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## **Usage and Knowledge of Online Tools and Generative AI: A Survey of Students**

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## Research Article

**Keywords:** ChatGPT, AI, Generative AI, Online Tools, Higher Education, Students

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# Usage and Knowledge of Online Tools and Generative AI: A Survey of Students

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## Abstract

Artificial Intelligence (AI) tools like ChatGPT are poised to transform student and educator workflows in higher education. However, there is less documentation on the range of tools students in higher education use, how they use them and in coordination with other online tools for learning, and their expertise using AI tools. We present a mixed-method analysis of a survey conducted at a doctoral-granting university in the United States investigating the adoption of AI tools in the context of other technologies. The findings include how the students used GenAI tools in light of other on-line technologies, their perception of expertise on the topic, and how they gain expertise in using AI for educational work.

**Keywords:** *ChatGPT, AI, Generative AI, Online Tools, Higher Education, Students*

# 1 Introduction and Literature

Artificial Intelligence (AI) researchers have developed applications for education for a long time as evidenced by several journals, publications, and focused conferences on the topic of AI in Education or AIEd. However, the introduction of ChatGPT and other Large Models (LMs) have changed the landscape for two reasons. One, Large Models (LMs), also known as Generative AI (GenAI), are broad tools that can perform several tasks across a huge spectrum of education-related activity including writing assignments, grading assignments, analyzing data, etc. with non-trivial quality and incredible speed (Brown et al., 2020). This is in contrast to the prior state in which each AIEd research was focused on narrow tasks such as automatic assessments of some types of essays (Ghosh & Beigman Klebanov, 2024), Intelligent Tutoring Systems for narrow subject materials (Mousavinasab et al., 2021), Conversational roleplay for language learning in specific scenarios (Divekar et al., 2022), among others. Two, these tools are no longer living only in research labs with limited access to students and practitioners; rather, many are easily accessible for free to anyone across the world via a simple internet browser. (Duha, 2023) have noted that this is not the first time technology has transformed education and that we have seen at least two such transformations before with Google and Wikipedia. However, when a new technology like this is released and becomes popular within the education community, it is likely to disrupt existing technologies and workflows. For example, when search engines like Google.com or online encyclopedias like Wikipedia first became popular, it augmented and replaced (in some cases) traditional information sources like a library or subject-matter experts in universities in the sense that a student no longer had to go to the library or to an expert for every question, rather they looked up online (Brindley, 2006). This prompted libraries to pivot to the integration of new technology and begin efforts to increase digital literacy.

We are at a similar crossroads again, with AI technology becoming a new source of information for university students. The education community must decide what changes we have to make in curriculum, teaching, learning, technical resources, etc. (Črček & Patekar, 2023) provided to students to create a future generation of experts that can use artificial intelligence to their advantage. However, we do not know whether AI technology is being used by students in addition or in substitution to the sources of information of the previous revolution like Google and Wikipedia. We also do not yet know what it means to have expertise in using AI tools like ChatGPT from a students' perspective. We hope to provide initial answers to that through our paper by discussing how students use AI technologies in relation to other online resources, thereby providing the groundwork to move the conversation forward in this next iteration in technology-enabled education.

## 1.1 Generative AI

AI technologies have been in the making since the 1950s (Toosi et al., 2021). The primary and simplified concept behind AI is that first a model is provided with some amount of task-specific numerical data. An AI model is then able to find the patterns that exist in the data. Then, it can apply the found pattern to new data and create predictions, outcomes, etc. Natural Language Processing (NLP), a subset of the AI research community, applies a similar concept except that they treat natural language (e.g., English, Hindi) words as numbers and perform computations on them to identify patterns and generate new words. In 2017, a *Transformer* model showed promised to find patterns in large amounts of text and generate new words based on that pattern in the context of language translation (Vaswani et al., 2017). OpenAI significantly scaled up the Transformer model to release the the first iteration of the Generative Pre-trained Transformer (GPT) (Radford et al., 2018) and then a second more capable GPT-2 (Radford et al., 2019). At a huge cost of upwards of 4 million US dollars (Leswing, 2023), they eventually released its iteration called GPT-3 (Brown et al., 2020) that powered ChatGPT, the first landmark successful interface and Large Language Model (LLM) that was good at many language tasks and went far beyond what the initial version of GPT promised. Other technology companies followed suit. At the time of writing this paper, we now have a variety of LLMs that are similar to ChatGPT, e.g., Copilot<sup>1</sup>, LLaMA<sup>2</sup>, Gemini<sup>3</sup>, Claude<sup>4</sup>, etc. and their subsequent versions. Similar advances were made in graphics, image, and audio processing science that allowed models like Dall-3<sup>5</sup>, Midjourney<sup>6</sup>, Stable Diffusion<sup>7</sup> to generate or edit images and audio based on text or vice versa. Collectively, these image, sound, and language models are called large models (LMs).

Other software developers and AI startups used these Large Models (LM) as a foundation for new products. Specific to education, scite.ai augmented LLMs with the ability to search academic papers providing an interactive way to conduct research. Perplexity.ai infused LLMs with the ability to search the Internet providing a new way to consume information. Elicit helps summarize research papers, while Writefull and Grammarly help edit text for better flow and grammar.

In addition, LLMs are not restricted to generating natural language. They are also able to generate programming languages. Subsequently, companies like OpenAI and Julius.ai generated programming code on a user's request and run that code behind the scenes on data that user uploaded. Basically, their solutions could allow the user to process and analyze data without knowing any programming language such as R or Python.

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<sup>1</sup><https://copilot.microsoft.com/>

<sup>2</sup><https://llama.meta.com/>

<sup>3</sup><https://gemini.google.com/>

<sup>4</sup><https://claude.ai/new>

<sup>5</sup><https://openai.com/index/dall-e-3/>

<sup>6</sup><https://docs.midjourney.com/>

<sup>7</sup><https://stability.ai/news/stable-diffusion-3>

Although there is no research on how many AI tools exist today, at the time of writing this paper, the authors are aware of several AI tools that can be used for educational purposes like writing essays, data analysis, creating slides, etc. that are now also available to students and anyone else. In the discussion above, we provided a large but non-exhaustive number of AIED usecases and products.

## 1.2 Students' AI Adoption in Higher Education

The International Monetary Fund estimates that about 40% of global employment is exposed to AI in that AI could either eliminate these jobs or play a complementary role and boost productivity (Melina et al., 2024). Finding suitable employment is one of the main goals of many students. Students are aware that AI will play an important role in their field and that some profiles might be replaced by AI (Almaraz-López et al., 2023). Therefore, it stands to reason that students are at least curious about tools like ChatGPT. Next, we summarize surveys on AI adoption in university students.

(Sallam et al., 2024) recently conducted a survey in the UAE to investigate the acceptance of ChatGPT within university student community. They saw that 85 of their respondents had used ChatGPT, higher than previously reported studies in other parts of the world that they have synthesized in their literature. Further, they found that attitude towards the technology was correlated on sex, type of university, and ethnicity. (Chan & Hu, 2023) surveyed students in Hong Kong and found similar familiarity, positive attitude, and willingness to use Generative AI within the student community. (Albadarin et al., 2024)'s systematic literature review of empirical research found that ChatGPT was being used for various writing tasks, feedback, on-demand answers, explanations, etc. However, they point out that ChatGPT may have negatively impacted collaboration and innovative tendencies in students.

Students also report using AI for a variety of reasons related to their university activities and life. (Crawford et al., 2024) found that AI tools like ChatGPT have been used to fill the social connections gap, especially for university students, with the caveat that when they filled the social need with AI, they experienced even more human isolation. The authors claim that lack of social connection could result in a lower sense of belonging on campuses and consequently affect grades and student retention. However, (Al-Zahrani & Alasmari, 2024)'s broader survey has found that the higher education community in Saudi Arabia uses a variety of AI tools that go beyond just ChatGPT and include face recognition, speech recognition, etc. for various purposes like educational, entertainment, etc. They report seeing similar negative experiences as other reports in the field i.e., privacy issues, financial costs, etc.

## 1.3 Educators' Outlook of AI in Higher Education

University students seem to have widely embraced ChatGPT, forcing educators to respond in a variety of ways: acceptance and rethinking of learning activities,

rejection and vigilance towards students using ChatGPT, and general panic over academic dishonesty (Črček & Patekar, 2023).

(Kiryakova & Angelova, 2023) presented a survey to university professors at Trakia University and found more concerns from faculty members that learners will unquestioningly accept the output from ChatGPT to be correct especially when ChatGPT has a tendency to be incorrect (Islam & Islam, 2024; Rawte et al., 2023). However, the university professors also showed a positive outlook while using ChatGPT towards their teaching e.g., to provoke interest in the subject, stimulate critical thinking, etc (Kiryakova & Angelova, 2023). Further, (Firat, 2023) found in their qualitative analysis that *evolution of learning and educational systems* and *changing role of educators* were the most frequent code in interviews from scholars and students from four countries. In a large scale analysis of X (Formerly, Twitter), (Mamo et al., 2024) found that within the Higher-education faculty community, while sentiment towards ChatGPT moved positively overtime, negative sentiments such as anger, fear, disgust, and sadness were also found. Plagiarism, job security, bias, threats to writing, disruption, assessment threats and disinformation were some of the factors contributing to the negative sentiments. Some of these factors are directly related to students using ChatGPT for university work.

While educators worry about the learning outcomes for their students given the use of AI, they themselves have not shied away from it, as AI has received tremendous attention from education researchers recently. (Crompton & Burke, 2023) conducted a PRISMA review of 138 articles in AIED and found an almost three-fold increase in the number of articles published in 2021-2022 compared to previous years where research on AI assistants was prominent. Furthermore, (Mahapatra, 2024) showed that, with some training, ChatGPT can give good feedback in writing classes and is especially useful in English as Second Language (ESL) student writing.

Given the various positive and negative reactions from students and faculty, (Črček & Patekar, 2023) strongly encourage educators to embrace technology, although with clear policies and guidelines on its use to optimize learning. However, doing so requires knowing how students are using AI. Although most previous studies have identified attitudes and adoption towards ChatGPT from students, there is not enough literature to show other AI tools that students use and how students use AI in context of already existing technology. This information is crucial to get a snapshot of the online technology stack that students use to accomplish their goals in universities. Further, we also recognize that AI will be a tool in the future of work and that teaching students to be experts at using AI in their domain is likely going to be a similar wave of education as digital literacy a few years ago. However, it is not clear what it means to be an expert in using AI. We bring these two perspectives through our study in this paper. We uniquely contribute to the existing body of literature by identifying how students use AI tools in the context of other online tools and what they consider an expert in the field.

We present a mixed-method analysis of a survey of 68 students at a doctoral-granting university in the United States. In the results, we show that ChatGPT



is still the most popular AI tool. However, we report that AI tools have not fully replaced ‘older’ tools such as search engines, Wikipedia, etc. In fact, search engines are still slightly more popular than AI tools within the student community. In addition, specific to AI tools, we note various uses of AI technology reported by students such as writing, brainstorming, and creative uses that we detail in our report and discuss the implications of it. We discuss what students see as expertise while using AI in their field and how students gain that expertise.

## 2 Methodology

Question	Response Type
How do you currently learn new topics on the Internet? (Select all that apply)	Multi-option with ability to fill in manually
Which AI tools have you used in the past?	Multi-option with ability to fill in manually
On average, how often do you use [Tool] <sup>a</sup> ?	Multi option
How do you use [Tool] <sup>a</sup> ?	Fill in, large text box
On a scale of 1 to 5, where 1 indicates minimal expertise in using AI tools and 5 denotes advanced proficiency, how would you rate your expertise in utilizing AI for your work?	Likert Scale 1-5
Please explain your expertise level and why you believe what you picked (e.g., if you have taken a course on prompting, read articles or tips/tricks related, feel like you always get the answer you want, etc.)	Fill in, large text box
Additionally, we welcome your thoughts on what it means to be an expert in AI usage. Please share your perspective.	Fill in, large text box

<sup>a</sup> [Tool] was automatically replaced with name of each AI tool they submitted in previous question

**Table 1:** Select Survey Questions

A link to an electronic survey developed using the Qualtrics platform was sent through mailing lists to currently enrolled undergraduate and graduate

students at a doctoral-degree-granting university in the United States. The email invitation stated the eligibility and ineligibility criteria mentioning that students currently enrolled or who wanted to enroll in classes with the project PI were not eligible to avoid biased responses. In addition, they were required to have some exposure to AI tools such as ChatGPT. Given that our survey also had a significant qualitative aspect, we set a target size of approximately 60 students with a higher compensation of \$5 gift card to encourage detailed qualitative responses. The survey was approved by the Institutional Review Board (IRB). Table 1 shows the list of questions relevant to the study. The responses to all except the last question were required to complete the survey. For the sake of brevity, we do not include sections and questions related to informed consent, eligibility criteria, logistics, and demographics, as they do not differ from the standards seen in other surveys.

### 3 Results and Analysis

The responses were analyzed using a mixed method approach, i.e. some responses were quantitatively analyzed to find broad patterns and others were qualitatively analyzed using thematic grouping. Using both approaches, we now deep dive into the various ways in which AI technologies are being used by university students, how they view expertise in AI use, and where they gain expertise.

#### 3.1 Demographics

Table 2 presents a quick view of the age range, enrolled study level, gender, and grade point average (GPA) of the 68 students who participated in the survey. From table 3, we see the count of students who represented majors, minors, or areas of subject matter expertise. Note that a student typically can major in more than one subject area alongside one or more minors. All data were self-reported by participants.

#### 3.2 Quantitative Analysis

##### 3.2.1 Number of tools used

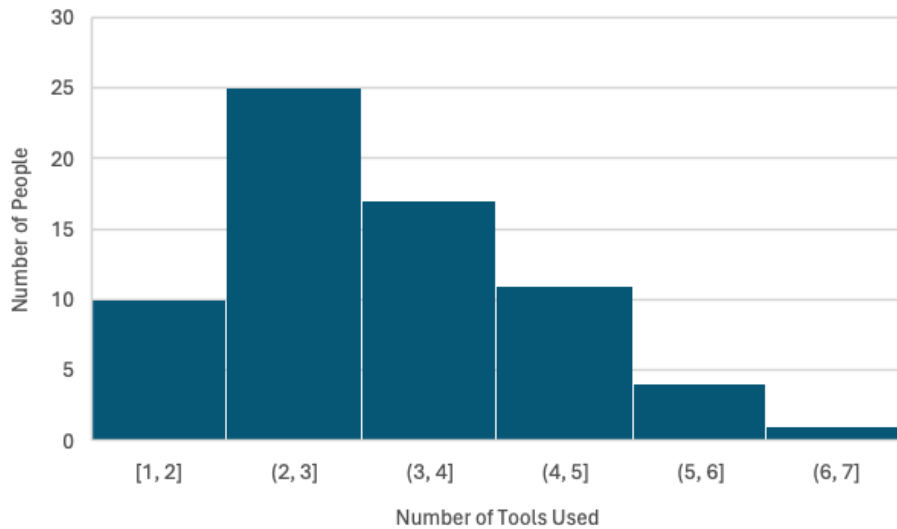
We asked students how they currently learn on the Internet and offered a multiselect box with the option to type in additional responses. We found that on average people currently use  $3.64 \pm 1.21$  (Min. 1, Max.7) online tools to learn. Fig. 1 shows the distribution

##### 3.2.2 Names and Types of Tools Used

We normalized names manually e.g., edited ‘co-pilot’ and ‘copilot’ to mean the same thing. Fig 2 shows the names of the tools that students indicated they use

Description	Number of Students
Total Valid Responses	68
Age Range	
18-10	35
21-23	25
24-26	7
27 or older	1
Enrolled Level of Study	
Undergraduate	51
Graduate	17
Gender	
Female	38
Male	30
GPA (max. 4)	
Above 3.5	45
3-3.5	18
2.5-3	1
Below 2.5	1

**Table 2:** Survey Demographics



**Fig. 1** Histogram of number of tools used to learn on the internet

<b>Majors and Minors</b>	<b>Number of Students</b>
Finance	26
Accounting	13
Management	9
Business Analytics	7
Computer Info. Systems	7
Data Analytics	7
Economics	7
Information Design and Corporate Communication	5
Marketing	4
Spanish	2
Business Administration	1
CFA	1
Film and Media Studies	1
Finance and Technology	1
Health studies	1
Human Factors in Information Design	1
International Affairs	1
Mathematical Sciences	1
Public Policy	1
Sociology	1
Sports Business Management	1
Undecided	1

**Table 3:** Self-reported Majors, Minors and Areas of Expertise

while learning on the Internet. Google is the most used tool followed closely by ChatGPT, YouTube, and Wikipedia.

Although Fig. 2 shows the frequency of each tool that students indicated they use, there are multiple tools that can be used similarly and toward the same goal. For example, Bing and Google are both search engine alternatives to each other. Therefore, we categorized these tools into types as shown in Table 4. Readers might note that the table shows Search and Multimedia Learning separate from AI even if search and multimedia tools use AI algorithms in their back-ends for recommendations and better search results. To clarify, here on, when we say AI for the purpose of this paper, we mean broad-application Generative AI tools like ChatGPT. Based on the categorization shown in Table 4, we counted the frequency of students who indicated using each type of tool after removing duplicates. This process allowed us to count unique mentions by tool types; for example, if one student mentioned that they used WSJ and NYT, we counted as one mention of *News* type. The popularity of types of tools that students use is seen in fig. 3 where Search, AI, and Multimedia Learning are the top-3 types of tools students indicated using while learning on the Internet.

However, we also wanted to capture the number of tools students use per tool type, for example, if a student said that they use WSJ and NYT, that was two counts of tools for the tool type of *News*. For each type of tool, on average, each student used close to one tool as shown in Table 5.

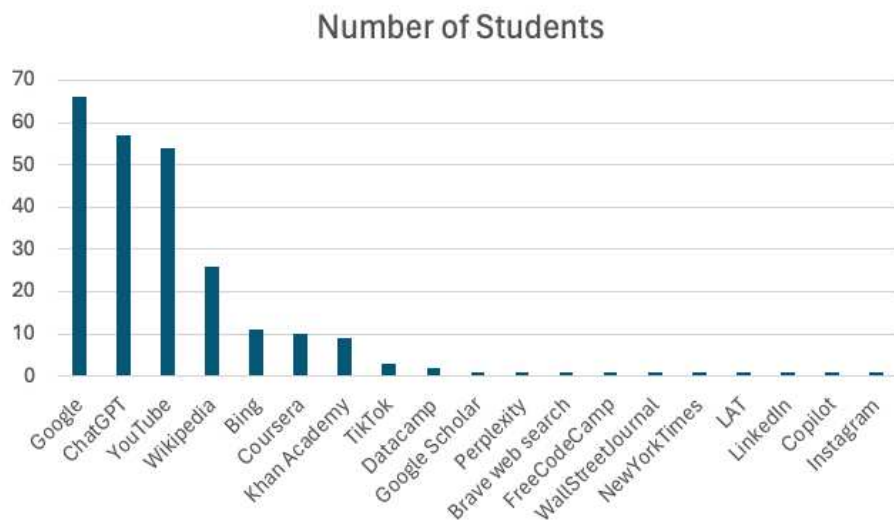
Tool Category	Tools under the category
Search	Google, Bing, Google Scholar, Brave Web Search
AI	ChatGPT, Perplexity, Copilot
Multimedia Learning	Youtube
Encyclopedia	Wikipedia
Guided Learning	Coursera, Khan Academy, Data Camp, Free Code Camp
Social Media	TikTok, LinkedIn, Instagram
News	Wall St Journal, NY Times, LAT

**Table 4:** Types of Tools used by Students

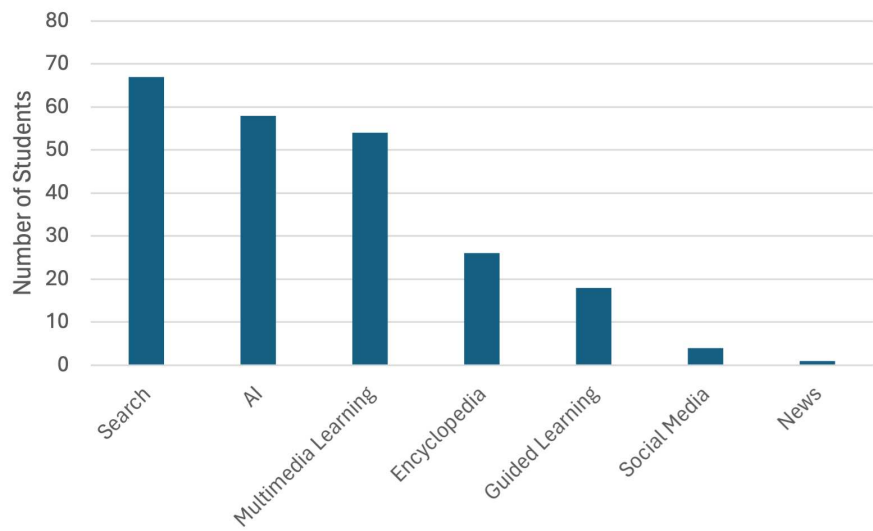
### 3.2.3 AI Tool Usage

Focusing on AI tools specifically, we asked them which AI tools they had used in the past to capture familiarity with AI tools. All 68 students mentioned they had used ChatGPT in the past. In addition, some of them also mentioned that they have used other tools as seen in Table 6. We also note that only 13 of the 68 students selected/entered an option other than ChatGPT. Out of the 13 only 4 selected/entered more than one additional option with one person writing in 4 option in addition to ChatGPT.

In the same table, we have added the third column describing the AI tool for readers' ease by searching the name on Google, visiting the tool's website, or



**Fig. 2** Popularity of Tools



**Fig. 3** Popularity of Tool Types

Tool Type	Mean±Std. dev.
Search	1.09±0.29
AI	1.03±0.19
Multimedia Learning	1±0
Encyclopedia	1±0
Guided learning	1.11±0.3
Social Media	1.33±0.6
News	N/A as only one person reported using news articles

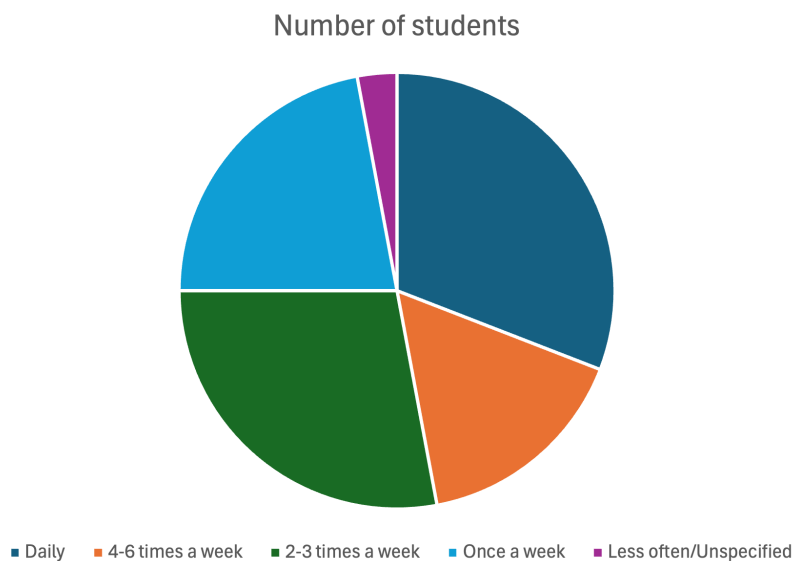
**Table 5:** Avg. Number of tools used per person in each category

from our own familiarity. However, the landscape of AI tools is rapidly changing and AI tools may be different than what we have established as their description by the time of publication.

Tool Name	Frequency	Description
ChatGPT	68	Multi-purpose LLM by OpenAI
Copilot	4	Multi-purpose LLM with search by Microsoft
Bard	3	Multi-purpose LLM by Google
Claude	3	Multi-purpose LLM by Anthropic
Dall-e	2	Image generation model by OpenAI
Automata	1	Marketing and Content Re-purposing Model
Beautiful.ai	1	AI Presentation Maker
Bing AI	1	LLM combined with search by Microsoft
Descript	1	Podcast and Video Editor
Grammarly	1	Writing Assistant with Plagiarism Checks
HyperWrite	1	Writing Assistant
Perplexity	1	LLM Combined with Search
Snapchat AI	1	Multi-purpose Assistant Combined with Social Media app
Writier	1	Writing assistant

**Table 6:** Familiarity with AI tools

In addition, we asked them how often they used AI tools for each tool they said they currently use. Fig. 4 shows responses for how often they use ChatGPT. Few people who use other AI tools like Perplexity (1) said 2-3 times a week. (3) rare usages of other tools. And one person mentioned they use Co-pilot/Dall-E as often and together with ChatGPT



**Fig. 4** Frequency of use of ChatGPT

### 3.2.4 AI and Student Expertise

We asked students to rate their expertise in utilizing AI for their academic work. Fig 5 shows the response graph where 6 means advanced expertise. We see students responded with a mean of  $3.2 \pm 0.97$ , median=3, and range of 1-5.

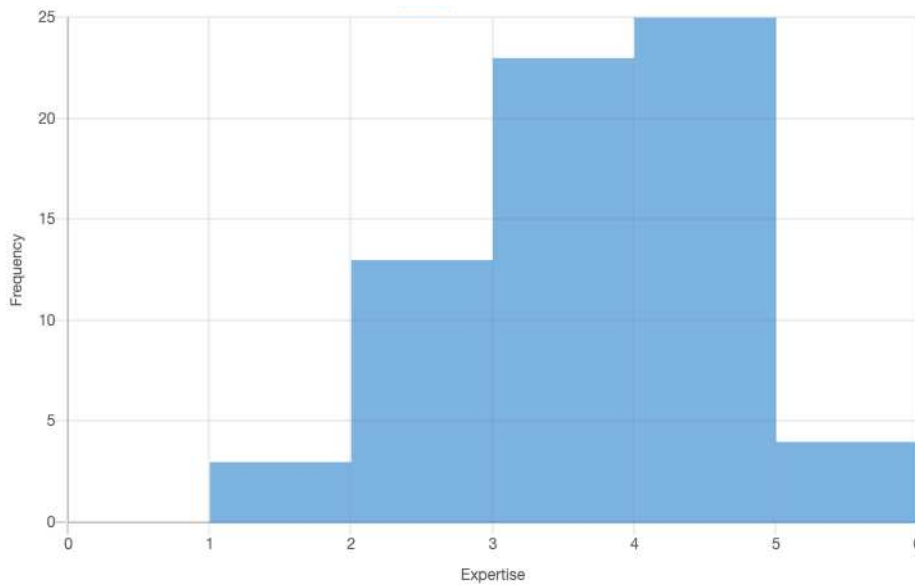
## 3.3 Qualitative Analysis of Tool Usage

We asked two types of open ended questions in our survey to understand how participants used AI tools and if they thought that expertise (if any) was required to use AI tools. We coded their responses and categorize them thematically. Our goal in the analysis was to identify as many themes as we can without finding a numerical count of the occurrence of each theme. Rather, we describe them with qualitative words such as few, many, most. We present the results below.

### 3.3.1 Usage: Learning Complex Topics

Learning complex topics was the most common theme in the responses. The participants learned complex topics in various ways. For example, one participant mentioned "... asking [AI] to explain a complex topic as if I am a younger student..." or answer "... daily questions". Other students more directly connected learning to university activities such as "asking questions on homework", "understand concepts taught in class...", "... do a lot of the tedious groundwork for assignments"





**Fig. 5** Expertise with AI tools

One participant mentioned that they liked ChatGPT because “... it skips the part of me scrolling different sites and gathering information” alluding to ChatGPT’s information distilling capabilities. Several other participants also mentioned that they use ChatGPT to summarize information or “...get basic information on a topic” or even organize thinking e.g., “... get a summary from chatgpt to help me format the text ideas in my head”, “... help think through ideas”, “... getting a step by step to solving economics problems”. Some even went to the extent of saying that they use chatgpt “...as a tutor”

### 3.3.2 Usage: Writing

The next popular code was Writing. We further divided writing into subcodes as follows.

**Communicative Writing** Several participants mentioned that they use ChatGPT to write various communication artifacts such as emails, letters, notes, resume, cover letters, etc. Some students mentioned that they use ChatGPT to write more professionally e.g., “... help with writing emails to allow me to adjust to a more professional tone and expand my vocabulary”

**Rephrasing** Several students mentioned that ChatGPT helps them rephrase things or “...provide new ways of wording sentences” possibly by “provid[ing] word ideas like phrases, synonyms etc” or “...strengthen[ing] my vocabulary in writing”.

**Proofreading** Similar to rephrasing, some students used it to proofread and check for spelling, check grammar, or give them feedback on their writing.

**Writing Outline** Some students also mentioned they use ChatGPT to "... create outlines for papers I need to write."

### 3.3.3 Brainstorming

Students mentioned that they used chatgpt to brainstorm university-related work such as "... get ideas for essays", "...suggestions for topics", "...how to start writing about something", "generate ideas...", "brainstorming ideas...", when they "... want some direction", "...create outlines for papers", "... to know the answer for questions which are interesting for me" or even "... help me organize thoughts".

### 3.3.4 Software and Data Analysis

Several students mentioned that they used ChatGPT for "... data cleaning, code writing", "... filter excel data", or to have code explained to debugged for them.

### 3.3.5 Entertainment

Some students mentioned that they used ChatGPT for "...games, entertainment", "... writing songs", or for "... hobbies where it helps me find new music and ideas"

### 3.3.6 Low frequency yet unique uses of AI tools

**Mental health resource** One student mentioned they use chatgpt for "... some personal advice" while another mentioned that they have used chatgpt for "... therapy reasons in the past"

**Presentations** One student used "... *canva prompt* for creating and editing presentations"

**Professional Development** Students mentioned they use ChatGPT to prepare for interviews.

**Social use** One student mentioned that they used ChatGPT to "... look for date ideas"

**Usage: Search** Some students used it as an alternative to search engines e.g., "help me find research papers..." or even simply "...basic search (like a search engine)"

**Usage of other AI tools** Usage of other competitor tools was primarily as a substitution of ChatGPT because "Copilot [has] become an add-on to Microsoft Edge" or to "... compare chatgpt responses"

## 3.4 Qualitative Analysis of ChatGPT and Expertise

The introduction of ChatGPT has led to several certificate courses and a movement in academia and industry to learn more about AI. We asked students if they thought they had the expertise as noted previously in the quantitative

analysis section. Here, we discuss their qualitative responses to why they self-rated their expertise as they did and to whether they had any thoughts on what it means to be an expert in AI. We thematically analyze those responses and present them in this section.

### **3.4.1 Learning by using**

Most people indicated that their expertise came from self-learning by using it longer. They didn't think that it was "... hard to use chat gpt"; some said that their "... prompts [got] better and currently it has become much easier to get the response I want from the AI model." Some attributed to the technology becoming better e.g., "... it's very user-friendly nowadays and I do not struggle with using it"

However, when asked what it means to have expertise, students overwhelmingly responded indicating that specialized knowledge is required to drive AI. For example, "...to be an expert in AI, it means knowing how to optimize the software to best get results." We explore different types of specialized knowledge below.

### **3.4.2 Technical Knowledge**

Few attributed their expertise to having an "...undergraduate [degree] in computer engineering and have [learning] the theory behind AI and the algorithms it uses". Very few people mentioned that their expertise comes from knowing the underlying algorithms or the fundamentals of computer science.

When asked what it means for someone to be an expert, many more students responded indicating technical expertise was necessary e.g., "in order to be an AI expert I think it takes much more than just basic knowledge of the publicly known and used models", "ChatGPT is a great tool and model, but having a deeper understanding of both how it works and other tools that can do the same job with less overlap in responses is what I'd say separates experts and normal users." However, some students also responded indicating that expertise is in a successful outcome or application of AI e.g., "being an expert in AI entails being able to use it professionally to gain knowledge and profit from it, as well as advance research and development of a business or career."

### **3.4.3 Domain Knowledge**

We note that most of our participants are from a business background and might be applying AI tools in their domain. While others may have implied that their domain expertise contributed to the expertise, only one person specifically attributed their success to being "...good at identifying misleading or inaccurate responses", indicating that having the knowledge of the domain to which ChatGPT is applied is essential to using it effectively.

### 3.4.4 Conceptualization of Technology

We found two metaphors about how people describe their own expertise using relationship metaphors such as calling it "... a student-teacher [relationship] where I have to teach the teacher to teach me in the most efficient way possible" and the other mentioned "... just talk to Chatgpt(prompt) like [it is] a child and specify the environment and the answer I am looking for."

### 3.4.5 Gaps in Knowledge

Some people mentioned that they did not have any more than general knowledge and attributed their lack of expertise to it; but that does not seem to have made the technology hard to use. For example, one participant said "... do not think it is hard to use chat gpt. But I know it has its limitations but I'm unsure what all the limitations are". Some students indicated that to be an expert in AI, "... requires you to understand both the tools but also the consequences and ethics behind them", indicating that consequences and ethics while using ChatGPT are not common knowledge as per the participant.

### 3.4.6 Sources of Information

We noticed that some participants attributed their expertise to the information they consumed about technology. Some students consumed information online through articles and videos e.g., "watch videos on how to prompt engineer", few learned via social media e.g., "...learnt a lot of tricks from Instagram reels". Few students had exposure to ChatGPT via their university either through classrooms e.g., "took a [university] course on AI Marketing" or research projects e.g., "...last summer I helped a professor with research about ai for [academia]. At the [unknown word] we used chat gpt". Few had taken a formal course on prompt engineering.

## 4 Discussion

### 4.1 Demographics

We conducted a survey in which 68 students participated. We know from their demographics that most of these student participants were between 18 and 23 years old enrolled in undergraduate and graduate courses at Bentley University. We had slightly more participation in the survey from people who identified as female rather than male, with no participation from any other gender. We know that most of these participants were in good academic shape as almost everyone had a GPA above 3. Furthermore, most of the participants came from nontechnical business-related areas such as Finance and Accounting. These demographic facts are important, as the results might change if the demographic of the participant changes. For example, we already know that technical students might be using AI tools differently than non-technical users (Zamfirescu-Pereira

et al., 2023). In addition, our inclusion criteria involved students who were at least familiar with AI tools. We acknowledge that the findings synthesized below might not apply in the same way to a broader population of university students who have never tried an AI tool. Therefore, the rest of the discussion is in the context of our participants' background. Tables 2 and 3 show a detailed view of the demographics data.

## 4.2 Online Tool Usage

We saw from Fig. 1 that participants on average use 3.64 tools to learn online, with some participants using up to 7 tools. This shows that as much as ChatGPT has the promise of serving education needs, it may not be serving all of them as students use more than just ChatGPT. Further, we still see from Fig. 2 and 3 that Google and Search Engine category outdo use of AI tools like ChatGPT. Considering that this result was seen in a sample that by inclusion criteria had to have some AI exposure, we anticipate that wider samples will show a higher usage of search engines rather than AI tools. Although the inclination of previous work showing that AI has entered the student learning toolkit may be correct, it is not the case that AI has completely replaced other online tools. This finding potentially alleviates some concerns (Kiryakova & Angelova, 2023) presented that learners will unquestionably accept the output of ChatGPT, as participants tend to use multiple tools. In addition, while previous transformations in education with Google and Wikipedia (Duha, 2023) have prompted pivots from existing systems such as libraries, we see that ChatGPT has failed to fully dethrone the search engine as the most used tool to learn and wikipedia, youtube and other information sources still remain popular.

Closely following the Search and AI tool categories, we see students using multimedia tools such as YouTube to learn online. This is not far from prior research that showed YouTube as a favorable learning tool (Maziriri et al., 2020). It is possible that even in the age where AI can summarize content from various sources and even YouTube videos, there is still a desire to learn via YouTube directly, possibly hinting towards the preference of non-textual modalities.

Although participants mainly used search, AI and multimedia learning tools to learn online, we saw in table 5 that for each type of tool, participants mainly use a tool from only one brand. For example, for Multimedia Learning, there was no tool other than YouTube that came up in the survey. This is not due to the lack of alternatives as YouTube faces competition from platforms DailyMotion, Vimeo, etc. For search and AI, the average was slightly higher at 1.09 and 1.03 tools per person. The results indicate that the students are loyal to one tool per category.

## 4.3 AI Tool Usage

### 4.3.1 Popularity and Frequency of Use

For AI tools specifically, ChatGPT is more known than any other tool, with all participants mentioning that they have used this tool in the past. In general, the participants indicated mainly familiarity with multi-purpose large-language models. However, some participants also indicated familiarity with AI tools designed specifically for narrower usecases, e.g., writing assistants, presentation assistance. An exhaustive list of the AI tools indicated as used by the participants is found in table 6.

(Sanasintani, 2023)’s survey found that higher education program students are not only familiar with AI concepts but prefer it over traditional educational methods and believe that including it in curriculum is important as it can improve the quality of learning in higher education. However, in the results section we reported that only 13 of 68 students selected an option other than ChatGPT. Out of the 13 only 4 selected more than one additional option with one person writing in 4 option in addition to ChatGPT. We notice that the familiarity of tools beyond the most popular ChatGPT rests within only a small subset of the sample. This indicates AI familiarity and education is not equal and that familiarity with more than the most popular tool exists only within a very small sliver of the sample.

Further, we also note that while many tools were listed under “tools used in the past” (see table 6), much fewer AI tools and only multipurpose LLMs were listed when asked about current tool usage (see fig. 2). This might indicate that narrow-usecase AI tools either did not meet students’ needs or the multipurpose LLMs did a good job at such a wide range of tasks that narrow usecase tools were not necessary. Especially in light of each tool having a price associated with long-term volume use of it, we see a churn in our sample from narrow-use-case AI tools to ChatGPT.

When using AI tools specifically, in contrast to (Singh et al., 2023) who noted in their survey that students did not use chatgpt for academic purposes frequently, we saw most of the participants use it daily or 2-3 times a week. We believe that the popularity and quality of the tool have increased since previous research was published in the student community and led to more adoption.

### 4.3.2 AI tool use cases

**Writing** Similarly to (Chauke et al., 2024; Črček & Patekar, 2023; Crompton & Burke, 2024), we see that students use AI tools to generate ideas, paraphrase, summarize, and proofread text, among other writing activities. This isn’t surprising as writing is perhaps the most common artifact that students submit and get graded on.

We caution that when students use AI tools for writing, even in early processes such as brainstorming or finding an idea, they might be nudged into one or another direction (Jakesch et al., 2023), which can hamper their ability to think creatively. However, AI can eliminate the writer’s block problem by creating

an outline and helping students brainstorm interactively. In addition, students who do not speak English as their first language might find a great help from tools like ChatGPT (Yan, 2023). The positive impact on language acquisition has also been seen in our data, where students mentioned that ChatGPT helped expand their vocabulary and help with the tone of their writing.

In addition to regular writing, we note that students use AI tools for writing software code and even executing the code to perform data analysis.

**Learning** Many participants mentioned ChatGPT’s ability to distill information into coherent texts. They mention that this ability can break down a topic so it can be explained at an easier level than how it was first introduced to the students. Some even say that ChatGPT can act as their tutor. However, we note that in the specific case of a math tutor, (Bastani et al., 2024) found that ChatGPT can actually harm education by acting as a “crutch”. They found that while ChatGPT can make tasks easier for humans, when its access was taken away from students, students performed worse than students who never had access to ChatGPT. (Crawford et al., 2024) also warn against substituting AI for humans (e.g., in the case of learning complex topics, brainstorming, etc.) as it can be detrimental to the student from a social perspective.

**Other** Our open-ended responses revealed students are using ChatGPT for various personal, academic, and professional purposes. Given the holistic nature of university life, students reported using ChatGPT for non-academic issues like mental health, relationship advice, date ideas, entertainment. This highlights the diverse range of university activities where ChatGPT is being utilized.

### 4.3.3 AI Expertise

**How students gained expertise** Our finding that most people gained expertise just by using ChatGPT points towards three things. One, that the technology itself and the user experience is simple enough to use; similar to (Romero-Rodríguez et al., 2023) who found that the user experience was the fundamental determinant of ChatGPT acceptance and that ChatGPT has an easy-to-use interface (Turmuzi et al., 2024). Two, it goes against what some professors have thought that the technology must be studied before being used (Kiryakova & Angelova, 2023). Three, several course offerings from universities, MOOCs, etc. in Prompt Engineering or LLM might not resonate with this demographic of students who think they can gain expertise by only using it unless a clear additional value can be demonstrated. In addition to usage, we also noted that few students learned how to use ChatGPT through research or classes at universities. Few students also mentioned that they learned on social media.

We note that the difficulty in using ChatGPT is not the graphical user interface itself but rather crafting the right set of words and providing enough context to get the appropriate response, especially for advanced use cases. Furthermore, since ChatGPT can generate incorrect information, one must also have sufficient expertise in the domain to identify responses that may be wrong. Domain expertise remains crucial as ChatGPT does not provide sources and

students using the tool must be able to identify good and bad information by themselves or in augmentation with other tools or experts. In (Ngo, 2023)’s study, students were aware of this issue; however, since not many mentioned the need for domain expertise in our study, we show a possible deviation from the finding.

### **Metaphors for Learning**

Metaphors and anthropomorphizations are often used to conceptualize new technology (Hurtienne & Blessing, 2007), especially one such as ChatGPT that is sufficiently complex in its working and can perform a variety of tasks at scale with non-trivial quality. We found two metaphors without specifically asking the students to identify them. They were mentioned in the context of expertise while using AI. In both metaphors, participants used anthropomorphizations and called ChatGPT a ‘Child’ and a ‘Teacher’ that needs to be taught. In both cases, the participants indicated that their relationship with AI was similar to that of the human guide rather than the other way around.

## **5 Assumptions and Limitations**

The Survey was administered only to people who indicated that they use AI tools. Most of our participants came from a business-studies background and had a good GPA. Our findings are limited to the sample described here. In addition, many of the specific tools mentioned by participants were written in by participants. Therefore, there could be an undercount of others who also used the same tools but did not remember to write it down. In this case, listing all the tools would have alleviated the problem. However, the list of AI tools on the market is vast and is rapidly growing; it would be impractical to list all of them. Other standard limitations of a survey such as not being able to ask follow-up questions, survey fatigue, etc. may also affect results.

## **6 Statements and Declarations**

The study presented in this paper was approved by the Institutional Review Board (IRB) of Bentley University. To avoid any conflict of interest and to obtain truthful responses, the survey tool automatically excluded any student who indicated that they were currently enrolled or were anticipating enrolling in classes conducted by the PI. Participants were compensated with a USD 5 gift card for their completed and valid responses.

The authors used AI (scite.ai) and search (Google Scholar) to find relevant papers. They used Writefull to edit the grammar of the paper. No part of the paper was written by AI. AI did not play a role in any analysis or synthesis of data (Quantitative or Qualitative).

Data related to this survey may be made available upon reasonable requests and the approval of the IRB.



## 7 Conclusion

Our research reveals that while AI tools like ChatGPT are rapidly gaining popularity among university students, they have not replaced traditional online learning tools such as search engines and multimedia platforms. On average, students use 3.64 tools to learn online, with search and AI tools like Google and ChatGPT being the top-2 tools. Students are actively integrating AI into their workflows, particularly for tasks such as writing and learning complex topics. In addition, some are also using it to meet their entertainment, mental health, social and other personal needs on campus. We have documented various use cases and listed technology tools, including several AI tools, that are now a part of students' learning toolkit.

The concept of expertise in AI remains multifaceted, with students attributing it to both technical knowledge and practical experience, and most students saying that they gained expertise just by using the tool rather than any formal introduction or education. In addition, we find that knowledge about AI tools beyond the most popular ChatGPT may be concentrated only within a few students.

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Rahul Divekar - PI. Conceptualization, Literature Review, Data Analysis, Synthesis, Writing, Visualizations, Methodology, Project administration, Funding acquisition

Lisette Gonzalez - Student. Piloting survey, proofreading and editing survey instruments, administering survey

Sophia Guerra - Student. Piloting survey, proofreading and editing survey instruments

Natasha Boos - Student. Piloting survey, proofreading and editing survey instruments

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