EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2025): 8.57 ISSN: 2348 – 814X
Volume: 12 | Issue:4 |April 2025

CHATGPT AND THE EVOLUTION OF AI-POWERED TUTORING SYSTEMS

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Article DOI: https://doi.org/10.36713/epra21332
DOI No: 10.36713/epra21332

ABSTRACT
The rapid advancement of Artificial Intelligence (AI) has profoundly transformed educational practices through AI-powered tutoring systems. This review critically examines the evolution of such systems, emphasising the transformative role of OpenAI's ChatGPT. Leveraging large language models, ChatGPT provides adaptive, personalised, and scalable educational support, offering real-time feedback and fostering deeper learner engagement. However, its integration also introduces ethical, pedagogical, and technical challenges, including bias, academic integrity, and privacy concerns. This study synthesises findings from 50 key publications between 2020 and 2025 using a narrative review approach informed by PRISMA guidelines. The paper explores the theoretical foundations of AI in education, assesses student and teacher perceptions, and maps future research trajectories. Findings highlight the need for strategic implementation frameworks prioritising transparency, inclusivity, and responsible innovation to harness AI's full potential in educational contexts.

KEYWORDS: *Artificial Intelligence (AI), ChatGPT, Generative AI, AI-powered Tutoring Systems, Personalized Learning, Adaptive Learning, Educational Technology, Academic Integrity, AI Ethics in Education, Digital Learning Innovation, Cognitive Load, Student Engagement, Technology Acceptance Model, Constructivist Learning Theory, Future of Education*

1. INTRODUCTION
Artificial Intelligence (AI) continues to develop rapidly and has changed most industrial sectors, producing fundamental education reforms through AI-based tutoring technology. AI platforms use customisable educational interactions powered by behaviour tracking and individual requirements assessment to provide real-time feedback. According to Chen et al. (2024), the requirement for student-friendly educational resources transformed AI tutor systems into promising educational solutions for both formal schooling and self-learning environments.

OpenAI's ChatGPT represents an essential progress through its integration with large language models to deliver this result. This software leverages accurate natural language processing capabilities, as its training is derived from a vast array of content across multiple databases. The system shows competency in handling discussions with users while duplicating teacher responses that create flexible responses across various fields of education. Educational organisations implementing ChatGPT enable AI tutors to offer customised solutions that combine personalised explanations and evaluations as they respond to student-specific needs (Deng et al., 2024).

The widespread use of ChatGPT-like models in educational settings creates important ethical, technical, and pedagogical challenges for educational institutions. The systems show clear benefits for quality learning accessibility, yet generate three primary barriers through their introduction of biased patterns and questions regarding academic validity and student data protection security. The education sector is concerned about AI-driven academic dishonesty, but they emphasise the need to monitor their technological systems in classrooms, as noted by Wargo and Anderson (2024) and Enrollify (2024). Multiple complex and evolving impacts affect both teachers, educational organisations, and students in their learning processes, thus requiring integrated strategic thinking.

This review analyses AI-powered tutoring systems throughout their history, with a special focus on the transformative effect of ChatGPT. The essay examines fundamental areas, including adaptive learning, natural language interaction, personalised feedback, and learning analytics. It also covers theoretical bases, recent implementations, and ethical aspects. This investigation analyses recent research from 2024 and 2025 to enhance education research on AI technology effects while recommending future AI learning system development and deployment practices with responsibility.

1.1 Background Information

Artificial Intelligence (AI) with education produces revolutionary opportunities through which students receive instruction from teachers, who lead their instruction. During the last ten years, AI-powered systems have transformed from basic automation tools to advanced adaptive systems that deliver personalised instruction, real-time feedback, and maintenance of intelligent learning routes. ChatGPT by OpenAI is a prime example of the recent large language model (LLM) innovations that brought the AI tutoring system to a new stage of accessibility and interactive functionality and scalability (Deng et al., 2024; Zhai, 2023).

Educational institutions and learners derive significant advantages from the dialogue system of ChatGPT, which generates human-like interactions to deliver educational materials, elucidate complex subjects, and simulate realistic tutoring sessions. ChatGPT's web-based platform availability and API solutions have strengthened its adoption in educational institutions from schools to universities to self-learning environments (Chen, 2024). The development of ChatGPT leads to controversies about teaching methods, combined with digital equality issues, privacy concerns and academic standards violations (Wargo & Anderson, 2024).

The urgent requirement is to examine the fit of ChatGPT within the developing pattern of AI-powered tutoring systems alongside the analysis of the educational, technological, and ethical considerations.

1.2 Objectives of the Review Paper

This review paper is designed to achieve the following objectives:

1. To trace AI-powered tutoring systems' historical development and technological progression.
2. To examine the integration and application of ChatGPT within these systems across various educational contexts.
3. To identify and analyse the core features, strengths, and limitations of ChatGPT-enabled tutoring tools.
4. To explore the ethical, pedagogical, and social challenges of using generative AI in education.
5. To map future research trajectories and highlight opportunities for innovation and responsible implementation.

1.3 Research Importance

Educational institutions are swiftly shifting their operations towards complete digital learning, while AI-powered tutoring systems emerge as leading drivers of transformation. Due to ChatGPT and other generative AI tools, educational institutions combined with educators now have exceptional potential to improve personalised instruction, enhance student engagement, and increase lesson scale (Kasneci et al., 2023). The critical issues arising from these systems include quality assurance, academic integrity, educational equity, and the vital role of human educators.

The comprehensive review serves several key groups, including education professionals who need to implement AI technology in classrooms, electronic technology developers who aim to enhance their products, and governmental officials who must establish AI governance for learning facilities. The paper organises knowledge on ChatGPT and related systems to enhance understanding about how these systems transform educational practices.

1.4 Research Questions

To guide the scope and depth of this review, the following research questions were formulated:

1. **RQ1:** How have AI-powered tutoring systems evolved over the past decade, and where does ChatGPT fit into this trajectory?
2. **RQ2:** What are ChatGPT's educational benefits and pedagogical affordances when used as a tutoring tool?
3. **RQ3:** What are the primary technical, ethical, and instructional challenges associated with integrating ChatGPT in learning environments?

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4. **RQ4:** What emerging research trends, theoretical frameworks, and practical applications define the future of AI-powered tutoring systems?

2.0 METHODOLOGY

This study adopts a narrative review design to systematically explore and synthesise current knowledge regarding the evolution of AI-powered tutoring systems, specifically emphasising the integration and implications of ChatGPT in educational settings. Narrative reviews allow for in-depth interpretation and critical reflection, particularly suited for emerging, interdisciplinary topics that span education, computer science, and ethics.

2.1 Research Design

The review is guided by a PRISMA-informed process (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), adapted for narrative synthesis. Although this method does not constitute a systematic review in the strictest sense, it offers a structured approach for literature selection, screening, and synthesis. A PRISMA-style flow diagram (Figure 1) has been included to illustrate the filtering process from initial identification to the final inclusion of studies.

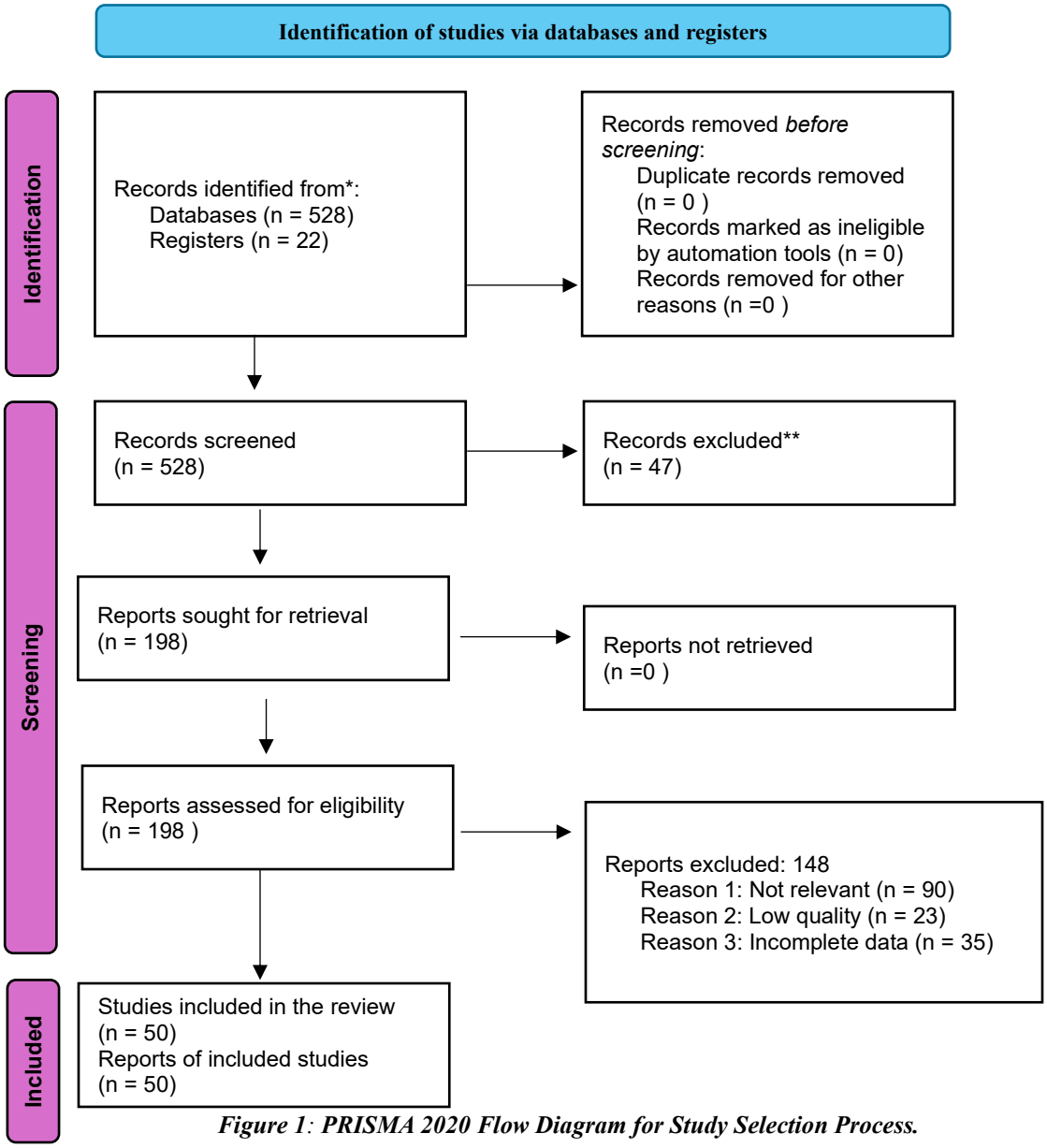


***Figure 1**: PRISMA 2020 Flow Diagram for Study Selection Process.*

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2.1.1 Search Strategy

A structured search was conducted in February–March 2025 across the following major academic databases:

- Scopus
- Web of Science
- Google Scholar
- ERIC
- SpringerLink
- IEEE Xplore

Peer-reviewed journal articles, reviews, conference proceedings, and preprints were considered. All records were exported and screened using a PRISMA-aligned funneling process.

Search Terms & Boolean Operators:

The search strategy combined free-text terms and controlled vocabulary. The main search string used across all databases was:

("ChatGPT" OR "Generative AI") AND ("education" OR "learning" OR "higher education") AND ("tutoring systems" OR "intelligent tutor" OR "AI-powered learning")

Additional synonyms and variations were tested to ensure comprehensive coverage.

2.1.2 Inclusion and Exclusion Criteria

Inclusion Criteria:

- Publications from January 2020 to March 2025
- Peer-reviewed journal articles, conference papers, or institutional white papers
- English language only
- Topics focused on ChatGPT**,** AI tutoring systems**,** adaptive learning**, or** AI ethics in education
- Empirical or theoretical relevance to educational contexts

Exclusion Criteria:

- Non-English language sources
- Duplicates and non-peer-reviewed content
- Articles focused exclusively on K-12 without AI integration
- Technical or engineering articles with no educational application
- News articles, blog posts, or opinion pieces without empirical data

2.1.3 Data Extraction and Synthesis

Following the initial retrieval of 528 articles, a multi-phase screening process was conducted:

A total of 50 high-relevance studies were selected for detailed analysis. Data extraction involved tabulating key details such as:

- Study objective
- Type of AI application (e.g., ChatGPT, other LLMs, adaptive engines)
- Educational setting (K–12, higher education, self-learning)
- Reported outcomes (engagement, performance, ethics, etc.)

The findings were then synthesized thematically**,** guided by four key research themes:

1. Adaptive Learning
2. Natural Language Interaction
3. Personalized Feedback
4. Assessment & Learning Analytics

2.1.4 Limitations

While this narrative review follows PRISMA-aligned rigour, it is not exhaustive. Several limitations should be acknowledged:

- **Language Bias**: Only English-language publications were included, potentially omitting valuable insights from non-English contexts.

- **Database Scope**: Although multiple databases were used, relevant studies in niche AI or education repositories may have been missed.
- **Publication Bias**: As an emerging topic, much of the research is in preprint or grey literature, which may lack peer-reviewed quality assurance.
- **Subjectivity in Interpretation**: Though mitigated through bibliometric validation, the thematic synthesis involves subjective coding and interpretation.

Despite these limitations, the methodology employed offers a robust, structured, and insightful foundation for understanding the evolving landscape of AI-powered tutoring systems and the role of ChatGPT in educational settings.

3.0 LITERATURE REVIEW

3.1 Overview of Generative AI in Education

Generative Artificial Intelligence (GenAI) is rapidly transforming educational environments by enabling the creation of personalised, interactive, and adaptive learning experiences. In contrast to conventional AI systems that follow set rules, GenAI, represented by models such as ChatGPT, has the capability to produce original content, mimic human conversation, and aid in activities like writing, summarizing, and resolving issues (Bahroun et al., 2024). This shift has allowed educators to experiment with AI-driven lesson plans, formative feedback, and content generation, often improving engagement and access.

The incorporation of GenAI brings forth multiple difficulties when it comes to usage. Shiwlani et al. (2024) explain that AI aids neurodiverse learners with cognitive scaffolding, but warn that this may lead students to reduce critical thinking skills because of their dependence on AI-generated answers. Wargo and Anderson (2024) identifies biased generated content as an ethical problem and discusses the lack of transparency in the algorithmic judgment process and privacy issues. Institutional GenAI adoption requires the resolution of ethical and pedagogical concerns to ensure AI supports educational leaders instead of becoming a replacement. Artificial intelligence transforms education through individual learning improvement, administrative process optimisation, and test evaluation system enhancement (Deckker & Sumanasekara, 2025a). GenAI stands as a promising technology advancement that needs strict regulation to enable its proper use in digital education systems of the future.

3.1.1 Historical Development of AI-Based Learning Tools

The evolution of AI-based learning tools reflects a broader shift in educational technology from rule-based instruction to intelligent, adaptive systems. Early forms of AI in education, such as Intelligent Tutoring Systems (ITS), were designed to mimic one-on-one tutoring through decision trees and structured feedback (Mishra, 2024). Although limited in flexibility, these systems laid the groundwork for current developments by demonstrating that technology could effectively support personalized learning. The emergence of machine learning and natural language processing has since enabled more dynamic platforms that adapt in real time to learner needs. Generative AI represents the latest milestone in this progression, offering tools that respond to input and generate novel content, explanations, and interactions (Illinois College of Education, 2024).

The key distinction between traditional AI and GenAI lies in creativity: while traditional systems follow preprogrammed responses, GenAI can simulate human-like conversation and autonomous reasoning. This historical trajectory underscores a shift from automation to augmentation, where AI enhances, rather than replaces, the teaching process. Understanding this development is critical to contextualising the role of contemporary AI tools like ChatGPT in today's classrooms.

3.2 ChatGPT and the Evolution of AI-Powered Tutoring Systems

OpenAI delivered ChatGPT as an essential step forward in developing AI-based tutoring solutions. ChatGPT from OpenAI does not follow scripted pathways like previous intelligent tutoring systems since it uses deep learning and transformer-based architecture to produce context-aware natural language responses in real time (Chen, 2024). ChatGPT uses human-like conversation abilities to create tutoring applications which formulate quizzes and generate essays alongside personalised explanations for different learner abilities. The ability to adapt naturally represents a major AI milestone towards becoming a supplementary tutor system within structured educational spaces and unstructured knowledge-sharing settings. Hardman (2024) points out that ChatGPT enables students to obtain easy

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access to knowledge, including curiosity development; however, the system presents pedagogical complications through excessive student dependency and possible avoidance of essential learning challenges.

The integration of ChatGPT within Microsoft Copilot Studio demonstrates increasing institutional interest in deploying generative AI features inside digital learning platforms. ChatGPT represents both a learning assistance tool and a catalyst for pedagogical changes that require the establishment of responsible AI-assisted education design protocols and educator monitoring practices.

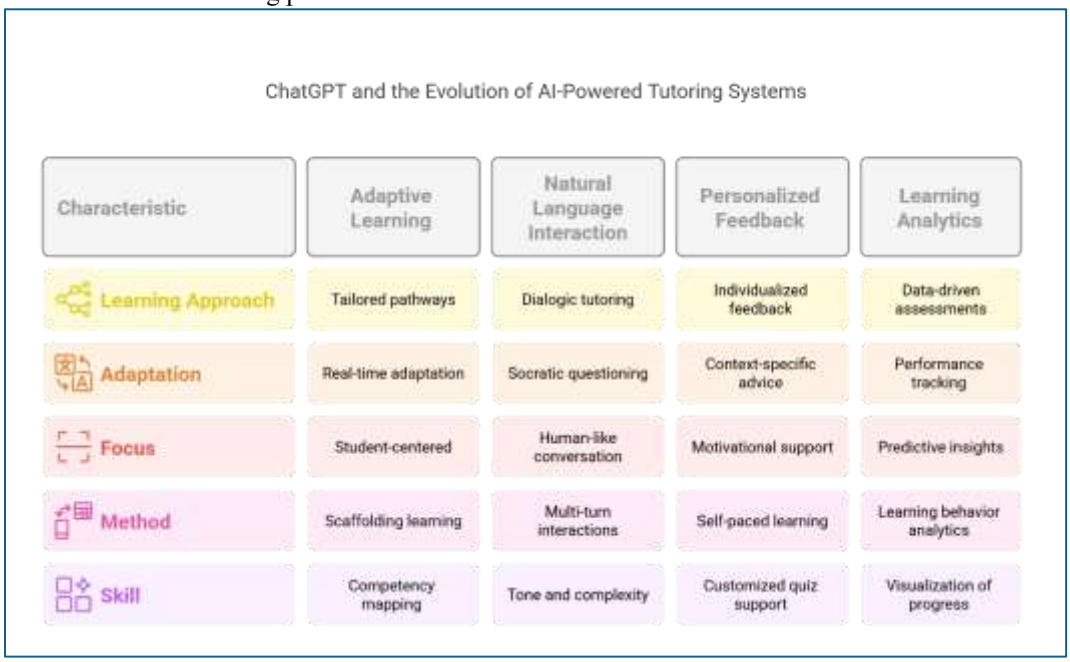


***Figure 2**: Characteristics and Functional Dimensions of AI-Powered Tutoring Systems across Adaptive Learning, Natural Language Interaction, Personalised Feedback, and Learning Analytics.*

3.4 Student Perceptions and Acceptance of AI in Learning

Educational achievement from implementing tools such as ChatGPT in student procedures depends fundamentally on student perceptions. Students show positive feedback regarding AI education because the technology delivers fast assessment results, tailored assistance, and enhanced student participation (Digital Education Council, 2024). Remote independent learners benefit from ChatGPT and comparable tools, which deliver immediate responses and accessible usage due to their apparent advantages. Nonetheless, concerns remain. In 2024, students from the Oregon State University Ecampus Research Unit voiced mixed opinions about the ethical implications of AI, along with their reliance on these technologies for enhancing critical thinking and fostering originality.

Students remain apprehensive about using AI at the assignment level because their educational institutions and instructors have failed to establish proper AI usage guidelines. Students need transparent information through digital competency and precise policy notes to create reliable relationships between students and educational institutions in AI utilization. The student perception of AI technology integration in education provides institutions with crucial information about enabling features and implementation challenges needed to develop student-aligned ethical learning solutions.

3.5 Impact of Generative AI on Study Habits and Learning Styles

Student behaviours related to academic tasks experience a significant change as ChatGPT offers innovative methods for engaging with content and educational techniques. These tools enable students to obtain immediate clarification features, summary support, and writing help that benefits students who need visualization and linguistic learning methods (University of Colorado Denver, 2024). Students achieve better productivity because of AI, yet they gain more self-assurance from using AI to clarify challenging subjects while planning their studies. Users encounter potential risks from using generative AI devices that give instant access to resources. Students risk developing a

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cognitive offloading condition when they use AI excessively, according to Abbas et al. (2024), as it causes them to avoid fundamental learning-related intellectual work.

Machine learning systems perform student thinking operations to influence critical thinking abilities, problem-solving functions, and metacognitive analysis performance. Different students obtain diverse learning benefits because each student has specific digital skill levels and unique learning styles. Implementing AI systems requires an educational framework guideline to realise their effective educational delivery. Educational professionals should instruct students about AI utilisation by demonstrating how to access positive benefits while maintaining essential active learning techniques. The implementation of GenAI systems influences both the beneficial and detrimental facets of contemporary student learning methods in the 21st century.

3.6 Academic Integrity and AI: Plagiarism, Cheating, and Ethics

ChatGPT, along with other generative AI tools, is facing significant challenges concerning academic integrity because they have gained popularity in educational settings for academic dishonesty and plagiarism. According to Yusuf et al. (2024), students frequently submit work generated by AI technologies. The research conducted by Eaton (2024) supports other scholars in advocating for institutions to revise their AI policy framework since AI threatens academic integrity by demanding specific guidelines for technology approval.

As identified by experts, AI detection tools face important challenges in their operational effectiveness. Perkins et al. (2024) studied current AI detectors, which prove inaccurate and easily manipulated through adversarial attacks, thus resulting in incorrect accusations of improper conduct. Academic evaluation tools must be cautiously deployed due to their unreliable operation. AI detectors encounter ethical issues as Cohney (2024) explains that these detectors can exhibit bias, particularly against non-native English speakers and neurodiverse students, which compromises fairness and inclusion in educational assessments.

Several educational professionals have started redesigning assessment formats to defend academic honesty. The researchers Kadel et al. (2024) present new educational methods which combine AI software with instruction to create ethical academic systems that benefit from this technology. The proposed method presents a future wave of assessment implementation that tests students' mastery of knowledge and proficiency in both AI ethical norms and technology effectiveness.

3.7 Teacher Perspectives on AI Integration in the Classroom

Implementing Artificial Intelligence in educational institutions causes educators to express a wide range of emotional responses from optimism to apprehension. Research findings show how teaching staff view AI technology inside education environments. British-Australian research with 1,754 educators from Greece, Hungary, Latvia, Ireland and Armenia showed that teachers understand AI benefits for personalized learning yet exhibit major reservations about its impact on critical thinking and ethical concerns (Daskalaki et al., 2024).

The South Korean study conducted by Oh and Ahn (2024) examined the automation of administrator tasks and personalized teaching features of AI through surveys with 100 elementary school teachers. AI systems have strengths and weaknesses when it comes to social and emotional capabilities, which leads teachers to maintain a belief that human interaction remains vital within educational settings.

Shamsuddinova, Heryani, and Naval (2024) examined GCC country education professionals in their study, which resulted in a combination of hopeful and measured responses from 11 participants. Educational professionals accepted AI's future transformation capabilities in teaching, yet insisted on proper education and sufficient resources for achieving successful execution.

Ghimire et al. (2024) studied university instructor attitudes toward generative AI tools by assessing their reception to these technologies, which led to mostly favourable results. The study states that successful widespread acceptance requires proper attention to perceived usefulness and ease of use factors.

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Educators understand AI offers promising educational potential, yet they demand professional training with ethical rules and system support for AI applications to enhance educational value.

3.8 Personalized Learning and Adaptive Feedback through ChatGPT

The educational implementation of ChatGPT has brought major developments to learning personalisation and feedback adaptation. The educational content processing capabilities of ChatGPT enable it to personalise learning materials for individual student needs, thereby enhancing student retention and learning outcomes. The framework created by Kuzminykh et al. (2024) enhances ChatGPT functionality through embedding technologies to analyse educational content effectively and create specific feedback for quizzes that maintains high levels of productivity at 90% to 100%. According to the review results, ChatGPT demonstrated its ability to customise feedback for educational assessments by achieving a 90% success rate in open-ended questions and a 100% success rate in multiple-choice formats.

Coban et al. (2024) studied merging AR (augmented reality) quantum cryptography experiments with feedback generated by ChatGPT. The article describes how ChatGPT provides individualised comments that optimise student learning outcomes by directing students to crucial educational aspects in their work based on research evidence. The result showed that artificial intelligence review methods and educational spaces enhanced learning outcomes.

Deploying ChatGPT for personalised learning creates various obstacles when introducing this technology for educational purposes. According to Maity and Deroy (2024), the three essential pedagogical challenges related to AI content biases exist with accuracy issues and the maintenance of student engagement. The authors emphasise that integrating ChatGPT properly with ITS systems will lead to practical application with existing educational protocols.

Student learning experiences that utilise ChatGPT generate vital questions regarding its ethics. Users must develop trust with educators through data privacy management and unbiased treatment of AI-made responses, as well as AI-based educational systems that present their operations in a transparent fashion. Firms need to evaluate all possible advantages as well as possible drawbacks before selecting ChatGPT for their adaptive feedback system and personalised learning solution.

3.9 Cognitive Load, Attention, and Engagement with AI Tools

The instructional tools based on Artificial Intelligence (AI) affect three vital aspects of learning spaces: cognitive load management, student engagement, and classroom interaction patterns. AI performs double functions as a generative technology when controlling cognitive mental workload because its design issues either enhance or decrease user mental strain. According to Cognitive Load Theory, eliminating irrelevant cognitive burdens in practical AI tools makes students learn more efficiently because the tools focus on essential knowledge (Macedo et al., 2023). System complexity and experimental characteristics of AI tools generate novel mental obstacles that create performance overload for users whose designers fail to implement proper management systems.

Research conducted within academia reveals that educational environments which employ AI technology produce heightened learner participation mainly because AI generates personalised, adaptive lessons. AI technology delivers platforms with real-time feedback components that provide customised content to achieve higher student participation rates while driving better engagement levels (Sajja et al., 2023). Student critical thinking abilities diminish when AI technologies exceed acceptable use in education systems (Gerlich, 2025).

Mental workload management, together with focus sustainability, depends on the proper selection of AI user interface designs. The interface elements of multimedia learning principles and built-in simplicity enable users to process knowledge effectively and prevent information from overwhelming them (Macedo et al., 2023). Educational staff must collaborate with developers to study AI tool cognitive patterns so they can boost positive outcomes while minimising negative effects.

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3.10 Comparison Between Traditional Learning and AI-Assisted Learning

Researchers explore AI-assisted educational methods against traditional teaching practices due to AI integration in academic environments. Research has shown that AI-assisted learning provides substantial benefits regarding student customization and interest level enhancement. Cha and Daud (2025) studied AI-assisted educational tools in early childhood classrooms, which improved student interaction and educational outcomes more effectively than traditional teaching approaches. Research by Xu et al. (2025) showed that students learned second languages effectively using AI assistance, which produced a significant positive outcome (d = 1.167) that specifically benefited their vocabulary acquisition and development of new receptive skills.

Various experts express doubts about how AI may negatively affect educational settings. According to Edutopia (2025), a research study shows AI tools such as ChatGPT enhance test performance but simultaneously lead to long-term adverse effects on understanding retention. Bastani et al. (2024) studied how high school students who got AI assistance to study for their math exams received worse results on real tests than students who did not use AI.

Al-Mamary et al. (2024) studied AI-based language training versus traditional educational methods in their research about language acquisition. Their findings showed that AI can contribute to learning development, but students should not entirely depend on AI to prevent their skills from deteriorating.

Aspect	Traditional Learning	AI-Assisted Learning
Personalisation	One-size-fits-all approach; limited adaptation to individual needs.	Highly personalised pathways through real-time adaptation (ChatGPT).
Feedback	Delayed and mostly manual feedback from instructors.	Instant, automated, and customized feedback.
Student Engagement	Variable engagement; it depends heavily on instructor methods.	Increased engagement through interactive AI dialogues.
Critical Thinking	Emphasizes critical thinking via human discussion and inquiry.	Risk of cognitive offloading if AI is overused (Abbas et al., 2024).
Learning Pace	Fixed pacing is problematic for individual learners to adjust.	Self-paced learning environments guided by AI feedback.
Assessment Method	Teachers design traditional exams, essays, and quizzes.	AI-assisted formative assessments, adaptive quizzes.
Access to Resources	Relies on physical materials and human instruction.	24/7 access to AI-generated explanations, summaries, and tutoring.
Academic Integrity Risks	Lower; easier to detect plagiarism manually.	Higher risk with AI-assisted content generation (Yusuf et al., 2024).
Social Interaction	High fosters peer collaboration and emotional skills.	Limited emotional intelligence; needs human augmentation.
Equity and Accessibility	Varies widely, depending on local education quality.	Can improve access, but digital divides still exist (OECD, 2024).

Table 1*: Comparison Between Traditional and AI-Assisted Learning Approaches.*

The pinnacle of student success in education occurs when traditional teaching methods are integrated with AI technologies. When sufficient attention is paid to integration-related challenges, AI implementation in education will lead to improved outcomes.

3.11 Accessibility and Equity in AI-Based Education

Incorporating Artificial Intelligence in education creates substantial learning opportunities for all students through superior learning environments. The Artificial Intelligence delivery system provides personalized education by tailoring content to specific needs, thus building more inclusive classrooms for disabled students (Gibson, 2024). AI-powered tools enable teachers to modify the learning materials' difficulty level, language types, and delivery speed in real time for students with learning disabilities (Pozdniakov, 2025).

Implementing AI technology continuously raises doubts about its effects on equal treatment and social inclusion standards. The OECD (2024) shows that AI systems using algorithms tend to intensify educational inequalities because

training data inputs tend to contain societal prejudices. The absence of equal access to internet infrastructure and digital networks stops students from disadvantaged regions from attaining equal benefits from AI educational programs (Fink, 2024).

The resolution of these inequality issues needs ethical and fair design priorities. The application of AI in education demands fairness alongside open system operations and contextual adaptability, while simultaneously requiring training data to contain diverse information and system design to demonstrate cultural awareness according to Pozdniakov (2025). Educational inequality can grow instead of diminishing when proactive measures are not implemented to manage AI-based education systems.

3.12 Regulatory and Institutional Responses to AI in Education

Educational institutions are quickly developing policies to guide the implementation of Artificial Intelligence (AI) in their settings. Interviews with An et al. (2025) revealed key topics from 50 U.S. university GenAI guidelines related to educational integration and assessment practices, ethical frameworks, and academic professional standards. Different policies toward GenAI emerged from guidelines used to target faculty members and students in educational institutions.

A study conducted by McDonald et al. (2024) reviewed 116 documents from U.S. universities and discovered that most organisations backed GenAI adoption by providing extensive directions about its classroom integration. The research team warned that extensive transformations of educational teaching methods might create excessive workload challenges for academic personnel.

Using the Diffusion of Innovations Theory, Jin et al. (2024) studied how universities across six regional areas adopted GenAI technology. These findings prioritised academic integrity alongside teaching enhancement programs and equity measures that demanded policy structures and communication methods to succeed.

According to Ghimire and Edwards (2024) who studied 102 high school principals and higher education provosts there exists a significant policy void because most institutions do not have specific guidelines for AI deployment ethics. The administrative staff understood that developing these policies became essential for protecting student safety, together with reducing plagiarism incidents.

Research data demonstrates how educational institutions must create ethical policy frameworks to effectively handle AI integration challenges.

3.13 Challenges and Limitations of Generative AI in Academic Settings

Academic institutions need strategic evaluation processes for GenAI implementation because it entails numerous challenges and restrictions. The main academic ethical standard violations stem from GenAI technological adoption. The ease of AI content generation tools creates conditions that make students tend toward academic dishonesty by substituting their work with AI-generated texts, thus damaging evaluation results, per Yusuf et al. (2024).

Implementation challenges in AI technology increase substantially because of unreliable detection system performance rates. Current AI detection systems, according to Perkins et al. (2024), demonstrate failure as adversaries can easily circumvent them, leading to wrongful allegations of academic misconduct. The detection systems for academic evaluations need deliberate methodologies because they demonstrate unreliable results.

AI detectors present ethical dilemmas, per Cohney (2024), because some detection models choose to check the work of non-native English speakers more frequently and work from students with neurological differences, thus violating assessment inclusiveness and equality in education.

GenAI presents promising educational possibilities, yet its deployment needs thorough monitoring. It modifies academic ethics and requires balanced assessment processes and instructional method adjustments that emerge from technological progress.

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3.14 Review of Relevant Theories

The proper application of design and technology adoption theories explains how Generative Artificial Intelligence (GenAI) operates in educational use. The Constructivist Learning Theory indicates that knowledge generation occurs when students actively analyse their learning experiences and become involved in their educational activities. GenAI facilitates testing platforms that enable students to find knowledge within AI-created answers provided by the systems (Pozdniakov, 2025).

Social Constructivism establishes a connection between GenAI and learning by enabling the simulation of conversations and group tasks. The learning partnership between students and ChatGPT allows them to develop knowledge together during peer interactions (Pozdniakov, 2025).

Research about the impact of AI interfaces on working memory continues to use approaches developed by cognitive load theory (CLT) in this field. The appropriate implementation of GenAI application systems simultaneously reduces unnecessary mental effort and enhances meaningful information processing, resulting in efficient operational outcomes (Macedo et al., 2023).

Users decide to use AI tools because of the framework described in the Technology Acceptance Model (TAM). Students and educators accept GenAI educational tools because they evaluate them as beneficial and equally accessible (Jin et al., 2024).

Through various analysis methods based on these theories, educational institutions gain insights into how Generative Artificial Intelligence affects contemporary educational procedures.

3.15 Theoretical Implications

The rising interest in generative AI prompts several inquiries regarding educational theory, despite new educational applications indicating positive advancements. Students who rely on GenAI outputs for passive learning do not develop their educational processes or knowledge by directing their education development according to constructivist theories (Pozdniakov, 2025).

AI systems face challenges in genuine human communication reproduction because social constructivist theories focus on conversation-based team settings. AI platforms without emotional capabilities make it harder for student populations to improve their social communication skills and their ability to empathize (Pozdniakov, 2025).

Interface design for GenAI systems will determine whether cognitive load increases or decreases based on Cognitive Load Theory. Students experience excessive workload from unsupportive decision trees and commentary in poorly implemented AI tools unless they receive training to understand AI information (Macedo et al., 2023).

According to TAM models, the successful implementation of GenAI depends on users developing positive attitudes and trust because this factor facilitates complete collaboration. According to Jin et al. (2024), ineffective institutional steering and insufficient training made AI tools less effective in research for faculty members and students.

Genai requires pedagogical integrity, technical design, and appropriate policy establishment to stop adverse consequences from materialising.

4.0 FUTURE DIRECTIONS

Integrating Generative Artificial Intelligence (GenAI) into education is rapidly evolving. Future research must concentrate on several key areas to fully understand and utilise its potential:

- **Longitudinal Studies**: Examining the long-term effects of GenAI on student learning outcomes and cognitive development.
- **Intervention Studies**: Assessing the efficacy of specific GenAI applications in educational settings.
- **Ethical Frameworks**: Developing comprehensive guidelines to ensure responsible and equitable use of GenAI in education.

EPRA International Journal of Environmental Economics, Commerce and Educational Management
Journal DOI: 10.36713/epra0414 |ISI I.F Value: 0.815|SJIF Impact Factor (2025): 8.57 ISSN: 2348 – 814X
Volume: 12 | Issue:4 |April 2025

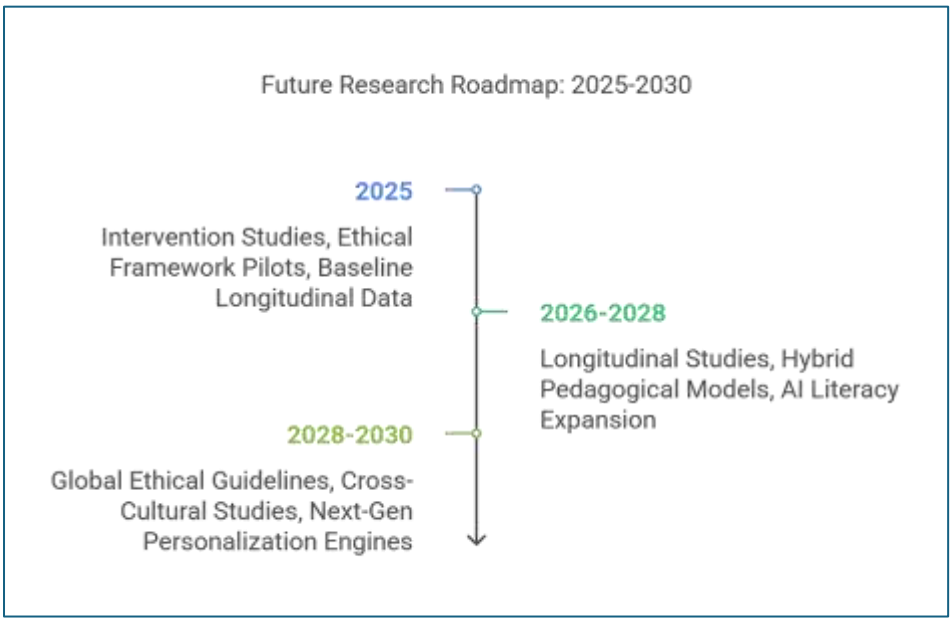


Figure 3 : Future Research Roadmap for the Development and Ethical Integration of AI-Powered Tutoring Systems.

4.1 Longitudinal Studies

More prolonged research must be conducted on GenAI education to determine its effects on student performance, brain development, and academic competencies. Wang et al. (2024) and van Niekerk et al. (2025) explain that researchers need prolonged research periods to study the enduring consequences that continuous GenAI interactions produce on knowledge retention and critical thinking capacities. Roe & Perkins (2024) emphasise that evaluating student academic evolution enables faculty members to determine the role of Genai tools in long-term educational development. Research designs implemented in this manner will produce valuable findings which explain both the enduring effects of GenAI technology and its constraints within educational settings.

4.2 Intervention Studies

The evaluation process for GenAI applications in educational contexts requires intervention-based studies to establish their success rates. The research done by Roe & Perkins (2024) tracked student GenAI tool usage across 12 months and established improved problem-solving capabilities together with enhanced student engagement. Bura & Myakala (2024) implemented ChatGPT for active learning that improved writing competencies and boosted student confidence in academic assignments. Academic leaders must find dedicated teaching strategies to establish successful GenAI system usage in education and measure related student learning outcomes.

4.3 Ethical Frameworks

Educational implementations of Genai call for powerful ethical guidelines because of their quick spread in the field. Swindell et al. (2024) established a five-step ethical framework that combines multiple layers for educational AI deployment, which protects student rights while promoting fairness according to ethical principles. Wynants et al. (2025) established the ETHICAL Principles AI Framework for Higher Education because it enables adjustable standards for AI responsibility within multiple academic situations. Genai frameworks exist to solve privacy-related issues as well as eliminate bias and ensure equitable benefit distributions to foster educational integrity and equity.

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Category	Description	Key Sources
Core Ethical Principles	-Fairness: Avoid algorithmic bias. -Transparency: Explainable AI processes. -Privacy Protection: Secure and ethical data handling. -Inclusivity: Ensure accessibility and cultural sensitivity. - Accountability: Maintain human oversight and responsibility.	Swindell et al. (2024); Wynants et al. (2025)
Application Guidelines	-Develop clear AI usage policies. - Provide AI literacy and ethics training for students and teachers. - Implement content moderation and bias mitigation strategies.	Swindell et al. (2024)
Long-Term Goals	-Institutional governance frameworks for AI in education. -National and international regulatory standards. - Development of ethical accreditation systems for AI tools.	Wynants et al. (2025)

***Table 2**: Ethical Framework Summary for the Implementation of AI-Powered Tutoring Systems.*

5.0 DISCUSSION

This section presents the main review outcomes linked to the research questions mentioned in Section 1.5. Based on analyses of reviewed publications, this discussion reviews the educational, technological, and ethical effects of implementing ChatGPT into AI-powered tutoring systems.

5.1. RQ1: How have AI-powered tutoring systems evolved over the past decade, and where does ChatGPT fit into this trajectory?

AI-powered tutoring systems have achieved this in stages, starting with basic rule-based models, then shifting to adaptive platforms based on large data sets. The earliest intelligent tutoring systems functioned with basic flexibility by operating through fixed, predefined paths (Mishra, 2024). Modern tutoring systems employ machine learning alongside natural language processing to analyse better learner behaviour, which enables them to create individualised assistance. ChatGPT is the current peak in this developmental line because it uses generative technology to generate interactive learning content that responds to specific learner contexts (Chen, 2024). The fundamental advantage of ChatGPT over previous versions consists of its online human-like interaction capabilities that adapt based on user needs regarding tone shift, complexity, and structural elements. ChatGPT functions as a pedagogical shift in addition to its technological role by moving beyond automation to augment AI tutoring.

5.2 RQ2: What are the educational benefits and pedagogical affordances of ChatGPT when used as a tutoring tool?

ChatGPT offers several educational benefits, including personalisation, accessibility, and engagement. Natural language processing enables this tool to conduct Socratic dialogues and deliver real-time feedback to build student comprehension (Kuzminykh et al., 2024). Placed inside educational platforms the system can help different students by offering flexible assistance which follows the learning principles of constructivist and social constructivist approaches (Pozdniakov, 2025). Multiple research investigations document how ChatGPT enhances both student learning performance and drives better educational engagement (Coban et al., 2024). However, its effectiveness is contingent upon responsible design and usage. Instructors must actively guide AI interactions to ensure they complement, not replace, authentic learning and critical engagement.

5.3 RQ3: What are the primary technical, ethical, and instructional challenges associated with integrating ChatGPT in learning environments?

While ChatGPT has its advantages, it also presents numerous challenges. Key technical issues comprise limitations in content accuracy, possible biases in training data, and the danger of excessive dependence (Maity & Deroy, 2024; Abbas et al., 2024). Ethically, the widespread use of ChatGPT raises questions about academic integrity, plagiarism, and data privacy (Yusuf et al., 2024; Perkins et al., 2024). Detection tools used to identify AI-generated content are often inaccurate and biased, which may unjustly affect certain student groups (Cohney, 2024). Instructionally, educators face the dual challenge of adapting pedagogical strategies to incorporate AI while maintaining meaningful learning experiences (Kadel et al., 2024). These multifaceted challenges require comprehensive ethical frameworks, clear institutional policies, and professional development for educators.

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5.4 RQ4: What emerging research trends, theoretical frameworks, and practical applications define the future of AI-powered tutoring systems?

Research development follows the principles of Constructivism and Cognitive Load Theory and the Technology Acceptance Model to establish an advanced framework for studying learner AI tool usage (Jin et al., 2024; Macedo et al., 2023). Educational institutions currently adopt ChatGPT integration within their learning platforms for system management, peer evaluation technology and assessment evaluation systems. The deployment of AI systems requires transparent frameworks according to Swindell et al. (2024) and Wynants et al. (2025), along with the simultaneous requirement for equitable and inclusive systems. The educational benefits of ChatGPT will be fully realised with proper implementation based on theoretical foundations.

6.0 CONCLUSION

Educational organisations keep implementing generative AI tools and ChatGPT into their classrooms to transform teaching methods at a historic pace. The research investigated how AI tutoring systems have evolved while examining the changes introduced by ChatGPT, and assessing its educational consequences for teachers and students. The research study specifies multiple barriers to educational technology adoption related to personalised correction programs and automatic student learning pathways, while discussing academic integrity concerns with their impact on equal educational opportunities.

The experts discuss AI by showing its major practical importance and issuing recommendations about the responsible usage of this technology. The implementation of ChatGPT should align with conditions that embrace scholarly design under ethical foundations, as well as evidence-derived practice for improving student accessibility, engagement, and scalability. The future development of generative AI for education will establish responsible frameworks because of initiatives which combine inclusive accessibility with effective transparency methods alongside human-AI teamwork. A balanced approach is needed to create a digital landscape that prioritises technological advancement and cognitive integrity (Deckker & Sumanasekara, 2025c).

6.1 Summary of Key Findings

Research Question	Key Findings
RQ1: Evolution of AI tutoring systems	Shifted from rule-based ITS to dynamic generative models like ChatGPT, enabling real-time, adaptive, and natural interactions (Chen, 2024; Mishra, 2024).
RQ2: Educational benefits and pedagogical affordances	ChatGPT supports personalised learning, immediate feedback, and engagement but must be guided to avoid overreliance (Coban et al., 2024; Pozdniakov, 2025).
RQ3: Challenges in integration	Challenges include plagiarism, data bias, AI detection reliability, and instructional complexity (Yusuf et al., 2024; Cohney, 2024; Kadel et al., 2024).
RQ4: Emerging trends and future applications	Emphasis on longitudinal/intervention research, theory-driven frameworks, and institution-wide ethical policies (Wang et al., 2024; Swindell et al., 2024).

Table 3**: **Summary of Key Findings

6.2 Call to Action

Educators, institutions, policymakers, and developers should transition from using generative AI as a passive tool for education to implementing intentional AI integration across educational settings. This includes:

- **Educators**: Redesigning assessments and instructional strategies to leverage AI's benefits while preserving human-centred learning principles.
- **Institutions**: Implement transparent, equitable policies for AI use and invest in digital literacy training for staff and students.
- **Researchers**: Conducting longitudinal and experimental studies to generate evidence on long-term impacts, equity outcomes, and pedagogical effectiveness.
- **Developers**: Creating AI tools grounded in ethical design, inclusive datasets, and user-centred interfaces that empower rather than replace human agency.

Only through collective and collaborative efforts can generative AI tools like ChatGPT be used to digitise learning and transform it meaningfully and responsibly.

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