Journal of
Data Science & Applied Analytics

Copyright © Authors, 2026

Article

Meta-Cognitive Analysis of Awareness and Uses of ChatGPT among Post-Graduate Students

Dr. Abhisek Panda [1], Dr. Laxmiram Gope [2], Dr. Debabrata Sarkar [3] and Dr. Susanta Pandey [4]

1. Assistant Professor, School of Education, Adamas University, Kolkata, panda.abhi2@gmail.com
2. Assistant Professor, Department of Education, Sidho-Kanho-Birsha University, Purulia, Laxmiram.1122@gmail.com
3. Assistant Professor, School of Education, Adamas University, Kolkata, debabratasarkarh@gmail.com
4. Associate Professor, School of Education, Adamas University, Kolkata,susanta.pandey1@adamasuniversity.ac.in

* Correspondence: panda.abhi2@gmail.com

Abstract

The use of artificial intelligence (AI) tools like ChatGPT has significantly impacted higher education, especially in enhancing students' cognitive abilities and academic engagement. This study explores about the awareness of ChatGPT among postgraduate students of Sidho-Kanho-Birsha University, Purulia, focusing on differences in gender and residential background. A descriptive survey method was used, using both primary and secondary data. A sample of 150 students was selected through stratified random sampling, and data were collected using a self-constructed five-point Likert scale questionnaire along with unstructured interviews. Statistical techniques such as mean, standard deviation, and t-test were applied for analysis. The analysis indicates partial variation in awareness levels across gender under conventional significance thresholds, though such differences diminish under stricter criteria. Furthermore, awareness remains largely the same regardless of residential background, indicating minimal impact of location on students' familiarity with ChatGPT. This study highlights the growing relevance of AI literacy in higher education and emphasizes the need for responsible and informed use of such tools. It reflects the inclusion of AI in the curriculum with the aim of enhancing critical thinking, digital literacy, and cognitive skills.

Keywords: *Meta Cognitive Analysis, Awareness, ChatGPT, PG Students, Artificial Intelligence.*

Open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license.

1. Introduction

In 21st century, Artificial Intelligence (AI) incorporation into education has significantly reformed Teaching and Learning Processes. ChatGPT is one of the most transformative innovations, and it is a generative AI model developed by OpenAI. Basically, this is utilizes Natural Language Processing (NLP) to generate humanized responses and side-by-side assist users in a wide range of academic and creative tasks. ChatGPT has emerged as a powerful tool in Higher Education due to its answering questions and generate content, facilitating interactive learning experiences ***(Dwivedi et al., 2023)***. Studies suggested that generative AI systems are reshaping current educational practices through the promotion of personalized learning, adaptive feedback, and collaborative knowledge creation ***(Luckin & Cukurova, 2024; Zawacki-Richter et al., 2023).***

In the context of higher education, particularly postgraduate level education, students are expected to engage in Higher-Order Thinking (HOT), independent research, and critical analysis. In such cases, awareness and effective use of AI tools like ChatGPT can play a crucial role. These kinds of tools enhance academic efficiency and influence students' metacognitive skills in planning, monitoring, and evaluating their learning processes (Flavell, 1979). AI-assisted or integrated learning environments help to improve self-regulated learning, cognitive and academic development ***(Holmes et al., 2022; Chan & Hu, 2023)***. Also, generative AI can support inquiry-based learning, in academic writing, search literature review, coding & decoding and multilingual teaching learning process ***(Kasneci et al., 2023; Baral, 2025; Tlili et al., 2023).*** However, a systematic investigation is required towards students' awareness and ability to use these advancements.

AI Integration in higher education mostly depends on student awareness, accessibility, and digital literacy skills. Particularly in geographically remote areas and educationally disadvantaged regions, these kinds of issues become more significant, like Sidho Kanho Birsha University, located in Purulia district, West Bengal, India. Where limited digital resources and technological contact affecting students' familiarity with these evolving AI tools. Digital inequality continues to influence students' adoption of emerging educational technologies ***(Selwyn, 2022; UNESCO, 2023).*** Therefore, exploratory ChatGPT awareness among postgraduate students in such contexts is really essential to navigate existing gaps and opportunities in digital learning environments.

AI-powered academic interactions and learning environments are increasing day by day. AI platforms create opportunities for continuous learning beyond the classroom by enabling 24/7 assistance ***(Khalil & Er, 2024).*** Some researchers also argue and worry that AI-assisted learning environments may reduce cognitive skills and improve academic productivity among university students ***(Chen et al., 2024).*** Similarly, scholars also caution that extreme dependency on AI-generated responses may decline students' analytical abilities, originality, and critical ***(Cotton et al., 2023).*** So, balancing technological convenience with critical and ethical engagement towards digital pedagogy and AI adoption is required.

Through the discussion, we are already aware that AI tools (ChatGPT) offer numerous advantages, like it reduces academic workload, enhancing content quality, and

providing instant support. Besides, we should not forget that these platforms also raise concerns related to overdependence, academic integrity, and ethical use (Kasneci et.al., 2023). So, it is better for the students or scholars that they should be aware of its benefits as well as its limitations and responsible usage.

1.1 Relationship between Metacognition and ChatGPT

The relationship between metacognition and ChatGPT depends on how we are using these, these have both supportive and potentially disruptive nature. Metacognitions indicate the ability to plan, monitor, and evaluate one's own thinking, self-expression, and learning. Now a days students are more rely on technological tools and if students use ChatGPT tool and its prompt as a support for making the concept more understanding, then they can improve these skills by systematically thinking like first planning what to ask, then carefully monitoring the model's responses, and finally evaluating where those responses might be incomplete or incorrect. These are regarded as classic meta cognitive strategies. Many Research studies shows that cobined with ChatGPT-generated answers with metacognitive prompts—such as "What strategy did you use?" or "Where might this go wrong?"—helps learners become more aware about their lacuna of their reasoning processes ***(Azevedo & Hadwin, 2005)***. But, if users treat ChatGPT as a dependable source of answers and simply copy its outputs in blind eyes without any reflection, their metacognitive skills can decline ***(Kasneci et al., 2023)***. In this case, own thinking skills, total planning and self-evaluation are avoided that leads to lower or minimum engagement with the material and over-confidence on the model. Studies also suggests that people may over-trust ChatGPT and believed that Technology don't make any mistakes, usually skipping the usual checks they would perform on their own thinking. On another level, recent work examines whether ChatGPT itself can display metacognitive-like behaviors, such as indicating confidence in its answers ***(Yoshizawa et al., 2026)***. When these signals are reasonably accurate, they can help users decide when to trust or verify outputs, effectively turning the model's 'self-awareness' into a tool for enhancing human metacognition. Here we can take the help of ChatGPT for scaffolding the mata cognitive strategies ***(Azevedo & Hadwin, 2005***).

1.3 Rationale of the Study

The growing effect of Generative AI Technologies in education and the need to understand their impact on learners, particularly at the Postgraduate level is one of the important influences for this study. ChatGPT is a Large Language Models (LLMs) continuously growing; and increasingly combined into academic practices, also making it essential to explore how student perceive and utilize the tool ***(Zawacki-Richter et al., 2019).***

Initially, ChatGPT provides technological advancement in education sector. Investigating postgraduate students' awareness towards these tools can offer valuable insights and their readiness to adopt AI-driven learning systems. This will also help educators design effective strategies for technological integration.

Secondly, the study will adopt metacognitive perspective, and will highlight the importance of self-regulated learning. The investigation on students' engagement with

ChatGPT and tool supports metacognitive development, can better understand for planning learning tasks, monitoring understandings, and evaluating outcomes ***(Schraw & Dennison, 1994).***

This study will also help to understand students' awareness and attitudes toward ChatGPT and optimise learning experiences as well. Systematic use of AI tools will enhance critical thinking, creativity, and independent learning; side-by-side misuse or overdependence may hinder cognitive development. So, the study aims to identify the patterns that may recognize the balanced and effective use of AI in an educational setting.

This research study is also pertinent in the context of rural and urban underserved educational settings. Particularly concentrating on Postgraduate students of Sidho Kanho Birsha University, the study will highlight digital inclusion and provide recommendations for inclusive and equitable access.

Exploring awareness of ChatGPT and AI tools through a metacognitive lens is both timely and significant for postgraduate students of Sidho Kanho Birsha University, Purulia, West Bengal. The findings of the study are expected to contribute to the broader discourse on AI in education and support the development of informed, ethical, and effective practices in higher education.

1.4 Objectives of the Study:

The objectives of the present study are:

I. To know the Post Graduate Students ChatGPT awareness level concerning their gender (male and female) of Sidho Kanho Birsha University (SKBU).

II. To know the attitude of postgraduate students towards ChatGPT in respect to the location (Urban and Rural) of SKBU.

1.5 Hypothesis of the study:

The researchers frame the following null hypothesis according to the objectives

1. There is no significant difference in awareness level towards ChatGPT with respect to gender (male and female) in Postgraduate students of SKBU.

2. There is no significant difference in awareness level towards ChatGPT with respect to location (Urban and Rural) in Postgraduate students of SKBU.

2. Methodologies of the Study:

2.1 Nature of the Study:

The study is a descriptive cum survey type; where data are collected from primary and as well as from secondary sources. Primary data was collected with the help of a five-point Likert scale questionnaire.

2.2 Population of the Study:

All the Postgraduate admitted students of academic session 2023-24 and 2024-25 in arts and science backgrounds at Sidho Kanho Birsha University are considered as the population of this study.

2.3 Sample and Sampling:

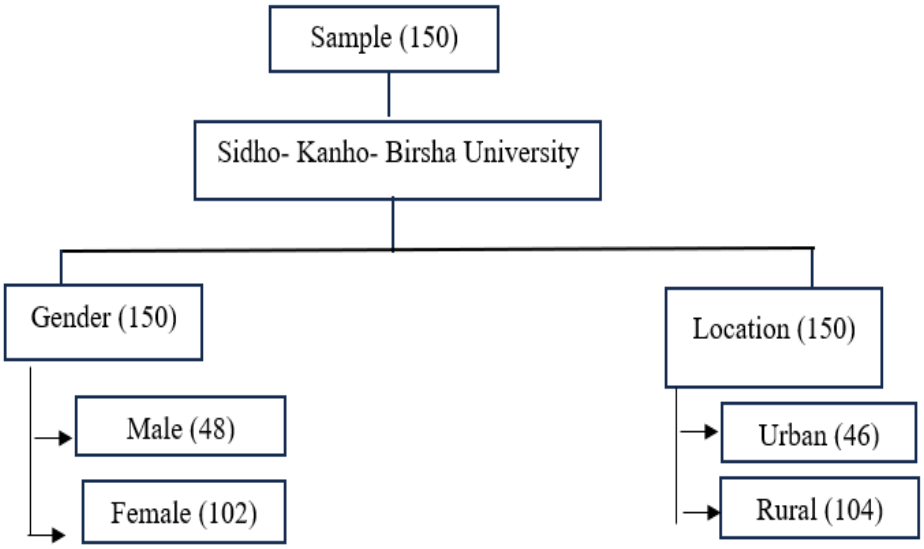
From the population, only 150 postgraduate students are selected as the sample for the study. Stratified random sampling technique is adopted for selection of the samples. After that, the selected samples are classified based on Gender (male & female) and residential background (Urban & Rural).

2.4 Sampling Design of the Study:

The researchers have used the following sampling design for the study:

Figure 1

Sampling Design



2.5 Tools and Techniques of the Study:

Research tools and techniques depend on the field of study and its objectives. In this study, a researcher-made 5-point Likert scale questionnaire and an unstructured interview were used. Here, the tools were validated by taking expert opinion from two experts and depending on their opinion, the tools were modified.

2.6 Variables of the Study:

The present study was conducted to study ChatGPT awareness among the Postgraduate students: A Metacognitive Exploration in the context of some variables. The included variables in the present study are under

- **Dependent Variable:**

  Awareness of ChatGPT

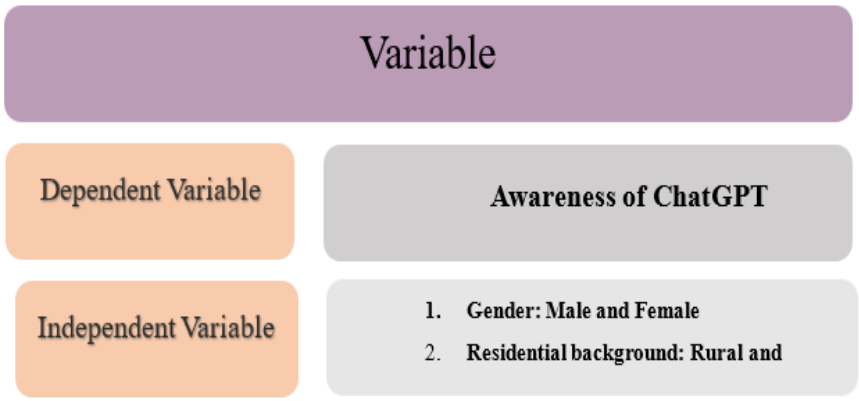
- **Independent Variable:**

I. Gender: Male and Female

II. Residential background: Rural and Urban

Figure 2

Variables of the Study



2.7 Delimitation of the Study:

Every research study has several delimitations. So, accordingly, this study also has some delimitations as well. The following are the delimitations of this study as stated below:

1. This study was only conducted in Sidho Kanho Birsha University in Purulia, West Bengal, India.
2. This study was only conducted on Postgraduate students with respect to their Gender and residential background.
3. This study was confined to 150 sample size.
4. This study is confined to male, female, urban, and rural postgraduate students.

2.8 Methodological Diagram:

Table 1

Methodological Diagram of the Study

Sl No	Objective of the Study	Hypothesis of the study	Nature of the study	Data Collection Device used	Statistical techniques will be used
1.	To know the Post Graduate Students ChatGPT awareness level concerning their gender (male and female) of Sidho Kanho Birsha University (SKBU).	There is no significant difference in awareness level towards ChatGPT with respect to gender (male and female) in Postgraduate students of SKBU.	Quantitative in nature	Questionnaire (Self-made)	Mean, Median, t-test, Histogram, Pie Chart

2.3. Result and	To know the attitude of postgraduate students towards ChatGPT in respect to the location (Urban and Rural) of SKBU.	There is no significant difference in awareness level towards ChatGPT with respect to location (Urban and Rural) in Postgraduate students of SKBU.	Quantitative in nature	Questionnaire (Self-made)	Mean, Median, t-test, Histogram, Pie Chart

Findings:

Objec

Objective Wise Data Analysis:

3.1 Objectives 1: To know the awareness Level towards ChatGPT with respect to their gender (male and female) among the Post Graduate Students of SKB University.

For the fulfilment of the above objective researchers set a null hypothesis and then differentiated the two means by t test and formulated the null hypothesis.

Null Hypothesis: There is no significant difference in awareness level towards ChatGPT with respect to gender (male and female) in Postgraduate students of SKBU.

Table 2

Gender wise ChatGPT Awareness among Postgraduate Students

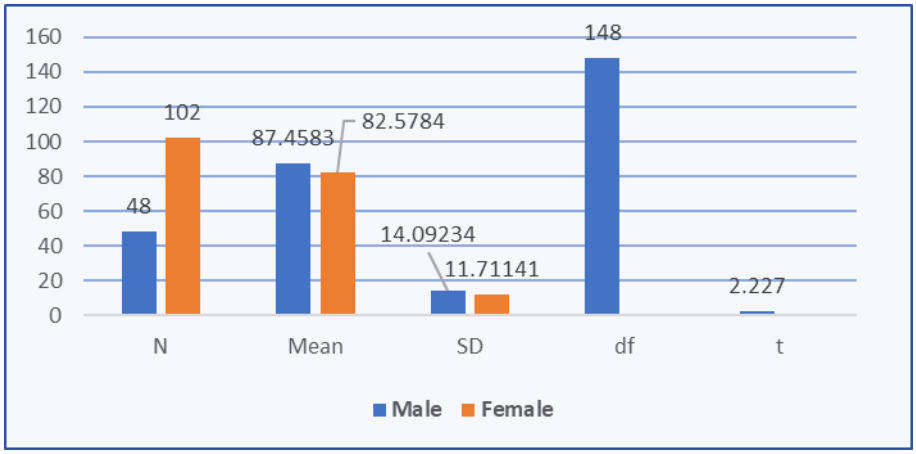
Group	N	Mean	∑	df	Calculated t-value	Critical t-value	Ns/S	Remark
Male	48	87.4583	14.09234	148	2.227	0.05 level =1.9766	S	Rejected (fail to accept)
Female	102	82.5784	11.71141			0.01 level= 2.6099	NS	Accepted

able shows the results of the gender wise ChatGPT Awareness among Postgraduate Students (M/F). The analysis shows the female students (102) majority than male students (48). Genders wise (M/F) Statistically significant difference in awareness levels is visible and the table showed a calculated t value of 2.227, which is greater than the critical t value of 1.9766 at a significance level of 0.05. So, the null hypothesis fails to be accepted and the 0.01 level of significance is accepted. The remark also shows "fail to accept " at a 0.05 level of significance. The difference in awareness scores between males and females is likely due to some other exceptional reason, but no significant difference at the 0.01 level.

The table showed a mean score of 87.46 for males and 82.58 for females. It suggests Females have a lower ChatGPT awareness than males and there might be a gender difference in awareness among postgraduate students at SKB University.

Figure 3

Bar diagram of Descriptive statistics of males and females



Above figure shows no significant difference, as data shows t-value is 2.227, df is 148, Standard error is 2.19086 at 0.05 significance level and is calculated t-value is 1.9766, so the null hypothesis is rejected or failed to accept. It shows that there is a significant difference in the awareness level among the post-graduates concerning gender.

The hypothesis is also tested at a 0.01 significance level, the calculated t-value is 2.227, and the critical table t-value is 2.6099, the calculated t-value is lower than the table value. The null hypothesis is accepted; it's predicted that there is no significant difference in awareness among the postgraduates with respect to gender.

Finally

(1) Significant differences are found in ChatGPT awareness between male and female students at 0.05 level.

(2) No significant difference is found towards ChatGPT awareness between male and female students at 0.01 level. This suggests that both genders (M/F) are aware about ChatGPT.

3.2 Objectives 2: To know the attitude of postgraduate students towards ChatGPT in respect to the location (Urban and Rural) of SKBU.

For this purpose, Null hypothesis has been tested to see if any significant difference are there or not. The null hypothesis was set as: There is no significant difference in awareness level towards ChatGPT with respect to location (Urban and Rural) in Postgraduate students of SKBU.

Table 3

Awareness level among the postgraduate students with respect to Urban and Rural areas

Group	N	Mean	∑	df	Calculated t value	Critical t value	Ns/S	Remark
Urban	46	84.9783	13.66827	148	0.537	0.05 level = 1.9766	NS	Accepted
Rural	104	83.7692	12.27139			0.01 level= 2.6099	NS	Accepted

ove table shows that:

The null hypothesis, which states that there is no significant difference between urban and rural students' awareness level towards ChatGPT, is accepted. This means it is not **rejected** at both levels of significance at 0.0l level of significance and 0.05 level of significance.

This is because the calculated t-value (0.537) is less than the critical t-value (1.9766) at a significance level of 0.05 and the same as the 0.01 level.

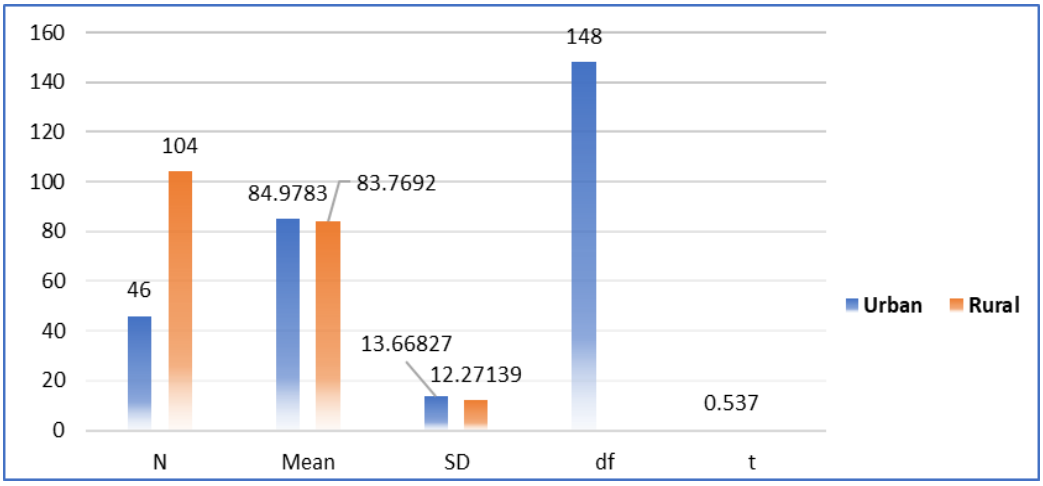
The "Remark" section of the table says "NS (Not Significant)" and "Accepted", further indicating that the observed difference in awareness scores between urban and rural students is likely due to random chance and not a true population difference.

On the basis of data analysis, no significant difference has been found between urban and rural postgraduate students in the level of awareness towards ChatGPT at SKB University. So, it is concluded that the null hypothesis is accepted.

Now, a histogram is created below from the above table for better understanding:

Figure 4

Descriptive analysis of awareness level about ChatGPT



The above figure shows that based on the t-values, the null hypothesis was not rejected, which suggests that there is no statistically significant difference between the two groups. So, it indicates that both urban and rural areas are aware of the use or application of ChatGPT.

4. Summary of the Study:

Present study was conducted in the SKB University of Purulia district, West Bengal. The purpose of the study was to identify awareness of ChatGPT among Postgraduate students. The study is based on a critical review that helps to build the pathway of this study. Review of related literature shows that the knowledge gap was found in ChatGPT awareness. The sampling design was made through stratified random sampling to achieve the research objective. Researchers collected the quantitative data from 150 postgraduate students from different streams of SKB University, which helps to fulfil the objectives. Data analysis was done using inferential analysis, involving t-tests, and descriptive statistics (mean, median, mode, and SD).

4.1 Major Findings:

The chapter is based on the analysis of data, the interpretation of results, and a set of findings

Objective 1: To know the awareness Level towards ChatGPT with respect to their gender (male and female) among the Post Graduate Students of S.K.B University

Findings: The researchers used a null hypothesis to find out the attitude among male and female students towards ChatGPT. Through the analysis researchers find that the null hypothesis is rejected at a significance level of 0.05 and 0.01 the null hypothesis is.

So, a significant difference between male and female students towards ChatGPT at the 0.05 level has been found and no significant difference at the 0.01 level.

Discussion:

The study at SKB University shows that male and female students have different opinions about ChatGPT. Researchers found a clear difference between how they perceive or use ChatGPT when looking at a standard measure of significance level at 0.05. The Result suggests that gender plays a major role in shaping attitudes. When looked closely with a stricter measure at 0.01, the difference was minimal, and this indicates the need for a more detailed investigation.

Objective 2: To know the attitude of postgraduate students towards ChatGPT in respect to the location (Urban and Rural) of SKBU.

Findings: To find out the attitude of postgraduate students towards ChatGPT in respect to the location (Urban and Rural) of SKBU, researchers used a null hypothesis, and it was accepted at a 0.05 significance level as well as at a 0.01 significance level.

Discussion:

The result shows that Urban and rural students show similar attitudes towards the use of ChatGPT. This recommends that factors such as geographical location (urban or rural) do not significantly impact ChatGPT use.

4.2 Educational Implication:

The educational implication of the study is that the integration of ChatGPT into the curriculum will boost students' access to diverse learning and personalized learning experiences, and that will fulfil academic needs and interests. This will also influence the metacognitive skills of students` interactions with ChatGPT, through understanding learning processes, monitoring comprehension, and regulating learning strategies.

Engagement of ChatGPT will foster critical thinking skills of students by evaluating information provided by AI, questioning assumptions, and verifying facts. Incorporation of ChatGPT particularly in SKB University will reshape teaching methods for educators as a supplementary tool for delivering content, enabling discussions, and providing feedback from students. This process will help enhance digital literacy skills for students learning process by the way of effective use and interaction with AI technologies. Evaluating the credibility of AI-generated content and navigating online information, this will create a responsible learner.

Ethical use of AI in education will raise considerations and bitterly understand of data privacy, bias in AI algorithms, and the responsible integration of AI into academic settings. For further research on the effectiveness of AI in education, leading to advancements in educational technology, this study will also act as a secondary source.

This will prepare students for future ready where familiarity with AI tools and digital skills is increasingly valuable.

So, awareness of ChatGPT among postgraduate students, educators, and researchers of SKB University can help them understand how AI technologies can be effectively leveraged to enhance learning outcomes and prepare students for a digitally driven future.

4.3 Recommendations:

The study is based on descriptive methods, and the research area is Sidho Kanho Birsha University. The sample size was 150, so it can be conducted on a larger sample size. This study can be conducted with M.Ed., B.Ed., etc. students as well. It is recommended that:

i. A similar study can be conducted with a large sample size from other universities or states.
ii. This study can also be conducted to gain awareness and effectiveness about ChatGPT in other categories of students, such as school students, various Higher Education Students, and professionals.
iii. Researchers can work on ChatGPT to improve language proficiency for non-native speakers.
iv. Case study may be conducted on the impacts of ChatGPT towards customer service experiences for the retail sector.

5. Conclusion:

ChatGPT is an Artificial Intelligence (AI) technology that can understand and generate human-like text in response to prompts. In higher education, awareness of ChatGPT can assist in research, tutoring, or even personal productivity. Students and educators need to understand its advancement and limitations to effectively integrate it into learning and teaching practices. Awareness can lead to innovative uses of ChatGPT to enhance educational experiences and outcomes.

5.1 Limitations of the Study

Despite this research's contributions, it has several limitations that must be acknowledged.

i. Firstly, the sample size (N = 150) is moderately small and confined to a single institution (Sidho-Kanho-Birsha University) only. This article restricts the generalizability of the findings to broader postgraduate populations.
ii. Third, the descriptive survey method limits causal interpretations, as it captures awareness at a single point in time.
iii. Additionally, the study has not focused on digital literacy, socio-economic status, academic discipline, and prior experience to AI tools.
iv. Lastly, one of the biggest challenges is that self-reported data, this may be affected by response bias, mainly in assessing awareness and usage of ChatGPT.

5.2 Future Research Directions

Future studies may be conducted by increasing the sample size across multiple or more than one university and diverse geographical regions. Longitudinal and experimental research designs also may be adopted to examine causal relationships between ChatGPT use and metacognitive development. Variables also may be increased like digital competence, academic performance, motivation, and ethical awareness to provide a

deeper, comprehensive understanding. Comparative studies across disciplines and educational levels are also recommended. So, lastly future research may explore the effect of structured AI training interventions on students' metacognitive skills, critical thinking, and responsible AI usage.

Author Contributions: Authors contributed as "Conceptualization, Dr. Abhisek Panda, Dr. Laxmiram Gope, and Dr. Debabrata Sarkar.; methodology, Dr. Abhisek Panda, Dr. Laxmiram Gope, and Dr. Debabrata Sarkar.; software, Dr. Abhisek Panda, and Dr. Debabrata Sarkar.; validation, Dr. Abhisek Panda, Dr. Laxmiram Gope, Dr. Debabrata Sarkar, and Dr. Susanta Pandey.; formal analysis: Dr. Abhisek Panda, Dr. Laxmiram Gope, Dr. Debabrata Sarkar, and Dr. Susanta Pandey. investigation, Dr. Abhisek Panda, Dr. Laxmiram Gope, Dr. Debabrata Sarkar, and Dr. Susanta Pandey; resources, Dr. Abhisek Panda, and Dr. Laxmiram Gope.; data curation, Dr. Abhisek Panda, Dr. Laxmiram Gope.; writing—original draft preparation, Dr. Abhisek Panda, and Dr. Debabrata Sarkar; writing—review and editing, Dr. Abhisek Panda, and Dr. Debabrata Sarkar; visualization: : Dr. Abhisek Panda, Dr. Laxmiram Gope, Dr. Debabrata Sarkar, and Dr. Susanta Pandey; supervision: Dr. Laxmiram Gope .; project administration: NA.; funding acquisition: NA. All authors have read and agreed to the published version of the manuscript."

Funding: Please add: "This research received no external funding"

Institutional Review Board Statement: Ethical review and approval were waived for this study because it involves educational practices that do not involve sensitive personal information.

Acknowledgments: The authors express their heartfelt gratitude to Dr. Laxmiram Gope for initiating and inspiring this research work. His valuable guidance, encouragement, and continuous support were instrumental in the successful completion of the study. The authors also sincerely thank the students of Sidho-Kanho-Birsha University (SKBU) for their active participation and for providing the data required for this research. During the preparation of this manuscript, the authors used ChatGPT (OpenAI, GPT-5.5) for language editing, grammar improvement, and assistance with manuscript formatting. The authors carefully reviewed and edited all generated content and take full responsibility for the content of this publication.

Conflicts of Interest: "The authors declare no conflicts of interest."

References:

Baidoo-Anu, D., & Owusu Ansah, L. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. Journal of AI, 7(1), 52–62.

Baral, D. (2025). Leveraging AI, magic, and field trips to prevent math anxiety in elementary school pupils. *American Journal of STEM Education*, *9*, 21-34. https://doi.org/10.32674/rxaamv34

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. Education and Information Technologies, 28(12), 1–20.

Chen, L., Chen, P., & Lin, Z. (2024). Artificial intelligence in higher education: Impacts on learning environments and academic productivity. Computers & Education: Artificial Intelligence, 5, 100172.

Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. Innovations in Education and Teaching International, 61(2), 228–239.

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M., Al-Busaidi, K. A., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., … Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. International Journal of Information Management, 71, 102642.

Enkelejda Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. American Psychologist, 34(10), 906–911. https://doi.org/10.1037/ 0003-066X.34.10.906

Fullan, M., & Langworthy, M. (2014). A Rich Seam: How New Pedagogies Find Deep Learning. Pearson.

Gregory Schraw, G., & Rayne S. Dennison, R. S. (1994). Assessing metacognitive awareness. Contemporary Educational Psychology, 19(4), 460–475. https://doi.org/10.1006/ce ps.1994.1033

Holmes, W., Bialik, M., & Fadel, C. (2022). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Center for Curriculum Redesign.

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., … Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, 102274.

Khalil, M., & Er, E. (2024). Will ChatGPT transform higher education? Opportunities and challenges in AI-assisted learning. Education Sciences, 14(2), 115.

Luckin, R., & Cukurova, M. (2024). Designing generative AI systems for education: Opportunities and ethical challenges. British Journal of Educational Technology, 55(1), 15–30.

Moorhouse, B. L., Yeo, M. A., & Wan, Y. (2023). Generative AI tools and the future of higher education: Student engagement and collaborative learning perspectives. Journal of University Teaching & Learning Practice, 20(5), 1–15.

Olaf Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education, 16(1), 39. https://doi.org/10.1186/s41239-019-0171-0

Panda, A. & Gope, L. (2024). Breaking barriers: The digital revolution in girls education across India. Journal of Interdisciplinary Studies in Education, 13(S1). https://doi.org/10.32 674/ffkmbm80

Selwyn, N. (2022). Education and Technology: Key Issues and Debates (3rd ed.). Bloomsbury Academic.

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. Smart Learning Environments, 10(1), 15.

UNESCO. (2023). Guidance for Generative AI in Education and Research. UNESCO Official Website

Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. Learning, Media and Technology, 45(3), 223–235.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2023). Systematic review of research on artificial intelligence applications in higher education. International Journal of Educational Technology in Higher Education.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). The publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.