Investigating how AI Chatbots Can Facilitate Group Work in Higher Education

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CCS CONCEPTS • Collaborative Learning• Computer Supported Collaborative Work • Artificial Intelligence (AI) • Collaborative AI

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1 Introduction

The use of artificial intelligence (AI) Chatbots in education is gaining momentum and various AI tools are being developed to enhance learning outcomes [17, 9, 11, 4,]. Chatbots motivate and engage students [11], enable personalized instruction [12], and optimize learning abilities [4]. Since it debuted in fall 2022, ChatGPT, an AI chatbot developed by OpenAI, has been used by both students and teachers for individual learning activities such as assisting with research, improving writing skills, aiding in language learning, and more [23]. However, research on chatbots for collaborative learning is limited [17].

This study explores student and teacher attitudes and perspectives on using AI chatbots for learning, and the potential for AI chatbots to facilitate collaboration in learning. In the paper, we discuss the prospect of using AI chatbots for collaborative learning through the lens of key concepts of computer supported cooperative work (CSCW) such as awareness, articulation work, and place and space.

In this study, we conducted surveys and gathered valid insights from forty-seven students and twelve teachers in higher education. The majority of respondents agreed that ChatGPT for learning could be both beneficial and detrimental to learning. Through this study, we conducted a thematic review of the findings and identified the opportunities and challenges that may arise when using chatbots for collaborative learning.

As AI advances, the need for enhanced learning and collaborative work with AI will surface [22]. Through this study, we aim to provide foundational research around the potential for AI chatbots to support collaborative learning experiences that are effective, inclusive, and personalized.

In this paper, we review related works on chatbots, AI, and collaborative learning, as well as CSCW concepts. Next, we describe our methodology for conducting the study, including surveying students and teachers, then present our findings, discussing the opportunities and challenges that may arise when

incorporating chatbots into collaborative learning environments. Finally, we conclude with a discussion of the implications of our findings for future research and practice.

2 Related Work

2.1 Collaborative Learning in Education

Collaboration is an essential part of the learning experience [19, 21, 17, 10] and necessary to support a student's performance, and satisfaction [21]. Collaboration means working together to complete a task or to achieve a shared goal [17]. In education, learning is the shared objective between students, as well as between students and teachers. Engaging in collaborative activities such as group discussion, negotiation, questioning, information sharing, and debate allows students to refine their problem-solving approaches and observe diverse thinking strategies [17]. Additionally, collaboration helps combat social isolation in remote learning [10].

As instruction shifts to e-learning, preserving collaboration in a remote setting is a priority; however, research has found that successful online collaborative learning requires more structure than in-person collaborative learning [18] and current systems lack adequate support for students to collaborate throughout the learning process [19].

Within the field of CSCW, researchers emphasize the importance of awareness and articulation work in supporting effective collaboration. Awareness refers to the understanding of the activities of others, which provides a context for one's own activity. This context is used to ensure that individual contributions are relevant to the group's activity as a whole, and to evaluate individual actions with respect to group goals and progress [13]. In group work, awareness ensures effective coordination and collaboration, allowing individuals to synchronize their activities, avoid duplication of efforts, and leverage each other's strengths [13].

Another CSCW concept, Articulation work, is the culmination of many tasks and coordination efforts that are necessary to get work done. When students and teachers work together on a task, articulation work plays a vital role in ensuring that the group has a shared understanding, an equal distribution of work, and effective negotiation and conflict resolutions among teachers and students [14].

When considering collaboration in education, it's also essential to examine the concepts of place and space. According to Dourish, Space is the opportunity; place is the understood reality. A place is generally a space with something added—social meaning, convention, cultural understanding, etc [16].

In educational settings, the notion of place and space extends beyond physical classrooms to include online platforms and virtual learning environments [16]. Understanding the dynamics of place and space is crucial for effective collaboration in education. Whether students are physically present in a classroom or engaged in remote learning, the design of the collaborative environment significantly influences interaction and knowledge sharing [12, 16]. By creating inclusive and supportive spaces that facilitate meaningful collaboration, educators can establish valued places that foster engagement and cooperation among students. [16].

For e-learning, the notion of place and space becomes even more critical. As education increasingly shifts to online platforms, educators face the challenge of recreating the sense of place and space that is inherent in traditional face-to-face classrooms. Establishing a virtual environment that promotes a sense of belonging and shared purpose is key to sustaining collaboration in remote settings [16]. Moreover, leveraging appropriate technologies and tools can help bridge the spatial gap and enable students to engage in collaborative activities effectively [16, 24].

2.2 Artificial Intelligence in Education

The term "artificial intelligence" is often associated with powerful supercomputers that mimic human behavior In education, AI has expanded beyond supercomputers and is being integrated into collaborative robots (cobots) and embedded computer systems in order to enhance the learning experience for students, even at the earliest stages of education. [2,3]. Prior studies explored that cobots, which work together with teachers or other robots, are being used to teach children basic tasks such as spelling and pronunciation, while also adapting to individual students' abilities [2,3].

Additionally, web-based and online education has evolved from a simple model of making learning materials available to download, to systems which include intelligent and adaptive features that learn and adjust to teacher and student behavior [4 5]. By utilizing machine learning and cognitive learning theory, these intelligent education systems offer customized feedback and instruction that provide enhanced learning outcomes [6].

Research has shown the effectiveness of using AI-based tools in education. For example, Quizbot, a dialogue-based agent that helps students learn factual knowledge, enabled students to recognize and recall 20% more than when using flashcards. [11]. Another study focused on co-designing a learning analytics tool which uses AI algorithms, data, and expert knowledge to assist teachers in providing personalized instruction [12].

AI systems for learning incorporate a variety of techniques, including machine learning, data mining, and knowledge modeling. These techniques are used for learning analysis, knowledge acquisition, and personalized recommendations to enhance the overall educational experience [7].

3 Methods

Through this paper, we conducted a survey-based study to gather and review the perceptions and experiences of both students and teachers regarding the usage of ChatGPT for learning and collaboration. To ensure an equitable comparison of preferences, we designed and implemented a distinct survey version for each cohort.

3.1 Survey Design

First in the survey, we gathered demographic information (gender, age, ethnicity, and education level), their level of familiarity with ChatGPT, frequency of use, and the primary purpose for utilizing the platform. We then explore participants' perceptions around the impact of ChatGPT on their learning process and their use of the platform to collaborate with peers or instructors. Finally, we seek to elicit perceptions of any drawbacks or pitfalls associated with using ChatGPT for learning. The complete version of the screening survey can be found in the Appendix.

3.2 Participants

Surveys were conducted on the academic server in Discord and distributed to students and faculty members of the Information System department at the University of Maryland Baltimore County. Participants met the following criteria: Had prior experience with ChatGPT, were over 18 years of age, and maintained a minimum task approval rate of 95%. We received a total of (n=59) responses, with (n=47) from the students and (n=12) from teachers. Upon eliminating low-quality responses, we received (n=45) valid responses from students and (n=12) from teachers, with the average survey completion time being approximately 5 minutes.

3.2.1 Demographic information

We recruited a diverse group of participants of various ethnicities, including Asian, White, African American, and Hispanic or Latino participants who were based in the U.S., Belgium, Thailand, and Canada. We surveyed (n=16) male and (n=31) female students ranging from 18 to 44 years old with a wide range of education levels (PhD, Master, Bachelor, and Associate degrees). Teacher participants ranged from 25 to 64 years old and held a PhD or Master's degree. Table 1 (see Appendix A1) summarizes participants' key demographic information.

3.3 Data analysis

The survey incorporated both quantitative and qualitative questions, including binary, multiple choice, and 10-point Likert scale, as well as open-ended. Our team of three researchers thoroughly reviewed all responses with the aim of familiarizing themselves with the data and identifying low-quality or invalid responses. The researchers employed a thematic analysis [1] of qualitative responses and collaboratively coded a subset of the data to establish an initial codebook. Next, the researchers independently coded another subset of the data then met, discussed, and reconciled their codes to address any discrepancies. With the updated codebook, the researchers continuously cross-checked codes to ensure accuracy and consistency, completing the coding process.

4 Findings

4.1 Perceptions of Using ChatGPT for Learning

Analysis of Survey responses revealed that the majority of student participants possessed at least an advanced beginner level of expertise in using ChatGPT. Additionally, 36.6% of student participants reported using ChatGPT at least once per week and 34.1% use it everyday for job-related tasks, academic pursuits, and more (Table 2). Notably, only 14 participants used ChatGPT as a leisure activity. The majority of participants expressed satisfaction with the quality of responses provided by ChatGPT, with the highest rating being 10 out of 10, and the lowest being 4 out of 10.

In contrast to student participants, almost half of the teachers displayed a proficient level of expertise in using ChatGPT. The teachers reported using ChatGPT at least once a week or everyday for a variety of purposes, including job-related tasks and academic pursuits (Table 2). Our data revealed that teachers were satisfied with chatGPT's response quality. When asked if they thought ChatGPT was useful for learning, 100% of teachers said yes and only 72% of students agreed while 13% of students answered maybe.

4.1.1 Time Savings and Assistance

Most students survey participants (n=31) reported that using ChatGPT for learning was advantageous, as it allowed them to save time and assisted them with their research. ChatGPT's ability to provide instant access to information, support multi-language communication, and offer an easy and free way to learn academic and general subjects was seen as highly beneficial. Some students expressed that ChatGPT helped them become more independent learners by allowing access to information without relying on expensive courses. They said:

" ChatGPT has lots of benefits which inspire most of their users. ChatGPT can be helpful to all students by providing Instant access to information, supporting multi-language agent and also it can be easy and free way for learning academic/general subjects" (Student)

Teachers reported that ChatGPT helped to generate additional topics for class discussion and fostered more in-depth conversations. ChatGPT also proved to be a useful tool for lesson planning and grading. The platform's ability to provide instant information and support multiple languages also proved advantageous for both teachers and students.

4.1.2 Drawback and Pitfall Surrounding the Use of Chat GPT in Education

Although many survey participants saw advantages to ChatGPT for learning, some concerns were raised regarding its reliability. Some teachers expressed concerns over the lack of sources provided in ChatGPT responses, saying:

"One of its biggest drawbacks is that it doesn't provide sources, links, or references for the information that it provides in its answers". (Teacher)

From a societal perspective, some participants' outlooks on the use of AI such as ChatGPT are negative and skeptical. Several students expressed concerns about the impact of AI on the human brain and its potential to render us increasingly dependent on AI. Participants worry that the ease of access to information provided by AI could lead to a decline in human mental capacity over time, saying:

"New generations of Human beings are physically less powerful than primary versions because we aren't using our muscles much nowadays that we have machines to do it for us. ChatGPT and similar AI software are going to replace our brains in the near future. Next Generations are going to have less brain power since we will stop using it as much as we are right now." (Student)

Another respondent mentioned "Skynet," insinuating that AI could rise up against humanity. A respondent noted, "in the future it may replace many white-collar jobs, destroying humans' intelligence."

4.2 New Space for Student-Teacher Collaboration

Many participants envisioned that AI Chatbots could bring collaborative aspects to the learning experience and allow students to explore topics more in-depth with diverse perspectives and a more customized experience. However, some participants expressed concerns about potential negative impacts.

4.2.1 Improved Learning Experience and Collaboration

Almost half of the student participants (n=21) and most teacher participants (n=10) found that integrating collaboration could enable teachers to address student pain points throughout the learning process. Participants noted that ChatGPT "could allow teachers to understand which topics students are interested in," and it could allow students to "go more in-depth with specific questions to peers and their teachers." Teachers stated that adding more collaborative aspects to ChatGPT could help them find gaps in student understanding enabling teachers to modify and adjust their syllabus to the specific needs of their students. One teacher mentioned that by gaining insight into the specific gaps in understanding, they can provide more targeted and effective instruction, ultimately enhancing the learning experience for all students. They said:

"I could see students using ChatGPT to quickly understand the basics for certain subjects and then going more in-depth with specific questions to peers and their teachers. If ChatGPT added more collaborative aspects to let the teacher know what the students are searching, it could help teachers understand the gaps in understanding and supplement their syllabus to cover those gaps." (Teacher)

Some student participants mentioned that AI chatbots can engage in informal communication, helping to build relationships with peers and teachers, by sharing knowledge and ideas in a less structured setting. For example, one student participant noted that using ChatGBT as a collaborative environment could lead to the

generation of more ideas and increased brainstorming on different topics, ultimately speeding up the learning process.

"I think that if teachers and students use ChatGPT as a new collaboration system, it could help them brainstorm ideas for activities and research, provide good overviews of topics, and answer very niche questions. It could be a way to build relationships between teachers and students." (Student)

Participants highlighted the platform's ability to foster awareness among students and teachers. This includes the ability to stay informed about the activities and goals of others in the group, and providing feedback and support as needed. This aspect of the platform promotes a more inclusive and supportive learning environment where participants can build stronger relationships and exchange ideas more freely.

4.2.2 Concerns over ChatGPT's Reliability for Exam

While many students and teachers see the potential benefits of using ChatGPT as a collaborative tool for education, some raised concerns about its potential drawbacks. It was suggested that teachers could use ChatGPT to generate more diverse and challenging questions for final exams. However, if students rely too heavily on ChatGPT to provide answers, students may not adequately learn the content or they may receive inaccurate information, leading to confusion and potentially, lower grades. ChatGPT's inaccuracies can make it challenging for teachers to assess students' knowledge and understanding. One student said:

"I'm concerned about chat GPT because it gives wrong answers with the same confidence that it gives correct ones. If someone doesn't know the area, they most likely couldn't tell what is correct, which is concerning. So, if I were to rely on it for an exam, I'd probably end up with a lower grade." (Student)

In summary, the integration of collaboration in ChatGPT was seen as a way to address student pain points, enhance the learning experience, and promote deeper understanding of subjects. However, caution was advised regarding over-reliance on ChatGPT for exams, as its inaccuracies could negatively impact students' grades.

5 Discussion

Through this study, We studied chatbots' potential for collaborative learning and investigated student and teacher attitudes towards using them for learning and collaboration. The survey responses revealed interesting insights into their perceptions of using tools like ChatGPT for collaborative learning.

Our findings indicate that both students and teachers recognize the significant potential of ChatGPT to support collaborative learning experiences. With collaborative features, AI chatbots can provide support for essential collaboration concepts like awareness, articulation work, and place and space [13,14,16]. Participants recognized the benefits of using AI chatbots to save time and provide enhanced learning through personalization, diverse perspectives, and language barrier aid.

Additionally, Some participants expressed concerns that chatbots would stifle creativity and critical thinking, as well as enable students to cheat and learn less in general. Participants also expressed concern about the potential negative societal effects of AI and the possibility of chatbots replacing human intelligence.

5.1 Design Implication

Our findings suggest several implications in design for the use of AI chatbots in education, especially in a collaborative context.

5.1.1 Promote awareness, support articulation work, and encourage a sense of space and place

To encourage effective collaboration, ChatGPT should promote awareness among students and teachers about each other's activities and goals. This can be done through a user interface where tasks and projects that each individual is working on can be synchronously interacted with by group members and ChatGPT. By making synchronous work viewable, and enabling features like scheduling and messaging, articulation work can also be supported.
In order to foster a more inclusive and supportive learning environment, it's important for students and teachers to develop a valued sense of place. By doing so, participants can build stronger relationships and exchange ideas more freely. One design implication for garnering a sense of place is for ChatGPT to host ice breaker sessions with groups that are fun and engaging. In this context, it would be important for the students to be able to use audio as well as chat features.

5.1.2 Integration with learning management systems (LMS).
ChatGPT could be integrated with existing LMS platforms to enhance collaborative learning. This integration could allow for real-time data sharing between the AI chatbot, students, and teachers. For example, ChatGPT could be used to identify topics of interest to students, and this data could be used to supplement the syllabus.

5.1.3. Integration with assessment tools.
To address concerns about ChatGPT's reliability for exams, the chatbot could be integrated with assessment tools that allow teachers to monitor students' progress and assess their understanding of the material. This would allow teachers to identify areas where students may be struggling and provide additional support as needed. Additionally, it would be important for ChatGPT to provide explainable responses and cite any answers provided.

In conclusion, our study shed light on the potential benefits and pitfalls of using AI chatbots for collaborative learning. Our findings suggest that integrating collaborative learning abilities for chatbots could enhance learning experiences by providing personalized, more in-depth learning, improved relationships, time savings, and diverse perspectives. Some participants raised concerns about the potential negative effects of chatbots on creativity, critical thinking, and cheating. To address these concerns and promote the benefits of AI chatbots in education, our study proposes several design implications, including providing awareness, articulation work, and space and place support, integrating with learning management systems, and integrating with assessment tools. These implications can help facilitate the effective use of ChatGPT and similar technologies in collaborative learning environments, leading to enhanced learning outcomes and improved educational experiences for students and teachers.

6 Limitations and Future Work

The survey responses by the participants gave us a substantial idea about the perspectives and perceptions of the teachers and students on tools like ChatGPT in the context of learning. Our study was limited to higher education perspectives, and in the future, additional research should be done for students and teachers at primary and secondary schools. Future studies could investigate the technical feasibility and usability of ChatGPT for collaborative learning in a real-world context. Questions related to the ethical implications of using AI chatbots in education, such as privacy, security, and fairness, should also be explored.

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REFERENCES

[1] Richard E Boyatzis. 1998. *Transforming qualitative information: Thematic analysis and code development.* Sage

[2] M. J. Timms, ‘‘Letting artificial intelligence in education out of the box: Educational cobots and smart classrooms,’’ *Int. J. Artif. Intell. Edu.*, vol. 26, no. 2, pp. 701–712, Jan. 2016.

[3] Y. Fang, P. Chen, G. Cai, F. C. M. Lau, S. C. Liew, and G. Han, ‘‘Outage Limit-approaching channel coding for future wireless communications: Root-protograph low-density parity-check codes,’’ *IEEE Veh. Technol. Mag.*, vol. 14, no. 2, pp. 85–93, Jun. 2019.

[4] M. Chassignol, A. Khoroshavin, A. Klimova, and A. Bilyatdinova, ‘‘Artificial intelligence trends in education: A narrative overview,’’ *Procedia Comput. Sci.*, vol. 136, pp. 16–24, Jan. 2018.

[5] H. T. Kahraman, S. Sagiroglu, and I. Colak, ‘‘Development of adaptive and intelligent Web-based educational systems,’’ in *Proc. 4th Int. Conf. Appl. Inf. Commun. Technol.*, Oct. 2010, pp. 1–5.

[6] H. T. Kahraman, S. Sagiroglu, and I. Colak, ‘‘Development of adaptive and intelligent Web-based educational systems,’’ in Proc. *4th Int. Conf. Appl. Inf. Commun. Technol.*, Oct. 2010, pp. 1–5.

[7] S. Nunn, J. T. Avella, T. Kanai, and M. Kebritchi, ‘‘Learning analytics methods, benefits, and challenges in higher education: A systematic literature review,’’ Online Learn., vol. 20, no. 2, pp. 1–17, Jan. 2016.

[8] Heloisa Candello, Mauro Pichiliani, and Claudio Pinhanez. 2021. Making Conversational Robots Learn from Children in a Collaborative Museum Exhibition. In Companion Publication of the 2021 Conference on Computer Supported Cooperative Work and Social Computing (CSCW '21). Association for Computing Machinery, New York, NY, USA, 208–212. https://doi.org/10.1145/3462204.3482888

[9] Wang, Q., Camacho, I., Goel, A.K. (2022). Investigating the Potential of AI-Based Social Matching Systems to Facilitate Social Interaction Among Online Learners. In: Wang, Y.'., Joksimović, S., San Pedro, M.O.Z., Way, J.D., Whitmer, J. (eds) Social and Emotional Learning and Complex Skills Assessment. Advances in Analytics for Learning and Teaching. Springer, Cham. https://doi.org/10.1007/978-3-031-06333-6_13

[10] Qiaosi Wang, Ida Camacho, Shan Jing, and Ashok K. Goel. 2022. Understanding the Design Space of AI-Mediated Social Interaction in Online Learning: Challenges and Opportunities. Proc. ACM Hum.-Comput. Interact. 6, CSCW1, Article 130 (April 2022), 26 pages. https://doi.org/10.1145/3512977

[11] Ruan, S., Jiang, L., Xu, J., Tham, B. J.-K., Qiu, Z., Zhu, Y., Murnane, E. L., Brunskill, E., & Landay, J. A. (2019, May). QuizBot: A Dialogue-based Adaptive Learning System for Factual Knowledge. In Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems.

[12] Nazaretsky, T., Bar, C., Walter, M., & Alexandron, G. (2021). Empowering Teachers with AI: Co-Designing a Learning Analytics Tool for Personalized Instruction in the Science Classroom. In Proceedings of LAK22: 12th International Learning Analytics and Knowledge Conference, 523-540. doi: 10.1007/s10956-020-09865-5.

[13] Dourish, P., & Bellotti, V. (1992). Awareness and coordination in shared workspaces. In CSCW '92: Proceedings of the 1992 ACM conference on Computer-supported cooperative work (pp. 107-114). December 1992. DOI: https://doi.org/10.1145/143457.143468.

[14] Schmidt, K., & Bannon, L. (1992). Taking CSCW seriously. Computer Supported Cooperative Work (CSCW), 1(1), 7-40. DOI: https://doi.org/10.1007/BF00752449

[15] Mackay, W. E. (2000). Is Paper Safer? The Role of Paper Flight Strips in Air Traffic Control. ACM Transactions on Computer-Human Interaction, 6(4), 311-340. https://doi.org/10.1145/331490.331491.

[16] Steve Harrison and Paul Dourish. 1996. Re-place-ing space: the roles of place and space in collaborative systems. Proceedings of the 1996 ACM conference on Computer supported cooperative work (CSCW '96). Association for Computing Machinery, New York, NY, USA, 67–76. https://doi.org/10.1145/240080.240193

[17] Sharon Mason. 2020. Collaborative Learning in Computing Education: Faculty Perspectives and Practices. In Proceedings of the 2020 ACM Conference on International Computing Education Research (ICER '20). Association for Computing Machinery, New York, NY, USA, 136–146. https://doi.org/10.1145/3372782.3406254

[18] Helen H. Hu, Aman Yadav, Donna M. Gavin, Clif Kussmaul, and Chris Mayfield. 2023. Teamwork in CS1: Student Learning and Experience with POGIL. In Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 1 (SIGCSE 2023). Association for Computing Machinery, New York, NY, USA, 729–735. https://doi.org/10.1145/3545945.3569813

[19] Abderrahim El Mhouti and Mohamed Erradi. 2018. Towards a Smart Learning Management System (smart-LMS) to Improve Collaborative Learning in Higher Education. In Proceedings of the 3rd International Conference on Smart City Applications (SCA '18). Association for Computing Machinery, New York, NY, USA, Article 7, 1–9. https://doi.org/10.1145/3286606.3286784

[20] Xinyue Lin, James Connors, Chang Lim, and John R. Hott. 2021. How Do Students Collaborate? Analyzing Group Choice in a Collaborative Learning Environment. In Proceedings of the 52nd ACM Technical Symposium on Computer Science Education (SIGCSE '21). Association for Computing Machinery, New York, NY, USA, 212–218. https://doi.org/10.1145/3408877.3432389

[21] Suhansa Rodchua. 2017. Group collaboration and effective tools in online education. In Proceedings of the 1st International Conference on Education and Multimedia Technology (ICEMT '17). Association for Computing Machinery, New York, NY, USA, 48–52. https://doi.org/10.1145/3124116.3124126

[22] Shanshan Yang and Chris Evans. 2020. Opportunities and Challenges in Using AI Chatbots in Higher Education. In Proceedings of the 2019 3rd International Conference on Education and E-Learning (ICEEL '19). Association for Computing Machinery, New York, NY, USA, 79–83. https://doi.org/10.1145/3371647.3371659

[23] David A. Joyner. 2023. ChatGPT in Education: Partner or Pariah? XRDS 29, 3 (Spring 2023), 48–51. https://doi.org/10.1145/3589651

[24] Gary M. Olson and Judith S. Olson. 2000. Distance matters. Hum.-Comput. Interact. 15, 2 (September 2000), 139–178. https://doi.org/10.1207/S15327051HCI1523_4

A APPENDICES

A.1 Demographic Information

Table 1: Demographic Information

Criteria	Student Users		Teacher Users	
Age	25 - 34 years old	72.2%	35 - 44 years old	50%
	35 - 44 years old	19.1%	25 - 34 years old	25%
	18 - 24 years old	18.6%	55 - 64 years old	12.5%
			45 - 54 years old	12.5%

Criteria	Student Users		Teacher Users	
Gender	Female	66%	Female	37.5%
	Male	34%	Male	62.5
Education	Master	48.8%	Ph.D.	75%
	Bachelor	23.9%	Master	25%
	Ph.D.	23.9%		
	Associate	2.2%		
	High school	2.2%		
ChatGPT Experience	Yes	82.7%	Yes	62.5%

A.2 ChatGBT Usage Table

Table 2: ChatGPT Usage

	Student User		Teacher User	
Level of Expertise with ChatGPT	Novice	8.1%	Novice	10%
	Advanced Beginner	40.7%	Advanced Beginner	20%
	Competent	17.1%	Competent	0%
	Proficient	29.3%	Proficient	50%
	Expert	4.9%	Expert	20%
The Frequency of ChatGPT Usage	Daily	34.1%	Daily	50%
	Weekly	36.6%	Weekly	50%
	Monthly	12.2%	Monthly	0%
	Rarely	19.5%	Rarely	0%

A.2 Student Survey

1. What gender do you identify yourself as?

- ☐ Female
- ☐ Male
- ☐ Non-Binary
- ☐ Prefer not to answer

2. What is your age?

- ☐ 18 - 24 years old
- ☐ 25 - 34 years old
- ☐ 35 - 44 years old

- ☐ 45 - 54 years old
- ☐ 55 - 64 years old
- ☐ 65 years old and above

3. Choose one or more races/ethnicities that you consider yourself to be (select all that apply).

   - ☐ American Indian or Alaska Native
   - ☐ Asian
   - ☐ Black or African-American
   - ☐ Hispanic or Latino
   - ☐ Native Hawaiian or Pacific Islander
   - ☐ White
   - ☐ Prefer not to answer

4. What country do you currently reside in?
   _____

5. What is the highest degree or level of education you have completed?

   - ☐ Some High School
   - ☐ High School
   - ☐ Bachelor's Degree
   - ☐ Masters Degree
   - ☐ PhD or Higher
   - ☐ Trade School
   - ☐ Prefer not to answer

6. Have you used chatGPT before?

   - ☐ Yes
   - ☐ No

7. How would you rate your level of expertise with ChatGPT technology?

- [ ] Novice
- [ ] Advanced Beginner
- [ ] Competent
- [ ] Proficient
- [ ] Expert

8. How frequently do you use ChatGPT? (Single select)

- [ ] Daily
- [ ] Weekly
- [ ] Monthly
- [ ] Rarely
- [ ] Other

9. What do you use ChatGPT for? (Multi select)

- [ ] It helps me do my job
- [ ] Personal interests
- [ ] General Knowledge
- [ ] Just testing it out
- [ ] Academic purposes
- [ ] Other

10. How satisfied are you with the responses you get from ChatGPT? (1 being not satisfied, 10 being very satisfied) - Options: 1, 2....10

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1. Do you think ChatGPT is a useful tool for learning? (Single Select)

- [ ] Yes
- [ ] No
- [ ] Maybe

11. Have you noticed an impact to your learning process due to the use of ChatGPT?

- [ ] Yes
- [ ] No

If yes, please explain. (Longform text area)

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12. How comfortable would you feel using ChatGPT to communicate with your classmates? - Options: 1, 2....10

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13. Would you prefer using ChatGPT over other methods of communication with your teachers (e.g. email, office hours, in-person meetings)?

- [ ] Yes
- [ ] No

If yes, could you please explain?

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14. What are some ways that come to mind that ChatGPT could help teachers and students with learning activities? (Longform text area)

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15. In your opinion, what are the benefits of using ChatGPT for learning? (Longform text area)

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16. In your opinion, what are the drawbacks of using ChatGPT for learning? (Longform text area)

If answered “no” to question #6:

Would you mind trying it out with using it for learning in mind?

1. Go to https://chat.openai.com/ and sign up.
2. Start talking to ChatGPT with learning in mind. Here are some example questions or statements to get started:
    a. Give me a creative writing prompt.
    b. What are some of the most interesting historical events that happened in Maryland?
    c. Write a funny haiku about dogs.

Continue to next: Bring user to question #10

A.2 Teacher survey

1. What gender do you identify yourself as?

    - ☐ Female
    - ☐ Male
    - ☐ Non-Binary
    - ☐ Prefer not to answer

2. What is your age?

    - ☐ 18 - 24 years old
    - ☐ 25 - 34 years old
    - ☐ 35 - 44 years old
    - ☐ 45 - 54 years old
    - ☐ 55 - 64 years old
    - ☐ 65 years old and above

3. Choose one or more races/ethnicities that you consider yourself to be (select all that apply).

    - ☐ American Indian or Alaska Native
    - ☐ Asian
    - ☐ Black or African-American
    - ☐ Hispanic or Latino

- [ ] Native Hawaiian or Pacific Islander
- [ ] White
- [ ] Prefer not to answer

4. What country do you currently reside in?
   —----------

5. What is the highest degree or level of education you have completed?

   - [ ] Some High School
   - [ ] High School
   - [ ] Bachelor's Degree
   - [ ] Masters Degree
   - [ ] PhD or Higher
   - [ ] Trade School
   - [ ] Prefer not to answer

6. Have you used chatGPT before?

   - [ ] Yes
   - [ ] No

7. How would you rate your level of expertise with ChatGPT technology?

   - [ ] Novice
   - [ ] Advanced Beginner
   - [ ] Competent
   - [ ] Proficient
   - [ ] Expert

8. How frequently do you use ChatGPT? (Single select)

   - [ ] Daily
   - [ ] Weekly

- [ ] Monthly
- [ ] Rarely
- [ ] Other

9. What do you use ChatGPT for? (Multi select)

   - [ ] It helps me do my job
   - [ ] Personal interests
   - [ ] General Knowledge
   - [ ] Just testing it out
   - [ ] Academic purposes
   - [ ] Other

10. How satisfied are you with the responses you get from ChatGPT? (1 being not satisfied, 10 being very satisfied) - Options: 1, 2....10

    ---

11. Do you think ChatGPT is a useful tool for learning? (Single Select)
    - [ ] Yes
    - [ ] No
    - [ ] Maybe

12. Have you noticed an impact to your students' learning process due to their use of ChatGPT? If yes, please explain. (Longform text area)

    ---

13. Would you feel comfortable using ChatGPT to communicate and collaborate with your students?

    - [ ] Yes
    - [ ] No

14. What are some ways that come to mind that Chat GPT could help teachers and students with learning activities? (Longform text area)

_____

15. In your opinion, what are the benefits of using ChatGPT for learning? (Longform text area)

_____

16. In your opinion, what are the drawbacks of using ChatGPT for learning? (Longform text area)

_____

If answered “no” to question #6:

Would you mind trying it out with using it for learning in mind?

1. Go to https://chat.openai.com/ and sign up.
2. Start talking to ChatGPT with learning in mind. Here are some example questions or statements to get started:
    a. Give me a creative writing prompt.
    b. What are some of the most interesting historical events that happened in Maryland?
    c. Write a funny haiku about dogs.

Continue to next: Bring user to question #10

A.3 Thematic Analysis Codebook

Code	Frequency	Theme
Efficiency	25	Time Savings and Assistance, Improved Learning Experience
Accuracy	6	Improved Learning Experience
Research	23	Enhanced Learning
Too New	3	Negative Societal Perspectives

Ideation	12	Time Savings and Assistance, Enhanced Learning
Less Critical Thinking	13	Negative Societal Perspectives, Potential Negative Effects for Education
Plagiarism / Cheating	3	Potential Negative Effects for Education
Incomplete Information	4	Potential Negative Effects for Education
Writing Help	12	Time Savings and Assistance, Enhanced Learning
Negative Perspective / Distrust	17	Negative Societal Perspectives
Automation	7	Time Savings and Assistance, Improved Learning Experience
Free tool	3	Enhanced Learning
Diversify Perspectives	2	Enhanced Learning
General Help	8	Time Savings and Assistance
Learning Languages	7	Enhanced Learning
Make Learning Fun / Entertaining	4	Improved Learning Experience
Personalized Learning	6	Enhanced Learning
Ease of Use	5	Improved Learning Experience
Inaccurate	16	Potential Negative Effects for Education
Potential to be Used for Evil	1	Negative Societal Perspectives
Collaborative Learning	7	Improved Learning Experience