



From search to work tasks: exploring students' AI chatbot information practices in higher education

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Abstract

Introduction. Research on AI chatbot use in higher education has largely focused on undergraduates, often overlooking graduate students or treating both groups as a single population. Drawing on activity theory, this study examines how task type shapes differences in AI chatbot use among undergraduate and graduate students. Distinguishing task types is theoretically important because shifts in the object of activity shape how students perceive agency, organise information practices, and engage with AI tools.

Method. Eighteen students participated in semi-structured interviews. Transcripts were coded in NVivo using activity theory components: Subject, Object, Tools, Rules, Community, Division of Labor, and Outcome.

Analysis. A deductive coding approach identified how students engaged with AI tools in relation to different learning tasks. Data triangulation enhanced credibility by combining self-reported reflections with interaction records.

Results. Undergraduates primarily used AI for course-related search tasks, often accepting responses with limited verification. Graduate students engaged in more complex work tasks and were more likely to verify AI outputs with secondary sources.

Conclusion. Task type influenced students' information interaction, particularly in credibility judgments and ethical considerations. These findings highlight the importance of task-based distinctions in AI literacy instruction and suggest tailoring guidance to both education level and task context.

Introduction

In response to growing interest in AI-mediated learning, prior research has mainly focused on undergraduates due to the broader applicability of AI chatbot features, such as academic performance analytics, which are less relevant to graduate students (Crompton & Burke, 2023). As a result, graduate students' interactions with AI tools are often not considered part of the learning process. However, within Vygotsky's (1978) sociocultural theory, learning is understood as a socially mediated process in which individuals' knowledge and development of higher-order cognitive functions occur through interactions situated within specific cultural and historical contexts. Informed by this perspective, this study adopts a broader conceptualisation of learning, one that extends beyond acquiring new concepts or facts.

Accordingly, this research explores the behaviors of both undergraduate and graduate students in their use of AI chatbots through the lens of Activity theory (AT). AT is a cross-disciplinary framework for examining various forms of human practice, emphasising the contextual and developmental nature of individual and collective activity (Kuutti, 1995). It highlights the mediating role of tools and artifacts in shaping interactions between individuals and their objectives, and conceptualises learning as a dynamic, collective process influenced by the activity system's components (Engeström et al., 1999).

This study adopts AT specifically because it enables a systems-level analysis of how AI chatbots interact with users' goals, roles and institutional structures within educational settings. Unlike frameworks that focus solely on individual cognition or behavior, AT allows for an examination of the broader sociocultural context in which AI chatbots are embedded and used. This perspective reveals how the use of AI chatbots is not merely a personal choice, but part of an activity system shaped by its key components, such as tools, roles and community norms. Given its versatility, AT has been widely used in disciplines such as education, psychology, and human-computer interaction to examine complex, situated users' behaviors. By analysing the entire system rather than isolated elements, AT offers a holistic framework for understanding how tools such as AI chatbots, along with user roles and social norms, co-evolve in educational practice. Guided by this framework, this study addresses the following research question:

RQ1. What kinds of tasks do undergraduate and graduate students use AI-based tools for in learning contexts?

RQ2. How do undergraduate and graduate students differ in their engagement with AI-based learning tasks, based on activity theory?

Literature review

Activity theory (AT) has its roots in classical German philosophy of Kant and Hegel, which emphasises the active and constructive role of human beings (Jonassen & Rohrer-Murphy, 1999). The modern AT model originates from Vygotsky's (1978) work and was further developed by Engeström (1987), who proposed an expanded framework widely applicable across disciplines. This model consists of three primary components, Subject, Object, and Community, and three secondary components, Tools, Rules, and Division of Labor (Figure 1). The Subject refers to the individual or group engaged in the activity; the Object represents the goal or motive that drives the activity; and the Community includes the social group that shares the same object; the Tools are mediating artifacts that facilitate the interaction between the subject and the object; the Rules encompass the norms, conventions, and guidelines that regulate actions within the activity system and the Division of Labor defines the distribution of tasks, roles, and responsibilities in the activity (Engeström, 2015; Jonassen & Rohrer-Murphy, 1999).

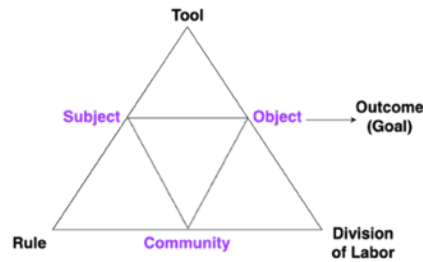


Figure 1. Activity theory model (Engeström et al., 1999).

AT has been widely used as a conceptual framework in educational research (Engeström, 2000; Hung & Wong, 2000; Jonassen & Rohrer-Murphy, 1999). In the field of AI in education, researchers have applied AT to investigate issues such as ethical considerations and experiences across a range of learner populations, from undergraduate students to young children (Kamali et al., 2024; Lai, 2021; Lim et al., 2024; Woo et al., 2025). For university-level learners, including graduate students, recent studies have examined key factors influencing AI tool adoption and student experience with ChatGPT-based learning activities (Sun & Deng, 2025; Tang & Su, 2025). However, there remains a gap in the literature: few studies have examined undergraduate and graduate students' information behaviors as distinct user groups or specifically explored how students use AI tools in relation to their diverse learning goals and task types.

Method

This study employed activity theory as the theoretical framework to analyse qualitative data gathered through one-hour, semi-structured interviews conducted between January and July 2025. The research received exempt approval from the university's Institutional Review Board. Grounded in Vygotsky's (1978) sociocultural theory of learning, the study conceptualised learning tasks not only as traditional academic activities, such as learning concepts or summarising texts, but also as exploratory processes including the development of ideas and the refinement of research questions.

Demographic Variable	Undergraduate (n=9)		Graduate (n=9)	
Year	Sophomore	4	Master's	3
	Junior	2	Doctoral	6
	Senior	3	-	
Field of Study	Business	1	Data Science	1
	Computer Science	2	Electrical Engineering	1
	Fine Arts	1	Information Studies (PhD)	6
	Information Science	4	Library & Information Science (MLIS)	1
	Mechanical Engineering	1	-	
Total	18			

Table 1. Participant demographics by academic levels and programs.

Participants were eligible if they 1) were either undergraduate or graduate students and 2) had experience using AI generative tools (e.g., ChatGPT, Claude, Copilot, DeepSeek, Gemini, Google Notebook LM, Perplexity) within a learning context. Eighteen participants (9 undergraduate and 9 graduate students) were recruited from a public research university in the Midwest through purposive and snowball sampling to reach students with diverse and relevant experiences (Table 1). This sampling strategy was chosen to ensure representation from diverse academic disciplines and experiences, and to reach participants with relevant exposure to AI-assisted learning tasks. Interview questions were designed to explore participants' primary goals for using AI tools in learning, their intentions for adopting AI, and their perspectives on prompt creations based on

their previous conversations with generative AI systems. Participants were prompted to reflect on specific moments of their past AI use, articulating their reasoning and decision-making processes. With participants' consent, all sessions were recorded via Microsoft Teams.

Analysis

The data were analysed thematically using a deductive coding scheme based on the core components of the activity theory framework: Subject, Object, Community, Tools, Rules, Division of Labor, and Outcome. Transcripts were closely read and coded using NVivo 15. To enhance the credibility of the analysis, data triangulation was applied by incorporating two complementary data sources: 1) screenshots of student-AI interactions, which provided contextual records of tool usage, and 2) interview transcripts, which captured participants' reflective reasoning and interpretations. According to Denzin (2017), triangulation enhances the validity of qualitative research by combining multiple data sources to cross-validate findings. Although both were collected during the same sessions, these data sources represented distinct types of information: objective records of AI use and subjective insights, allowing for a more comprehensive understanding of students' learning activities with AI tools. As this is a single-author study, coding was conducted by the researcher. Coding decisions and selected excerpts were reviewed with a colleague to ensure clarity and reduce potential bias. Because only one coder was involved, intercoder agreement metrics were not applicable.

Results

For RQ1, the tasks performed by undergraduate and graduate students differed. In general, undergraduate students' tasks are related to the courses they have taken (e.g., class assignment consulting, coding support, course material comprehension, image generation, learning material creation, quiz/exam searching, summarisation, writing revision for assignments). In contrast, graduate students focused on research-related tasks such as data analysis, formatting assistance, and idea generation (Figure 2). Specifically, the dominant AI usage task among undergraduates was coding support, related to course assignments. For graduate students, generating ideas was the most common task.

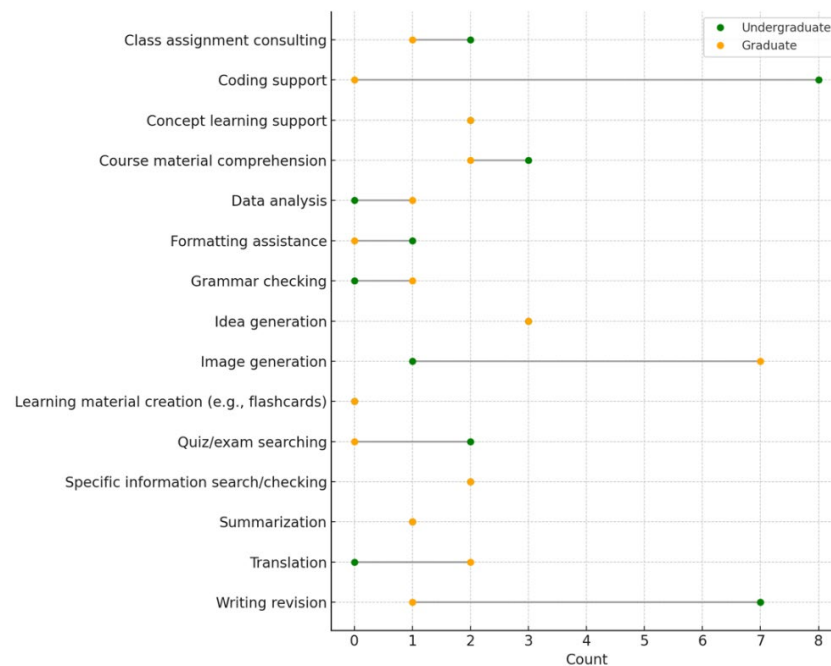


Figure 2. Task-based frequency of AI tool use among undergraduate and graduate students.

These results reveal that undergraduate students primarily engaged in search tasks while graduate students focused more on work tasks. A search task refers to the process of retrieving specific information, such as looking up definitions or finding known items, while a work task involves broader academic activities that prompt information seeking, such as conducting research for a project or writing a paper (Xie & Joo, 2012). Applying this, undergraduates tended to focus on search tasks, using AI chatbots to obtain answers for quizzes, clarify course concepts, or summarise class materials. Graduate students, by contrast, used AI chatbots for more complex and personalised work tasks, such as obtaining feedback on writing, expanding their research ideas and identifying trends in their research areas.

For RQ2, differences were observed in the AT components, particularly in Rules, Community, and Division of Labor and Outcome, based on each group's tasks (Figure 3). For undergraduates, whose tasks were closely tied to classroom activities, the Rules were primarily shaped by guidelines and instructor policies. In contrast, graduate students, although also enrolled in courses, were more guided by academic integrity standards, such as avoiding plagiarism and adhering to ethical research practices in their independent work.

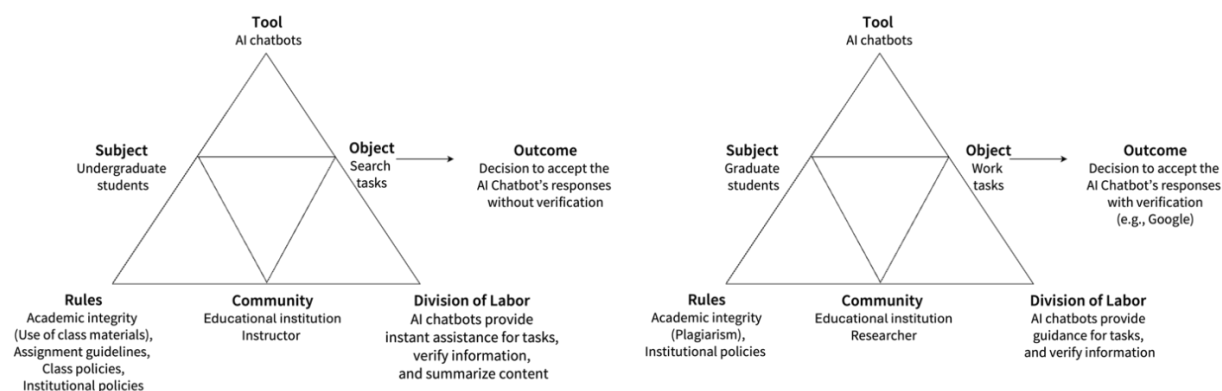


Figure 3. AT Models of undergraduate and graduate students based on task types.

In that sense, in the undergraduate students' model, the Community includes instructors, while the graduates' model it includes a self-concept as researchers and consideration of the broader academic community. Although, some undergraduate students also considered academic integrity, such as when creating flashcards for midterm exams using class materials, there was a tendency to disregard it when simply checking quiz answers. *'So, for my homework it's just solving the math problem. It [the task] is not too much important [to consider ethics]'* (Student 11, Undergraduate student)

Furthermore, AI chatbots served different roles within each group's activity system, as reflected in the Division of Labor. For undergraduates, the chatbot functioned as a short-term, task-specific assistant. For graduate students, it acted as a longitudinal support tool, offering guidance throughout the projects. The task differences affect the Outcome as well: there was a tendency for students engaged in work tasks to double-check the AI Chatbot's responses with other sources (e.g., Google), whereas students engaged in search tasks tended to accept the responses without further verification, as these tasks were usually one-time activities. *'I didn't really say, according to this [task] is what the complete proof is, so I don't really double-check'* (Student 03, Undergraduate student)

I mainly use ChatGPT if I want to search for something particular. When ChatGPT give me some answers, I go back to the Google to search the answer whether that is wrong, I mean correct or not. (Student 18, Graduate student)

Discussion and Conclusion

In this study, AI chatbot use in learning contexts among undergraduate and graduate students was examined through the lens of activity theory. Analysis of interview data and screen recordings revealed clear task-based differences in how students interacted with AI tools as information systems. Graduate students were more actively engaged in complex, work-oriented tasks, whereas undergraduates primarily used AI tools for course-related, search-oriented information seeking. These findings highlight the importance of recognising task-based variation in AI-mediated information interaction across academic levels and the need for further investigations into how task type shapes credibility judgments and verification behaviors.

An important implication of this study lies in instructional design and information literacy education. Undergraduates, who often accept AI-generated responses with limited verification, would benefit from explicit guidance that emphasises critical evaluation skills and awareness of academic integrity. Graduate students, by contrast, demonstrated more frequent verification practice but may require targeted support for responsibly integrating AI tools into research workflows. These differences suggest that AI literacy curricula should be tailored not only to educational level but also to the type of task they undertake.

Moreover, the study contributes to ongoing discussion of digital literacy by illustrating how structural factors such as community expectations, classroom rules, and disciplinary norms shape AI use. Task type mediated how students judged AI credibility, underscoring the importance of embedding ethical considerations into AI-mediated learning. In practice, educators should move beyond generic AI guidelines and instead provide differentiated frameworks that address search-oriented and work-oriented activities.

This study is limited by its small sample size and focus on a single institution. Future research should include more diverse and larger samples to enhance the generalisability of the findings. Incorporating quantitative approaches may help validate and extend the observed patterns across broader student populations, while longitudinal studies would further clarify how task-based AI use evolves over time and influences learning outcomes.

About the author

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