is the use of data analytics and predictive modeling. AI algorithms can analyze large datasets to identify patterns and trends, enabling universities to make data-driven decisions in areas such as student enrollment, retention, <sup>6</sup> and academic support (Lukianets & Lukianets, 2023). Predictive modeling can help identify students who may be at risk of academic difficulties or dropping out, allowing institutions to intervene and provide targeted support.

AI tools can also facilitate research and knowledge discovery in higher education. Natural Language Processing techniques can be used to analyze vast amounts of academic literature, helping researchers identify relevant articles, extract key information, and generate insights (Adiguzel et al., 2023). AI-powered recommendation systems can suggest relevant research papers, collaborators, and funding opportunities, enhancing the efficiency and effectiveness of the research process. However, the integration of AI in higher education also presents challenges and considerations. Ethical and transparency issues need to be addressed to ensure responsible and equitable use of AI (Lainjo & Tsmouche, 2023). Privacy concerns and data management practices must be carefully managed to protect students' personal information. Additionally, there is a need for comprehensive policies and guidelines to guide the application of AI in higher education and address potential biases or discrimination.

Overall, AI tools offer practical applications that can significantly enhance higher education. From AI-powered chatbots and virtual assistants to intelligent tutoring systems and data analytics, AI has the potential to improve administrative processes, personalize instruction, support research, and enhance the overall learning experience. <sup>2</sup> However, ethical considerations and the need for clear policies and guidelines must be addressed to ensure responsible and equitable use of AI in higher education.

#### *Advantages of AI use on institutional, social, and instructional levels*

The integration of AI tools in higher education offers numerous advantages on institutional, social, and instructional levels. These advantages have the potential to transform the learning experience and improve various aspects of higher education. On an institutional level, AI tools can streamline administrative processes and enhance operational efficiency. AI-powered chatbots and virtual assistants can provide personalized support to students, helping them with administrative tasks and answering frequently asked questions (Koedinger & Aleven, 2007). This reduces the workload on administrative staff and improves the overall student experience. Additionally, AI tools can assist in data analytics and predictive modeling, enabling universities to make data-driven decisions in areas such as enrollment, retention, and resource allocation (Bloom et al., 2014). This data-driven approach can lead to more effective resource management and strategic planning.

From a social perspective, AI tools can promote inclusivity and accessibility in higher education. AI-powered language translation tools can break down language barriers and facilitate communication among students from diverse linguistic backgrounds (Adiguzel et al., 2023). AI can also support students with disabilities by providing adaptive learning experiences and assistive technologies. These tools can help create a more inclusive learning environment and ensure that all students have equal opportunities to succeed. On an instructional level, AI tools offer personalized and adaptive learning experiences. Intelligent tutoring systems, such as Cognitive Tutors, provide individualized instruction and feedback to students, helping them improve their problem-solving skills and achieve better learning outcomes (Koedinger & Aleven, 2007). These systems adapt to individual student needs, providing tailored instruction and support. AI can also be used to develop adaptive learning platforms that adjust the content and pace of instruction based on students' progress and performance. This personalized approach enhances student engagement and promotes deeper learning.

Furthermore, AI tools can support research and knowledge discovery in higher education. Natural Language Processing techniques can analyze vast amounts of academic literature, helping researchers identify relevant articles, extract key information, and generate insights (Adiguzel et al., 2023). AI-powered recommendation systems can suggest relevant research papers, collaborators, and funding opportunities, enhancing the efficiency and effectiveness of the research process (Abgaryan et al., 2023). These tools can accelerate the pace of research and facilitate interdisciplinary collaboration.

In conclusion, the use of AI tools in higher education offers significant advantages on institutional, social, and instructional levels. These tools can streamline administrative processes, promote inclusivity, provide personalized learning experiences, and support research and knowledge discovery. However, it is crucial to address ethical considerations, provide training and support, and establish clear policies to ensure responsible and effective use of AI in higher education.

### *Emergence of ChatGPT as Disruptive AI Tools in Education*

One of the emerging and disruptive AI tools in education is ChatGPT, an AI-powered language model developed by OpenAI (<https://chat.openai.com/>). ChatGPT has gained significant attention and popularity due to its ability to generate human-like text and engage in conversational interactions (Gupta et al., 2023). It has been applied in various educational contexts, offering potential benefits and posing new challenges.

The use of ChatGPT in education has been explored in different studies. Researchers have investigated its impact on learning motivation, finding that ChatGPT-based teaching can be motivational and enhance reading and writing skills (J. K. M. Ali et al., 2023). It has also been examined in L2 writing practicums, demonstrating its potential applicability in L2 writing pedagogy (Yan, 2023). Moreover, ChatGPT has been evaluated in anatomy courses, outperforming students in multiple-choice tests (Talan & Kalinkara, 2023). The emergence of ChatGPT in education has raised several implications and considerations. Scholars and students perceive ChatGPT as having the potential to transform learning and education systems, impacting assessment and evaluation processes, the role of educators, and future work and employability. However, ethical and social considerations need to be addressed to ensure responsible and ethical use of ChatGPT in education (Firat, 2023).

Despite the advantages of ChatGPT, there are limitations and challenges associated with its use. Plagiarism detection is a concern, as the automatic text

generation feature of ChatGPT combined with human modification or other AI-based rephrasing tools can lead to issues of originality and authenticity (Yan, 2023). Additionally, there is a need for further research to explore the full potential of ChatGPT in different aspects of language learning and to understand its negative effects (J. K. M. Ali et al., 2023).

Overall, ChatGPT has emerged as a disruptive AI tool in education, offering potential benefits such as enhanced learning motivation and improved language skills. However, ethical considerations, plagiarism detection, and further research are necessary to ensure responsible and effective use of ChatGPT in educational settings. As ChatGPT continues to evolve, it has the potential to transform teaching and learning experiences, but careful implementation and ongoing evaluation are essential to maximize its benefits and mitigate its limitations.

### ***7 Challenges and limitations of AI use in higher education***

The use of AI tools in higher education presents several challenges and limitations that need to be addressed for their effective implementation. The following references provide insights into these challenges and limitations. Bozkurt et al. (2021) highlights the lack of critical reflection on the pedagogical and ethical implications of implementing AI applications in higher education. It emphasizes the need for a deeper understanding of the risks and ethical considerations associated with AI in educational settings. Ethical challenges are also discussed by others (Akgun & Greenhow, 2022), which emphasizes the need to identify and address the ethical implications of using AI in K-12 educational contexts. The article suggests introducing ethical challenges to teachers and students and provides recommended instructional resources to enhance understanding of AI and ethics.

The lack of an all-inclusive public policy and financial support for AI in higher education is identified as a major challenge (Lainjo & Tsmouche, 2023). They emphasize the importance of strong policy support to fully leverage the potential of AI in enhancing higher education. The challenges of limited research and understanding of the impacts of AI in higher education are also highlighted. More studies to widen the understanding of the topic and find viable solutions to the challenges are required. Equity and inclusion are identified as significant challenges in the application of AI in higher education (Lainjo & Tsmouche, 2023). Ones need to ensure that AI-based learning does not deepen existing divides and inequalities, and that disadvantaged individuals are not marginalized from AI-based learning. Furthermore, the lack of trust in AI-based educational technology is discussed (Nazaretsky, Cukurova, et al., 2022). It highlighted the importance of addressing practitioners' misconceptions, myths, and fears related to AI, and building trust in AI tools among teachers.

In conclusion, the use of AI tools in higher education faces challenges and limitations that need to be addressed. These include the lack of critical reflection on pedagogical and ethical implications, ethical challenges, limited public policy and financial support, limited research and understanding, equity and inclusion concerns, and the need to build trust in AI-based educational technology. By addressing these challenges, higher education institutions can harness the potential of AI tools while ensuring responsible and equitable implementation.

### **AI Language Learning Tools**

The utilization of AI algorithms in language education has shown promise in improving the learning experience for language learners. These AI language learning tools offer tailored training, feedback, and assistance to those seeking to better their

language skills (Aydin, 2016; Pokrivačkova, 2019). AI language learning systems employ natural language processing methods to examine and comprehend learner input, thereby facilitating the provision of precise and contextually appropriate feedback. These instruments have the capability to evaluate many facets of language acquisition, encompassing grammar, vocabulary, pronunciation, and fluency. According to Aydin (2016), AI language learning tools have the capability to assess learner performance and detect areas that require improvement. These tools may then offer tailored activities and resources to effectively address the distinct language learning needs of individuals. An instance of an AI language acquisition tool can be observed in the implementation of chatbots within the realm of language teaching. Chatbots have the capability to actively participate in interactive dialogues with individuals, replicating genuine linguistic exchanges that occur in real-world scenarios. The chatbots employ artificial intelligence algorithms to comprehend the input from learners, provide suitable responses, and offer feedback on aspects such as grammar, vocabulary, and pronunciation. According to Aydin (2016) and Ruan et al. (2021), chatbots have the ability to adapt to the unique demands of individual learners and offer tailored language learning experiences. This adaptability is achieved by ongoing interaction between the chatbot and the learner.

An additional utilization of AI in the realm of language acquisition is the incorporation of virtual reality and augmented reality technology. The integration of immersive technologies with AI algorithms has the potential to generate language learning settings that closely resemble real-life scenarios, enabling learners to engage in authentic language practice. According to Fu et al. (2020), language learning tools that incorporate AI and virtual reality or augmented reality technology have the potential to provide learners interactive situations, simulations, and virtual discussions. These immersive experiences facilitate experiential learning, allowing learners to enhance their language ability. In addition, AI language learning systems have the capability to facilitate adaptive learning methodologies. These technologies have the capability to assess learner data, encompassing performance history, learning preferences, and progress, in order to customize the learning experience for each individual learner. According to Kohnke et al. (2023), AI language learning technologies have the potential to maximize learning outcomes and enhance learner engagement and motivation by adjusting the content, tempo, and difficulty level of language education. Nevertheless, it is crucial to acknowledge that the efficacy and usability of AI language learning tools are contingent upon several elements (Figure 4). These factors encompass the caliber of the underlying AI algorithms, the accessibility of superior language resources, and the seamless integration of these tools inside the language curriculum. Additional investigation and assessment are required to examine the possible advantages and constraints of artificial intelligence language learning technologies in diverse educational settings (Aydin, 2016; Pokrivačkova, 2019).



Figure 4. Graphical summary of artificial intelligent as a language learning tools.

### *AI language learning tools and their advantages*

AI language learning tools are computer programs or software applications that use AI algorithms to help users learn and improve their skills in a foreign language (Vall & Araya, 2023). These technologies provide a variety of advantages that enhance the language learning experience and promote more effective language acquisition. One of the key advantages of AI language learning tools is their capacity to reduce time and increase learning speed. These tools can provide personalized learning experiences tailored to individual needs and proficiency levels. AI algorithms analyze a student's language proficiency and learning style, adjusting the content and pace of lessons accordingly (Vall & Araya, 2023). This personalized approach optimizes learning efficiency and enables learners to progress at their own pace.

Real-time feedback is another significant advantage of AI language learning tools. These tools can provide immediate feedback to students, helping them identify areas for improvement and track their progress in their language learning journey (Vall & Araya, 2023). The instant feedback allows learners to correct errors and reinforce their understanding of language concepts, leading to more effective learning outcomes. Efficiency is a notable benefit of AI language learning tools. These tools can save time for teachers by automating specific tasks, such as grading assignments or providing pronunciation guidance (Fu et al., 2020). By automating routine tasks, teachers can focus more on individualized instruction and providing targeted support to students. This efficiency allows for more effective use of instructional time and resources.

AI language learning tools also have the potential to introduce learners to different cultures and foster intercultural competence. These tools can provide authentic language materials, cultural insights, and interactive activities that expose learners to the target language's cultural context (Vall & Araya, 2023). By immersing learners in authentic language and cultural experiences, AI language learning tools enhance learners' understanding and appreciation of different cultures. Furthermore, AI language learning tools offer flexibility and accessibility. Learners can access these tools anytime and anywhere, allowing for self-paced learning and accommodating different schedules and learning preferences (Vall & Araya, 2023). The tools can be accessed on various devices, including computers, tablets, and smartphones, providing learners with convenience and flexibility in their language learning journey.

It is important to note that while AI language learning tools offer numerous advantages, they are not meant to replace human interaction and instruction. These

tools should be used as complementary resources alongside traditional language learning approaches, such as classroom instruction and interaction with native speakers (Vall & Araya, 2023). Human interaction remains crucial for developing communicative and interpersonal language skills.

In conclusion, AI language learning tools provide several advantages that enhance the language learning experience. These tools offer personalized learning experiences, real-time feedback, efficiency, cultural exposure, and flexibility. By leveraging AI algorithms, these tools optimize learning efficiency and support learners in their language acquisition journey. However, it is essential to recognize the complementary role of human interaction and instruction in language learning.

### *Opportunities, challenges, and limitations of using AI language learning tools*

AI language learning tools offer numerous opportunities for language learners, but they also come with challenges and limitations that need to be considered. The following section provides an overview of these aspects based on the literature.

- Personalized learning experiences: AI language learning tools can provide personalized instruction tailored to individual learners' needs and proficiency levels (Vall & Araya, 2023). This personalized approach optimizes learning efficiency and allows learners to progress at their own pace (Vall & Araya, 2023).
- Real-time feedback: AI tools can provide immediate feedback to learners, helping them identify areas for improvement and track their progress (Pokrivicakova, 2019). This instant feedback allows learners to correct errors and reinforce their understanding of language concepts.
- Cultural exposure: AI language learning tools can introduce learners to different cultures through authentic language materials and cultural insights (Vall & Araya, 2023). This exposure enhances learners' understanding and appreciation of different cultures.
- Flexibility and accessibility: AI tools offer flexibility and accessibility, allowing learners to access language learning resources anytime and anywhere. These tools can accommodate different schedules and learning preferences, providing convenience and flexibility in the language learning journey.

#### Challenges and Limitations:

- Need for human interaction: While AI language learning tools offer advantages, they should not replace human interaction and instruction (Vall & Araya, 2023). Human interaction is crucial for developing communicative and interpersonal language skills.
- Contextual nuances of language: AI tools may struggle with understanding the contextual nuances of language, such as idiomatic expressions or cultural references (Vall & Araya, 2023). These nuances require human interpretation and explanation.
- Dependence on large amounts of data: AI algorithms rely on large datasets for training and may require substantial amounts of data to provide accurate and reliable results. Access to diverse and representative datasets can be a challenge.
- Ethical considerations: The use of AI in language learning raises ethical considerations, such as data privacy and algorithmic bias. It is important to address these concerns to ensure responsible and equitable use of AI tools.

### **Ethical Considerations and Competencies for AI-Based Tools in Education**

Ethical considerations and competencies are essential when it comes to the development and use of AI-based tools in education. Addressing issues (Figure 5)

such as data privacy, algorithmic bias, transparency, accountability, and the impact on human interaction is crucial. Educators and stakeholders<sup>4</sup> need to possess the necessary competencies to understand and navigate the ethical implications of AI and to effectively integrate AI tools into educational practices. A community-wide framework can provide guidance and ensure the responsible and ethical use of AI in education.

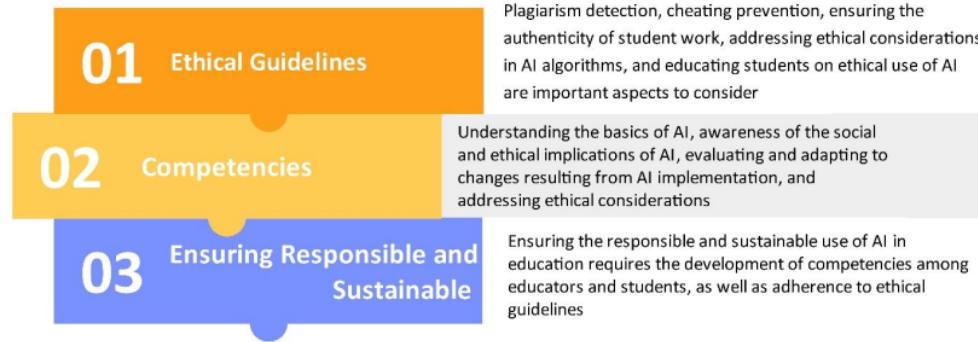


Figure 5. Graphical summary of artificial intelligent tools in Education.

#### *Ethical guidelines for AI in education*

When considering the ethical guidelines for AI-based tools in education, it is essential to address the aspect of student integrity, particularly in relation to authentic assessment. Authentic assessment aims to evaluate students' real-world skills and knowledge by engaging them in meaningful tasks that reflect the complexities of the subject matter (Russell et al., 2023).

AI-based tools can play a role<sup>4</sup> in supporting authentic assessment by providing automated grading and feedback. However, it is crucial to ensure that the use of AI in assessment maintains the integrity of the process and upholds ethical standards. Here are some considerations related to student integrity in the context of authentic assessment and AI-based tools.

- Plagiarism detection: AI tools can assist in detecting plagiarism by comparing students' work against a database of existing sources. While this can be helpful in maintaining academic integrity, it is important to strike a balance between detecting plagiarism and respecting students' privacy. Clear guidelines should be established to ensure transparency and fairness in the use of AI for plagiarism detection (McCabe et al., 2001).
- Cheating prevention: AI tools can help identify potential instances of cheating during assessments, such as detecting patterns of suspicious behavior or unauthorized access to resources. However, it is crucial to ensure that the use of AI for cheating prevention does not infringe upon students' privacy rights. Guidelines should be in place to protect students' data and ensure that the use of AI tools is transparent and accountable (McCabe et al., 2001).
- Authenticity of student work: Authentic assessment aims to evaluate students' genuine understanding and application of knowledge. AI-based tools can support this by providing feedback that focuses on the quality and depth of students' work. However, it is important to ensure that the AI tools do not compromise the authenticity of the assessment process. Students should have the opportunity to demonstrate their unique perspectives and creativity, and AI tools should be designed to support and enhance their authentic contributions (Russell et al., 2023).

- Ethical considerations in AI algorithms: The algorithms used in AI-based assessment tools should be designed and implemented with ethical considerations in mind. This includes addressing potential biases and ensuring fairness in the assessment process. AI algorithms should be regularly evaluated and updated to minimize any unintended biases or discriminatory outcomes (Smallman, 2022).
- Educating students on ethical use of AI: It is important to educate students about the ethical implications of using AI-based tools in education. Students should be aware of the potential benefits and limitations of AI, as well as the ethical considerations involved. This can help foster a culture of integrity and responsible use of AI tools among students (Russell et al., 2023).

In summary, when integrating AI-based tools into authentic assessment practices, it is crucial to consider student integrity and uphold ethical guidelines. Plagiarism detection, cheating prevention, ensuring the authenticity of student work, addressing ethical considerations in AI algorithms, and educating students on ethical use of AI are important aspects to consider. By maintaining ethical standards and promoting student integrity, AI-based tools can enhance the authenticity and effectiveness of assessment practices in education.

#### *Competencies for the use of AI-based tools by healthcare professionals*

When it comes to the use of AI-based tools in education, it is important to consider the competencies required for their effective and ethical use. Competencies refer to the knowledge, skills, and attitudes that individuals need to possess in order to engage with AI tools responsibly and ethically. The following references provide insights into the competencies necessary for the use of AI-based tools in education.

Anderson & Dron (2011) discusses three generations of distance education pedagogy, which can be relevant to the design and development of AI-based tools in education. They emphasize the need for openness and explicitness in content and process, which can inform the competencies required for using AI tools effectively. Russell et al. (2023) presents a study on defining AI-related competencies for healthcare professionals. Although focused on healthcare, the competencies identified can be applicable to the broader context of AI-based tools in education. These competencies include basic knowledge of AI, understanding the social and ethical implications of AI, and the ability to evaluate and adapt to changes resulting from the implementation of AI tools. Kim et al. (2021) explores the competencies needed for teaching AI to elementary school students. While specific to elementary education, the competencies identified can provide insights into the broader skills and knowledge required for engaging with AI-based tools in education. McLennan et al. (2022) proposes the integration of ethics into the development of AI and highlights the need for competencies in identifying and addressing ethical considerations. These competencies can be relevant to the use of AI-based tools in education, as they emphasize the importance of anticipating, identifying, and addressing ethical issues. Huriye (2023) discusses the ethical considerations surrounding the development and use of AI, particularly in African countries. The study emphasizes the need for a human-centered approach and engagement with local stakeholders, which can inform the competencies required for responsible and culturally sensitive use of AI-based tools in education.

In conclusion, the competencies for the use of AI-based tools in education encompass a range of knowledge, skills, and attitudes. These competencies include understanding the basics of AI, being aware of the social and ethical implications of AI, evaluating and adapting to changes resulting from AI implementation, and

addressing ethical considerations. The specific competencies may vary depending on the context and target audience, but they should emphasize responsible and ethical engagement with AI-based tools in education.<sup>5</sup>

### ***Ensuring responsible and sustainable use of AI in education***

Ensuring the responsible and sustainable use of AI in education requires a focus on ethical considerations and the development of competencies among educators, students, and other stakeholders. The literature offers insights into the competencies necessary for the use of AI-based tools in education, as well as the ethical guidelines that should be followed.

To ensure responsible use of AI in education, it is important to consider the competencies required for effective engagement with AI tools. Russell et al. (2023) discusses the competencies needed for healthcare professionals to work effectively with AI-based tools. These competencies include understanding the basics of AI, evaluating the reliability and accuracy of AI outputs, and being able to interpret and communicate AI-generated information effectively. It explores the competencies needed for teaching AI to elementary school students. While specific to elementary education, the competencies identified can provide insights into the broader skills and knowledge required for engaging with AI-based tools in education. These competencies include understanding AI concepts, critical thinking, and ethical considerations related to AI.

Ethical guidelines are crucial for ensuring the responsible use of AI in education. Vasoya (2023) emphasizes the role of parents and educators in managing the risks of AI in education. It highlights the need for transparency, accountability, and privacy protection in the use of AI tools. It also emphasizes the importance of transparency and accountability in AI systems, particularly in the context of educational settings.

Furthermore, ethical considerations should be integrated into the development and use of AI-based tools. Ariffin & Maskat (2021) discusses the need for an ethical competence model that blends AI and ethical intelligence (EI) skills. This model can guide the development of AI tools that align with ethical principles and values. To promote responsible and sustainable use of AI in education, it is important to educate stakeholders about AI ethics and the potential risks and benefits associated with AI tools. Vasoya (2023) emphasizes the role of parents and educators in managing the risks of AI and provides policy recommendations for promoting responsible and ethical use of AI in education.

In conclusion, ensuring the responsible and sustainable use of AI in education requires the development of competencies among educators and students, as well as adherence to ethical guidelines. Competencies should encompass understanding AI concepts, critical thinking, and ethical considerations. Ethical guidelines should emphasize transparency, accountability, and privacy protection. By integrating ethical considerations and fostering competencies, stakeholders can promote the responsible and ethical use of AI-based tools in education.

## **CONCLUSION**

Recent progress in the use of AI tools in education has shown promising advancements across various domains. The integration of AI in education has been recommended, with studies emphasizing the need to incorporate AI training into curricula Sapci and Sapci (2020). AI tools have also been explored in journalism and media education, highlighting the implications of generative AI for these fields (Pavlik, 2023). In language education, AI-powered writing assistance tools have been examined for their potential to improve students' writing skills (Alharbi, 2023).

Additionally, AI has been introduced to explore its impact on students' learning experiences (Dao et al., 2022; Mehta et al., 2021). The importance of AI education in middle school technology education has also been recognized, with studies focusing on *A7* competency development (Park & Kwon, 2023). Overall, recent progress in the use of AI tools in education has demonstrated their potential to enhance learning experiences and improve educational outcomes.

## RECOMMENDATION

The advancements in AI tools in education present several implications for future research and practice. Firstly, there is a need for further research to explore the effectiveness and impact of AI tools in different educational contexts. This includes investigating the pedagogical approaches and strategies that can maximize the benefits of AI tools in enhancing learning outcomes. Additionally, research should focus on understanding the ethical considerations and implications of using AI tools, ensuring responsible and equitable use.

In terms of practice, educators and institutions should consider integrating AI tools thoughtfully into their teaching practices and curricula. This involves providing appropriate training and support for educators <sup>3</sup> to effectively utilize AI tools and integrate them into their instructional strategies. It is also important to ensure that AI tools are accessible and inclusive, addressing potential biases and promoting equal opportunities for all learners.

Furthermore, collaboration between researchers, educators, and developers is crucial to drive innovation and improve the design and functionality of AI tools in education. This collaboration can help address the specific needs and challenges in different educational contexts and foster the development of AI tools that align with educational goals and values.

Finally, the recent progress in the use of AI tools in education holds great potential for <sup>2</sup> enhancing learning experiences and improving educational outcomes. However, further research is needed to explore the effectiveness and ethical implications of AI tools in education. Educators and institutions should carefully integrate AI tools into their practices, ensuring accessibility and inclusivity. Collaboration between stakeholders is essential to drive innovation and improve the design and functionality of AI tools in education, ultimately benefiting learners and educators alike.

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