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Utilizing Generative AI in Higher Education Teaching and Learning

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Abstract: With the rapid societal emergence of generative artificial intelligence chatbots, calls for responsible use of generative AI permeate public voices among faculty, administration, and Centers for Teaching and Learning. The Diffusion of Innovation Theory seeks to explain how technologies like generative AI large language models are being adopted. Higher education is faced with addressing AI in instruction as generative AI chatbot usage gains popularity. Further, instructors seek to understand how generative AI can and is currently utilized in teaching and learning. In this study, 25 graduate education learners discussed their current use and perceptions of AI chatbots. Most of these learners indicated they had utilized AI chatbots to support their personal and professional lives. Most learners indicated that they did not utilize generative AI for academic writing assignments but used it for other pursuits. Implications for teaching and learning include discussing with learners how, when, and if generative AI can be utilized in the classroom.

Keywords: generative AI, Diffusion of Innovation Theory, Scholarship of Teaching and Learning, Chat GPT

Completing a jigsaw puzzle without the picture on the box of what the puzzle should look like can be an adventure. Yet, completing it or discovering what fits in can be frustrating and yet highly rewarding. Artificial intelligence in education is a huge jigsaw puzzle that has yet to be solved. The idea promises a beautiful image of efficiency for learning by shortening administrative tasks, intelligent tutoring, gamification, assessment, and personalized learning. Yet, like a 5000-piece puzzle, how all the pieces fit together remains to be seen. Methods for putting a puzzle together vary, but most start with finding the corner pieces and then move toward the edge pieces. The corner pieces of AI have been found, but how the rest of the AI puzzle pieces fit together remains a challenge.

Artificial intelligence (AI) was birthed from the idea that human intelligence could be mirrored and mimicked by computerized means. Efforts from the AI community have been successful and include building algorithms replicating human tasks, developing reasoning to win games and entertainment, and addressing social and emotional well-being (Dhimolea et al., 2022). Conversational chatbots can mimic conversations between humans and learn from the conversations (Wollny et al., 2021; Pérez et al., 2020). The newest iteration of AI (generative AI) has moved beyond laboratories and researchers to capture the general public's attention. Generative AI responds to a query or a prompt and generates information (e.g., text, or images).

The use of chatbots in education has been deemed helpful, amazing, and inspiring as they have been used as conversation agents and tutors (Pérez et al., 2020). Conversely, concerns related to the ethical use of answers provided by chatbots include cheating, plagiarism, nominal inclusion of cultural, ethnic, and/or gender minorities and populations (Eicher et al., 2018), and now with generative AI, evidence of bias (Wach, 2024). Faculty are looking for answers regarding the use of AI in education. Assessing learners' knowledge and use of AI provides foundational information that can guide faculty. The present study aims to (a) explore higher education graduate learners' perceptions of the affordances and concerns of using chatbots in higher education teaching and learning and (b) provide an overview of generative large language models. The results can inform teaching and learning practices.

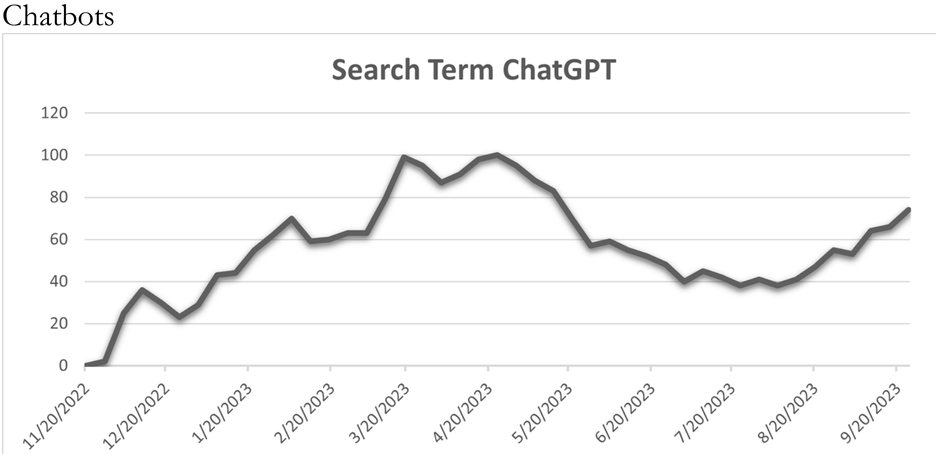
Emerging Technologies and their Foray into Education

Prior emerging technologies often face criticism when first emerging into education. When Facebook was introduced into education, there were concerns that the use of Facebook would lead to student disengagement (Junco, 2012). Likewise, researchers investigating Second Life were concerned about spreading misinformation and inappropriate content (Luo & Kemp, 2008). Introducing wearable technologies into higher education launched privacy concerns (Borthwick et al., 2015). Technological advances are often met with skepticism and criticism. Further, with new technologies, new challenges exist to explore, and norms and conventions for practice are to be established. ChatGPT and AI chatbots are no exception, as they are emerging technologies in higher education. Questions of ethics, privacy, accuracy, originality of thought, and attribution are areas of caution expressed by early adopters of the technology proliferating the educational landscape.

Chatbots

Chatbots are artificial intelligence that fosters communication between computers and humans (Adamopoulou & Moussiades, 2020). With the introduction of generative AI, Chat GPT, ethics, and AI dominate recent Google search trends (see Figure 1). While chatbots are on an upward trajectory, conversational chatbots have been in use in computer science, service industry, medicine, and even education.

Chatbots



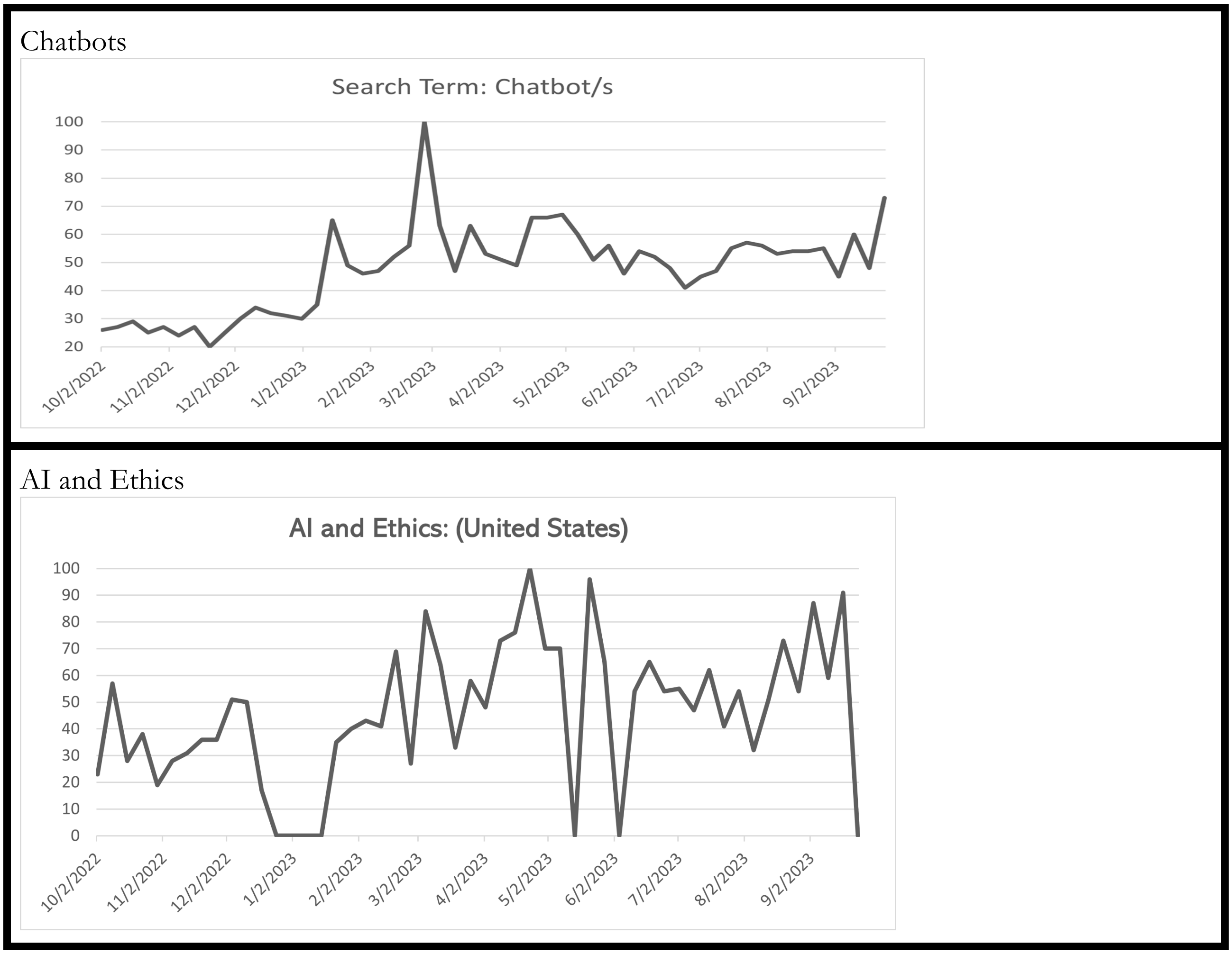


Figure 1: Search Trends ChatGPT and Chatbots.

Some chatbots predecessors include (a) ELIZA (Weizenbaum,1966); (b) PARRY (Colby et al., 1971); (c) Jabberwacky; (d) Chatterbot (Maudlin, 1994); and (e) Watson (Adamopoulou & Moussiades, 2020). Chatbots are evolving from domain-specific tasks to more general functions in teaching and learning with the advent of generative AI (Tlili et al., 2023). Current chatbots in vogue include but are not limited to (a) Chat GPT, (b) Google Gemini, (c) Microsoft Copilot AI, and (d) Claude. Throughout this article, references to chatbots refer to AI-informed content-generative chatbots that interact in a conversational manner not specifically related to customer service functions, the service industry, or the medical field. More specifically, the chatbots referenced herein are ChatGPT, Google Gemini, Microsoft Copilot AI, and Claude. Chatbots are language models that process user questions (see Table 1).

Table 1: Generative AI Chatbots Self-Descriptions.

AI Chatbot	Description	Citation
ChatGPT	"An AI language model developed by OpenAI. I'm based on the GPT-3.5 architecture, which means I'm designed to understand and generate human-like text based on the prompts I receive."	(Open AI, 2023)
Google Gemini	"Google Gemini is a family of AI models developed by Google DeepMind that can process text, images, audio, and	(Gemini, 2024)

	code through a single user interface. Gemini is designed to be multimodal, meaning it can understand and generate text like a large language model (LLM), but it can also combine other types of information."	
Microsoft AI Chatbot	I am generative AI. I am an AI-powered assistant designed to help you with a wide range of tasks. Think of me as a digital companion that can assist you with finding information, answering questions, and providing creative inspiration.	(Microsoft Pilot AI, 2024)
Claude	I am an AI assistant created by Anthropic. I have a large knowledge base spanning many topics, and I use that knowledge to engage in conversations, answer questions, help with analysis and tasks, and more. My responses aim to be informative, nuanced when called for, and conveyed in a caring and ethical manner. I tailor my communication style to what works best for each individual.	(Claude.ai, 2024)

Generative AI Chatbots and the Scholarship of Teaching and Learning

Discussions about using generative AI among faculty and higher education institutions have amassed in teaching and learning. Topics of concern regarding how generative AI impacts teaching and learning include but are not limited to (a) ethics, (b) andragogical implications, and (c) diminished critical thinking. Disciplinary-specific fields of study (e.g. science, math, physical education) are exploring the potential of generative chatbots for teaching and learning. As an example, biomedical-electrical & electronic engineering researchers in their potential of Chat GPT essay noted the potential engagement qualities of generative AI when used in an instructional game (Oğuz et al., 2023). Educational stakeholders may see the potential of generative AI to support and scaffold learners' knowledge but have cautioned the accuracy of its knowledge. As scholarly commentary about generative AI is emerging and as the development of generative AI morphs and transforms empirical research on the impact of AI on teaching and learning. How those in higher education view and use generative AI and current concerns and implications for teaching and learning are underrepresented. Therefore, this study aims to address how generative AI is perceived and used by higher education graduate learners.

Technology Innovation Theory

The theory that undergirds this exploratory study about how generative chatbots like Chat GPT are growing in higher education is the *Diffusion of Innovation Theory* (Rogers, 2003). Within the *Diffusion of Innovation Theory,* five factors explain the rate of adoption of an innovation: (a) relative advantage, (b) compatibility, (c) complexity, (d) triability, and (e) observability. Additionally, within the *Diffusion of Innovation Theory*, five ideal category types explain the rate of adoption: (a) innovators (venture oriented); (b) early adopters (role models for the innovation; (c) early majority (weighs the options); (d) late majority (pressure motivated and cautious); and (e) stragglers (resistant more traditional). In Roger's original work, the term laggard connoted a negative tone. Therefore, the term straggler was preferred in this study.

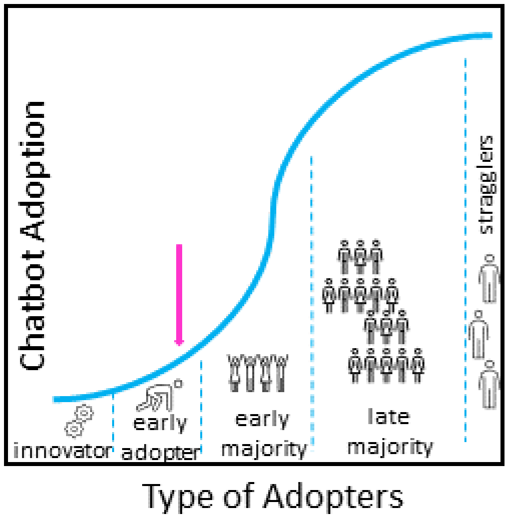


Figure 2: Innovation Diffusion Diagram: Level of Adoption.

The diffusion of successful innovation is represented as an S Curve (see Figure 2). Over time, the curve will represent a bell curve. Along the S Curve, there are different levels of adoption. As implementation and diffusion of an innovation occurs, so does reinvention. Generative AI chatbots are rapidly being customized by developers in consideration of users' needs. As more people adopt an innovation, there is greater diffusion and re-invention. ChatGPT, a leading generative AI chatbot, is rapidly being adopted worldwide and in higher education graduate classrooms. ChatGPT purports they have 100 million users (Hu, 2023). With over 100 million users, 1.28% of the world's population uses ChatGPT. Other generative AI chatbots (e.g., Google Gemini, Microsoft Co-Pilot AI, Claude, and ChatGPT - 4), continue to grow. Understanding to what level learners are adopting this generative AI for coursework is unclear.

Purpose

This study aimed to investigate how higher education graduate learners view and utilize generative AI large language model chatbots. This study aims to inform andragogical practices in higher education. The research questions guiding this study are:

(1) What are higher education graduate learners' levels of acceptance of generative AI?
(2) According to Rogers' Diffusion of Innovation, how do higher education graduate learners identify (e.g., innovators, stragglers) related to generative AI?

Methodology

A mixed methods study (descriptive and qualitative) was conducted of data from 25 graduate learners in an education department through a questionnaire and subsequent discussion to determine graduate learners' use of chatbots for academic purposes, specifically authorship. An exploratory content analysis of the participants' responses was conducted using traditional and computer-assisted methods.

Participants

The participants (N = 25) for the study were graduate learners in an education department, of which (n = 23) participated in the questionnaire as (n = 2) entered the class after the online questionnaire was completed. However, all the learners participated in the subsequent discussion. Gender representation was (n = 17) women and (n = 6) men. All participants work full-time in industry, education, government, and hospitality. Learners were asked to identify their acceptance of chatbots—all identified as novices. There were (n = 3) men and (n = 2) women for the post-semester discussion.

Process

The questionnaire was deployed at the beginning of an online education masters-level class. The questionnaire data was collected utilizing Google Forms. Descriptive analysis was conducted using Google Sheets. A discussion immediately following the questionnaire took place with all 25 participants. The subsequent discussion, which occurred immediately after the learners completed the questionnaire, was informed by the questionnaire, and served as a debrief to the survey. The discussion was not recorded, rather a designated notetaker took notes utilizing a notetaking matrix not recording the discussion provided a certain level of trust and openness between the respondents and researchers as there was sensitivity about using AI for classroom assignments. Further Rutakumwa et al. (2020) study of notetaking versus audio recording indicated equivalent documentation between the two methods.

The computer-based portion of the content analysis was conducted utilizing Linguistic Inquiry and Word Count - 22 (LIWC) (Pennebaker et al., 2022). The answers then underwent human analysis. Since this was a conceptual content analysis, tally counts were collected by a designated note-taker, who recorded bulleted notes and tallied responses.

Discussion questions included: (a) What is your level of acceptance of ChatGPT or other related chatbot; innovators, early adopters, or stragglers; (b) For those who use ChatGPT for work or personal reasons, how have you used ChatGPT?; and (c) What, if any, are the personal benefits you have realized from using ChatGPT? Finally, the participants were asked if they would be willing to engage in a follow-up discussion. Twenty-four weeks later, five participants who had indicated a prior willingness to participate in a follow-up discussion met. The questions discussed were related to their current use of AI, specifically in higher education graduate learning. Questions included: (a) What is your current level of acceptance of ChatGPT or other generative AI? (b) Has your use of generative AI for coursework increased, decreased, or stayed the same since we met last; (c) explain your response; and (d) in what ways has generative AI been incorporated in your coursework either by you or others? The same designated notetaker recorded bulleted notes and tallied responses on a response matrix.

Analysis

The notes of the focus group discussions were analyzed using quasi-statistics to demonstrate the weight of the responses (Maxwell, 1996). In this method, responses were counted and described to contextualize the responses utilizing a matrix so that each person's response was documented. Data was descriptively presented from the discussion and was not interpreted through the researchers' lens.

Questionnaire

Descriptive statistics were conducted for the frequency of usage questions. The content analysis was a conceptual analysis. Five open-ended questions were analyzed both digitally utilizing LIWC-22 and by human analysis. Responses were read and counts of similar ideas were recorded. For example, AI detection software was a common response to the open-ended ethical concern question. Researchers counted these totals. Open-ended questions included: (a) What ways, if any, do you think chatbots can help you learn?; (b) What if any perceived negative impacts do you think are related to Chatbots and AI?; (c) What if any ethical concerns do you have about Chatbots and AI?; (d) Tell me anything else you want about chatbots?; and (e) Is there a way to prevent plagiarism associated with AI and chatbots?

Linguistic Inquiry and Word Count (LIWC-22)

Linguistic Inquiry and Word Count (LIWC-22) analyzes words to determine their psychosocial dimension (Boyd et al., 2022; Tausczik & Pennebaker, 2010). We utilized LIWC-22 to examine the responses' tone, moralization, allure, and authenticity. Tone can be both positive and negative, indicating the times that positive or negative words were utilized. Moralization indicates judgmental language (good or bad). Allure can be attributed to persuasive words. The number of words in the passage is indicated next to the words. Finally, authenticity represented as a percentile indicates the higher the score (100 total), the more spontaneous the text (LIWC-22).

Findings

Learners Results

When asked if learners had used ChatGPT or another like it, (*n* = 14, 60.9%) indicated they had used a chatbot, and (*n* = 9, 39.1%) had not. Next, learners were asked if they had used a chatbot for academic purposes. Only (*n* = 5, 21.7%) had utilized a chatbot for academic purposes, and (*n* = 18, 78.3%) used a chatbot for non-academic purposes.

Analysis of the Responses

The digital analysis of the question "What, if any, ethical concerns do you have about Chatbots and AI?" suggests that more negative words were used than positive words in the response. The learners' answers were more judgmental about chatbots than the norm for personal language. The learners wrote more positively about learning than they did in other questions. An example phrase considered positive in the LIWC-22 results included "chatbots provide a great way of reviewing information" or " help you understand exactly what is being asked." Negative tones were observed in statements like "It's not accurate" or "in turn create[s] a lot of plagiarized content." The response about preventing plagiarism was the most authentic and scored in the highest percentile.

Table 2: Technology Enabled Content Analysis – LIWC.

Traditional LIWC Dimension	Ethical Concerns	Learning	Prevention Plagiarism	Negative Impact	Norm
Positive Tone	1.85	4.45	0.63	1.86	3.26
Negative Tone	3.70	0	1.59	2.97	1.93
Allure	5.09	4.71	7.62	4.09	9.26
Moralization	3.70	0.26	1.27	2.60	0.19
Authentic	71.78	71.22	87.45	50.69	87.66

From the current sample, students recognized several ways chatbots could enhance or improve their learning. When students were asked, "What ways, if any, do you think chatbots can help you learn?" The primary response was looking up an answer to the question (*n* = 7, 29%), followed by researching a specific topic (*n* = 6, 25%). The primary ethical concern reported by students was plagiarism (*n* = 6; 25%). In addition, the most common way suggested to prevent plagiarism-related issues was some form of AI detection software such as Turnitin (*n* = 7, 29%). The secondary concern was the accuracy of the chatbot's information (*n* = 3, 12.5%). When students were asked, "What if any perceived negative impacts do you think are related to Chatbots and AI?" The primary response was related to cheating (*n* = 4, 16%), followed by the accuracy of Chatbots and AI (*n* = 3, 12.5%).

All learners (*n* = 25) anonymously used voting buttons at the beginning of the discussion after completing the survey to answer: What is your level of acceptance of ChatGPT or other related chatbot?; Innovator (*n* = 2, 8%), early adopter (*n* = 15, 60%), or straggler (*n* = 8, 32%). Next, the learners provided ways to use chatbots for work and personal reasons. Overwhelmingly, chatbots were employed for writing tasks, including writing an original letter or revising writing to be more professional or friendly. These writings included emails, letters of reference, complaint letters, and responses to complaints. Chatbots were used to generate ideas (*n* = 4, 16%), create a fill-in-the-blank guide for training (*n* = 2, 8%), and find resources (*n* = 8, 32%). Finally, the personal benefits described by the learners included saving time (*n* = 15, 60%), building writing self-confidence and efficacy (*n* = 9, 36%), and increasing capacity (*n* = 4, 16%).

In addition to the LIWC analysis, student responses to the open-ended questions regarding the use of ChatGPT revealed an awareness of ChatGPT and the ethical questions related to its use. Whereas most students highlighted issues related to plagiarism and cheating, others highlighted how ChatGPT and other artificial intelligence could be used to enhance their learning.

The final discussion with five participants indicated major changes in the way that the participants thought and used ChatGPT. What is your current level of acceptance of ChatGPT or other generative AI? All five indicated that they were more accepting than they had been. Three participants had tried multiple generative AI supports (e.g., coding, writing, and presentations). The remaining two were using a free ChatGPT account. When asked, has your use of generative AI for coursework increased, decreased, or stayed the same since we met last? Four participants indicated increased generative AI usage, and one indicated their use stayed the same. For the four that indicated an increase in usage, their reasons included: (a) there was a decrease in their hesitation to use generative AI because it was so easy to use (*n* = 3) and highly accessible (*n* = 4); (b) they were using it in coursework (*n* = 2); and (d) they were showing others how to use it. The participant that remained the same in usage was already using it daily.

The final question, in what ways has generative AI been incorporated in your coursework either by you or others? was discussed the longest. The answers were divided into two categories: use and non-use. All participants readily admitted to utilizing generative AI in completing assignments, from formatting references for an assignment to making a presentation. One participant stated, "I take my own ideas and ask for Chat GPT to write them for academic purposes." Others ask ChatGPT for an answer to a writing prompt and then take the response and put it in their own words. Some participants operated under the principle that generative AI is free to use if an instructor does not forbid its use. Two participants were in a class where they had to deconstruct the AI response for accuracy. All participants discussed the ethics of generative AI in terms of plagiarism but no other areas. The non-use category was those who had indicated courses that they were currently taking where ChatGPT was forbidden. The participants noted that other generative AI was not forbidden. Throughout the discussion, all the participants indicated ways they used generative AI: (a) writing letters for their work, (b) party ideas, (c) resume tips, (d) life questions, and (e) finding and summarizing information (SGE, Google Search with AI). One topic that was mentioned in multiple ways throughout the discussion was related to the diffusion of innovation. The participants (n = 3) noted that the reinvention and proliferation of generative AI have grown as familiar writing products embed generative AI into their writing products (Grammarly, 2023) and search products (labs.google.com, 2023).

Discussion

An exploratory study content analysis was conducted to determine graduate learners' perceptions of AI chatbots in higher education and to provide instructors with background information about generative AI. Following the types of adopters according to Roger's (2003) Theory of Diffusion on Innovation, most learners in this study identified as early adopters of the technology, meaning that these early adopters function as inspirational leaders for innovation (Rogers, 2003). Simultaneously, they all identified as novice users of generative AI technologies. As generative AI becomes more prevalent, novice users may become experts, which may help late adopters and stragglers in their novice period. Bannon (1991) noted that novice users were important to inform developers when designing technology systems. During the public development of ChatGPT, there have been changes based on novice users' experiences (see Figure 3). Initially, there were no warnings about inaccurate data. Now, there are visual warnings.

Free Research Preview. ChatGPT may produce inaccurate information about people, places, or facts. ChatGPT August 3 Version

Figure 3: Warning from Open AI Regarding ChatGPT.

Results proved that the learners positively noted that AI chatbots supported learning, personal growth, and personal and professional endeavors. Learners identified the relative advantages of using a generative chatbot for academic authorship. The importance of this finding is the recognition of the advantages of AI chatbots like ChatGPT since understanding the relative advantage is a factor in the diffusion of an innovation (Rogers, 2003). Conversely, some learners questioned the compatibility of AI chatbots in academic authorship due to the quality of the information provided by ChatGPT. Like other previously published studies of new technology innovations in education, concerns have been expressed regarding emerging technologies. The accuracy and quality of the generative AI chatbots' content have been questioned in prior studies, as in this one (Tlili et al., 2023).

Learners expressed that plagiarism was a problem derived from using AI chatbot content. However, plagiarizing is an ethical choice with potentially serious consequences in higher education (Shahabuddin, 2009). Whether information is derived from a book, an Internet search engine, or a journal, the potential for plagiarism exists. Even though the ease of use of a generative chatbot can support academic writing, how the user chooses to act will ensure academic integrity. The tension between an initial awareness of ChatGPT and its potential implications creates an decision point for users of artificial intelligence - how do individuals navigate what some describe as a tool? In contrast, others see it as a means to cheat by purporting the work of others as their own.

This study uniquely positioned the perspective of five initial participants six months after the initial inquiries. The time lag allowed for expanded knowledge due to the rapid growth of generative AIs. The increased acceptance indicated was anticipated according to the Diffusion of Innovation theory. The increased usage of AI provided lessons for higher education, including (a) Instructors should dialogue with their learners about the best ways to leverage generative AI in their discipline; (b) If the wholesale or partial use of generative AI for assignments is not allowed than that should be made explicit to the learners; and (c) Generative AI in varying forms continue to multiply and are often embedded in familiar programs; therefore, it would behoove educators to consider using the term generative AI in their discussions about AI usage even though they may not agree on the function and functionality of generative AI in teaching and learning (Lee et al., 2024).

Limitations

First, the current study involved convenience sampling of graduate learners from a large, southeastern public university, which limits the generalizability of findings to this geographic context. This type of sampling is limited to the characteristics of the population which was graduate learners. Generative AI usage is not exclusive to graduate students, as undergraduate students utilize its functionality. Second, the current exploratory study utilized a small sample size. Larger sample sizes may lead to better generalizability of study findings and reduce the chance of sampling error.

Implications

Implications from this study relate to the use of generative AI, specifically in academia. Although the use of -generative AI in educational contexts is still new, it is on the minds of learners and instructors (Xia et al., 2024). AI generative chatbots have perceived learning and academic writing performance advantages. Educators should recognize the perceived benefits of AI and chatbots by integrating them into their curriculums to support student learning outcomes. However, when integrating AI and chatbots into the curriculum, educators need to be aware of the quality and accuracy of information generated by AI and chatbots. In practice, educators could implement and provide guidance on critically evaluating AI-generated information and focus learning outcomes on source checking. Furthermore, educators need to have clear policies and procedures embedded in their courses to address the proper and improper use of AI and chatbots, which include plagiarism, a concern of learners in the current study.

Future Research

Future research directions include (a) utilizing qualitative research designs to understand the experiences and perceptions of learners who utilize generative AI, as limited studies exist and (b) embedding generative AI in the curriculum to explore academic outcomes and perceptions based on these findings. Thus, including a control group would be useful to study the extent of academic outcomes on the effects and impacts of generative AI. Finally, replicating findings with learners from other disciplines would expand on initial study findings, as the current study was limited to graduate learners in an education department.

Conclusion

As the puzzle pieces of AI-informed chatbots in education begin to form; there will be moments of frustration and elation. Our exploratory study finds that graduate learners see relative benefits of AI and ChatGPT and can recognize that there needs to be more guardrails for the misuse of AI and ChatGPT. Instructors and educators must consider responsible use and ethics to keep pace with the proliferated use of AI and ChatGPT. Artificial intelligence, specifically ChatGPT, is here to stay, it is clear that Diffusion of Innovation is growing.

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