International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

The Impact of Artificial Intelligence on Education: A Paradigm Shift in Learning

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Abstract:

Artificial Intelligence (AI) technology is to make human life easy and trouble-free and contribute to the advancement of human development. AI is a driving technological force of the twenty-first century and it has been a centre of discussion in technological innovations for its unlimited potential to alter the scenario of social interaction through resolving social challenges and virtually transform every industry. Education is the top priority of present society because it is a fundamental human right that builds peace and drives sustainable development across the world. The integration and application of AI in the classrooms will make teaching and learning effective by supporting teachers and learners in the process through the usage of robotic technology and sensors. AI-based technology facilitates inclusive and equitable quality education along with ensuring universal access to life-long learning for all across the world. The technology of AI has been advanced and sophisticated that can recognize the gesture of the students and understand their mood and ease during the lecture even it can read facial expressions and posture of the students to understand difficulties and problems they are facing in the lecture and recommends altering the lesson. AI technology-based assessment system can be used to assess students' knowledge, understanding, skills such as collaboration and persistence and characteristics such as confidence and motivation etc. AI technology has developed speech-to-text transcription, predictive text and facial recognition promising an inclusive future for all learners.

Introduction:

Artificial Intelligence (AI) has revolutionized education by transforming traditional teaching methods, personalizing learning experiences, and fostering a more inclusive and accessible environment. AI-powered tools and platforms enable educators to create dynamic and interactive learning experiences for students, analyzing vast amounts of educational data to identify patterns and insights that inform instructional design.

AI also enables the development of intelligent tutoring systems that provide personalized learning experiences, promoting self-paced learning and addressing gaps in understanding. By offering

personalized feedback and recommendations, AI tutors empower students to take ownership of their learning journey, fostering autonomy and intrinsic motivation.

AI also facilitates the creation of immersive learning environments through technologies like virtual reality and augmented reality, allowing students to explore complex concepts in a simulated environment, enhancing their understanding and retention of course material. AI-powered chatbots and virtual assistants can provide real-time support and guidance with homework assignments, exam preparation, and academic inquiries.

AI has the potential to foster a more inclusive and accessible educational environment by identifying and addressing learning disabilities and cognitive challenges, and facilitating communication and collaboration among students from diverse linguistic backgrounds. However, the integration of AI in education raises ethical and social considerations, such as data privacy, algorithmic bias, and the impact of automation on employment opportunities.

In conclusion, AI's impact on education represents a paradigm shift in learning, offering unprecedented opportunities to enhance teaching effectiveness, personalize learning experiences, and foster inclusivity. By responsibly and ethically leveraging AI-powered technologies, educators can empower students to thrive in an increasingly complex and interconnected world.

1. The role of AI in personalized learning:

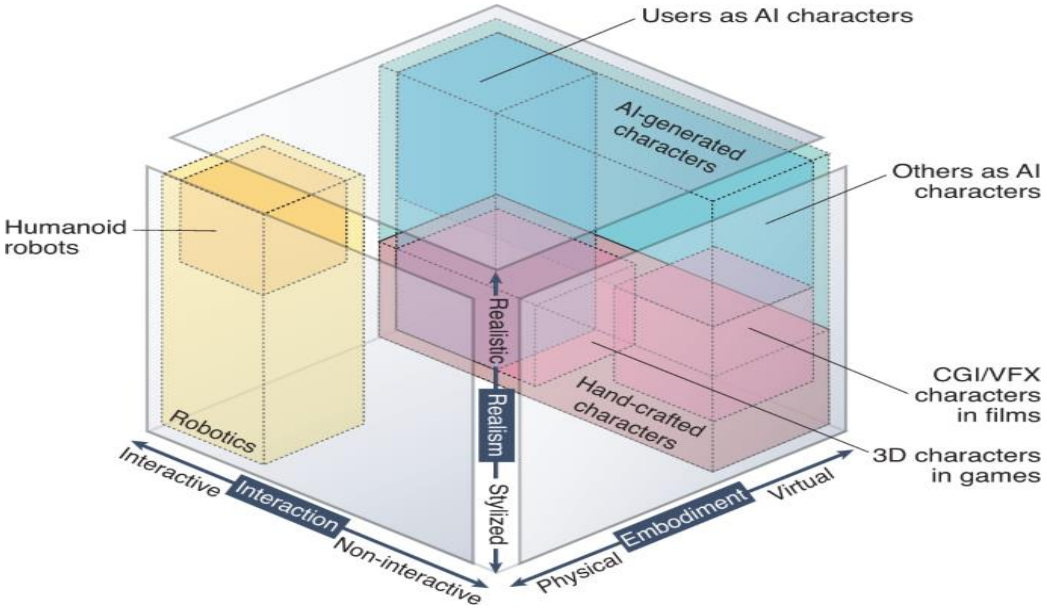
Artificial intelligence plays a key role in personalized learning, allowing teachers to tailor learning experiences to students' specific needs and interests. This approach moves away from a one-size-fits-all approach and provides guidance and support to meet students' learning needs, thoughts, and feelings. AI technology uses machine learning algorithms and predictive analytics to assess and understand each student's learning patterns, strengths, and areas for improvement. AI can identify patterns in student performance, identify challenges, and adjust instructional content and activities to improve learning outcomes. AI has also created smart lessons that use AI to provide instruction and support to students. These systems can adjust target difficulty levels, make recommendations, and provide additional support when needed. AI also personalizes learning experiences based on students' learning preferences (such as visual, auditory, or tactile changes), thus improving engagement and understanding.

1.1 AI generated characters:

In artificial intelligence, an artificial intelligence-generated character refers to a virtual entity created using artificial intelligence algorithms. These characters can exhibit different levels of complexity, from simple chatbots to highly realistic and autonomous virtual beings. AI-generated characters are commonly used in video games, virtual reality environments, customer service applications, and educational platforms.

One of the key features of AI-generated characters is that they can interact with users in a natural and engaging way. Advanced natural language processing algorithms enable these characters to understand and respond to user input, enabling more immersive and personalized interactions. Additionally, AI-generated personas can learn from your interactions and adapt their actions and reactions over time to better meet your needs.

AI-generated characters offer exciting possibilities for improving the user experience, but they also raise ethical and social considerations. Issues related to the ownership of AI-generated personas, their potential impact on relationships, and the risk of abuse and manipulation must be carefully considered. Despite these challenges, AI-generated characters represent significant advances in AI technology and have the potential to revolutionize the way we interact with virtual beings in the digital world.



1.2 AI-generated characters for education:

Students spend approximately 15,000 hours learning during their first 20 years of life. Therefore, the learning environment has a significant impact on individuals and ultimately on society. With AI characters, you can create engaging learning content for all age groups, from classroom presentations to consumable content in museums, historic buildings, and even nature. Using advanced algorithms, we bring famous historical, contemporary or fictional figures to life, allowing scientists to make discoveries, historical figures to narrate battles, painters to tell stories, and more. To talk about your inspiration and process.

1.3 AI-generated characters as virtual instructors:

An ideal learning environment is one that successfully promotes learning motivation, including by optimizing student-teacher relationships. Research shows that access to technology does not automatically lead to improved motivation or learning outcomes. Instead, the way teachers incorporate technology into their curricula plays a key role in motivation, along with students' psychological processes and situational factors involved in learning. In learning situations, various studies have shown that the appearance of the character can have a positive effect on the learner's behaviour, attitude and motivation. Learning experiences that combine fictional characters and stories have also been shown to increase attention and engagement. It showed in early 2020 that one professor saw the enthusiasm of students after teaching an online class as an animated character. His students were especially interested in the animated character, and he noticed an overall increase in student participation and a significant increase in retention rates in undergraduate and graduate programs.

These immersive opportunities support a variety of new scenarios for lifelong learning, such as learning art from a famous artist or learning to cook from the world's best chefs. For example, in the Dolly Life 10 exhibit, a version of the famous artist talks to visitors and even takes selfies with them inside the museum. This interactive installation is said to allow people to learn more about Dali and his artwork. It's easy to imagine other artists "bringing to life" generated versions of themselves, demonstrating the potential of AI-generated characters to motivate learning inside and outside the classroom.

1.4 AI-generated characters as peers:

Finally, in addition to using AI-generated characters as role players for instructors and students to provide a more immersive learning experience, we also envision the use of generated characters as companions in learning support groups. Social rewards, such as praise from others, have been shown to increase children's motivation, improve academic performance, and increase self-efficacy. Praising artificial beings, such as robots and virtual agents, has similarly been shown to improve human motivation and task performance. The researchers also found that robots designed as social agents that interact with children as peers (rather than teachers or tutors) can improve student language through social activities such as storytelling games where the agent introduces new vocabulary. It has also been shown to help improve skills organically. Good storytelling skills 37.

2. AI and student engagement in the classroom:

Academic motivation is critical to academic success, and research shows that academic engagement and academic outcomes can influence student motivation. Xiong et al. (2015) found that students' engagement in learning is an indicator of learning motivation and that clear teaching strategies can improve learning motivation and outcomes. Teachers have evolved to include learning methods such as learning games and drama to encourage physical motivation and improve learning outcomes.

Zhou et al. (2010) examined the results of integrating video recommendations into online video services and found two main effects: 60% of video viewers rely on search and recommendations to find videos, and using recommendations reduces the Gini coefficient by 3%; The importance of recommendations in business scenarios.

The suggestion is mostly used in education, but two problems have been neglected in related research. Rivera et al. (2018) highlighted the challenges of using self-recommendation in academic settings due to the lack of positive self-efficacy. Zhong et al. (2019) concluded that assessing student learning is the best way to determine the effectiveness of the validation process; however, relevant studies focus only on students' working knowledge and technology acceptance level, not on educational support.

Artificial Intelligence (AI) technology can support personalized learning in the classroom, Hwang and others say. (2020) reported that for policymakers, AI can play one of four roles in education: smart teachers, smart students, smart learning tools, and smart advisors. Research confirms that smart teaching methods can improve student learning.

This study uses Bayes theorem and logistic regression distribution as a method of teaching individual intelligence in a flipped classroom for teaching methods and investigates its effects on student learning, motivation and outcomes.

2.1 Teachers' movements and behaviour in video conferencing:

Teachers' movements and behaviours in video conferencing significantly impact student engagement, providing autonomy, competence, and relatedness support. Motivating behaviours include asking questions, encouraging problem-solving, providing constructive feedback, and developing positive relationships. Non-verbal cues like eye gazing, silence, and facial expressions can also enhance engagement. However, most current tools for measuring student engagement are designed for face-to-face learning environments. A systematic literature review identified 11 characteristics of engaging teaching videos, categorised into three themes: teachers' behaviours, movements, and use of technology. These indicators and characteristics are essential in improving student engagement in online learning environments. A comprehensive instrument is needed to measure these engaging teaching videos.

Main theme	Characteristics	Indicators
Teachers' Behaviours	Encourage Active Participation	• Encouraging students' participation in discussion • Encouraging students to share their knowledge and ideas • Encouraging students to ask questions • Encouraging collaborative learning activities • Encouraging meaningful interaction • Encouraging students to turn on their webcams
	Establishing Teacher Presence	• Clear and concise explanations of information • Recognising and considering learners' Individual differences • Using an appropriate style of presentation • Allowing sufficient time for students' information processing • Providing Learning resources • Giving clear instructions • Using a range of teaching strategies • Appropriate speed of lecture delivery
	Establishing Social Presence	• Maintaining constant teacher-student interaction • Encouraging student-student interaction (Peer collaboration) • Active and constructive communication • Taking on multiple roles
	Establishing Cognitive Presence	• giving students a sense of puzzlement (trigger) • providing opportunities for students to reflect

Main theme	Characteristics	Indicators
		(exploration) • leading students to think and learn through discussion with others (integration) • helping students apply knowledge to solve issues (resolution)
	Questions and Feedback	• Addressing students' questions & Providing prompt feedback • Asking for questions and feedback • Clarifying misunderstanding
	Displaying Enthusiasm	• Motivating students • Displaying positive emotion
	Establishing Clear Expectations	• Outlining the learning objectives • Outlining teachers' expectations of students' behaviours and responsibilities
	Demonstrating empathy	• Using appropriate changes in tone of voice • Ensuring the learning environment is a respectful, safe, and supportive one • Showing concern
	Demonstrating Professionalism	• Demonstrating in-depth and up-to-date knowledge • Displaying appropriate behaviours
Teachers' Movements	Using non-verbal cues	• facial expressions • gestures • eye gazes • silence • eye contact • physical proximity • appropriate body language
Use of Technology	Using technology effectively	• Screen sharing & Enabling Chat, Camera, and Microphone • Varying the presentation media • Providing technical support to students • Providing multiple communication channels • Providing interactive software tools • Enabling class recording for later review

2.2 AI and education:

Artificial intelligence is widely used to read and analyze text and videos in many applications such as medicine and education. Research has explored the effects of video quizzes on learning and interest. Researchers are also using artificial intelligence techniques such as computer vision and deep learning to process and document data. AI-EVL is an artificial intelligence for learning, searching and optimizing YouTube videos. Deep learning models such as Recurrent Neural Networks, Convolutional Neural Networks and Transformers have been used in image and video classification. OpenAI's ChatGPT is an AI-based tool that has gained a large user base, creating subscription plans with unlimited access and faster response times.

ChatGPT is a powerful educational tool with the potential to transform learning, but it also raises ethical concerns and biases. Teachers and students must develop the ability to understand the limitations and disadvantages of technology. Although it has many features, it should complement traditional teaching methods for general education. An educational approach that emphasizes thinking and researching facts is important. The latest version of ChatGPT, GPT-4, has multi-modal learning capabilities including video analysis. The LSTM model was used to predict student performance and problem-solving ability with an accuracy of 93%, outperforming other models. A deep neural network (DNN) model was also used to record the entire class and record student behavior in the classroom with 88.9% accuracy.

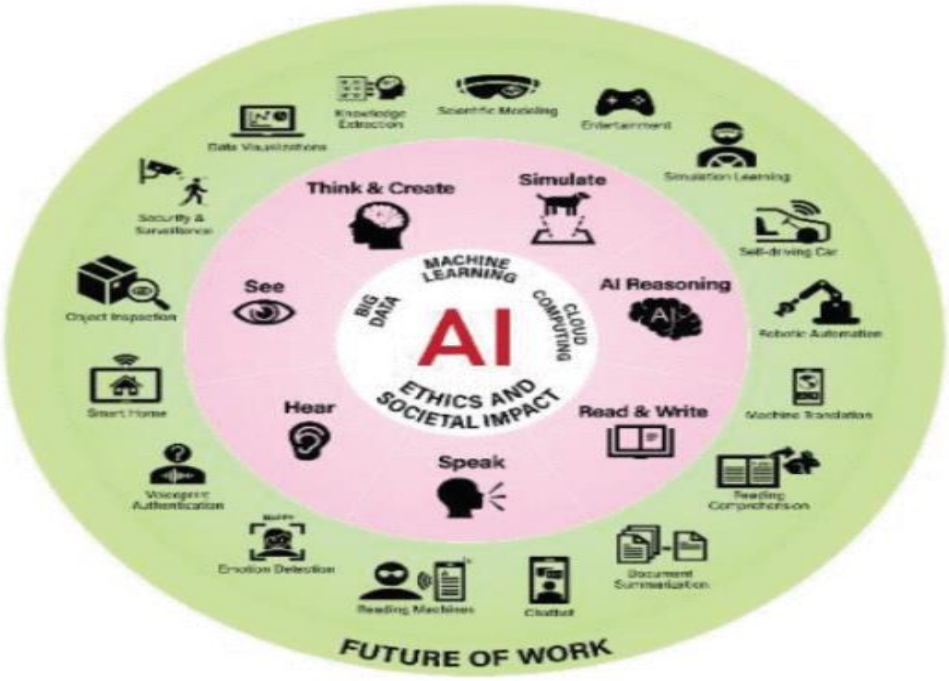
Bati et al. (2021) developed a free learning model to evaluate teachers' face-to-face teaching in the classroom and achieved 96.8%. This study highlights the importance of teacher training and behavior in increasing student engagement during online learning. However, there is a gap in AI research in identifying educational videos that can improve learning outcomes and student experience.

3. AI in Curriculum Development:

The pretertiary AI education initiative in Hong Kong faces three challenges: creating a foundational and specific AI curriculum, translating the initiative into practice with available manpower and resources, and addressing the varying needs of schools. The project aims to design a modular and reconfigurable curriculum structure that supports flexible learning pathways. The curriculum should be flexible, allowing teachers to adapt it to suit each student's personal and cognitive capacities. It should respect differences in learning methods and provide teachers with the flexibility to ensure content is appropriate for their students' needs and capabilities. The curriculum should foster teacher autonomy in designing classroom activities and school-based curriculums, leading, assisting, and encouraging each student.

3.1 Overview of the Co-Created Curriculum:

The infographic outlines the curriculum for AI, emphasizing its rapid advancements, ethical considerations, and societal impact. It covers various branches of AI, including perceptual machine intelligence, human language technologies, machine reasoning, and creative content generation. The outer circle in green shows potential applications supported by AI, with significant societal implications, particularly for the future of work. The curriculum emphasizes the importance of ethical considerations in AI applications.



The middle circle in pink showcases AI branches like perceptual machine intelligence, human language technologies, machine reasoning, problem-solving simulations, and creative content generation. The outer circle in green highlights potential applications supported by AI, with significant societal implications, particularly for the future of work.

3.2 Curriculum Framework:

The project has created a curriculum framework with 12 chapters and five levels of depth, covering topics such as introduction, fundamental concepts, AI branches, societal impact, ethical use, and future work transformation. These chapters aim to capture breadth and comprehensiveness, allowing teachers to choose content that fits their teaching objectives. For example, a teacher may cover only introduction and society chapters, and select branches of AI, but the curriculum remains coherent and self-contained.

Chapters	Descriptions
Awareness	Awareness of the history, background and development of various types of AI technologies (corresponding to different subsets of intelligence: machine perception, understanding, reasoning, etc.)
Knowledge	Identification of key concepts and the impact of AI through eye-catching, illustrative applications, especially usage contexts of local relevance.
Interaction	Experimentation of AI technologies in AI Lab
Empowerment	Acquisition of the abilities to design, develop and integrate component AI technologies into end-to-end systems.
Ethics & Impact	Exploration of AI topics and case studies to promote social good, illustrate transformative effects to the future of work, and reflect on ethical use of AI.

4. Educational Applications of AI:

AI plays a crucial role in education, particularly in e-learning and smart learning environments. The origins of automatic learning processes can be traced back to B.F. Skinner's teaching machine and programed learning, but there has been a significant evolution since then. In 2019, experts at the Beijing Conference agreed on the "Beijing Consensus on AI and Education," emphasizing the importance of promoting AI in education. Key actions include planning educational policies, empowering teachers and learners, promoting values and skills for life and work, offering lifelong learning opportunities, breaking digital barriers, encouraging equitable and inclusive uses, ethical and transparent use, and research, evaluation, and support innovation.

Real-world experiences around AI include Watson Tutor by IBM, the DSMLP (Data Science/Machine Learning Platform) from UC San Diego, Boost, a mobile app integrated with Canvas LMS, and the intelligent tool Edulai for assessing and developing soft skills. Despite ethical concerns, the higher education sector of AI applications related to teaching and learning is projected to grow significantly.

Another relevant report analyzes three areas: learning with AI, learning about AI, and preparing for AI. These experiences are generally related to tutoring or assessment.

4.1 AI for Tutoring:

Intelligent tutoring systems, developed in collaboration with human natural language processing and learning analytics, aim to provide high-quality feedback that complements or substitutes teacher actions. These systems provide personalized answers, making them relevant for a variety of complex tasks students can develop. AI will significantly impact personalized education through automated assistance, particularly in virtual interactions, with examples like Duolingo. Personalized tutoring feedback is particularly relevant in computer-based technologies, with gender differences in feedback efficiency.

IA has been shown to be useful in feedback, assessment, and formative evaluation, using machine learning and checklists. Santos and Boticario's Collaborative Logical Framework (CLF) uses AI to promote interaction, discussion, and collaboration in educational learning strategies, reducing teacher workload.

AI applications in higher education have shown support in various topics, such as geography, circuits, medical diagnosis, computing, and genetics. These intelligent tutors can be essential tools for improving online learning and assessment.

4.2 AI for Educational Assessment:

AI has been applied in various fields, including medicine, where it has been used to provide automatic feedback based on performance metrics. Mirchi et al. created a Virtual Operative Assistant to help students improve their performance. Janpla and Piriyasurawong analyzed the use of AI in e-learning environments and developed intelligent software for selecting questions for online exams. Saplacan et al. suggested that digital feedback should evoke positive emotions, while Samarakou et al. focused on continuous monitoring and assessment of engineering students. Rodríguez-Ascaso et al. focused on adaptive learning systems and self-assessment, combining a personalized system with self-assessment and learning objects for people with disabilities. They found that the procedure allows students to self-assess and report their preferences to access electronic learning materials, but encountered interaction problems

in some students with visual impairments. Overall, AI has shown potential in various applications, including improving communication between humans and machines.

4.3. Other Educational Uses of AI:

This study explores the practical application of AI in student assessment, focusing on its application in educational organizations, evaluation of educational quality, personalization of content for students, and prediction of academic achievement. It also discusses the potential of AI in promoting applications that cater to individual needs, such as chatbots, which can interact in real-time with users and provide personalized information. The research aims to provide a pedagogical framework for those interested in implementing AI for assessment, allowing them to build on previous research and make informed decisions about AI implementation in education.

5. AI in Personalizing education with the emergence of data-driven EdTech:

Personalizing education is an evidence-based approach in educational practice that focuses on individual learning abilities, requirements, and study goals. This customization can involve revision, reorientation, or reconstruction of a unified curriculum. Personalization helps eliminate learning difficulties of marginalized learners and enhances teaching and learning productivity. Education Technology (EdTech) has provided a tactile medium for personalization through data. In the late 1990s and early 21st century, EdTech was primarily focused on supplementing student learning through offline teaching formats. However, recent innovations in data analytics have provided a feedback system to the teaching-learning process, allowing for more comprehensive understanding of the most optimal learning environment. This approach has led to the use of data mining, Big Data, and related technologies to personalize education. Educational Data Mining (EDM) focuses on formulating algorithms to better understand the learning environment and make better predictions, while learning analytics focuses on efficiently using these algorithms. Success has been achieved by recording vast amounts of student responses to teaching techniques, content, and learning resources, analyzing this data for pattern recognition and building predictive models. The structural shift towards using Big Data, EDM, and learning analytics in education has led to immense possibilities for AI in the sector.

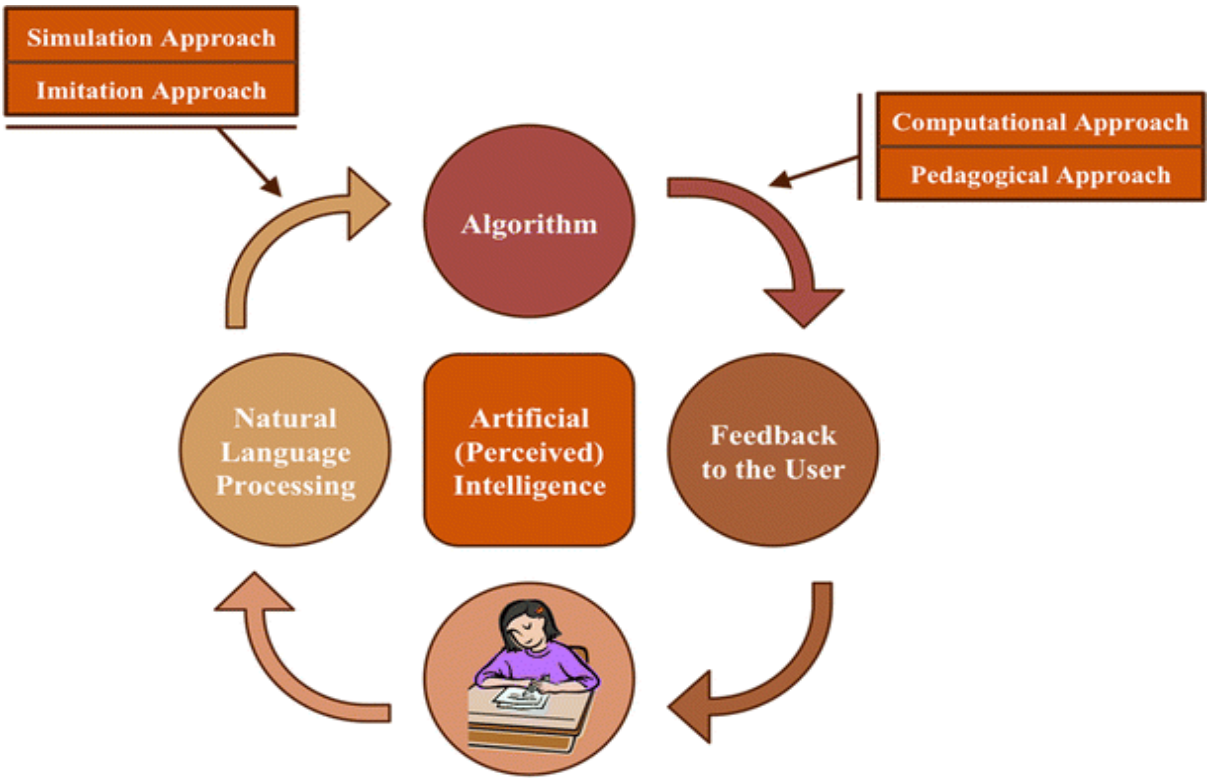
AI is being used in education to create interactive Personalized Learning Spaces (PLS) and Intelligent Tutoring Systems (ITS). These systems provide massified access to learning, eliminating geographic barriers and allowing students to learn from any location at their convenience. AI-driven adaptive iterations can also recommend learning plans based on AI-driven adaptive iterations. AI-enabled education has also been successful in language studies, with studies showing that AI companions enhance learning experiences. AI-powered education systems also contribute to improving pedagogical planning, with studies in Taiwan demonstrating that AI-driven systems reduce learning anxiety.

Learning management systems, learning companions, virtual reality, and intelligent tutors are all tools built on the essence of AI. These systems receive feedback, understand learners' needs, and prescribe suitable learning choices based on predictive algorithms. The existing literature acknowledges the need for AI EdTech to be more connected to the mainstream pedagogical structure of the education system globally. This review focuses on how AI infusion is shifting the educational paradigm and achieving personalization across the three biggest EdTech hubs: USA, China, and India.

5.1 AI in Natural language processing intelligent writing strategy tutoring system:

Natural Language Processing (NLP) is a crucial tool in Intelligent Systems (ITS) that address ill-defined areas like writing or dialogue interactions. Unlike ITSs that focus on well-defined domains, NLP algorithms interpret open-ended and potentially ambiguous user inputs. These systems, like the Writing Pal, use NLP algorithms to interpret user input and provide useful feedback. NLP algorithms are

developed based on artificial intelligence principles and can either simulate or imitate human processes. When aiming to simulate cognitive processes, variables or features are theoretically guided and constrained. However, when aiming to mimic human performance, variables or features may not have a priori theoretical connection to the underlying cognitive processes. For example, the linguistic or textual features used to mimic essay scoring may not necessarily be the same as those influencing human scoring processes. This may provide insight into human processes but not necessarily provide the same level of intelligence.



Writing quality is primarily related to the words and syntax in a text, not to the cohesive features. Automated essay scoring systems provide detailed feedback on lower-level essay features, such as syntax, grammar, and spelling. However, a recent meta-analysis of writing interventions by Graham and Perin (2007) found that feedback at lower levels, such as grammar and spelling, is ineffective. The most effective interventions were those that provided students with instructions on strategies for various stages of writing, such as planning, drafting, editing, and summarizing. The studies reviewed suggest that interventions should focus on writing strategies and seek to help students improve the structure and rhetorical quality of the essay, rather than improving grammar and spelling within an essay. This is particularly important for weak essays, as it is more productive to suggest strategies for elaboration or planning than correcting spelling. Providing feedback at the levels that lead to a more substantive essay is essential for producing higher quality essays.

5.2 AI in Intelligent Tutoring System Development:

Hepius is a new course that uses internal and external environments to provide periodic feedback and accelerate course completion. There are three main models: the field model, which organizes knowledge according to teaching content; standardized tests, which describe tests that measure a student's level of understanding; and a learning model that predicts students' outcomes compared to tests. While the domain model units of information consist of diagnostic hypotheses and diagnostic factors, the assessment model

compares each student's behaviour to a list of correct behaviours. The learning model is a Bayesian information tracking algorithm that uses the learner's performance in binary analysis to predict diagnosis across a series of experiments. Bayesian knowledge tracking is based on Hidden Markov Models (HMMs) and provides an estimate of the likelihood that a student will have a skill (such as understanding a medical condition or diagnosis) as a history student. The algorithm is implemented by the R package HMM.

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