A Case Study on the Integration of Artificial Intelligence into the Accounting Curriculum

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Abstract

This study seeks to understand, from the perspective of first-year accounting students, the extent to which they are aware of AI and their motivation for the use or nonuse of AI in their accounting studies. We conducted a comprehensive literature review on the benefits and limitations of AI applications in the accounting industry and discussed gaps in students' AI skill set. Our survey results indicate that while most participants are aware of AI capabilities, fewer than half of them have used AI in their studies, despite having positive perceptions of the use of AI as teaching (or learning) tools. The participants identified the statement of cash flows as the most challenging and needed AI assistance. Using an AI-embedded case, we analyzed students' performance in comparison to that of leading AI chatbots. This study contributes to the literature by documenting the positive aspects of AI and how an AI-embedded teaching case can be implemented to assist students in acquiring critical analytical skills and practicing the ethical and responsible use of AI tools in the accounting curricula.

Keywords: artificial intelligence; AI chatbots; first-year accounting students; enrollment cliff

1. Introduction

Accounting technology and data analytics, which rely on artificial intelligence (AI), are critical to the accounting profession and industry. The findings of various researchers on accounting pedagogical studies have noted that accounting curricula do not adequately prepare students with the technological and data analytical skills necessary to thrive in the profession. The objective and motivation for this case study, therefore, is to explore the extent to which participants enrolled in a 2nd semester first-year accounting course are aware of and use generative artificial intelligence (AI)-powered chatbots in their accounting studies. The 2nd semester of the first-year accounting course covers the overarching concepts and their related learning objectives, accounting applications and business applications related to fixed assets and depreciation; long-term liabilities; corporations; partnerships; the statement of cash flows; analysis of financial statements; changes in financial position; recording of bond transactions and stocks and bonds as a means of raising capital and borrowing money.

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A chatbot is a computer program that stimulates human conversation with an end user. When prompted to answer the question, "How do you describe yourself? ChatGPT stated the following:

> I'd describe myself as a conversational AI designed to assist with a wide range of questions and tasks. I'm here to provide information, help solve problems, and engage in discussions on various topics. My responses are generated based on patterns in the data I've been trained on, and I aim to be as helpful and engaging as possible. Whether you need detailed explanations, creative ideas, or just a chat, I'm here to help! (Generated on September 9, 2024, from ChatGPT 4o)

ChatGPT is the fastest-growing AI technology platform ever (Harris, 2022; Hu, 2023). As this is an ever-evolving technology, AIs like Claude, Google Gemini, and Perplexity often surpass it in specific areas. AI tools like Microsoft Copilot and Kimi.ai are other powerful alternatives to ChatGPT. The accounting profession is investing billions of dollars in AI. Jon Raphael, Deloitte's audit chief innovation officer, noted that AI is being developed by multiple accounting firms and will dramatically change the profession in the coming years (Ovaska-Few, 2017). AI's impact on the accounting profession has been researched by various authors who have concluded that while accounting firms are investing in AI technologies, accounting education has not kept pace with integrating AI technology tools into the accounting curriculum to prepare students for AI innovations in the industry (Bao, 2019; Cory & Pruske, 2012; Damerji & Salimi, 2021; Kokina & Davenport, 2017; Song, 2019; Watty et al., 2016).

To fill in the gaps in accounting pedagogical studies, we contribute to this discussion by (1) providing data on the extent to which students perceive that AI can be leveraged as a teaching and learning tool to help them in learning accounting. (2) Provide evidence that more than half of accounting students have not used AI in their accounting studies. This is concerning as students may not be adequately prepared for the workforce if this trend continues. (3) We compare the performance of AI chatbots in answering accounting homework, class work and exam questions to student averages on the same set of questions administered to both face-to-face and online students and note where students outperformed AI chatbots and offer possible reasons for this. (4) We note the type of accounting problems that chatbots had difficulty answering. (5) The participants used AI chatbots to prepare a statement of cash flows extra credit assignment, documented the prompts used to interact with the chatbots, and critically analyzed AI-generated solutions for accuracy or illogical reasoning by the chatbot. The participants identified the preparation of the statement of cash flows and the recording of transactions involving long-term liabilities and partnerships as the most challenging topics that they would like AI to assist them in learning.

Our results (a) highlight the need for faculty to expose students very early in their accounting journey to the immense ability of AI to help students complete homework assignments, take exams and work on special projects and (b) reinforce the need for students to be confident in their overall knowledge of accounting to be able to identify AI hallucination and illogical solution of problems. Perhaps the most important contribution of this study is that accounting educators use the findings to prepare students for a workforce that will expect them to use AI effectively.

The next sections provide insights into the background literature that forms the basis of the research questions explored, the methodology used, the results reported, and the discussion

and conclusions, which include the limitations of the study and opportunities for future research.

2. Background and literature review

Universities across the globe are grappling with developing policies on the use of AI in their classrooms. Many universities in the U.S., including Purdue University, Syracuse University, and the University of Texas-Austin, have issued guidelines that allow Professors to determine whether the use of GenAI tools is permissible in their classrooms and the limitations of their use (Paykadmian, 2024). The UK Quality Assurance Agency for Higher Education (QAA) has published some guidance on the implications of AI for academic quality and standards, assessment, and integrity. The Australian Government's Tertiary Education Quality Standards Agency and the European University Association issued guidance on the responsible use of AI tools in higher education in 2023 (Ballantine et al., 2024).

2.1 Importance of AI to the accounting industry

Accounting technology represents the software, systems, and tools used to automate the accounting process. Accounting analytics uses data analytics to help accountants answer business questions to make informed financial decisions. Both accounting technology and accounting analytics rely on artificial intelligence (AI) to achieve efficiencies such as saving time, reducing overhead costs, minimizing errors, and increasing productivity. AI enables computers to perform decision-based tasks that previously required human intelligence and is used in accounting to perform repetitive tasks, identify relationships in financial data, and to provide insight for efficient decision making. Accounting firms use AI to automate and enhance various accounting processes. Accounting Today (2020) discussed the most important issues in accounting, Tim Ryan, chair and senior partner of PwC U.S., observed that the digital skills gap is one of the greatest threats to the accounting profession and the corporate American workforce as a whole, whereas Jeff Thomson, president and CEO of the Institute of Management Accountants, noted the technological revolution the accounting profession is undergoing related to artificial intelligence and observed that "AI can allow finance and accounting professionals to unlock their full potential as strategic business partners within their organizations". AI has many potential benefits for accounting pedagogy. Various authors have alluded to AI's significant impact on accounting pedagogy, and this impact is reverberating both in industry and among accounting faculty (Brink & Reichert, 2020; Holmes & Douglass, 2022).

2.2 Accounting staff shortages and the enrollment cliff

The accounting profession is experiencing staffing shortages and struggling to retain staff; and institutions of higher education are having difficulties attracting and retaining accounting students at unprecedented levels for various reasons including the fact that accounting is widely considered boring and characterized by drudgery and mundane activities (Boyle et al., 2015; Copley & Douthett, 2020; Dawkins et al., 2020; Gabbin et al., 2020; Harris, 2023).

2.2.1 Benefits of AI in addressing accounting staff shortages and enrollment cliffs

AI has several benefits in education for learning and teaching, including the use of AI as a tutor, automation of grading, assistance in assessing student needs and challenges for early

intervention to enable students to stay on track in their studies. AI has the ability to automate many mundane tasks performed by accounting students and entry-level accounting staff; analyze entire accounting data and highlight errors in a very short time; improve the accuracy of financial data and generate information quickly (Deloitte LLC 2018; PwC LLP 2017). Despite these AI capabilities, human capabilities such as empathy, creativity, intelligence, and intuition cannot be automated; therefore, experienced accountants will always be needed to perform analytical work, verify information, write reports, and perform business and financial advisory services to clients. Ultimately, AI could be used to automate many mundane elements of traditional education without undermining student learning (Ballantine et al., 2024; Lazanis, 2023).

2.2.2 Gaps in the AI skill set of accounting students

The connection between accounting education and the accounting practitioner community is strong, as accounting firms and professional bodies often provide scholarships, training, and internships to assist and build the capacity of accounting students; however, accounting students are ill-prepared for the wide range of skills required to perform accounting jobs. Koltin's (2017) top 10 sound bites of the year for 2017 included comments such as the accounting profession will be replaced by robots; within 5 years, 40% of all accounting jobs will be done by robots; we just don't need that many accountants, and 25% of all new entry-level hires are STEM hires. According to Lin and Hazelbaker (2019), the Association to Advance Collegiate Schools of Business (AACSB) called for adding to accounting curricula the development of skills and knowledge related to data creation, data sharing, data analytics, data mining, data reporting, and storage within and across organizations. Tandiono (2023) explored the impact of AI on accounting education through a semi-systematic review of the literature and concluded that there are concerns about the impact of AI on accounting education and called for the reform of the accounting curriculum to include AI applications. The use of AI in the accounting profession has caused most entry-level accounting jobs to be automated, and the skills required to perform entry-level accounting jobs are significantly different from those in accounting curricula. It is necessary to redesign accounting curricula to match the requirements of the profession to produce employable accounting graduates who will acquire the necessary skills and experience to address dire accounting staffing shortages. The alarm to reform accounting education has been sounding for a long time (Awayiga et al., 2010; Damerji & Salimi, 2021; Holmes & Douglass, 2022; Kokina & Davenport, 2017; Spraakman et al., 2015; see also Kavanagh & Drennan, 2008; Wells et al., 2009).

2.3 Limitations and responsible use of GenAI chatbots

AI has potential limitations when it performs some essential skills required by accounting professionals, such as judgment, communication, and critical thinking, and often has shortcomings in finding solutions to accounting problems. Both Young (2024) and Meisner (2023) reported that all of the latest AI chatbots suffer from "hallucinations", a word used to describe situations when the chatbot fabricates details when it does not know the answer to a question asked by a user. Rechtman (2023) tested the claim that even without much teaching, an AI-based LLM could become a lawyer, doctor, or accountant by having a team of experts in auditing, taxes, internal auditing, risk management, and forensic accounting evaluate the responses of AI to professional accounting queries. The answers provided by AI to the questions revealed that "AI is still work in progress; AI is not yet ready for prime time when it comes to presenting professional expertise".

Gaetano (2023) reported that ChatGPT did poorly on undergraduate accounting questions and even worse on the CPA exams, with an average of 42% across all four sections. ChatGPT seems to lack a sense of nuance and context that is essential for many accounting tasks and has trouble recognizing how GAAP standards change over time. There is still much to be learned about what AI does not do well and why it does not perform as well as an individual with expertise, experience, and human intuition (Rechtman, 2023). Wood et al. (2023) conducted a mega study on how ChatGPT performs on accounting-related tests administered by accounting faculty from 186 educational institutions around the world in various areas of the accounting curriculum. The results showed that across all the assessments, students scored an average of 76.6 percent, whereas ChatGPT scored 47.4 percent based on fully correct answers and an estimated 56.5 percent if partial credit was included. Cheng et al. (2024) evaluated the ability of ChatGPT models 3.5 and 4 to solve accounting questions and concluded that the models performed better on accounting problems that require explanations, application of rules, and ethical structure, and performed poorly on questions that require the creation of financial statements, journal entries, and the use of software. The models are ineffective in detecting text created by artificial intelligence text generators. With the ever-increasing use of AI by Big 4 accounting firms, other accounting firms, and accounting students, it is crucial to identify the extent to which first-year accounting students are aware of AI, AI chatbots, and their capabilities, and to determine if and how they have used AI to support their learning.

Institutions of higher education are concerned with students' ethical use of AI and are putting systems into place to ensure that students are aware of ethical issues around the use of AI. Students should cite AI sources used to avoid claiming that AI-generated material is their own. The researchers cited below are advocating that both students and educators pay attention to ensuring that private and confidential information is not used in chatbots when they ask questions and use prompts. As AI is prone to hallucinations, students should have confidence in their own knowledge and ability to identify inaccuracies. Chatbots have potential use in accounting; however, students ought to be diligent in fact-checking AI-generated responses to avoid any biases. This would also help strengthen students' critical thinking skills (Ballantine et al., 2024; Joost et al., 2023; Mintz, 2024). Institutions of higher education, such as Syracuse University, Georgetown University, and Vanderbilt University, have developed guidelines to ensure the ethical and responsible use of AI technologies across their campuses. There are ongoing discussions on teaching with AI, ethical considerations, and lessons learned about integrating AI effectively for the benefit of both students and faculty. Many institutions of higher education are following suit. The Association of College and University Educators (ACUE) offers courses to instructors and students on the effective and ethical use of AI. Publishers of accounting textbooks, such as Wiley and McGraw-Hill, are conducting webinars on AI to build the capacity of accounting instructors to incorporate AI into the curriculum. These webinars provide a forum for professors, instructors, and content developers to share ideas and learn from each other. Interestingly, a 2023 survey conducted by Best Colleges revealed that half of college students believe that using AI to perform school work is cheating or plagiarism, yet a significant number of them use it for various types of school work, such as tests, quizzes, and writing assignments (Welding, 2023; Westfall, 2023). Research findings suggest excessive use of AI by students could negatively impact their academic performance (Abbas et al., 2024; Chan, 2023; Chan et al., 2023). Institutions of higher education should take these concerns into consideration as they formulate policies on ethical and responsible use of AI tools.

On the basis of the above literature review, our overarching research question is as follows:

Based on your experience in Principles of Accounting II, which of the following accounting concepts and applications would you like to use AI to assist your learning?

This overarching research question has several sub-exploratory questions that assess participants' (1) awareness of AI, (2) familiarity with the capabilities and application of AI, (3) use of AI to study accounting, (4) identification of AI chatbots used and frequency of use, (5) the circumstances and reasons under which AI is used, (6) identification of accounting topics that students find most challenging and (7) the topics and related learning objectives that participants would like AI to help them learn. The responses to these survey questions are used to evaluate students' awareness, perceptions, opinions, expectations, and use of AI in accounting studies.

3. Methodology

The study was conducted in two phases as shown in the timeline below:

Phase	Implementation Timeline	Nature of the study
Phase 1: Pilot study	Fall 2023	Survey conducted to solicit the opinion of students on the use of AI in the classroom (35 participants)
Phase 2: AI-embedded case study results	Spring and Summer of 2024	Classwork, exams, and extra credit assignments were administered to both in-class and online students and AI. AI's performance was ranked against participants' results. (107 participants)

During Phase 1, a pilot survey was administered to collect information to determine the accounting topics and learning objectives that students find most challenging and how they perceive that AI can be leveraged to help them learn those challenging concepts. The survey also determined whether the use of AI would reduce workload and study time so that students can focus on their analytical and other soft skills. The survey received appropriate Institutional Review Board approval and was conducted at the end of the Fall 2023 semester, when all the required topics and learning objectives had been taught to the participating students registered for and attending the class face-to-face. Thirty-five accounting students, or approximately 92% of the 38 students enrolled, completed the survey. The survey was manually administered in class; however, some students were allowed to complete the survey outside of the classroom because of conflicting schedules. The survey collected information needed to answer the following overarching research question: *Based on your experience in Principles of Accounting II, which of the accounting concepts and applications you have studied would you like to use AI to assist your learning?* This overarching research question had 18 follow-up questions where participants were prodded to answer various AI-related questions concerning their awareness of the use and capabilities of AI, the extent to which they had used AI in their accounting studies, and the frequency of use. The participants were requested to identify the AI tools they had used in their studies and the circumstances under which they used AI to support their studies. At the end of the survey, the students were requested to provide demographic information on their major, age, gender, ethnicity, and year of study. We manually

tabulated the results, as shown in the figures and tables below, and the full results are available upon request. Appendix 1 shows the survey questionnaire.

For the second phase, a teaching case with an embedded AI element was used as a mode of instruction and a learning tool for 107 students (60 in-person students and 47 online students) enrolled in the Principles of Accounting II course for the Spring and Summer 2024 term. The participants completed an impromptu classwork and an exam that we graded, and the students' grades were compared with the answers provided by various chatbots (ChatGPT, Claude, Google Gemini, and Microsoft Copilot) for the same classwork and exam. The participants completed an extra credit assignment requiring them to compare their solution to a statement of cash flows (SCF) accounting problem to the AI-generated solution to the same SCF problem and to critique the AI-generated results.

4. Results and discussion

4.1 First phase - Pilot survey

4.1.1 Demographics

As shown in Table 1, the demographic profiles of the participants included 46% accounting majors, 11% finance majors, and 11% marketing majors. Eighty percent are between the ages 18-22; 60% are male, and 40% are female. The ethnicity distributions are 29% Asian, 20% Black, 6% White/Caucasian, and 40% other, some of whom identified as Hispanic or did not want to disclose. Empirical evidence and key findings from the pilot survey are discussed below.

Table 1: First phase - Participants by major and age

	Major Distribution		Age Distribution			
	No. of Major	% Major	18-20	23-28	>32	Total
Accounting	16	46%	75%	25%	0%	100%
Aviation	2	6%	100%	0%	0%	100%
Finance	4	11%	50%	25%	25%	100%
Marketing	4	11%	100%	0%	0%	100%
Other	9	26%	89%	11%	0%	100%
Total	35	100%	80%	17%	3%	100%

4.1.2 Participants' knowledge of AI

As shown in Figures 1 through 3, all (100%) participants had heard of AI, and over 79% were aware of AI's use and capabilities. Over 75% of the participants identified ChatGPT as the AI chatbot they had heard of and used in their studies; however, only 45% used AI to support their accounting studies. Our results, shown in Figure 4, indicate that participants in the 18–22 years age group are more likely to use AI more frequently than those in the 23–28 years age group. The participants in the 18-22 years age group use AI more frequently in their studies than those in the 23–28 years age group and those in the over 32 years age group. This demonstrates that younger students are more exposed to technology and are more likely to use AI tools in their studies than older students are.

4.1.3 Participants' views on the use of AI as a teaching tool

Figure 5 shows students' positive views on the use of AI as a teaching tool. Sixty-five percent (65%) of the students thought that using AI as a teaching tool would help them better understand the material. Figure 6 shows that somewhat fewer than 35% of the participants reported that the use of AI in the classroom would help them verify the accuracy of AI-generated information and develop essential critical thinking to determine whether AI-generated results are accurate, help them develop analytical, communication, and judgment skills. Figure 7 shows that 70% of the participants agreed that the use of AI in the classroom would help them understand and learn accounting, whereas 30% did not agree. Figure 8 shows that 97% of the participants believe that AI will perform several activities, including (1) generating data quickly, analyzing information, interpreting results, and reducing workload; however, it is noteworthy that no student thinks that AI will do the work for them.

Figure 1: Participants' knowledge about AI, use, and capabilities

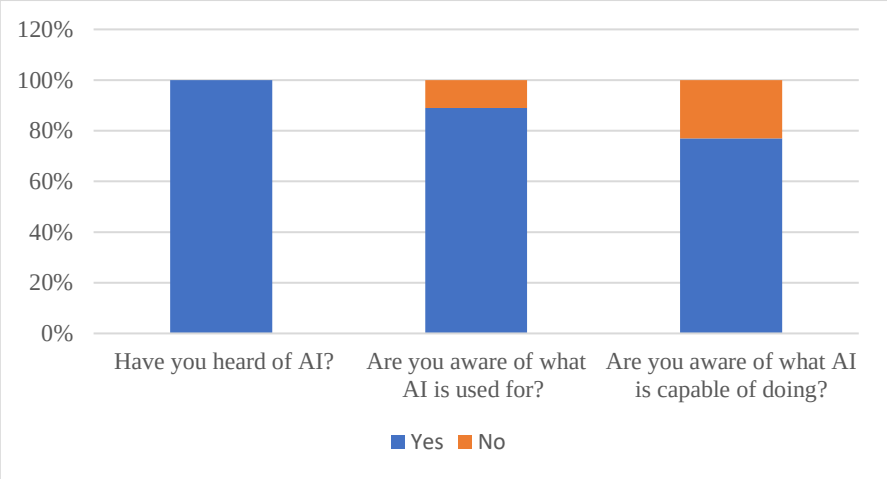


Figure 2: What AI is used for in accounting studies

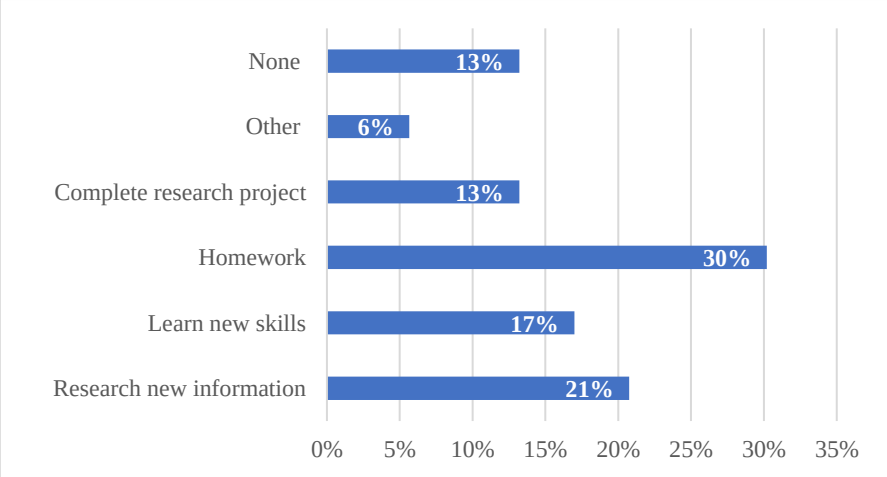


Figure 3: Participants' use of AI in accounting studies

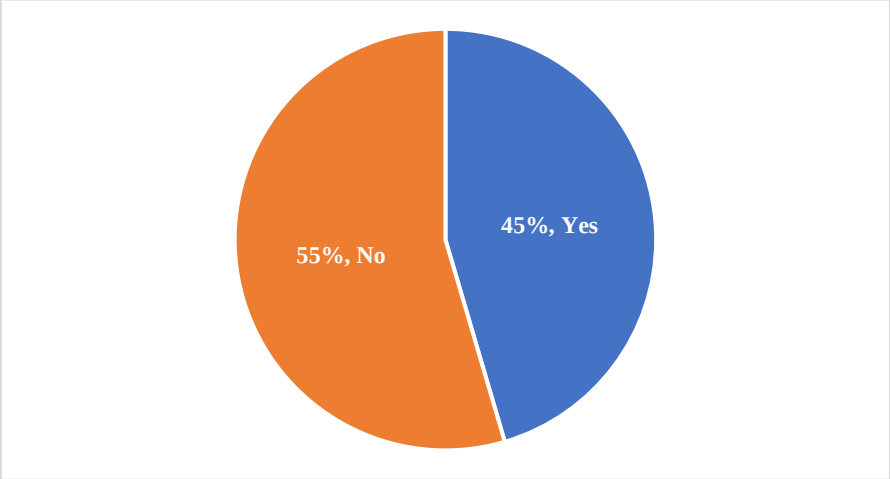


Figure 4: Heard of, use of AI, and frequency of use by age

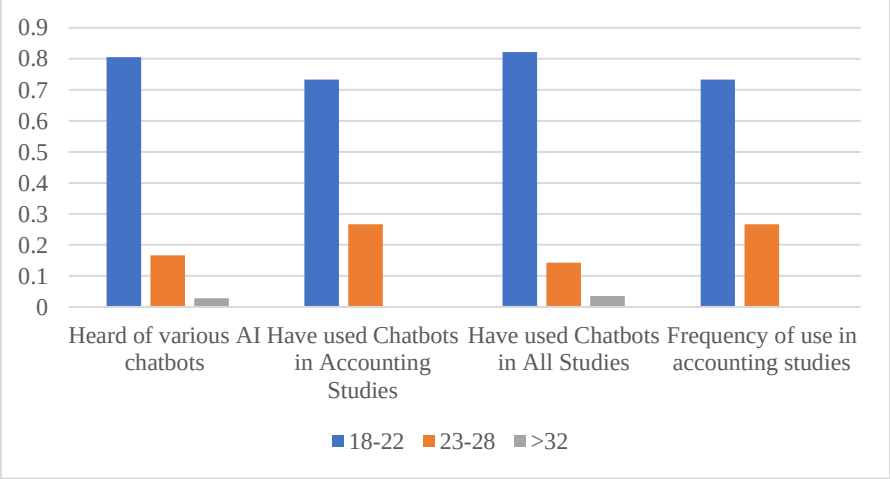


Figure 5: Using AI as a teaching tool will help to better understand the material

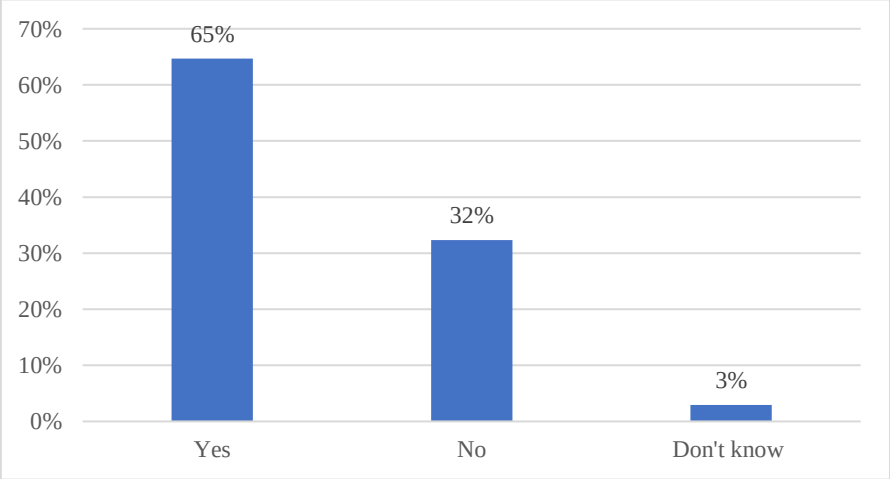


Figure 6: Participants' views on the use of AI to develop essential skills

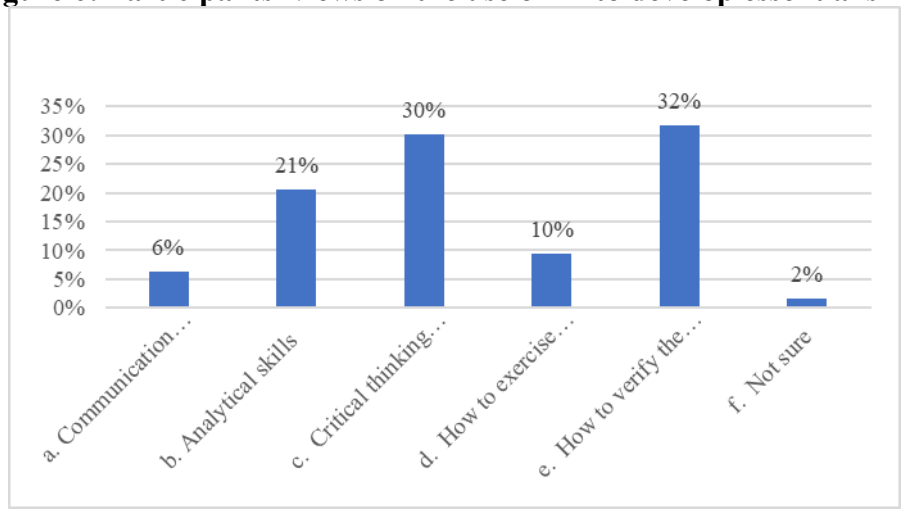


Figure 7: Use of AI in the classroom will help me understand and learn accounting

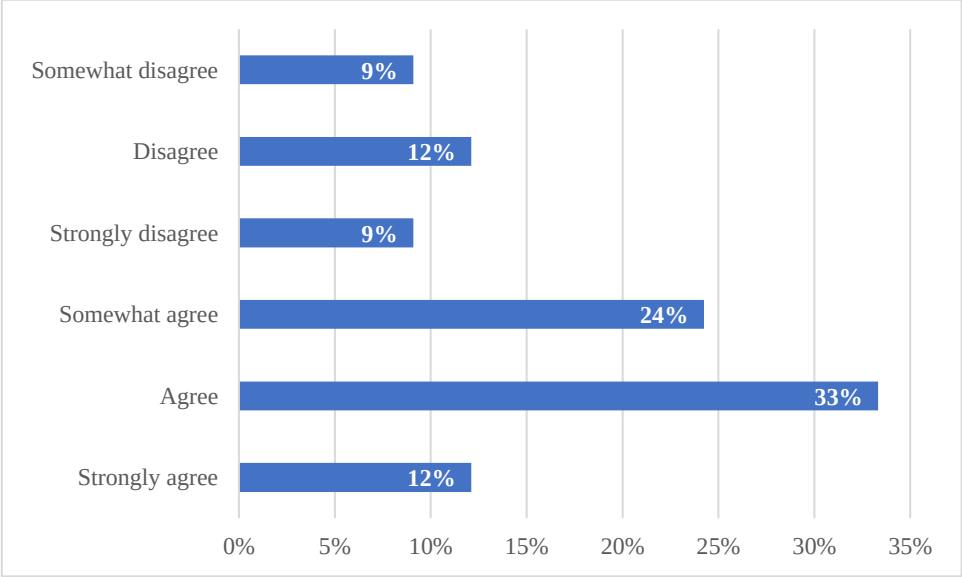
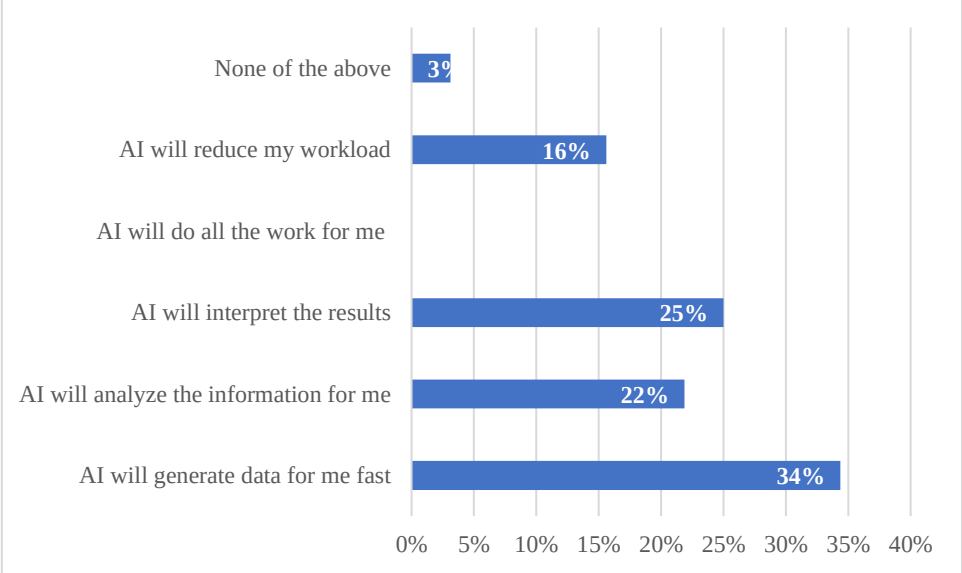


Figure 8: AI will perform the following activities for me if used in the classroom



4.1.4 Accounting topics that participants find most challenging, and that AI can assist them to learn

The results for the research question (RQ): *Which of the following topics that you have studied this semester did you find most challenging?* The topics provided are (a) plant assets (property, plant, and equipment), (b) long-term liabilities, (c) corporations, (d) statement of cash flows, (e) partnerships, and (f) financial statement analysis project. Figure 9 shows that the topics that participants found most challenging, in order of most challenging, are (1) the Statement of Cash Flows (SCF); (2) Long-Term Liabilities (LTL); (3) Partnerships; (4) Financial Statement Analysis Project (FSA); (5) Plant Assets and (6) Corporations. Notably, even though the total scores for SCF and LTL are the same, and the scores for partnerships and FSA are the same, both the SCF and partnerships have a greater number of challenges.

Figure 9: Accounting topics that participants found most challenging

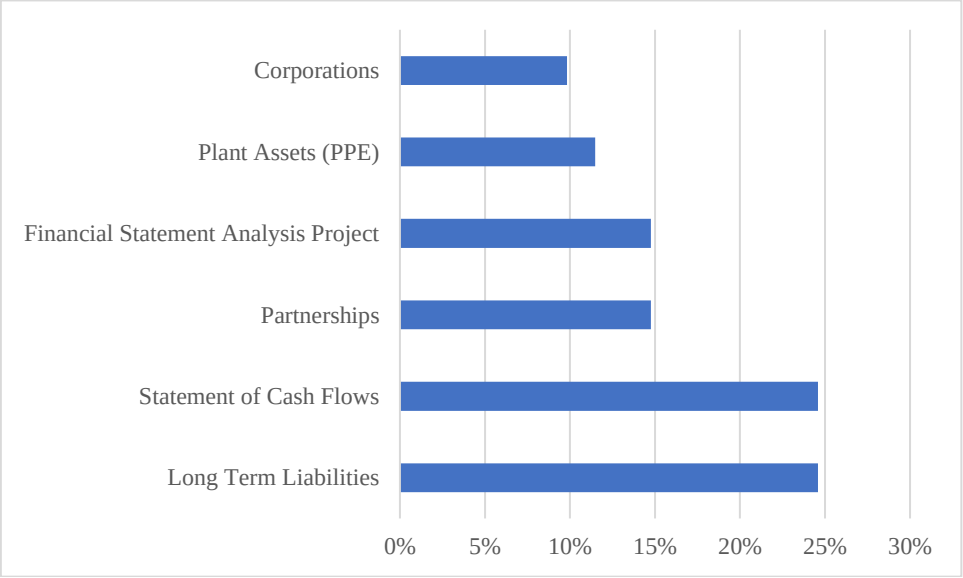
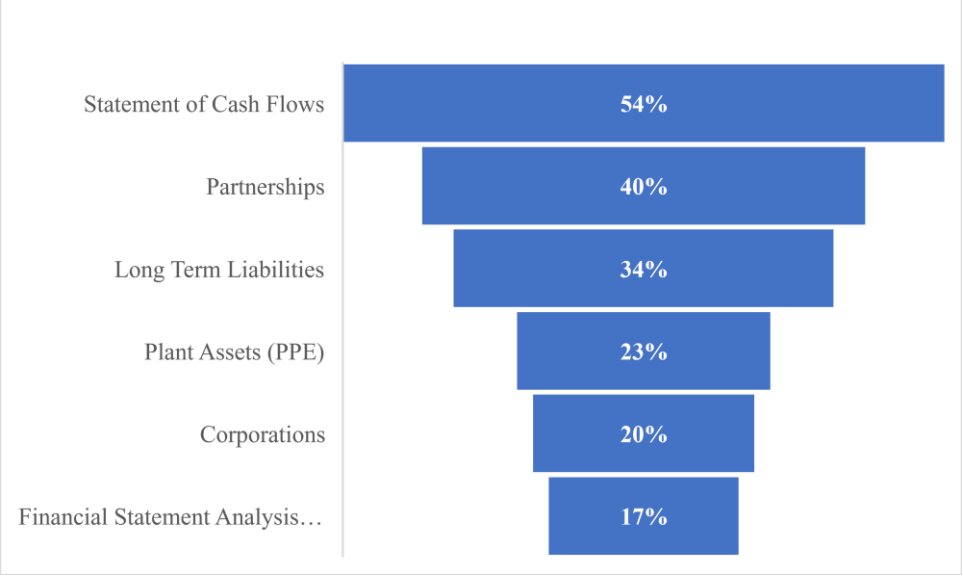


Figure 10: Accounting topics that participants would like AI to assist them to learn



RQ - *In your opinion, which of the following topics that you have studied this semester would you like AI to assist you to learn?* Figure 10 shows the top three accounting topics that participants would like AI to assist them in learning in order of preference. (1) the statement of cash flows, followed by (2) partnerships and (3) long-term liabilities. The overall results, therefore, identified the statement of cash flows as the topic that participants find most challenging and would like AI to assist them the most in learning.

4.2 Second phase – Embedded AI case study

During the Spring 2024 semester, participants completed two case studies with embedded AI components to assess students' performance compared with AI performance. Students enrolled in both the Spring and Summer 2024 programs completed an extra-credit assignment, requiring them to solve a statement of cash flows problem on their own and then use AI to solve the same problem. The participants were required to compare their solutions to the AI-generated solution. The participants were required to identify areas where the AI solution was wrong and to analyze the AI solution, determine why the AI made a mistake, document the prompt they used, and their interaction or engagement with the AI over the solution. The first assignment required the students to complete a 30-minute impromptu case study classwork, which was administered in class. The second assignment was an in-class exam with an allotted time of approximately 2 hours. Students were given prior notice and had ample time to study for the face-to-face in-class exam. The same assignments were administered to AI through various chatbots, namely ChatGPT, Claude, Google Gemini, and Microsoft Copilot. The questions were copied directly into the chatbots and prompted to provide answers. For both assignments, the chatbots took less than two minutes to generate the answers.

As shown in Table 2, for the impromptu classwork administered in Sept. 2024, Microsoft Copilot scored 100% and is the only chatbot to correctly recognize that accumulated depreciation should include depreciation expenses recorded for prior years. Google Gemini scored 57%, and Claude had the lowest score of 43%, whereas the mean class score was 33%. Seven participants performed better than ChatGPT, Claude, and Google Gemini did and scored between 64% and 100%. For the in-class exam, Microsoft Copilot scored 85% compared with 80% for ChatGPT and Claude and 65% for Google Gemini. For the exam scores, the means were 65% for face-to-face class participants and 79% for the online class participants. For the face-to-face in-class exam, 8 participants performed better than all chatbots did, with scores ranging from 90% to 100%; 4 participants scored the same as ChatGPT and Claude; 22 students performed better than Gemini did; and 4 students received the same score as Gemini. Notably, when a similar exam was administered to online students, 22 students performed better than Copilot did; 29 participants performed better than ChatGPT and Claude, with scores ranging from 81% to 100%; 43 students performed better than Gemini did and one received the same score as Gemini. It should be noted that these results were achieved in 2024 and may differ in future research as AI technology continues to evolve.

4.3 Educators' view on integrating AI into accounting education.

The results clearly demonstrate that chatbots outperform several students on both classwork and face-to-face in-class exams, although online students significantly outperform chatbots on exams. One may speculate that online students may use AI to quickly generate answers and have the time to review AI-generated answers for accuracy. This may demonstrate that AI has the capacity to reduce some of the mundane work and free students' time to develop their critical thinking, analytical, and judgment skills by analyzing AI-generated answers for

accuracy. On the negative side, chatbots are unable to answer some questions requiring journal entries; specifically, chatbots place debits and credits haphazardly without following accounting conventions - chatbots were unable to analyze transactions to determine the acquisition cost of an asset. Chatbots may mislead students into providing wrong answers if they are not confident in their own knowledge of the material to differentiate between correct and incorrect answers. These results support the findings of Wood et al. (2023) and the observations of Young (2024) and Meisner (2023) that ChatGPT does not always recognize or understand questions and makes nonsensical errors, especially with respect to workout problems.

Table 2: Second phase - Participants' scores compared to various chatbot scores

Scores (The total available score is 100.)*		Count	Mean	Median	Standard Deviation
Impromptu Classwork					
Participants' Scores		50	33	29	28
ChatGPT Score	57				
Claude Score	43				
Google Gemini Score	57				
Microsoft Copilot Score	100				
In-Class Exam					
Participants' Scores		50	65	65	18
ChatGPT Score	80				
Claude Score	80				
Google Gemini Score	65				
Microsoft Copilot Score	85				
Online Class Exam					
Participants' Scores		47	79	83	23
ChatGPT Score	80				
Claude Score	80				
Google Gemini Score	65				
Microsoft Copilot Score	85				

Note. *Models used: ChatGPT 4o, Claude 3, Google Gemini 1.5, and Microsoft Copilot. The results were obtained in September 2024.

On a positive note, as a result of the extra credit assignment, where participants were asked to solve a statement of cash flows problem on their own and then use AI to solve the same problem and identify areas where AI provided wrong solutions and why, the study exposed students to the limitations of AI and the need for students to learn how to use prompts to obtain a more accurate response from AI and to recognize AI hallucinations. When ChatGPT was prompted to prepare a statement of cash flows, it often got the classifications wrong and sometimes made up its own figures. These findings align with the findings of Rechtman (2023) and Wood et al. (2023). While the use of AI in accounting education can be helpful in teaching and learning, educators must pay attention to recent studies by Abbas et al. (2024) and others documenting the negative impact on university students' academic and personal performance. The ongoing efforts by colleges and universities to formulate policies and guidelines on the

ethical and responsible use of AI tools are timely and would hopefully address the negative impact of excessive use of AI in accounting education.

5. Conclusions

We surveyed first-year accounting students to assess their awareness of AI; familiarity with the capabilities and application of AI; use of AI to learn and study accounting; identification of AI chatbots used and frequency of use; the circumstances and reasons under which AI is used; identification of accounting topics that students found most challenging; and the topics and related learning objectives that participants would like AI to help them learn. This study is important for several reasons, including the fact that public accounting firms and the accounting industry have invested billions of dollars in AI technology to improve effectiveness and efficiency (Cooper et al., 2019, 2022; PwC LLP, 2017; Lin & Hazelbaker, 2019). Training accounting students to use AI effectively will increase their marketability and overall effectiveness in solving problems and analyzing data using AI. As demonstrated by the results of the extra credit assignment, faculty can ask students to use AI to solve all types of problems and then critique the AI-generated answers for accuracy. This approach can help students practice the ethical and responsible use of AI very early in their accounting studies and identify AI hallucinations or illogical solutions to problems.

The results indicate that while 100% of the participants are aware of AI, fewer than half have used it in their accounting studies. This is alarming as accounting firms and the accounting industry expect students to be capable users of AI when they enter the workforce. The participants believe AI would enhance their learning of accounting concepts and help build their critical thinking, analytical, and judgment skills. The study identified the preparation of the statement of cash flows, recording of bond transactions, and recording of partnership transactions as the areas of study they found most challenging and would like AI to assist them in learning. A limitation of this study is that participants are at the nascent stages of their accounting studies and may not be committed to pursuing an accounting career. While all participants are aware of AI, some are not aware of AI's potential and capabilities, and have not yet used AI in their accounting studies. Our study focused on first-year accounting students; however, our findings can be generalized to higher-level accounting courses, as the use of AI in accounting studies is still relatively novel, and accounting students at all levels of study are grappling with the use of AI tools. Future research may examine the extent to which students who have declared accounting as a major and are committed to the profession use AI to support their accounting studies. As AI technology improves and its use expands, there is a renewed focus on ethical and responsible use of AI tools; this makes for a promising area for future research.

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References

Abbas, M., Jam, F. A., & Khan, T. I. (2024). Is it harmful or helpful? Examining the causes and consequences of generative AI usage among university students. *International Journal of Educational Technology in Higher Education*, *21*(10), 5–22. https://doi.org/10.1186/s41239-024-00444-7

Accounting Today. (2020). *The most important issues in accounting: A supplement to Accounting Today: The top 100 most influential people in accounting.* MyDigitalPublication. https://lsc-pagepro.mydigitalpublication.com/publication/?i=637007

Awayiga, J., Onumah, J., & Tsamenyi, M. (2010). Knowledge and skills development of accounting graduates: The perceptions of graduates and employers in Ghana. *Accounting Education*, *19*(1–2), 139–158. https://doi.org/10.1080/09639280902903523

Ballantine, J., Boyce, G., & Stoner, G. (2024). A critical review of AI in accounting education: Threat and opportunity. *Critical Perspectives on Accounting*, *99*, 102711. https://doi.org/10.1016/j.cpa.2024.102711

Bao, W. (2019). Research on the application of artificial intelligence technology in accounting teaching in colleges. *Advances in Social Science, Education and Humanities Research*, *322*, 333–335. https://doi.org/10.2991/iserss-19.2019.88

Boyle, D. M., Carpenter, B., & Hermanson, D. (2015). The accounting faculty shortage: Causes and contemporary solutions. *Accounting Horizons, 29*(2), 245–264. https://doi.org/10.2308/acch-50967

Brink, A. G., & Reichert, B. E. (2020). Research initiatives in accounting education: Serving and enhancing the profession. *Issues in Accounting Education*, *35*(4), 25–33. https://doi.org/10.2308/ISSUES-2020-018

Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, *20*(1), 1–25. https://doi.org/10.1186/s41239-023-00408-3

Chan, M. M. K., Wong, I. S. F., Yau, S. Y., & Lam, V. S. F. (2023). Critical reflection on using ChatGPT in student learning: Benefits or potential risks? *Nurse Educator.* https://doi.org/10.1097/NNE.0000000000001476

Cheng, X., Dunn, R., Holt, T., Inger, K., Jenkins, J. G., Jones, J., Long, J. H., Loraas, T., Mathis, M., Stanley, J., & Wood, D. A. (2024). Artificial intelligence's capabilities, limitations, and impact on accounting education: Investigating ChatGPT's Performance on Educational Accounting Cases. *Issues in Accounting Education, 39*(2), 23–47. https://doi.org/10.2308/ISSUES-2023-032

Cooper, L. A., Holderness, D. K., Sorensen, T. L., & Wood, D. A. (2019). Robotic process automation in public accounting. *Accounting Horizons*, *33*(4), 15–35. https://doi.org/10.2308/acch-52466

Cooper, L. A., Holderness, D. K., Sorensen, T. L., & Wood, D. A. (2022). Perceptions of robotic process automation in Big 4 public accounting firms: Do firm leaders and lower-level employees agree? *Journal of Emerging Technologies in Accounting*, *19*(1), 33–51. https://doi.org/10.2308/JETA-2020-085

Copley, P. A., & Douthett, E. B. (2020, October 5). The enrollment cliff, mega-universities, COVID-19, and the changing landscape of U.S. colleges. *The CPA Journal.* https://www.cpajournal.com/2020/10/05/the-enrollment-cliff-mega-universities-covid-19-and-the-changing-landscape-of-u-s-colleges/

Cory, S. N., & Pruske, K. A. (2012). A factor analysis of the skills necessary in accounting graduates. *Journal of Business and Accounting, 5(1),* 121-128.

Damerji, H., & Salimi, A. (2021). Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting. *Accounting Education*, *30*(2), 107–130. https://doi.org/10.1080/09639284.2021.1872035

Dawkins, M. C., Dugan, M. T., Mezzio, S. M., & Trapnell, J. E. (2020, October). The future of accounting education: In-demand skills, workplace readiness, the 150-hour requirement, MAcc programs, and the CPA exam. *The CPA Journal, 90*(9/10). https://www.cpajournal.com/2020/10/12/the-future-of-accounting-education/

de Winter, J. C. F., Dodou, D., & Stienen, A. H. A. (2023). ChatGPT in education: Empowering educators through methods for recognition and assessment. *Informatics, 10*(4), 87. https://doi.org/10.3390/informatics10040087

Deloitte. (2018). *Artificial intelligence* [White paper]. https://www2.deloitte.com

Gabbin, A. L., Irving, J., & Shifflett, E. (2020, September 16). Accounting education at a crossroads: Does a drop in enrollment foretell a decline in the marketplace? *The CPA Journal.* https://www.cpajournal.com/2020/09/16/accounting-education-at-a-crossroads/

Gaetano, C. (2023, May 8). *We had ChatGPT take the CPA exam — and it failed*. *Accounting Today.* https://www.accountingtoday.com/news/we-ran-the-cpa-exam-through-chatgpt-and-it-failed-miserably

Georgetown University Library. (2024). *Artificial intelligence (generative) resources.* https://guides.library.georgetown.edu/ai/home

Harris, A. (2023, March 23). *Why artificial intelligence will improve accounting*. *Accounting Today.* https://www.accountingtoday.com/opinion/sages-harris-why-artificial-intelligence-will-improve-accounting

Harris, R. (2022, December 23). *ChatGPT gains 1 million users within 5 days*. *App Developer Magazine.* https://appdevelopermagazine.com/chatgpt-gains-1-million-users-within-5-days/

Holmes, A. F., & Douglass, A. (2022). Artificial intelligence: Reshaping the accounting profession and the disruption to accounting education. *Journal of Emerging Technologies in Accounting, 19*(1), 53–68. https://doi.org/10.2308/JETA-2020-054

Hu, K. (2023, February 1). *ChatGPT sets record for fastest-growing user base — analyst note. Reuters.* https://www.reuters.com/technology/chatgpt-sets-record-fastest-growing-user-base-analyst-note-2023-02-01/

Kavanagh, M., & Drennan, L. (2008). What skills and attributes does an accounting graduate need? Evidence from student perceptions and employer expectations. *Accounting and Finance*, *48*(2), 279–300. https://doi.org/10.1111/j.1467-629X.2007.00245.x

Kokina, J., & Davenport, T. (2017). The emergence of artificial intelligence: How automation is changing auditing. *Journal of Emerging Technologies in Accounting*, *14*(1), 115–122. https://doi.org/10.2308/jeta-51730

Koltin, A. D. (2017). *Top ten sound bites of the year.* Koltin Consulting Group. https://koltin.com/pdfs/Koltin%20Top%2010%20Sound%20Bites%20of%20the%20Year%2012-15-17.pdf

Lazanis, R. (2023, September 8). *AI in accounting: A guide written by artificial intelligence*. *Future Firm.* https://futurefirm.co/ai-in-accounting/

Lin, P., & Hazelbaker, T. (2019, June). Meeting the challenges of artificial intelligence: What CPAs need to know. *The CPA Journal, 89*(6), 48–52. https://www.cpajournal.com/2019/07/10/meeting-the-challenges-of-artificial-intelligence/

Losbichler, H., & Lehner, O. M. (2021). Limits of artificial intelligence in controlling and the ways forward: A call for future accounting research. *Journal of Applied Accounting Research*, *22*(2), 365–382. https://doi.org/10.1108/JAAR-10-2020-0207

Meisner, C. (2023, August 29). *ChatGPT is everywhere in this district. Here's what it looks like*. *Education Week.* https://www.edweek.org/technology/chatgpt-is-everywhere-in-this-district-heres-what-it-looks-like/2023/08

Mintz, S. (2024). Ethics of ChatGPT in education: While ChatGPT can provide benefits to students' education, educators must mitigate its ethical issues. *Strategic Finance, 105*(7), 53–58. https://www.sfmagazine.com/articles/2024/january/ethics-of-chatgpt-in-education

Ovaska-Few, S. (2017, October). How artificial intelligence is changing accounting. *Journal of Accountancy*. https://www.journalofaccountancy.com/newsletters/2017/oct/artificial-intelligence-changing-accounting.html

Paykadmian, B. (2024, January 29). *Purdue leaves generative AI guidelines up to professors. Government Technology.* https://www.govtech.com/education/higher-ed/purdue-leaves-generative-ai-guidelines-up-to-professors

PwC. (2017). *Sizing the prize: What's the real value of AI for your business and how can you capitalise?* https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf

Rechtman, Y. (2023). Can artificial intelligence become an accounting expert? *The CPA Journal, 93*(1), 6–9. https://www.cpajournal.com

Song, G. (2019). Reform and exploration of accounting professional practice teaching under the background of artificial intelligence. *IOP Conference Series: Materials Science and Engineering, 563*, 052005. https://doi.org/10.1088/1757-899X/563/5/052005

Spraakman, G., O'Grady, W., Askarany, D., & Akroyd, C. (2015). Employers' perceptions of information technology competency requirements for management accounting graduates. *Accounting Education, 24*(5), 403–422. https://doi.org/10.1080/09639284.2015.1089177

Syracuse University Libraries. (2024). *Artificial intelligence: AI assistant comparison.* https://researchguides.library.syr.edu/c.php?g=1341750&p=10294298

Tandiono, R. (2023). The impact of artificial intelligence on accounting education: A review of literature. *E3S Web of Conferences*, *426*, 02016. https://doi.org/10.1051/e3sconf/202342602016

Vanderbilt University Library. (2024). *AI in teaching & research.* https://researchguides.library.vanderbilt.edu/c.php?g=1351379&p=9974070

Vanderbilt University. (n.d.). *Data Science Institute.* https://www.vanderbilt.edu/datascience

Watty, K., McKay, J., & Ngo, L. (2016). Innovators or inhibitors? Accounting faculty resistance to new educational technologies in higher education. *Journal of Accounting Education*, *36*, 1–15. https://doi.org/10.1016/j.jaccedu.2016.03.003

Welding, L. (2023, March 17). *Half of college students say using AI on schoolwork is cheating or plagiarism. Best Colleges.* https://www.bestcolleges.com/research/college-students-ai-tools-survey/

Wells, P., Gerbic, P., Kranenburg, I., & Bygrave, J. (2009). Professional skills and capabilities of accounting graduates: The New Zealand expectation gap? *Accounting Education*, *18*(4–5), 403–420. https://doi.org/10.1080/09639280902719390

Westfall, C. (2023, January 28). *Educators battle plagiarism as 89% of students admit to using OpenAI's ChatGPT for homework*. *Forbes.* https://www.forbes.com/sites/chriswestfall/2023/01/28/educators-battle-plagiarism-as-89-of-students-admit-to-using-open-ais-chatgpt-for-homework/

Wood, D. A., Achhipilia, M. P., Adams, M. T., & Aghazadeh, S. (2023). The ChatGPT artificial intelligence chatbot: How well does it answer accounting assessment questions? *Issues in Accounting Education*, *38*(4), 81–108. https://doi.org/10.2308/ISSUES-2023-013

Young, J. R. (2024, January 22). *Some experts skeptical of AI tutors, recalling IBM's "Watson." Government Technology.* https://www.govtech.com/education/higher-ed/some-experts-skeptical-of-ai-tutors-recalling-ibms-watson

Appendix 1: Survey Questionnaire: A Case Study on the Integration of Artificial Intelligence into the Accounting Curriculum

Research Question: Based on your experience in Principles of Accounting II, which of the following accounting concepts and applications would you like to use AI to assist your learning?				
Questions	Available options to select			
1. Have you heard of AI?	Yes	No		
2. Are you aware of what AI is used for?	Yes	No		
3. Are you aware of what AI is capable of doing?	Yes	No		
4. Have you heard about the application of AI?	Yes	No		
5. If yes, indicate which of the following AI tools you have heard about	ChatGPT	Bard	Bing	Other (indicate)
6. Have you used AI in your accounting studies?	Yes	No		
7. If yes, how frequently do you use AI for your accounting studies?	Daily	Every other day	Once a week	Every two weeks
	Once a month	occasionally		
8. Indicate which of the following AI tools you have used for your studies	ChatGPT	Bard	Bing	Other (Please indicate)
	None			
9. Under what circumstances did you use AI for your studies?	Research new info	Learn new skills	Help me with homework	Help me complete research project

	Other (please indicate	None		
10. Do you think that using AI as a teaching tool in accounting 102 will help you to better understand the material?	Yes	No		
11. The use of AI in the classroom will help me understand and learn accounting 102 better?	Strongly agree	Agree	Somewhat agree	Strongly disagree
	Disagree	Somewhat disagree		
12. The use of AI in the classroom will help me understand and learn accounting better because (select 1)	a. AI will generate data for me fast	b. AI will analyze the information for me	c. AI will interpret the results	d. AI will do all the work for me
	e. AI will reduce my workload	f. None of the above		
13. The use of AI in the classroom will help me learn essential skills	Strongly agree	Agree	Somewhat agree	Strongly disagree
	Disagree	Somewhat disagree		
14. The use of AI in the classroom will help me to develop essential skills such as communication,	Strongly agree	Agree	Somewhat agree	Strongly disagree

critical thinking, and judgement				
	Disagree	Somewhat disagree		
15. The use of AI in the classroom will help me develop essential skills such as (select all that apply)	a. Communication skills	b. Analytical skills	c. Critical thinking to determine if AI generated results are accurate.	d. How to exercise judgement
	e. How to verify the accuracy of AI generated results/analysis			
16. Which of the following topics that you have studied this semester did you find most challenging? (select only three - list the most challenging first)				
(A) Plant Assets (PPE)	1. Calculating the acquisition cost of an asset	2. Calculating depreciation expense using the straight line, units of activity and double declining balance Methods		3. Determination of gain or loss upon sale or disposal of plant assets
(B) Long Term Liabilities	1. Calculating the issue price of a bond	2. Recording the sale of bonds (at Face Value, Premium or Discount)	3. Amortization of Bond Discount or Premium	4. Recording the periodic payment of bond interest
	5. Recording the redemption of bonds			

(C) Corporations	1. Accounting for common, preferred and treasury stocks	2. Preparation of Stockholders' Equity	3. Calculation of cash and stock dividends	4. Determination of the effects of dividends (cash, stock, and stock splits) on stockholders' equity
(D) Statement of Cash Flows	1. Preparing the statement of cash flows using the indirect method	2. Computing the Free Cash Flow of a company		
(E) Partnerships	1. Determining and recording the initial investment of a partner in the partnership	2. Dividing the net income/loss of a partnership	3. Accounting for liquidation of a partnership	4. Accounting for the dissolution of a partnership
(F) Financial Statement Analysis Project	1. Perform the financial statement analysis project without using AI generated information	2. Perform the financial statement analysis project using AI generated information	3. Compare the AI generated results to your work and report the observed differences in the results	
17. In your opinion, which of the following topics that you have studied this semester, would you like AI to assist you to learn? Select only 3 in order of priority				
(A) Plant Assets (PPE)	1. Calculating the acquisition cost of an asset	2. Calculating depreciation expense using the straight line, units of activity and double declining balance Methods		3. Determination of gain or loss upon sale or disposal of plant assets
(B) Long Term Liabilities	1. Calculating the issue price of a bond	2. Recording the sale of bonds (at Face Value, Premium or Discount)	3. Amortization of Bond Discount or Premium	4. Recording the periodic payment of bond interest

	5. Recording the redemption of bonds			
(C) Corporations	1. Accounting for common, preferred and treasury stocks	2. Preparation of Stockholders' Equity	3. Calculation of cash and stock dividends	4. Determination of the effects of dividends (cash, stock, and stock splits) on stockholders' equity
(D) Statement of Cash Flows	1. Preparing the statement of cash flows using the indirect method	2. Computing the Free Cash Flow of a company		
(E) Partnerships	1. Determining and recording the initial investment of a partner in the partnership	2. Dividing the net income/loss of a partnership	3. Accounting for liquidation of a partnership	4. Accounting for the dissolution of a partnership
(F) Financial Statement Analysis Project	1. Perform the financial statement analysis project without using AI generated information	2. Perform the financial statement analysis project using AI generated information	3. Compare the AI generated results to your work and report the observed differences in the results	
Demographics				
1. What is your major?	Accounting	Aviation	Finance	Marketing
	Other - Please indicate:			
2. What is your age?	18-22	23-28	29-32	>32
3. What is your gender?	Male	Female	Other	Prefer not to disclose

4. What ethnicity best describes you?	Asian	Black (African American/other)	White/Caucasian	Other
	Prefer not to disclose			
5. Are you a	Freshman	Sophomore	Junior	Senior