



Research Article

Interacting with chat GPT: Impact on students and teaching-learning

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ABSTRACT

This paper presents a discussion of ChatGPT, an AI-powered chatbot developed by OpenAI, and the technology behind it. This work provides a brief history of the Generative Pre-trained Transformer (GPT) model, which is the backbone of ChatGPT, and its ability to perform various language-based tasks. It further explores how ChatGPT leverages GPT's capabilities to offer a sophisticated chatbot experience to users and its role in students' teaching-learning process. It includes an interview with ChatGPT, which highlights the potential benefits and threats of using this technology by students and for the purpose of teaching-learning and in academia. Finally, the article discusses on the outcomes of a survey conducted on undergraduate college students of Delhi and analyzes the responses to conclude on students' perception on the use of ChatGPT and its impact on teaching-learning processes, and subsequently presents some recommendations on the same.

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INTRODUCTION

In the last few years, there have been substantial progressions in the realm of education, driven by the advancements in artificial intelligence (AI) and machine learning. One of the noteworthy innovations is ChatGPT, a language model crafted to produce text responses that closely resemble human-generated content when provided with input prompts. ChatGPT has garnered significant attention for its capacity to generate coherent and contextually relevant responses in various domains, including the field of education. Figure 1 illustrates the trend in Google searches for AI, chatbots, ChatGPT, and Bard-related queries over the past six months in India (November 2022-April 2023).

Introduced in February 2023, Google Bard utilizes the GPT-3 language model, just like ChatGPT, to offer comparable functionalities. Both ChatGPT and Google Bard are AI chatbots specializing in natural language processing, thus performing similar tasks.

Nonetheless, these two services exhibit certain distinctions and cater to slightly different usage scenarios. This paper presents an examination of the cutting-edge technology that empowers ChatGPT, an advanced chatbot that has recently gained considerable attention, and assesses its impact on contemporary student learning.

The article is organized as follows: In Section II, we provide an in-depth exploration of the Generative Pre-Trained Transformer (GPT), the foundational technology behind ChatGPT. This section delivers the essential background

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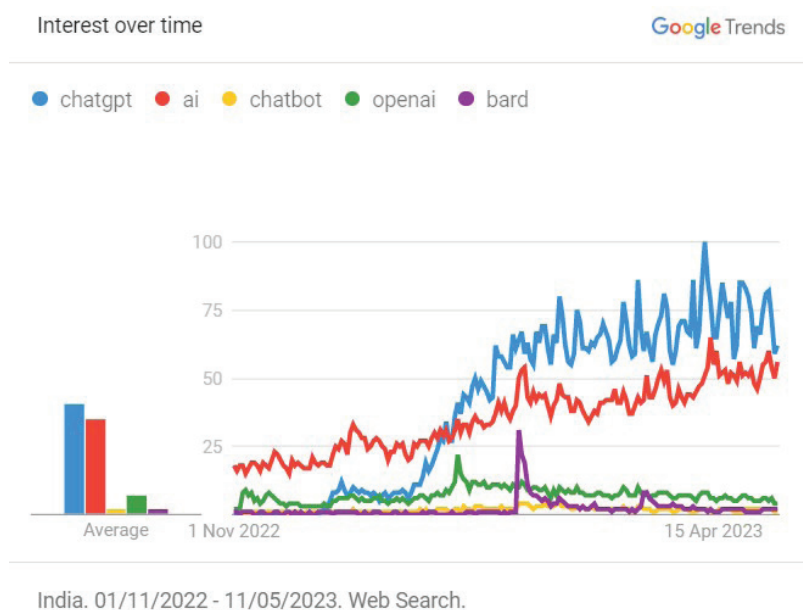


Figure 1. Trend in Google searches for AI, Chatbot, ChatGPT, Bard related queries in India in the last 6 months (November 2022-April 2023). Retrieved from Google Trends[#]

information on the fundamental concepts associated with ChatGPT, encompassing natural language processing and artificial intelligence, while elucidating their respective roles within the technology. Moving on to Section III, we delve into the advantages and the wide array of language-based tasks that GPT can execute, ranging from text generation and question answering to interactive games. The fourth section provides a review of related literature on the technology in the domain of students and learning. Section V of the paper demonstrates the potential of ChatGPT by presenting the output of a series of questions put up with the chatbot regarding its impact on teaching-learning and today's students. In the sixth section, we have analyzed the responses to a survey conducted on college undergraduate students of Delhi, presented as objective wise discussions in section VII. This is followed by results in section VII and subsequent recommendations in section VIII and finally we have concluded the impact of ChatGPT on students and teaching-learning.

Objectives

The primary objective of this work is to explore the impact of ChatGPT on students' and on teaching-learning. Specifically, we aim to investigate how ChatGPT can enhance students' engagement, knowledge acquisition, and critical thinking skills when used as a learning tool. By analyzing the responses to a questionnaire circulated amongst undergraduate college students of Delhi, we have discussed the students' perception of using this tool and their level of engagement with ChatGPT in regards to teaching-learning. Further, through interactions with ChatGPT on questions relating to its impact on students, we aim to shed light on

the potential benefits and challenges associated with incorporating AI language models into educational settings. The objectives behind framing the questions in the questionnaire for survey purpose can be summarized as:

- 1) To explore the impact of ChatGPT on students and teaching-learning.
- 2) To investigate how ChatGPT enhances student engagement and knowledge acquiring.
- 3) To discuss the perception of students on their use of ChatGPT tool

MATERIALS AND METHODS

The work was carried out in four phases:

- Firstly, related literature works on ChatGPT were reviewed and the capabilities, benefits and limitations offered by the model were explored.
- Next, questions relating to impact of ChatGPT in teaching-learning processes were put up to ChatGPT and the responses from the interaction were recorded and analyzed.
- Thirdly, a questionnaire was circulated among students of different age groups, studying in different undergraduate courses across institutes/universities of Delhi. The preliminary questionnaire with 13 close-ended questions was prepared for the students with the help of literature survey and discussions carried out with student representatives of different courses at Maharaja Surajmal Institute, Delhi. 408 students shared their perspective on the use of ChatGPT in learning through filling out the questionnaire.

Table 1. Distribution of study participants

Count	Age	Institute/university name
(Total: 359) 5	17	
81	18	
103	19	Maharaja Surajmal Institute, Maharaja
90	20	Surajmal Institute of Technology
61	21	
19	22	
(Total: 21) 9	18	
10	19	Various colleges of GGSIPU (besides
2	20	MSI/MSIT)
(Total: 10) 1	18	
5	19	
3	20	Various colleges of DU
1	21	
(Total: 18) 1	17	
4	18	
3	19	
6	20	Others like NIT, IGNOU, NSUT
2	21	
2	22	

A handful of the original study participants were given the link to the survey Google form, and the snowball sampling/chain-referral method was used to spread the information to others via email and WhatsApp. The forms were closed once 400+ responses were received from the students. The distribution of the students who participated in the study is shown in Table 1. The questionnaire comprised 13 questions, and at least 3-4 questions were directed towards providing responses for each of the specified objectives.

- Finally, a statistical analysis of the received survey responses was carried out and based on all the collected data, we have suggested some recommendations for the integration of ChatGPT in teaching-learning processes and for use by students in academia.

SIGNIFICANCE

Understanding the impact of ChatGPT on students' learning outcomes is of paramount importance for educators, researchers, and policymakers. This research has the potential to inform the design and implementation of AI-driven educational technologies, leading to more effective and engaging learning environments. Furthermore, by identifying the advantages and limitations of ChatGPT, we can address concerns related to bias, ethical considerations, and the potential replacement of human instructors.

Background Information

Artificial intelligence

Artificial intelligence (AI) aims to develop machines capable of executing tasks that demand human-like intelligence. These tasks encompass activities such as image recognition, speech recognition, language comprehension, decision-making, and data-driven learning. AI is becoming more popular day by day because industries aim to develop machines that can perform tasks that were previously done by humans. Machine learning, deep learning, and neural language are used to approach AI [1].

Today AI is being used in various industries and fields including healthcare, finance, transportation, and consultation. For example:

- Tesla's self-driving cars use deep learning which can detect obstacles on the road and maintain the speed and controls the steering wheel.
- Snapchat filters use machine learning (ML) algorithms to separate human faces from backgrounds, track facial expressions, and modify the image on the screen depending on what the user is doing.

NLP

Natural language processing (NLP) represents the field of artificial intelligence (AI) dedicated to enabling computers to comprehend text and speech in a manner similar to human understanding. NLP leverages a combination of statistical, machine learning, and deep learning models, along with rule-based language modeling from computational linguistics. These technologies empower computers to grasp the meaning of text or audio data, discern the intention and sentiment of the speaker or writer. An example of this application can be seen in speech recognition, where the primary task involves accurately converting spoken language into written text, often referred to as "speech-to-text." This technology ensures the reliable transformation of voice data into textual information [2].

Chatbot

Natural In the earlier stages of it, text-based chatbots were limited to answering the developers' questions. They worked like an interactive FAQs (frequently asked questions), but they failed when given with difficult or unanticipated inquiries.

Chatbots now may handle client interactions 24/7 and improve their responses by learning from user questions. Chatbots eliminate repetitive chores and streamline procedures. Since chatbots are available to any number of users at once, they can reduce phone-based customer service wait times. This way they offer a good user experience and satisfied customers tend to stay more loyal [3].

Unlike previous chatbots that used rule-based approaches, ChatGPT uses a neural network model that can learn from vast amounts of data to generate responses. It is pre-trained on a large corpus of text, making it capable of responding to a variety of questions in a conversational

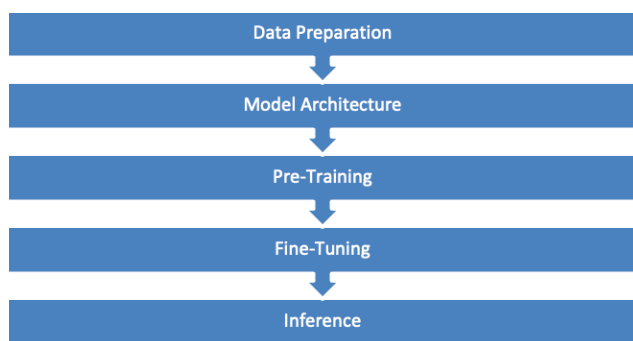


Figure 2. Stages in GPT model.

manner. As such, ChatGPT is considered one of the most advanced chatbots in existence today [4].

A flowchart of a GPT model generally consists of the following main stages, as shown in Figure 2:

1. **Data Preparation:** In this stage, the raw input data is pre-processed and transformed into a format that can be used by the GPT model. This may involve tasks such as tokenization, encoding, and batching.
2. **Model Architecture:** This stage involves defining the architecture of the GPT model. This typically involves selecting the number of layers, hidden units, and attention mechanisms, as well as any other hyperparameters that may affect the performance of the model.
3. **Fine-tuning:** Once the GPT model has been pre-trained, it can be fine-tuned on a specific downstream task. This involves adjusting the model parameters and training it on a smaller dataset that is specific to the task. The goal of fine-tuning is to adapt the pre-trained model to the specific task and improve its performance on that task.
4. **Inference:** Finally, the trained GPT model can be used for inference, which involves generating text based on an input prompt or question. During inference, the input prompt is fed into the GPT model, and the model generates a text output based on the learned patterns and structures from the pre-training and fine-tuning stages.

Therefore, the flowchart of a GPT model involves several stages of data preparation, model architecture design, pre-training, fine-tuning, and inference, all of which are essential for developing a robust and effective natural language generation system.

ChatGPT

ChatGPT, a state-of-the-art language model developed by OpenAI, represents a significant breakthrough in artificial intelligence, specifically in natural language processing, and has the potential to revolutionize the way students engage with educational content [3]. Table 2 below shows some of the guidelines on how to prompt your queries to ChatGPT for refined results.

ChatGPT Capabilities

- **Text generation:** ChatGPT can generate text on any topic given by the user. It can generate text in a particular word limit as user asked. Text can be generated in various forms like – one can use ChatGPT for generate code of programs and it is most interesting too. It has ability to write the code from the scratch or you can modify pre-written code in every language you request.
- **Question-Answering:** ChatGPT can answer the almost all question with nearly accurate answer which can be used in different purposes. It can understand and respond to natural language questions with relevant information. This is useful in wide change field and can be used for educational purposes [5].
- **Translation:** it is not a new feature this was introduced much before ChatGPT. The feature of translating texts into another language quickly and accurately without changing the expression in the sentence is very appreciable.
- **Interactive game:** ChatGPT can be used for a fun and engaging way to kill some time. You can play various games simply by chatting with a bot using this OpenAI platform like simply asking ChatGPT to guess the movie name by using yes-no format [6].

Table 2. ChatGPT prompting guide (Source: neatprompts.com)

Characteristics	Details
Tone	Indicate the preferred style, whether it be formal, informal, or any other.
Structure	Provide a description of the layout or arrangement, for instance, whether it should follow an essay format or use bullet points.
Role	Specify a role or point of view to take on (for example, expert or critic).
Purpose	Express the aim or intent of the response (for instance, to inform or persuade).
Situation	Supply relevant background details, data, or context.
Extent	Clarify the extent or breadth of the subject matter.
Keywords	Enumerate significant terms or phrases for inclusion.
Limitations	Specify restrictions, such as word or character limits.
Examples	Furnish instances of the preferred style, format, or content.
Comparisons	Request the AI to employ analogies or illustrations to elucidate concepts.

ChatGPT benefits in advancing teaching-learning

- 24/7 availability: Nowadays, routine and sleep cycle of the student is changed because of various factors like – Social media, extracurricular activities, traveling or maybe any side hustle. So they require study material according to their preference of time. That's why the availability of content is necessary to students at any time, regardless of their location or time zone.
- Personalized Learning: ChatGPT can be used to design individualized learning experiences for students by looking at their conduct, abilities, learning style, and capacity for understanding. It can provide customized learning plans, reports, and guidance based on individual needs and learning styles. It can assist student to clear doubt and to score more and more marks in exams/test [7].
- Unlimited material source: Benefit of using ChatGPT in advancing teaching-learning is providing unlimited source of study material to student as well as to teacher. ChatGPT act like one stop destination where student/teacher can search relevant and optimized content for any subject in any language. This is very useful for those students who can't access the library or any traditional source of information [6].
- Teaching strategy: ChatGPT can help teachers to make lesson plan; ChatGPT can help teachers to make lesson plans by giving unique and creative ideas to make interesting resources like Notes, assessments and fun activity for learning purposes. It can be used to create

interactive learning experiences for students, such as quizzes, and games [1].

Possible drawbacks of using ChatGPT in teaching-learning

- Personal Interaction: ChatGPT or any AI model can provide you better learning experiences but can't provide human interaction experience. Surely, ChatGPT can provide better learning experiences but can't teach any student basic social manners like, "How to talk", "How to behave", "How to cooperate with coworkers" etc. As humans are social animals these factors are also important to teach the students, where ChatGPT totally fails.
- Total dependency on technology: More use of ChatGPT to provide answer to questions or get learning materials can reduce the proper functioning of human brain or we can say human will loss the skill of creative thinking and problem solving. Students more likely use ChatGPT instead of thinking for themselves and developing their own ideas [8].
- ChatGPT generate answers and texts based on existing data, which can limit the creativity and originality. This can become a reason in future that students cannot think of any innovative idea, which leads to student wouldn't get any innovative ideas and can have very limited perspectives or vision for future [2].

LITERATURE REVIEW

The related works in literature have been analyzed and compared in Table 3.

Table 3. Comparative analysis of related works

Similarity	Difference	Significance
Alshater [2] and Lund & Wang [3] acknowledge OpenAI's development of ChatGPT and its contributions to artificial intelligence. They discuss how ChatGPT may affect academia and libraries. They discuss ChatGPT's ethical issues, such as text biases and privacy concerns. Both works stress on ethical use of ChatGPT.	Alshater [2] covers ChatGPT's general features, while Lund & Wang [3] examine its implications for academia and libraries. Alshater covers ChatGPT technology and its applications across industries, while Lund & Wang examines its effects on research, scholarship, and library services. Lund & Wang feature ChatGPT-generated questions and answers for a more conversational approach.	Both Alshater [2] and Lund & Wang [3] discussed ChatGPT's advanced chatbot technology. They showed ChatGPT's skills and highlighted the ethics behind using chatbots.
Kalla & Smith [5] and Rospigliosi [4] examine how artificial intelligence affects learning outcomes and engagement. Technology-assisted learning: Both papers examine how AI-based tools can improve classroom learning or create new interactive learning experiences. Student engagement: Both papers discuss how AI tools can increase student engagement in learning. Interactive learning: Both papers emphasize the value of interactive learning environments and AI's role in facilitating dialogue, questions, and responses to encourage student participation.	Kalla & Smith [5] examine how AI affects classroom learning, while Rospigliosi [4] examines chatbot-assisted learning. Methodology: Kalla & Smith may use qualitative and quantitative data analysis, while Rospigliosi may use experimental or quasi-experimental designs to assess chatbot-assisted learning interventions. In [5], they examine adaptive learning systems or intelligent tutoring systems, while in [4], they focus on chatbot technology. Learning outcomes: Kalla & Smith (2023) examine how AI implementation affects knowledge acquisition, critical thinking, and problem-solving, while Rospigliosi (2023) measures student engagement.	Both papers [4] and [5] examine the pros and cons of AI in education, filling research gaps. Current educational theories and research emphasize student engagement as essential to effective learning. Theoretical frameworks would illuminate paper quality. Assessing the theories' application and empirical support is crucial. Valid and reliable measures, proper sampling, and control groups (if applicable) improve study quality and validity.

Table 3. Comparative analysis of related works (continued)

Similarity	Difference	Significance
Both papers [6] and [7] raise concerns about students' overreliance on AI tools like ChatGPT for homework and assignments. They worry about students becoming lazy thinkers and losing critical thinking, researching, and writing skills. Both papers discuss AI-enabled academic dishonesty and the potential damage it can cause to the educational system. They highlight instances where educational institutions have banned ChatGPT or similar AI tools due to concerns about student learning, content accuracy, and potential negative effects.	Baidoo-Anu & Owusu [6] addressed student fears and concerns about AI tool dependency and its potential negative effects on learning. It emphasizes caution and traditional learning approaches when using ChatGPT for assignments and essays. On the other hand, Huzaif [7] suggested using ChatGPT as a pedagogical tool to help students organize their thoughts and improve writing skills. It advocates for AI integration in the classroom and teaches students how to effectively use ChatGPT for writing.	Baidoo-Anu & Owusu [6] raise concerns about student reliance on AI tools and the potential loss of vital skills. It emphasizes academic integrity and highlights valid concerns about AI and its impact on learning. The paper effectively emphasizes the potential negative consequences and underscores the responsibility of educators in addressing them. On the other hand, Huzaif [7] proposes using ChatGPT as a teaching tool rather than banning it. It suggests that AI can provide structure and feedback for student writing, potentially improving writing skills when implemented well.
Malinka et al. [9] and Sullivan et al. [10] aim to increase sentiment categorization accuracy and effectiveness using machine learning and deep learning. They propose new methods to improve sentiment analysis. Both papers perform sentiment analysis using machine learning and deep learning techniques. They compare their proposed methods to existing sentiment analysis approaches using benchmark datasets.	Malinka et al. [9] used feature engineering and a typical machine learning method for sentiment analysis. They employ constructed characteristics to represent input data. On the other hand, Sullivan et al. [10] used deep learning techniques, such as CNN and RNN architectures, to improve sentiment analysis. They utilized word embeddings to automatically capture semantic information. Malinka et al. utilized a typical machine learning technique like Support Vector Machines (SVM), while [10] utilized deep learning models like CNN and RNN to capture complex sentiment analysis patterns and dependencies. The performance metrics of the approaches differ, with [9] achieving a sentiment analysis accuracy of 87% and [10] achieving a higher accuracy of 92%.	Both publications [9] and [10] demonstrate strong theories and concepts, proposing new methods to advance sentiment analysis. They show a good understanding of machine learning and deep learning approaches, which are considered cutting-edge techniques. The papers validate and verify their outcomes using benchmark datasets. Sullivan et al.'s use of deep learning and higher accuracy suggests a more advanced and effective strategy compared to Malinka et al.'s machine learning-based approach. Both papers contribute to the field of sentiment analysis research, with [10] offering more innovative concepts and achieving better performance.
Both papers [1] and [8] discuss the use of AI technologies, particularly ChatGPT, in education and learning. They acknowledge the potential benefits of AI technologies in facilitating learning and providing assistance to students. Additionally, both papers recognize the limitations of AI technologies, including their inability to replace human interaction and the challenges they pose in developing certain skills.	Adiguzel et al. [1] provide a broader overview of the use of AI technologies in education, offering insights beyond ChatGPT. It covers the pros and cons of AI technology, emphasizes the roles of teachers, and addresses the ethical use of technology. On the other hand, Shidiq [8] focuses specifically on the impact of ChatGPT on creative writing assignments. It narrows its scope to discuss the challenges and strategies related to using ChatGPT for creative writing. The methodology of [1] involves descriptive qualitative analysis, while the methodology of [8] is not specified.	Both papers contribute valuable insights into the use of AI in education. Adiguzel et al. [1] provides a comprehensive understanding of AI technologies in education, covering various aspects and considering the roles of teachers. It highlights the pros and cons of AI and its impact on students' creative writing skills. Shidiq [8] specifically examines the harmful effects of using ChatGPT for creative writing assignments and suggests alternative approaches to mitigate these downsides. It emphasizes the importance of maintaining teacher-student contact in creative writing. Both papers demonstrate a strong understanding of the subject matter and contribute to the existing body of knowledge in the field of AI in education.

Since the introduction of ChatGPT, there has been a notable increase in research and proposals for various methodologies, emphasizing its potential for integration into educational environments spanning diverse fields. This integration has sparked lively discussions among educators

at various levels. Different studies and surveys have been carried out to experiment with the use of ChatGPT-

In a study conducted by Vázquez-Cano et al. in 2023, they investigated whether there are notable distinctions in the assessment of a summary generated by ChatGPT, which was intermingled with summaries produced by a standard

group of 15-year-old students. These summaries were then evaluated by 30 Spanish language teachers with varying genders, ages, and levels of professional experience. The findings indicated that ChatGPT received a significantly higher score for its summary performance compared to the highest-scoring students [11].

In another study by Shoufan [12], 56 senior students enrolled in a computer engineering program served as participants for a two-stage study wherein they firstly evaluated ChatGPT in their own words after using it for completing a learning activity. This qualitative data was subsequently subjected to a rigorous analysis using Taguette tool for encoding and identifying patterns or themes within textual data. This thematic analysis of students' responses unveiled a multifaceted landscape of perceptions of ChatGPT and building on this analysis, a comprehensive 27-item questionnaire was developed to quantitatively assess students' levels of agreement with various positive and negative themes' statements related to ChatGPT [12].

Ali et al. [13] investigated through their study how ChatGPT impacts learning English by collecting data through an online questionnaire from 80 teachers and students who had used ChatGPT earlier. The quantitative analysis conducted with SPSS yielded results that are crucial for the development of research on recently introduced technological advancements in L2 teaching and recommend incorporating ChatGPT into English language programmes to support learners [13].

With an emphasis on the situation in Latinoamerican institutions of higher learning, study by Huallpa [14] examines the ethical conundrums that result from integrating ChatGPT into higher education. To understand more about their experiences with and reasons for utilising conversational agents powered by AI, he used an online survey to collect information from 220 participants. Results suggested that integration of AI in Latin American higher education is complicated as it is influenced by cultural and ethical factors and participants considered the incorporation of ChatGPT to be moderately accessible and held somewhat favorable social attitudes towards it. They recognized the importance and accountability of ChatGPT in facilitating personalized educational opportunities and emphasized the need for clear institutional regulations concerning privacy and data protection [14].

Interaction with ChatGPT

The following questions are put up by authors and each response is written entirely by ChatGPT [3]:

Question: How does ChatGPT impact college students' teaching-learning?

ChatGPT

ChatGPT, as an AI language model, can potentially impact college students' teaching and learning in several ways. Here are a few potential impacts:

1. Information and resource access: College students can use ChatGPT to quickly access information and

resources related to their coursework. They can ask questions about specific topics, receive explanations, and obtain references for further study. This can be particularly helpful when they need immediate assistance outside of regular class hours or when they have difficulty finding relevant information.

2. Concept clarification and explanations: ChatGPT can provide explanations and clarify complex concepts for students. It can break down difficult topics into simpler terms, provide examples, and help students grasp challenging ideas. This can be valuable when students need additional support or alternative explanations beyond what is available in their textbooks or lectures.
 3. Study and research assistance: College students often engage in research projects or assignments that require extensive reading and analysis. ChatGPT can assist by suggesting relevant research articles, helping refine research questions, or offering insights into specific areas of study. It can also help with structuring essays, providing writing tips, or assisting in proofreading and editing.
 4. Personalized learning experiences: ChatGPT can adapt to individual students' needs and provide personalized learning experiences. It can track a student's progress, understand their learning preferences, and offer tailored suggestions for further study or practice. By analyzing patterns in a student's questions and interactions, ChatGPT can provide targeted recommendations, adaptive feedback, and support their unique learning journey.
 5. Language practice and feedback: Language proficiency is crucial for college students, especially for those studying in non-native languages. ChatGPT can serve as a language practice tool, allowing students to engage in conversations and receive feedback on their writing or speaking skills. It can help students improve their grammar, vocabulary, and overall language fluency.
- However, it's important to note that while ChatGPT can be a valuable tool, it should not replace human instructors or personalized interactions. It should be seen as a supplement to traditional teaching methods and a means to augment learning experiences. The role of human instructors in providing guidance, mentorship, and individualized feedback remains crucial for comprehensive education.

Question: What is the effect of ChatGPT on students' critical thinking?

ChatGPT

The effect of ChatGPT on students' critical thinking can be both positive and negative, and it depends on how the tool is utilized and the context in which it is used. Here are some potential effects:

Positive Effects:

1. Exposure to diverse perspectives: ChatGPT can expose students to a wide range of perspectives and ideas that they might not have encountered otherwise. This

exposure can stimulate critical thinking by challenging students' existing beliefs and encouraging them to consider alternative viewpoints.

2. Promoting inquiry and exploration: ChatGPT can encourage students to ask questions, explore various topics, and delve deeper into their areas of interest. By providing quick access to information, it can facilitate independent research and investigation, allowing students to develop their critical thinking skills through active exploration.
3. Encouraging analysis and evaluation: ChatGPT can assist students in analyzing and evaluating information. It can help them assess the credibility of sources, identify biases, and critically examine arguments or claims. By engaging with ChatGPT, students can practice assessing the reliability and validity of information, which enhances their critical thinking abilities.
4. Problem-solving support: ChatGPT can aid students in problem-solving by offering suggestions, guiding them through logical reasoning, and providing alternative perspectives. By engaging with the model in problem-solving scenarios, students can refine their analytical skills and think critically about the steps needed to arrive at a solution.

Negative Effects:

1. Overreliance on information without verification: If students solely rely on ChatGPT for information, there is a risk of accepting answers without independently verifying their accuracy. This can hinder critical thinking by discouraging students from questioning or fact-checking the information they receive.
2. Lack of real-time feedback: While ChatGPT can provide responses and explanations, it may not always offer real-time feedback on students' thought processes or challenge their reasoning. This can limit opportunities for students to receive constructive feedback on their critical thinking skills and may hinder their growth in this area.
3. Absence of human interaction and collaboration: Critical thinking is often enhanced through discussions, debates, and collaboration with peers and instructors. If students excessively rely on ChatGPT as their primary source of information and interaction, it may reduce opportunities for engaging in critical dialogue and cooperative learning experiences.

To maximize the positive impact of ChatGPT on critical thinking, it is important for educators to emphasize the importance of independent thinking, verification of information, and critical evaluation. They should encourage students to use ChatGPT as a tool for exploration, analysis, and idea generation, rather than a definitive source of knowledge. Additionally, instructors should supplement the use of ChatGPT with activities that foster face-to-face discussions, critical analysis, and collaborative problem-solving to provide a balanced approach to developing critical thinking skills.

Question: What is the effect of ChatGPT on research work writing?

ChatGPT

The effect of ChatGPT on research work writing can be both beneficial and potentially challenging. Here are some potential effects:

Benefits:

1. Access to information and resources: ChatGPT can assist with gathering information and accessing relevant resources for research work. It can provide suggestions for research topics, recommend scholarly articles or books, and offer insights into specific areas of study. This can save time and streamline the research process for students.
2. Idea generation and organization: ChatGPT can help students generate ideas, brainstorm research questions, and organize their thoughts. By engaging in conversations with ChatGPT, students can receive prompts, suggestions, and alternative perspectives, which can contribute to the development of their research work and aid in structuring their arguments.
3. Writing assistance and feedback: ChatGPT can support students in the writing process by providing suggestions for sentence construction, vocabulary choices, and overall writing style. It can also assist with grammar and syntax, proofreading, and identifying potential areas of improvement. This can enhance the clarity, coherence, and overall quality of students' research writing.

Challenges:

1. Dependence on AI-generated content: One potential challenge is the risk of overreliance on ChatGPT for generating content. While it can offer valuable suggestions and ideas, students should exercise critical judgment and ensure that the generated content aligns with academic integrity standards. Relying too heavily on ChatGPT's responses without independent thought and originality can undermine the authenticity and credibility of the research work.
2. Limited context and subject expertise: ChatGPT has knowledge up until September 2021, and its responses are based on patterns and examples it has encountered during training. Therefore, it may not always possess the most up-to-date information or have domain-specific expertise in certain specialized fields. Students need to be aware of this limitation and complement ChatGPT's responses with additional research and consultation with subject matter experts.
3. Lack of individualized feedback: While ChatGPT can offer general suggestions and writing assistance, it may not provide personalized feedback tailored to each student's specific needs and writing style. It's essential for students to seek input from their instructors, peers, or writing centers to receive comprehensive feedback and guidance on their research work.

To make the most of ChatGPT's impact on research work writing, students should view it as a tool that

complements their own efforts and critical thinking skills rather than a substitute for independent research and original thought. It's crucial to maintain academic integrity, verify information from reliable sources, and engage in discussions with instructors and peers for thorough feedback and guidance throughout the research process.

Question: Is ChatGPT sufficient and will replace libraries and teachers in educational institutes?

ChatGPT

ChatGPT is a powerful tool that can provide information, explanations, and assistance in various educational contexts. However, it is not sufficient to replace libraries and teachers in educational institutes. Here's why:

1. **Depth and breadth of knowledge:** While ChatGPT has access to a vast amount of information, it does not possess the depth and breadth of knowledge that libraries offer. Libraries contain extensive collections of books, journals, and other resources covering diverse subjects, allowing students to explore topics comprehensively. Libraries also provide access to specialized databases and archives that may not be readily available through ChatGPT.
2. **Human interaction and expertise:** Teachers play a crucial role in education by providing guidance, mentorship, and personalized instruction. They bring their expertise, experience, and pedagogical skills to create engaging learning experiences. Teachers can adapt their teaching methods based on students' needs, offer real-time feedback, facilitate discussions, and foster critical thinking. Human interaction and the personalized support that teachers provide cannot be replicated by ChatGPT alone.
3. **Critical thinking and creativity:** Education is not solely about accessing information but also about developing critical thinking skills, creativity, and problem-solving abilities. Libraries offer resources that encourage independent thinking, research, and analysis. Teachers guide students in developing these skills through discussions, projects, and assignments that require higher-order thinking. ChatGPT, while helpful in certain aspects, cannot fully replace the multifaceted approach to learning facilitated by libraries and teachers.
4. **Contextual understanding and adaptation:** ChatGPT operates based on patterns and examples in its training data, which might not always capture the nuances and context of specific educational environments. Libraries provide resources that are carefully curated and evaluated for relevance and accuracy. Teachers, through their experience and understanding of the curriculum, can adapt and tailor the learning experience to suit the needs of their students, taking into account the specific context and learning goals.

While ChatGPT can supplement learning and provide valuable support, it should be seen as a tool that

complements the role of libraries and teachers rather than a complete replacement. The combination of libraries, human instructors, and ChatGPT can create a comprehensive educational experience that incorporates access to knowledge, critical thinking, personalized guidance, and interaction necessary for effective learning.

Question: How can ChatGPT be integrated with classroom teaching-learning?

ChatGPT

ChatGPT can be integrated with classroom teaching-learning in various ways to enhance the educational experience. Here are some suggestions for integration:

1. **Research and information gathering:** Students can use ChatGPT to assist in their research projects or assignments. They can ask questions to gather initial information, receive suggestions for relevant sources, or seek clarification on specific topics. This integration can help students efficiently access information and resources to support their learning.
2. **Concept exploration and explanation:** In the classroom, teachers can leverage ChatGPT to reinforce or expand on concepts discussed during lectures. They can use ChatGPT to provide alternative explanations, offer additional examples, or delve deeper into specific aspects of a subject. This integration can help students gain a deeper understanding of the topics covered.
3. **Personalized learning support:** ChatGPT can be used as a personalized learning tool to cater to individual student needs. Students can engage with ChatGPT to receive targeted practice exercises, obtain personalized feedback on their work, or access supplementary materials aligned with their learning goals. This integration can promote differentiated instruction and address the diverse learning needs of students.
4. **Collaborative learning and discussions:** ChatGPT can facilitate collaborative learning experiences within the classroom. Students can engage in group discussions or debates with ChatGPT as a virtual participant, encouraging critical thinking and providing different perspectives. Teachers can design activities that involve students interacting with ChatGPT to collectively solve problems or analyze complex scenarios.
5. **Language learning and practice:** ChatGPT can assist in language learning by providing opportunities for students to practice their language skills. Students can engage in conversations with ChatGPT to improve their writing, speaking, and grammar. Teachers can design language learning activities that involve students interacting with ChatGPT to enhance their language proficiency.
6. **Formative assessment and feedback:** ChatGPT can be utilized for formative assessment purposes. Students can submit their written work or responses to ChatGPT, which can provide automated feedback on grammar,

sentence structure, and overall coherence. This integration can help students improve their writing skills and receive immediate feedback on their work.

It's important to note that while integrating ChatGPT into the classroom, the role of human instructors remains vital. Teachers should guide students on the appropriate use of ChatGPT, help them critically evaluate the information received, and encourage independent thinking. They should also balance the use of ChatGPT with other teaching strategies to provide a comprehensive and interactive learning experience.

RESULTS AND DISCUSSION

On the basis of interview conducted with ChatGPT, it is analyzed that it has both positive and negative impacts on students' learning. It is a tool for exploration, analysis, and idea generation, rather than a definitive source of knowledge. Rather than looking at ChatGPT as a replacement, the combination of libraries and ChatGPT can create a comprehensive educational experience for students that incorporate access to knowledge, critical thinking, personalized

guidance, and interaction necessary for effective learning. Teachers should integrate and balance the use of ChatGPT with other teaching strategies and guide students on the appropriate use of ChatGPT.

The survey results have been statistically analyzed and interpreted according to the defined objectives, as presented in Table 4.

The foundation of this research lies in acknowledging digital literacy education as an essential component of modern learning. In today's digital age, students and teachers must be equipped with the skills to navigate and harness technology effectively. Following results can be concluded for each of the objectives according to the discussions:

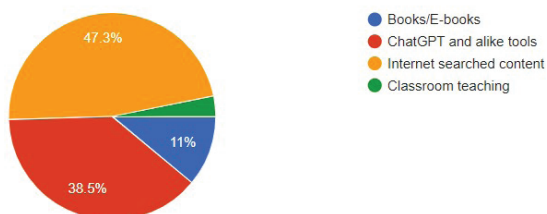
1. To explore the impact of ChatGPT on students and teaching-learning: Around 47% of students rely on Internet-based searches and content for learning, with 38.5% using AI tools like ChatGPT. Classroom teaching and traditional books/e-books are less popular for learning. Students find ChatGPT helpful for assessments and assignments, with mostly positive impacts, although some negatives. Over 75% believe that ChatGPT has

Table 4. Analysis of survey responses

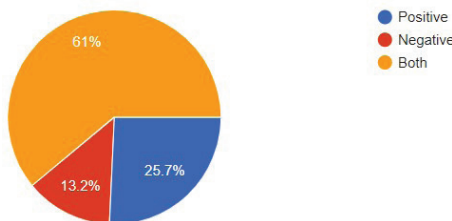
Objective: To explore the impact of ChatGPT on students and teaching-learning

Results

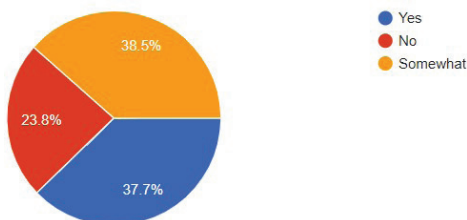
• Methods on which students nowadays rely on for learning process



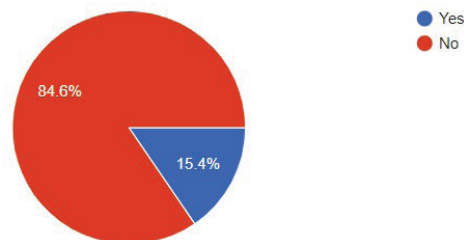
• Implications of using ChatGPT for assignments and assessment purposes



• Is ChatGPT affecting the use of libraries in educational institutes by the students



• Can ChatGPT replace classroom teaching and libraries in educational institutes



Discussion: Around 47% students nowadays rely on Internet based searches and contents for learning, followed by ChatGPT like AI tools (38.5%). Reliability of students on classroom teaching and use of books/e-books for learning is significantly low.

Most students also agree that using ChatGPT for assessment and assignment purposes has both positive as well as negative impacts on them, but mostly positive, as it proves to be helpful, resourceful and time saving.

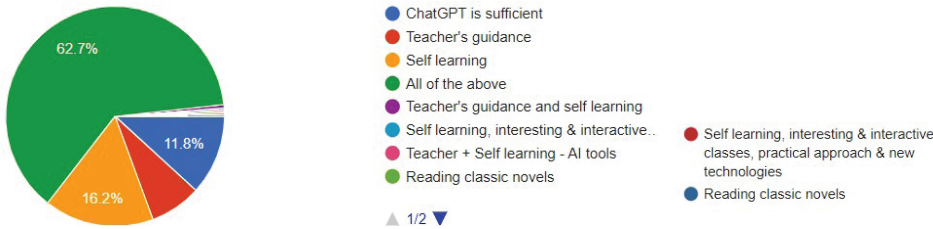
Also, more than 75% students believe that the students' use of institute libraries and its resources has been affected in varying extents by the increasing use of ChatGPT nowadays. However, it can still not completely replace the libraries and the classroom teaching, as agreed by 85% of the respondents.

Table 4. Analysis of survey responses (continued)

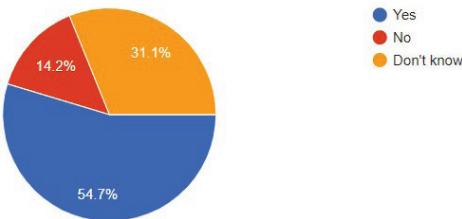
Objective: To investigate how ChatGPT enhances student engagement and knowledge acquiring

Results

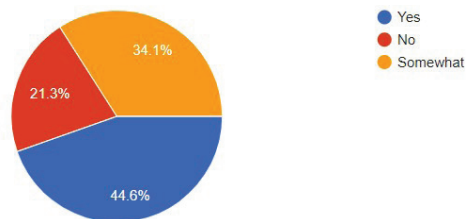
- Method(s) required for building skills such as academic writing/creative writing/business writing etc.



- Engaging activities like personalized tutoring, games, building aptitude etc. have a positive impact on students



- ChatGPT is making students lazy thinkers, i.e. interactive impacting their critical thinking



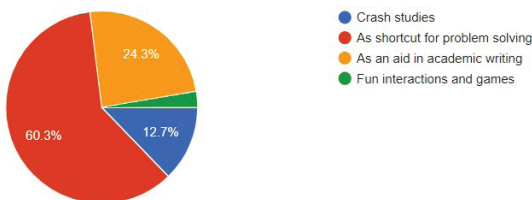
Discussion: Only around 12% students believe that ChatGPT alone is sufficient for building skills such as academic writing/creative writing/business writing. Over 62% students feel that a combination of all-ChatGPT, classroom teaching and self-learning is required for developing such skills.

Majority of respondent students (almost 55%) are also of the opinion that through engaging activities like personalized tutoring, interactive games etc., ChatGPT has a positive impact on them, while 31% were not sure about the impacts of the same. However, 44.6% of students do feel that ChatGPT and alike tools are making students lazy thinkers, i.e. have a negative impact on their critical thinking abilities.

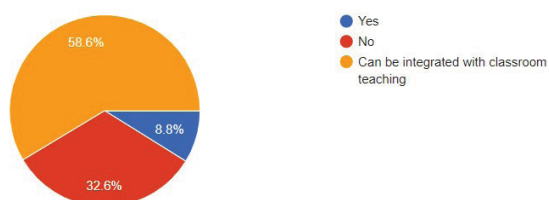
Objective: To discuss the perception of students on their use of ChatGPT tool

Results

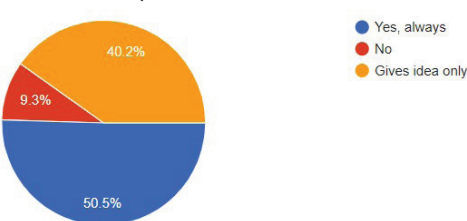
- Purpose for which students generally use ChatGPT



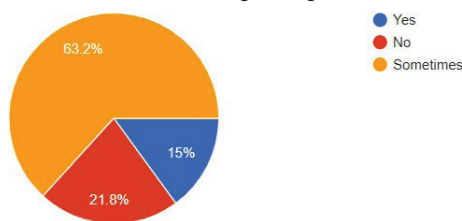
- Banning ChatGPT like models in educational institutes



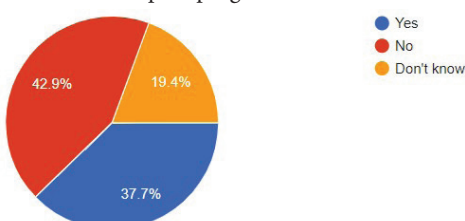
- Answers provided by ChatGPT are suitable and satisfactory



- Use of ChatGPT involves risk of getting inaccurate information and learning wrong



- Threat posed by ChatGPT to replacing software developers/programmers



- Possibility of ChatGPT like AI models to replacing traditional search engines in the long run

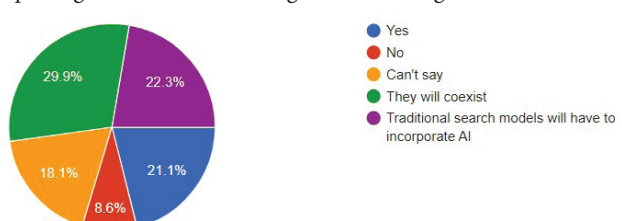


Table 4. Analysis of survey responses (continued)

Discussion: A major section of students (60%) use ChatGPT as a shortcut to problem solving, followed by as an aid in academic writing and a very low percent use it for crash studies or fun interactive games. According to over 58% of the respondents, ChatGPT like models should be integrated with classroom teaching processes rather than putting a ban on their use in educational institutes. In their use of the tool, 50.5% students believe that they get suitable and satisfactory answers from ChatGPT. However, the risk of getting inaccurate information and learning wrong sometimes also exists, as agreed by over 63% students.

A good section of students (almost 43%) do not think that ChatGPT is posing a threat to replacing software developers/programmers. Also, there is a much divided opinion on the possibility of ChatGPT like AI models replacing traditional search engines in the long run, where 21% students believe that this will happen, but almost 30% students think that both will coexist and, around 22% say that traditional search models will have to incorporate AI.

affected institute libraries, but 85% agree it can't fully replace libraries and classroom teaching.

2. To investigate how ChatGPT enhances student engagement and knowledge acquiring: Only 12% of students believe ChatGPT is sufficient for building writing skills, with 62% advocating a combination of ChatGPT, classroom teaching, and self-learning. Approximately 55% of students find ChatGPT's engaging activities beneficial, while 44.6% think these tools may hinder critical thinking, though 31% are uncertain about their impact.
3. To discuss the perception of students on their use of ChatGPT tool: About 60% of students use ChatGPT for problem-solving, with fewer using it for academic writing or fun games. Over 58% believe ChatGPT-like models should be integrated with classroom teaching, not banned. While 50.5% get satisfactory answers, over 63% acknowledge the risk of inaccuracies. Most students (43%) don't see ChatGPT as a threat to replace software developers/programmers. Opinions are divided on ChatGPT replacing traditional search engines; 21% think it will, while almost 30% believe both will coexist, and 22% see traditional search models incorporating AI.

Understanding these constraints encourages critical thinking and problem-solving skills.

- Academicians should redesign assessment tasks (such as examinations) in a way that they can't be completed as easily by AI tools and rather adopt more personalized reflective tasks which are contextualized to the subject content. Faculty should include concept-based/ innovative classroom assignments which invoke students' critical thinking rather than encouraging copy-pasting content from the Internet or books or from ChatGPT like tools.
- The use of authentic assessments, which are creative learning experiences that evaluate students' skills and knowledge in realistic situations, should be included by teachers. These assessments go beyond traditional tests to reflect real-world challenges' complexity, enhancing motivation and learning applicability for students.
- One approach advocates for a variety of assessment formats, including presentations, performances, and digital forms such as web pages, videos, and animations. This allows students to demonstrate their understanding and creativity through mediums they find comfortable and engaging.

RECOMMENDATIONS

Few recommendations for teachers and students around teaching-learning processes and the use of ChatGPT like AI tools are:

- Students should gain a comprehensive understanding of the benefits of AI tools, such as augmenting creativity, streamlining processes, and solving complex problems efficiently. Acknowledging these advantages can inspire innovation.
- Also, rather than putting a ban on their use, integrating the use of ChatGPT, Grammarly or other AI tools in institute libraries and/or as part of teaching-learning processes through appropriate ways can serve to be beneficial. These tools have the potential to help spark the creative process when wielded thoughtfully
- Equally important is the awareness of AI's limitations. Students need to grasp that AI tools are not infallible and may not always provide perfect solutions.

CONCLUSION

ChatGPT, introduced by OpenAI in November 2022, is part of a lineage of AI language models that have evolved rapidly in the last decade. The proliferation of these large language models has ushered in a fundamental question for the field of education that whether these models are a blessing or a potential challenge to the existing teaching and learning paradigms. Understanding their viewpoints is imperative for comprehending the implications of AI-driven language models on the educational landscape. Through a four-phase methodology in this work, more than 400 students of different undergraduate courses in Delhi were surveyed on their perception and use of ChatGPT, and similar questions from the questionnaire were also put up for interacting with the tool. Several other authors have conducted studies and surveys on a range of participants to experiment with the use of ChatGPT with objectives varying from checking its capabilities to write summaries

in Spanish, or integrate into English language programs to promote learners to considering ethical impacts of integrating ChatGPT in higher education. The findings of our paper indicate a generally positive reception of ChatGPT among students. They appreciate its potential benefits for learning and professional life, such as motivation and valuable explanations. However, students also acknowledge the need for a solid subject knowledge foundation and express concerns about accuracy and potential drawbacks. Teachers therefore can and should integrate ChatGPT into teaching-learning processes. While the impact on academic integrity and job opportunities is a modest concern, the overall outlook remains optimistic. And as education keeps changing, it's going to be crucial to keep researching and figuring out how to make the most of AI like ChatGPT in the classroom.

AUTHORSHIP CONTRIBUTIONS

Authors equally contributed to this work.

DATA AVAILABILITY STATEMENT

The authors confirm that the data that supports the findings of this study are available within the article. raw data that support the finding of this study are available from the corresponding author, upon reasonable request.

CONFLICT OF INTEREST

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ETHICS

There are no ethical issues with the publication of this manuscript.

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