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Exploring the Potential of ChatGPT to improve experiential learning in Education

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ABSTRACT

Artificial Intelligence (AI) is revolutionizing the field of education by offering new possibilities for personalized and experiential learning along with data-driven insights. The advancement in AI to Generative Artificial Intelligence (GAI) has made the tables turn notably in the field of education. Generative AI application tool ChatGPT is emerging as a game changer offering personalized learning experiences by analyzing huge amounts of student data, generating study materials and pacing to individual needs. Intelligent educational tools powered by AI provide personalized guidance and feedback, adapting to curriculum to address knowledge gaps. GAI also automates the grading process, providing instant feedback and relieving teachers for qualitative assessments. This research paper offers a thorough examination of the potential uses, advantages, difficulties, and moral issues related to implementing ChatGPT in educational contexts. The authors closely analyze how ChatGPT can improve educational experiences, assist personalized learning, and encourage student- teacher interaction, while exploring the drawbacks of using generative AI models in education, such as concerns about bias, data privacy, and over-reliance on technology. This research article intends to offer educators & academicians useful insights into the usage of ChatGPT in the educational field through a critical analysis of the existing literature and real- world experiences.

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KEYWORDS

Generative Artificial Intelligence (GAI), OpenAI, ChatGPT, Natural Language Processing, Teaching & Learning, Education

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1 INTRODUCTION

Education is one of the many industries where GAI is rapidly growing its usage. ChatGPT is a popular GAI based Large Language Models (LLM) that has attracted a lot of attention recently. A generative AI model called ChatGPT, created by OpenAI, can generate texts and conversation that imitates human linguistic and conversing skills. There is a grave need of examining its position in the education sector prompted by its capacity to comprehend doubts and react with coherent and contextually relevant answers. The GAI is a useful tool to create opportunities for interactive learning experiences. It can act as a virtual educator that provides personalized help, criticism, and direction. By incorporating GAI in education, active learning may be facilitated, concept comprehension could be improved, and student engagement could be raised. Educators can also benefit from ChatGPT's assistance in a number of areas. It may be used to create educational materials, respond to inquiries from students, and offer on-the-spot support during group projects [3]. This paper will explore the potential uses of ChatGPT in the fields of personalized learning, language learning, content development, and student support [14]. The research study probes closely at its advantages, such as better accessibility, increased student participation, and effective knowledge imparting. Further, the cons are also investigated such as potential biases, privacy concerns, and ethical considerations.

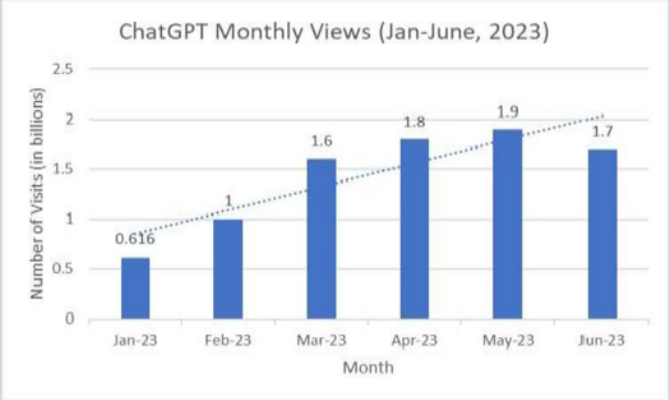

Figure 1: Monthwise representation of ChatGPT access [10]

The researchers review the scenario and seek to add value to ongoing discussions of AI integration in education by offering a thorough analysis of ChatGPT's role. This assessment of GAI's role would facilitate educators, decision-makers, and researchers with insightful information on how to use ChatGPT to improve teaching and learning experiences [5]. The study conducted on chatbot illustrates that students performed better academically comparing to those who interacted with the course instructor [1]. This study described that use of artificial intelligence (AI) chatbot improves student academic performance. As per the latest statistics on ChatGPT, it has over 1700 million users globally. The monthly statistics of ChatGPT monthly usage is shown Figure 1. The growth has reached different benchmarks starting from millions to billions in a short span of time. The potential increase in popularity of ChatGPT may be estimated from the percentage change observed in website visits.

The research paper is organized in following sections. It begins with stating the challenges of ChatGPT, opportunities, potential applications & limitations of the research. Subsequently literature review section describes present state of art in the field. After reviewing literature the result & discussion follows with tables, graphs & figures to present data findings effectively including commenting on relevant statistical analysis of results. Lastly Conclusion summarizes pivot findings of our review study and discuss potential future research directions.

1.1 Challenges in Education Sector

Despite the fact that Generative AI has a lot of potential advantages for the education sector, there are a few obstacles that must be carefully evaluated and overcome in order to be implemented. These challenges are as follows:

1. Accuracy and Reliability: The responses produced by GAI are based on instances and patterns in its training data.
2. Lack of Emotional Intelligence: Although it is excellent at producing text-based responses, it lacks emotional intelligence and fails to understand emotions or psychological state of students.
3. Limited Understanding of Context: When asked complex or domain-specific questions, it could give generic or incomplete answers.
4. Overreliance on Technology: its usage encourages overreliance on technology. Ahuman educator's value may be diminished by the desire to substitute AI generated responses for interpersonal communication and individualized instruction.
5. Ethical Considerations and Data Privacy: Using GAI requires collection of personal information which can cause data privacy and security issues.
6. Continual Model Improvement: ChatGPT is a dynamic model that can improve from ongoing user feedback-based development.

A multi-faceted strategy involving cooperation between researchers, educators, politicians, and AI developers is needed to address these issues. There is a strong need of following suggestions to combat above given challenges: Strong model training procedures, data curation to reduce biases, contextual understanding development, and continuous monitoring and improvement.

1.2 Opportunities in Educational Environment

There are a number of exciting prospects to improve teaching and learning processes with the implementation of GAI tools in educational sector. It can benefit a variety of fields by utilizing its capabilities listed below:

1. Personalized Learning: By adjusting to the specific needs and interests of each student, ChatGPT has the ability to offer personalized learning experiences. Based on the particular learning preferences, learning pace, and past knowledge of each learner, it can provide customized explanations, examples, and feedback.
2. Accessible Education: ChatGPT offers inclusive educational experiences that can aid in addressing accessibility issues. It can help students who have special needs or impairments by giving alternate formats, enabling text-to-speech functionality, or by adapting the curriculum to meet those needs.
3. 24/7 Support: In order to encourage independent learning and lower barriers to advancement, students have access to immediate assistance and coaching on assignments, homework, or conceptual clarifications.
4. Language Learning and Communication Skills: ChatGPT is an effective tool for learning languages and enhancing communication skills because of its conversational capabilities. It can facilitate meaningful communication between students, give them language practice, and provide immediate feedback on pronunciation, grammar, and vocabulary.
5. Teacher Professional Development: By giving access to a huge collection of educational resources, research articles, and pedagogical advice, ChatGPT can aid in teachers' professional development.
6. Collaboration and Group Learning: Collaborative learning opportunities are made possible by ChatGPT's capacity for conversational exchanges. It can foster peer-to-peer learning, group debates, and knowledge exchange among students.

7. Intelligent Feedback and Assessment: This platform can provide insightful comments on student work by pointing out faults, making ideas for improvement, and giving thorough justifications.

1.3 Limitation of using GAI in Education Sector

While ChatGPT has a number of advantages for the educational sector, there are also some restrictions that must be taken into account such as:

1. Cannot provide in-depth Information: Users have observed that it typically provides a summary in response to questions that can have extensive replies, and occasionally such summaries can provide incorrect information.
2. Potential Bias and Stereotyping: Biases and stereotypes existing in the original material may be present in ChatGPT's training data, which may unintentionally affect the results.
3. Limited Creativity and Originality: This AI based platform can generate text in response to questions, however rather than using genuine creativity; its responses are based on patterns discovered from previously collected data.
4. Ethical Considerations: The use of ChatGPT in education raises ethical questions about data security and privacy. It takes careful handling to ensure compliance with applicable privacy requirements and the protection of student information when gathering and processing student data to engage with ChatGPT.

It is critical to be aware of these shortcomings and take steps to correct them by continuous observation, assessment, and careful use of ChatGPT in educational contexts.

2 LITERATURE REVIEW

This paper explores [1] the application of chatbots in education for individualized learning, using ChatGPT. It goes into how chatbots can modify their explanations, illustrations, and advice to fit the needs and learning preferences of particular pupils. The study highlights chatbots' beneficial effects on student engagement, learning results, and satisfaction while also emphasizing their potential to change conventional educational paradigms. The results demonstrate [7] that the students when conversed with a chatbot delivered improved results comparative to ones who communicated with instructor. This shows that student academic performance can be enhanced drastically when chatbots are used for academic purpose. The authors [2] focus on how ChatGPT and other chatbot technologies might increase accessibility in education. It goes over how text-based chatbots with alternative forms, integration with assistive technology, and inclusive learning settings can help students with visual or hearing impairments. The research emphasises the significance of easily available education and demonstrates chatbots' ability to help achieve this objective. The paper explored role of teacher in following issues such as curriculum development, AI enabled conversation and Student-AI Collaboration (SAC) in learning. In a case study where 10 Korean teachers and students were put to a survey for an AI induced learning environment. The findings show that subject-matter knowledge is essential for achieving efficient SAC. Intelligent chatbots [3] affecting student learning in higher education is explained in this paper. It examines how chatbots might boost student engagement, provide personalized learning experiences, and offer immediate feedback. The paper examines the benefits of utilizing chatbots in terms of better learning results, higher student happiness, and the possibility to scale personalized education. The concern corresponds to creation of fake and plausible information generated by computers rather than human decision-making. Guidelines to promote critical thinking when using ChatGPT in future research would be necessary. The potential of chatbots as tutors is examined by authors [4] [6- 8] [25]. It looks at how chatbots, like ChatGPT, can assist students individually by giving them assistance, explanations, and academic help. The study emphasizes the advantages of chatbot tutoring, such as improved accessibility, personalized help, and the capacity to expand educational support, while also emphasizing the necessity of striking a balance between chatbot interventions and human connection. Despite the fact that GAI facilitates optimal support and guidance, it fails to replace the existence of human academicians. That' why it become essential to keep an eye on students while they use generative AI for education purpose.

This paper [5] focuses on the function of chatbots in promoting collaborative learning. It covers the ways that GAI tools can facilitate group conversations, manage projects, and encourage student knowledge sharing. It investigate the potential of chatbots in bridging geographical divides, encouraging teamwork in online learning environments, and improving students' collaborative abilities [8]. The article highlights that critical thinking need to be worked upon inspite of using ChatGPT. It was highlighted that AI driven education has experienced numerous transformative changes, categorized into three paradigms. These paradigms include AI-directed, AI-supported and AI-empowered approaches where learners take the lead, with AI empowering them to become leaders. Across these paradigms, AI techniques are employed to tackle educational [6] and learning challenges in diverse ways, such as representing knowledge models and facilitating cognitive learning. In this paper the authors [9] explains how lecturers utilize AI based platform for learning and their rationales for choosing or rejecting the technology in an effort to better understand their perspectives and reasoning. The comprehensive understanding of the use of ChatGPT in learning should be explored despite limitations, to improve productivity and learning efficiency. Studies are also conducted as to what extent ChatGPT answers questions. The study on microbiology datasets showed that ChatGPT is capable of answering both first and second-order knowledge questions. The model achieved appreciable accuracy and showed ChatGPT capability of answering first-order questions and second-order knowledge questions [11]. The paper [12] explores the potential of ChatGPT as an educational tool in communication, business writing, and composition courses. The study conducted an analysis on the opportunities and challenges posed by the newly introduced ChatGPT. Instructors can utilize ChatGPT to integrate technology in classrooms, offering examples for discussion and evaluation. However, challenges arise as students may be tempted to rely on ChatGPT for generating assignments, hindering their academic and professional development, while instructors may face the task of grading robotic submissions. The study reveals ChatGPT skillfully rephrases and generates responses in a manner that effectively evades detection by similarity detection software. To ensure the continued efficacy

of such software, providers must diligently upgrade their systems to prevent instances where these incidents go undetected [12]. The study [13] reveals that educational chatbots contribute positively to project-based learning by facilitating knowledge sharing, providing real-time assistance, and promoting effective collaboration among team members. The findings emphasize the potential of chatbots as valuable tools in enhancing learning outcomes and fostering engagement in team-based design courses. The Advent of Generative Language Models were explored in Medical Education [15] [26]. The paper acknowledges certain inherent limitations of ChatGPT, including the potential for generating incorrect information, the presence of biases in the training data can reinforce existing biases, as well as privacy concerns. However, the paper also emphasizes the need for recommendations on how ChatGPT can be effectively utilized to optimize teaching and learning outcomes [16]. Although ChatGPT has great promise, there are significant restrictions and moral issues to take into account. Researchers have raised [17] issues with potential inaccuracy and prejudice in the content. To mitigate these issues, proper data curation and continual monitoring are essential. The comprehensive review of ChatGPT [18], covering its background, applications, key challenges, bias, ethics, limitations, and future scope. It provides an outline of ChatGPT's development and its potential applications in various domains, including education. It also discusses the challenges faced by ChatGPT, such as biases in training data and ethical considerations. The study highlights ChatGPT's future potential while also acknowledging its current shortcomings. The utilization of the AI tools is discussed by the authors in education and research [19] [20] sectors. In [21] [22], the researches explore the transformative potential of ChatGPT in autodidactic experiences and open education. The paper discusses how ChatGPT can enhance self-directed learning by providing personalized guidance, answering queries, and offering interactive educational experiences. In the context of ChatGPT in education, plagiarism can be a problem since students may rely on the model to create work without giving correct credit, which could result in academic dishonesty. To address this problem and encourage originality and integrity in student work, it is essential to provide clear standards and instruction on responsible use. In this literature identification of factual and fictional content produced by ChatGPT, as well as the detection of plagiarism in generated write-ups, has been thoroughly examined [23] [24]. Evaluators are apprehensive about the potential for students to employ ChatGPT in the creation of their written assignments, generate reports easily and inconspicuously, thereby escaping from plagiarism detection.

In foreign countries to mitigate distinct challenges encountered by international students [12] and to enrich their academic journey, higher education institutions are progressively embracing the integration of Artificial Intelligence (AI) applications. Examples of such applications include adaptive testing, predictive analytics, and chatbots designed exclusively for learning and research, which can be strategically employed to enhance overall outcomes. Through an analysis of AI's role in education for international students, ChatGPT demonstrates the potential for AI to enhance learning efficiency and deliver personalized educational support. The reviewed literature showcases the vast potential of ChatGPT in revolutionizing education through personalized learning, interactive experiences, and improved learning outcomes. However, further research is needed to address ethical considerations, mitigate limitations, and ensure responsible implementation for the effective integration of ChatGPT in educational settings. [27] [28] [29]

3 RESULTS AND DISCUSSION

In this section, the comparative analysis of ChatGPT is described with respect to learning aspect, tools, and features on different attributes. The Table 1 indicates numerous crucial areas where ChatGPT has an edge over conventional learning. This tailored strategy can boost participation, fill in particular knowledge gaps, and ultimately enhance learning outcomes. ChatGPT's interactive features generate lively discussions and promote active involvement and critical thinking. This greater involvement can foster collaborative learning environments and boost comprehension. Traditional training frequently uses textbooks and lectures to reinforce concepts, which may not be suitable for all learners' learning preferences. Learners can gain a thorough knowledge of important ideas with the help of ChatGPT's succinct descriptions, real- world examples, and hyperlinks to other resources. This reinforcement can fill in cognitive gaps and improve retention. The development of proficiency in a language depends on practice, yet traditional instruction may not offer enough opportunity for practice. Through interactive chats and quick feedback, ChatGPT gives students the chance to practice their language abilities. This feature is especially advantageous for language learners because it offers a welcoming atmosphere for enhancing grammar, vocabulary, and fluency. Critical thinking may only be used in class discussions and tasks in conventional instruction. By raising insightful queries, fostering discussions, and providing a variety of viewpoints, ChatGPT stimulates critical thinking.

In traditional instruction, time and physical closeness can place restrictions on collaborative learning. By promoting online collaboration, group conversations, and cooperative problem- solving activities, ChatGPT gets beyond these restrictions. Resources for learning are often restricted by set hours or geographical places in traditional training. Because ChatGPT is accessible around the clock, students may get help and materials whenever it's most convenient for them, fitting a variety of learning schedules and preferences. Language learners and multilingual environments gain a lot from ChatGPT's capacity to support learners in several languages. It aids in language practice, offers translations, and clarifies ideas in the native tongues of learners. Table 2 presents a comparison of features wise usage of AI based tools in the field of education.

As indicated in Table 3, the comparison of ChatGPT in the educational space reveals a number of characteristics that should be taken into account while using this technology. For educational institutions, ChatGPT's capacity to cover a wide range of topics and courses is advantageous. It may accommodate multiple topic areas and support a variety of curricula, enabling students to obtain support from a range of academic fields.

In Table 4, the "Yes" and "No" numbers for several categories are used to compare ChatGPT with a number of learning tools. The checkbox next to "Yes" in this area denotes AI based learning tools capability to have discussions with users. This indicates that it is

Table 1: Comparison of Tradional (without AI Tools) vs Generative Artificial Intelligence (GAI) on different Learning Aspect

Learning Aspect	Traditional (without AI Tools)	Generative Artificial Intelligence (GAI)
Personalization	Limited personalization based on teacher-student interaction	Provides personalized tutoring Tailored explanations Adaptive responses to meet individual learners' requirements
Interactivity	Limited interactive opportunities in classroom settings	Engages in interactive conversations Presents challenging questions Encourages critical thoughts and contribution
Concept Reinforcement	Primarily relies on textbooks and classroom lectures	Offers brief summaries Real-world examples References to reinforce key concepts Facilitate better understanding
Language Practice	Classroom discussions and limited speaking/writing practice	Assists in practicing speaking and writing skills Offering instant feedback on grammar Vocabulary Sentence structure
Critical Thinking	Emphasized but limited to classroom discussions and assignments	Prompts critical thinking through discussions Debates Posing thought-provoking questions to stimulate learners' reasoning abilities
Collaborative Learning	Group projects and limited opportunities for online collaboration	Facilitates collaboration Peer interaction by promoting group discussions Sharing resources Encouraging cooperative learning
Accessibility	Limited access to learning resources beyond classroom hours	Provides 24/7 availability, allowing learners to access learning support Resources at their convenience
Multilingual Support	Limited language support based on teacher's proficiency	Assists learners in multiple languages Helping practice language skills Translating texts Clarifying concepts in their native language

built to comprehend and respond to inputs in natural language. It has been quite clear no attributes from the below mentioned Table IV does not provide the Supervised Learning and Reinforcement Learning, only one attribute "Domain Specific Knowledge" provide the knowledge graph. Only ChatGPT learning tool provide the conversational, extensive pre-training and real time interactions.

The Table 5 demonstrates the benefits of ChatGPT in the educational space. Compared to earlier versions, ChatGPT 3.5 (Plus) exhibits outstanding language understanding as shown in Table V. This translates into a stronger ability to perceive and interpret user inquiries and responses, which improves communication and problem-solving. Compared to its predecessors, ChatGPT 3.5 (Plus) has a better capacity to maintain context. It has a greater memory for earlier exchanges in a discussion, enabling more thoughtful and pertinent responses. From version 2.0 to version 3.5, the size of the training data used for ChatGPT dramatically grew. In general, more training data improves model performance and comprehension. Comparing ChatGPT 3.5 (Plus) to older versions, the Plus version shows enhanced response coherence. As a result, interactions with the model are more meaningful and efficient. It is better at producing logical and coherent responses. Given that ChatGPT 3.5 (Plus) exhibits very strong factual correctness, it can respond to user inquiries with more precise and trustworthy information. It's crucial to remember that no model is flawless, and it's still wise to fact-check for significant or delicate facts. Comparing ChatGPT 3.5 (Plus) to earlier versions, the latter shows improved answer originality. It can elicit more varied and innovative responses, which can be very helpful for inspiring original thought and involving students in instructive exchanges. In ChatGPT 3.5 (Plus), the consistency of responses has been enhanced.

As compared to past versions, ChatGPT 3.5 (Plus) offers a better control system. It enables users to have more control over the replies produced and provides for improved guidance and fine-tuning of the model's behavior. It provides opportunities for customization, allowing users to modify the behavior of the model to suit their own needs. This makes it possible for a user experience that is more unique and personalized.

Table 2: Features Wise usage of Generative AI Tools in Education Sector

Features	Description	Examples
GPT-3	A powerful generative AI model developed by OpenAI. It can generate human-like text based on prompts Is trained on a wide range of internet data.	ChatGPT Article writing Creative writing
Style Transfer	A technique that allows the transfer of artistic styles from one image to another Creating a new image that combines the content of one image with the style of another.	Neural Style Transfer DeepArt.io
Image Generation	Generative AI models that can create realistic images from scratch or based on given prompts.	DALL-E BigGAN Pix2Pix
Music Composition	AI tools that can compose original music or generate music based on given input.	OpenAI'sMuseNet Jukedeck Amper Music
Text-to-Speech	AI models that can convert text into natural-sounding human speech.	Google Text-to-Speech Amazon Polly Microsoft Azure Speech
Image Captioning	AI models that can generate textual descriptions or captions for images.	Microsoft CaptionBot Google Cloud Vision API
Video Generation	AI models that can generate new videos based on given prompts or manipulate existing videos.	Deepfake videos Face2Face Vid2Vid
Data Augmentation	Techniques that use generative models to generate synthetic data to augment existing datasets for training machine learning models.	CycleGAN CutMix MixUp
Story Generation	AI models that can generate fictional stories or narratives based on given prompts or genres.	AI Dungeon StoryAI TalkToTransformer
Code Generation	AI models that can generate code snippets or even complete programs based on given requirements or examples.	OpenAI Codex GitHub Copilot Kite
Design Assistance	Tools that can help designers by generating design suggestions Layouts, or even creating complete designs based on given inputs.	Canva'sDesignAI Sketch2CAD Framer X

4 CONCLUSION

In conclusion, this paper explores the potential of ChatGPT in education sector to improve the experimental learning. By fusing the power of AI-driven interactions with the principles of hands-on, practical learning, educators can move into a new era of dynamic and personalized pedagogy. This platform has ability to provide personalized guidance, create realistic simulations, offer real-time feedback, and facilitate reflection opens up new avenues for immersive and effective learning. This paper helps the researchers to explore the different aspects of education sector in which they do their research. The tabular representation in result and discussion section will help the learners to understand about the AI tools on different learning attributes.

Table 3: : Usages of AI tools on different attributes in education

Attribute	Description	ChatGPT
Versatility	The range of subjects and topics that can be covered.	ChatGPT has the ability to cover a wide range of subjects and topics Including math, science, history languages. It can adapt to various educational contexts.
Scalability	The ability to handle a large number of students simultaneously.	ChatGPT can handle multiple student interactions concurrently Making it scalable for use in classrooms Online learning platforms.
Speed	Response time for providing answers or assistance.	ChatGPT can generate responses quickly Allowing for near real-time interactions with students. Response time may vary based on system load Complexity of queries.
Learning Curve	Ease of use for students and teachers.	ChatGPT is designed to be user-friendly Requiring basic text input Providing natural language responses. Some students and teachers may require initial familiarization to optimize usage.
Engagement	Ability to captivate and hold students' attention.	ChatGPT can engage students through interactive conversations, providing personalized responses and valuable learning materials. Individual student engagement may vary.
Accuracy	Precision and correctness of information provided.	ChatGPT leverages its vast knowledge base to offer accurate information. Occasional inaccuracies or errors may occur, emphasizing the need for human oversight.
Adaptability	Flexibility to accommodate different learning styles and levels.	ChatGPT can adapt to individual student needs Providing personalized learning experiences and catering to different learning styles Levels of proficiency.
Availability	Accessible at any time or limited availability.	ChatGPT can be available 24/7 Providing continuous support and learning opportunities beyond traditional classroom hours.
Cost- effectiveness	Financial viability for educational institutions.	ChatGPT's cost-effectiveness depends on factors such as deployment scale, Integration requirements Maintenance considerations. It may involve licensing or subscription fees.
Ethics and Bias Mitigation	Ensuring fairness, inclusivity, and unbiased content.	Efforts must be made to train ChatGPT on diverse and inclusive datasets, and ongoing monitoring is necessary to identify and address any potential biases or ethical concerns.
Data Privacy	Protecting student data and	ChatGPT usage should comply with privacy regulations, and appropriate measures must be implemented to safeguard student data from unauthorized access or breaches.

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Table 4: : Comparison AI learning tools on different educational attributes

Learning Tool	Conversational	Extensive Pre- training	Domain-Specific Knowledge	Real-Time Interactions
ChatGPT (GPT-3.5)	Yes	Yes	No	Yes
Rule-Based Systems	No	No	Yes	No
Supervised Learning	No	No	No	No
Reinforcement Learning	No	No	No	No

Table 5: : Comparison of different versions of ChatGPT in Education Sector

Attribute	ChatGPT 2.0	ChatGPT 3.5 (Base)	ChatGPT 3.5 (Plus)
Language Understanding	Good	Better	Excellent
Knowledge Base	Up to 2021	Up to 2021	Up to 2021
Context Retention	Limited	Improved	Enhanced
Response Coherence	Moderate	Better	Improved
Factual Accuracy	Fair	Good	Very Good
Response Creativity	Limited	Improved	Enhanced
Consistency	Inconsistent	Improved	Enhanced
Control Mechanism	Limited	Improved	Enhanced
Computational Resources	Moderate	Higher	Higher
Fine-tuning Capability	Not Available	Available	Available
Customization	Limited	Limited	Available

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