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Generative Artificial Intelligence in Information Systems Education: Challenges, Consequences, and Responses

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Abstract:

ChatGPT, an interactive, generative artificial intelligence (AI) system, was introduced in late 2022, quickly becoming one of the most rapidly adopted technologies in history. The rapid emergence of ChatGPT and similar AI tools, such as Google's Bard, and GPT-enabled Bing from Microsoft have led to intense discussions about how they will affect various aspects of society, including higher education. Information systems (IS) education will not escape the impact of AI tools. Our goal for this paper is to develop a better understanding of the range of possible impacts of ChatGPT on IS education and to describe how IS educators might respond to these potential impacts. To that end, we discuss challenges for IS education brought on by generative AI tools, and discuss potential future scenarios based on the emergence of such tools, ranging from AI having little impact on IS education to AI serving as competition for IS educators. We examine the challenges and consequences of each scenario. We also discuss potential responses, ranging from doing nothing to embracing AI tools as legitimate learning aids. We then provide several specific recommendations that will allow IS educators to effectively respond to the rise of AI tools.

Keywords: Information Systems Education, Artificial Intelligence, Generative Artificial Intelligence, ChatGPT.

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1 Introduction

OpenAI announced the artificial intelligence based chatbot ChatGPT in November 2022. Seemingly overnight, ChatGPT burst into public awareness and within a few months, it had over 100 million users worldwide (Milmo, 2023). Within a month of its release, people were having conversations about how the new technology would affect education and the workplace. Currently, it is unclear whether ChatGPT will ultimately be a savior or a devil for higher education. Like computers and the Internet when they emerged, ChatGPT was argued to hold the promise of freeing people from the mundane aspects of work but simultaneously carried the threat of taking their jobs altogether. Since its release, users have found many creative ways to leverage ChatGPT. It has been used to create and critique resumes, generate and troubleshoot software code, plan parties, develop characters for role-playing games, and write poetry, stories, blog posts, and jokes. In addition, as of February 2023, Amazon.com included over 200 books that listed ChatGPT as a co-author (Bensinger, 2023).

Information systems (IS) education is not free from the promise and threats of ChatGPT and similar technologies. Soon after the technology became available, concerns arose over students using it to write papers, create code and perform other learning tasks. In some cases, its use was clearly an ethical violation, but the ethics of other uses were not as clear. The ultimate impact of ChatGPT on IS education is also unclear. However, it is clear that IS educators will have to deal with ChatGPT and its implications for IS education and for the IS careers for which we prepare our students.

Our goal for this paper is to develop a better understanding of the range of possible impacts of ChatGPT on IS education and to describe how IS educators might respond to these potential impacts. Further, we describe conditions that may lead to each set of impacts and the consequences of the various responses. Finally, we make recommendations for IS educators with respect to these potential impacts and responses.

2 Background

ChatGPT is a generative and conversational AI-Powered chatbot that OpenAI launched on the last day of November 2022. What makes ChatGPT different from previous AI initiatives is its capability to understand natural human language and generate contextually coherent responses, which had been deemed impossible (Shankland, 2023). The breakthrough has attracted substantial attention by revolutionizing human-computer interaction and crossed the milestone of over 100 million users in only two months (Milmo, 2023), setting the record for the fastest adopted technology (Hu, 2023).

ChatGPT relies on several cutting-edge technologies, such as machine learning, natural language processing, and deep learning to create a neural network model that simulates the way the human brain functions. The model has been trained using a massive corpus of data to generate responses that are natural, coherent, and contextually appropriate (OpenAI, 2022). The numerous capabilities of ChatGPT are yet to be fully discovered, but the chatbot can assist individuals in writing essays, crafting new ideas, designing nutrition plans, designing educational materials such as syllabus and exam questions, writing software code, summarizing documents, and much more.

ChatGPT has already made its way into higher education with students quickly using it as a tutor, a study partner, and, in some cases, a ghostwriter. Faculty soon became concerned about its growing use, leading to discussions of how to deal with the emerging technology. Some faculty and institutions called for banning ChatGPT's use, but others sought ways to leverage the technology to reduce their workload and enhance student learning. Currently, the effects of ChatGPT on higher education and information systems education are unclear. What is clear, however, is that the seal has been broken, and the ChatGPT genie is out of the bottle. As a result, IS educators must not only be aware of the potential impacts of AI tools but must also decide how to respond to the threats and opportunities from these new technologies.

As a discipline, IS scholars are beginning to reflect on ChatGPT and its implication for research and teaching (Dwivedi, et al., 2023). However, we currently lack in-depth knowledge about how ChatGPT and related tools might influence IS education in the next five years. Based on our knowledge and use of ChatGPT, discussions with other faculty, and anecdotal evidence from social media this article discusses the challenges that ChatGPT will likely bring to IS education and makes recommendations for how IS educators should respond to this new technology. We note that the examples herein are only intended to

present the scope of potential uses and are not intended to be exhaustive. Select use cases are also included.

3 Challenges for IS Education

The introduction of AI tools such as ChatGPT carries numerous challenges for educators. In this section, we discuss several important challenges IS educators will face as the use of AI tools increases among students.

3.1 Cheating

One of the major areas of concern to educators is the ability of students to use ChatGPT to cheat. From popular press articles to educational institutions, there is great trepidation about the ability of this tool to make cheating easier and harder to detect. For example, ChatGPT was able to pass an MBA exam given at the Wharton School of Business (Terwiesch, 2023). Not surprisingly, within a month of its release multiple colleges were already seeing students use ChatGPT to cheat and gain an advantage (Tangermann, 2023), and many of the largest public school districts (e.g., New York City, Seattle, and Los Angeles and several universities have instituted bans on the use of ChatGPT by students (Nolan, 2023)).

Cheating by students creates several concerns for educators. First, when only some students are using the tool, it can give them an advantage over students who do not use the tool. Once students discover that they are at a disadvantage, they are likely to try to overcome their disadvantages by also using tools such as ChatGPT. Second, cheating can undermine learning processes. One of the goals we have as IS educators is to help students move beyond simply repeating and understanding facts, to the point that they are able to integrate and evaluate data to make better decisions with information. In a sense, as students move through our programs, they will be moving through the levels of Bloom's taxonomy (Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation) (Krathwohl, 2002). The examples below illustrate how ChatGPT can be used to undermine learning at various levels of this taxonomy.

For example, in the Carson College of Business at Washington State University, one of the key learning goals is that students will be able to "[m]ake theory-based and data-driven decisions" upon completion of their programs. For this to successfully occur, students must start by remembering and understanding facts and concepts (Knowledge and Comprehension), followed by the gaining ability to apply and analyze ideas or concepts (Application and Analysis), and finally moving to more complex evaluation and even creation of new perspectives and ideas (Synthesis and Evaluation). ChatGPT can undermine these processes at each of the levels. For example, one of the pieces of knowledge that students typically gain in an introductory information systems course are the four components of an information system. If an assignment is provided to students that asks them to identify and define the four components of an information system, they could use ChatGPT¹ to answer the question. Figure 1 shows an example of this.

¹ Unless specified otherwise, examples were generated using ChatGPT 3.

Prompt	Identify and define the four components of an information system
Output	<p>The four components of an information system are:</p> <ol style="list-style-type: none"> 1. Data: This refers to raw facts and figures that are collected and processed by the system. Data can be in different forms, such as text, images, audio, and video. 2. Hardware: This includes all the physical components of the system, such as the computer, servers, networking devices, and storage devices. 3. Software: This refers to the programs and applications that are used to process and manipulate data. Software can be off-the-shelf or custom-built, depending on the specific needs of the organization. 4. People: This refers to the individuals who use and interact with the system. This includes end-users, IT professionals, system administrators, and other stakeholders who are involved in the system's design, development, and maintenance.
Note: ChatGPT is a conversational agent. Prompts are the input into the conversation	

Figure 1. Definitional ChatGPT Output at the Knowledge Level²

The answer provided by ChatGPT is strong enough to demonstrate mastery of the two lowest levels in Bloom's Taxonomy (e.g., Knowledge and Comprehension). Given that these levels are the foundations upon which higher levels build, ChatGPT can shortcut the learning process, making it challenging, if not impossible for students to achieve higher levels of learning.

However, the capabilities of ChatGPT go beyond rather simplistic recall to the point where it can simulate higher levels of learning. Consider how ChatGPT answered an end-of-the-chapter question from Laudon and Traver's (2021) eCommerce textbook (Figure 2). This example moves into Bloom's Application and Analysis levels.

² Although this answer is technically correct, there are different views on how the components should be delineated and instructors should ensure that the answers align with how they delineate them in their courses.

Prompt	Select an e-commerce company that has participated in an incubator program such as Y combinator, TechStars, DreamIt, Capital Factor, or another of your choosing and write a short report on its business model and the amount and sources of capital it has raised thus far. Include your views on the company's future prospects for success. Then create an elevator pitch for the company.
Output	<p>One e-commerce company that has participated in an incubator program is Warby Parker, which graduated from the Techstars incubator program in 2010. Warby Parker is a direct-to-consumer eyewear company that was founded in 2010 by four friends who were frustrated with the high cost of prescription glasses. The company's business model involves cutting out the middlemen in the traditional eyewear industry and offering stylish and affordable glasses directly to customers online and in their retail stores.</p> <p>Since its launch, Warby Parker has raised over \$530 million in funding from various sources, including venture capital firms, strategic investors, and private equity firms. Some of the company's notable investors include General Catalyst, Tiger Global Management, and T. Rowe Price.</p> <p>Warby Parker has seen tremendous growth and success since its launch, with a reported valuation of over \$3 billion as of 2021. The company has expanded its product offerings to include contact lenses and sunglasses, and has also expanded its retail presence to over 140 stores across the United States.</p> <p>Overall, I believe that Warby Parker has strong prospects for future success. The company has disrupted the traditional eyewear industry by offering affordable and stylish glasses directly to customers, and has built a strong brand and loyal customer base. With its continued expansion and innovation, Warby Parker has the potential to become a major player in the eyewear market.</p> <p>Elevator Pitch:</p> <p>Warby Parker is a direct-to-consumer eyewear company that offers stylish and affordable glasses, contacts, and sunglasses online and in retail stores. By cutting out the middlemen in the traditional eyewear industry, we offer customers high-quality products at a fraction of the cost. With a reported valuation of over \$3 billion and a loyal customer base, Warby Parker is revolutionizing the way people buy eyewear. Join us on our mission to make glasses accessible to everyone.</p>

Figure 2. Short Answer ChatGPT Output

These two examples illustrate that the use of ChatGPT by students to complete assignments (or to cheat) can undermine the learning process and make it challenging for students to make the theory and data-driven decisions that are part of the development goals of the college. When students do not have a strong comprehension of basic concepts, it is difficult for them to understand what data are important and which tools are appropriate for analyzing the data. This ultimately impedes our ability to ensure that students gain the skills necessary to be attractive to the companies that hire them.

In response to these concerns, OpenAI and other groups have introduced tools to help educators and others to detect the use of AI to write text. For example, OpenAI has created OpenAI Text Classifier to determine whether the text was generated by AI. In addition, a student at Princeton has developed GPTZero to assess the content to determine if it is likely to have been generated by AI. However, these tools are still not very accurate and by themselves will not help overcome the risks of cheating. For example, OpenAI Text Classifier only detects AI-generated text about 25% of the time (Wiggers, 2023). Thus, educators will need to remain diligent about developing assignments and assessments which are able to assess learning goals while also reducing the likelihood of students using ChatGPT to cheat. In addition, educators may find it useful to run questions through ChatGPT (or other AI tools) before

assigning them in order to 1) determine the ease with which students can cheat, 2) determine whether students will need to engage in independent thought beyond the answer provided by the AI tool, and 3) gain insights on how to identify AI-generated responses to the questions.

3.2 Career Readiness

As IS educators, we prepare students for the workforce, helping them develop the knowledge and skills needed to not only be competitive on the job market but also to help them progress in their careers. Tools such as ChatGPT can inhibit the development of these skills, creating a gap between the skills that employers expect new hires to obtain as part of their education, and the skills which new employees actually have. In addition, AI-tools such as ChatGPT can undermine employee development in entry level positions. For example, one of the entry level jobs for programmers has typically been maintenance programming. However, ChatGPT can produce simple code faster and more accurately than entry level programmers and can do so in multiple languages. This reduces skill development of entry level programmers, making it harder for them to be prepared for their next position. Further, it may be that the need for IT professionals to possess certain skills may disappear. For example, the need for maintenance programming through coding was greatly reduced with the proliferation of configurable enterprise systems. Over time, the capabilities of AI tools may also lead to dramatic shifts in the skill requirements for IS professionals. Faculty must remain vigilant of such disruptions and adapt their programs accordingly.

Evidence from the training of medical residents to conduct surgery (Beane, 2019), and the financial industry (Anthony, 2021) supports these arguments, finding that the use of advanced AI-enabled tools can undermine the skill development of entry level employees. AI-enabled tools may also place employee functional skills at risk of atrophy (Eubanks, 2018), because these tools can complete many of the functional tasks that employees previously completed. These tools may even lead to employees trusting AI to “generate a final decision without questioning its actions” (Johnson et al., 2006, p.447), even when the system contains fundamental and obvious errors (Will, 1991), because they are not as intimately engaged in their functional work. Thus, as IS educators, we may not only need to rethink how we develop students for their first jobs, but we may also have opportunities to partner with organizations to help organizations better develop entry level employees’ skills. As tools such as ChatGPT continue to evolve, the skill sets required for employees will rapidly evolve and new positions and skill sets will be needed. Ultimately what IS jobs will look like in 5-10 years is unclear and IS educators will need to adapt how we prepare students for the AI-enabled jobs of the future.

3.3 Faculty Responses

Another challenge facing IS faculty is that we will need to learn how to leverage these tools as well as adapt how we assess student learning in light of these tools. For example, the increased risk of cheating with ChatGPT on assignments completed outside the classroom means that the ability of these assignments to reflect student knowledge is reduced. In other words, these assessment tools lose their predictive and evaluative validity. If we turn to the work on the use of unproctored Internet testing (UIT), a form of employee selection testing where the job candidate can take the test anywhere and at any time, we see that organizations faced similar issues regarding cheating (Tippins et al., 2006). Organizations were concerned that these tests would lose their predictive validity, so they adapted hiring processes to include a short in-person testing to confirm that UIT performance is reflective of the candidate’s actual knowledge or skills (Tippins, 2009). In addition, researchers have argued that UIT may be best used for assessments that are not performance oriented (e.g., personality) (Tippins et al., 2006). This provides insights into how faculty can best adapt to ChatGPT. This includes the need to find new ways of assessing knowledge that we may have previously assessed through projects completed outside the classroom. For example, faculty may need to dedicate more time to mini-in-class assignments to effectively assess students’ ability to evaluate and analyze content. The rise of AI tools may lead to an increased need for faculty to consider assessing for changes in knowledge and skill levels rather than for absolute levels of knowledge or skill. The former is a better indicator of learning, which may be increasingly important in an environment in which students increasingly use AI tools.

In addition to adapting teaching to assess student learning differently, faculty will need to learn to leverage ChatGPT to support the design and delivery of materials. For instance, ChatGPT can help faculty design exam questions and projects. Using the example of the four components of an information system, ChatGPT can help design a multiple-choice or short-answer question for a test. Figures 3 - 5 illustrate the

process through which one of the authors developed a multiple-choice question based upon the four dimensions of an information system.

Prompt	Write a multiple-choice question that focuses on the four components of an information system
Output	Which of the following is NOT one of the four components of an information system? A. Data B. Hardware C. Software D. People Answer: There is no correct answer, as all four options are components of an information system.

Figure 3. Multiple Choice Prompt

Prompt	Edit the question so that there is a correct answer
Output	Which of the following is one of the four components of an information system? A. Data B. Hardware C. Software D. Internet Answer: A, Data is one of the four components of an information system.

Figure 4. First Edited Multiple-Choice Prompt

Prompt	Edit the question so that there is only one correct answer
Output	What is the term for the programs and applications used to process and manipulate data in an information system? A. Data B. Hardware C. Software D. People Answer: C, Software is the term used for the programs and applications used to process and manipulate data in an information system.

Figure 5. Second Edited Multiple-Choice Prompt

In the first prompt, chat GPT did not provide a correct answer from which a student could choose. One solution could be to add option E) None of the above. However, another option could be to rewrite the prompt so that the question contains a correct answer (Figure 4). However, in this case, ChatGPT responded with multiple correct answers to the question. This also would not be an effective question (unless the goal is to include multiple correct responses). Finally, the third prompt produced a question that could be used on a multiple-choice question (Figure 5).

ChatGPT can also assist faculty as they develop and create solutions for short answer questions on exams (see Figure 6). In this case, the prompt was effective. Overall, it appears that ChatGPT can be a useful tool for faculty as they develop exams. However, it is important for faculty to understand that at times ChatGPT can produce nonsensical responses. In addition, faculty should expect that there will be a learning curve as they begin to use the tool. For example, prompting ChatGPT effectively requires some experimentation. The three-prompt series illustrated above (Figures 3 – 5) could be condensed to a single prompt that specifies the requirement that the question has exactly one correct answer (e.g., “Write a multiple-choice question that focuses on the four components of an information system. There should be exactly one correct answer”).

Prompt	Write a short answer question for undergraduate students that focuses on the four components of an information system; provide a sample answer
Output	<p>What are the four components of an information system, and why are they important?</p> <p>Sample answer</p> <p>The four components of an information system are data, hardware, software, and people. Data refers to the raw facts and figures that are collected, processed, and stored by the system. Hardware includes all the physical components of the system, such as computers, servers, and storage devices. Software refers to the programs and applications that are used to process and manipulate data. People are the individuals who use and interact with the system. These components are important because they work together to create a system that can store, process, and analyze data to provide useful information to the users. Understanding these components is crucial for designing, developing, and maintaining effective information systems in various settings, including businesses, healthcare organizations, and government agencies.</p>

Figure 6. Sample Short Answer Question

Although ChatGPT is still a very new tool, we can foresee a time in the future when textbook publishers may partner with OpenAI to design tests that are based on that specific textbook’s content. In this case, faculty could specify test parameters such as the types of questions, the number of specific questions, and the topic coverage. ChatGPT could then dynamically generate a personalized test for each individual student in the class. This helps overcome the problem of test-banks and tests becoming broadly available to students and can help reduce cheating. In addition, with the ability to dynamically generate tests, it can also support the use of computer adaptive testing (CAT). CAT is already being used by the Educational Testing Services (ETS) and to support employment selection tests (Way et al., 2001; Tonidandel et al., 2002). Research on the use of CAT tools has shown that these tests can reduce testing time by over 50% with no reduction in the validity of the test (Alkhadher et al., 1994; Overton et al., 1997). Tools such as ChatGPT can help reduce testing time for students as well as the administrative burden of developing, managing, and grading tests by faculty.

In addition, textbook publishers can utilize AI tools such as ChatGPT to serve as virtual tutors or digital learning twins. Virtual tutors can provide students with advice and guidance as students learn, basing this guidance on student reading and testing patterns. Using this information, the virtual tutor can then recommend learning pathways that improve the chances for student success. These tools can improve learning engagement and some research suggests that virtual tutors can improve learning outcomes (Hwang et al., 2003; Fletcher & Morrison, 2014). For example, Target found that trainees that utilized a virtual tutor were more likely to transfer what they learned to the job (Oesch, 2018).

ChatGPT can also assist faculty in designing in-class and outside-of-class projects and cases. Staying with the theme of the four components of an information system, the following prompt focuses on creating an in-class case for an introductory MIS course for undergraduate students (Figure 7). This example illustrates how prompt priming can be useful. Our prompt provided a specific view of the components of information systems (e.g., hardware, software, data, networks) and ChatGPT used this information in

creating the case and solution key. As can be seen from the example, the case would require some editing prior to use.

<p>Prompt</p>	<p>Write a 500-word case for in-class use that has students identify the four components of an information system used in the company (hardware, software, data, networks); the company should make widgets; the case should not mention the four components of an information system; the name of the company should reflect the product they make; provide a solution key.</p>
<p>Output</p>	<p>Case Study: WidgetMaster Enterprises</p> <p>Located in the industrial heartland of Pittsburgh, Pennsylvania, WidgetMaster Enterprises is a distinguished manufacturer of widgets of all shapes and sizes. Their widgets are integral components for a myriad of industries, including automotive, aerospace, and consumer electronics.</p> <p>WidgetMaster's efficient operations are supported by a comprehensive system spanning from the initial product order to the final shipment to clients. This system encompasses various functions including product design, order management, production planning and scheduling, inventory control, shipment tracking, and customer relationship management.</p> <p>The company's production design process relies heavily on sophisticated 3D modeling applications, making the product customization experience seamless for the clients. Upon finalizing the design, the client's order is recorded in the company's central management system, triggering the production phase.</p> <p>The production planning and scheduling are optimized by a specialized application that forecasts demand and adjusts production accordingly. This application interfaces directly with automated machinery on the factory floor, ensuring timely and accurate widget production.</p> <p>Inventory control is another crucial aspect of WidgetMaster's operations. An intricate system monitors the number of widgets in stock and in production and cross-references this information with incoming orders. In the event of a stock shortage, the system initiates a production run to fulfill the demand.</p> <p>WidgetMaster also utilizes a global tracking system to manage its shipments. This system ensures timely and accurate delivery of the widgets, managing everything from dispatch to the final delivery confirmation. The system also handles product returns and rerouting if necessary.</p> <p>Furthermore, the company maintains a robust customer relationship management system. This stores detailed client records, their order histories, and preferences, facilitating personalized service. Feedback from this system drives WidgetMaster's continuous improvement process.</p> <p>All these systems are interconnected through a sophisticated network that allows for real-time data sharing and collaboration among different departments. These operations make WidgetMaster a leader in the widget industry, setting standards in product quality and customer service.</p>

	<p>Solution Key:</p> <ol style="list-style-type: none"> 1. Hardware: This includes the physical components of WidgetMaster's operations. It consists of servers for data storage, workstations for designing products, machines for manufacturing widgets, and GPS-enabled devices for tracking shipments. 2. Software: WidgetMaster uses several types of software for their operations. 3D modeling applications for product design, an ERP system for managing orders and production, inventory control software, a global tracking system for shipment, and a CRM system for managing customer relationships. 3. Data: This is the information that flows through WidgetMaster's systems. It includes order data, production schedules, inventory levels, shipment information, and customer records. 4. Networks: This is the infrastructure that connects all the components of WidgetMaster's information system. It allows data sharing between different systems, making real-time collaboration possible among various departments. It includes both local networks within their facilities and wide-area networks for connecting different locations.
<p>Note: This example was created using ChatGPT 4.</p>	

Figure 7. Example Case for Use in Introductory Information Systems Course

Having described some potential use of generative AI tools such as ChatGPT. We turn our attention to what the future may hold. In the next section, we describe a range of possible futures with respect to AI tools in IS education.

4 Scenarios for the Future

Although nobody knows how AI will impact IS education and careers in the long term, it is possible to envision a range of plausible scenarios regarding how AI-based tools might affect IS education and IS careers. Although our focus here is on IS education, considering the impacts on IS careers is also important because the future of IS careers will help shape the future of IS education. In this section, we present four plausible scenarios, ranging from AI-based tools having minimal impact, to such tools acting as competition for IS faculty and professionals. Each scenario is described below.

Little to no impact: One possible outcome is that there are few impacts from AI-based tools such as ChatGPT. In this case, these tools are, in hindsight, viewed as “much ado about nothing.” As for how and what IS faculty teach, the status quo remains. In addition, new IS professionals perform their work in largely the same ways they have for many years, using traditional methods with little assistance or interference from AI tools. However, given the changes in the nature of work enabled by AI already being identified by researchers (Strich et al., 2021; Anthony, 2021), it is unlikely that our pedagogy and content will remain unaffected by AI tools such as ChatGPT.

AI as tools (automation): A second potential impact of these tools is that AI simply automates tasks that professors and students previously completed manually. Under this scenario, AI acts as a tool to help students, faculty, and IS professionals perform their tasks. The status quo largely remains, with AI tools added to help with relatively specific tasks. For example, as noted earlier in the paper, IS faculty may use AI tools to build exercises, cases, exam questions, and the like. Students will use AI tools to help them prepare for exams, check their written work, keep up with their schedules, and similar tasks. Information systems practitioners will use AI tools to write code according to specification, debug code, optimize database design, create test bed data, and perform other routine tasks. We already see this happening with organizations using AI-enabled algorithms to make decisions and removing humans from the loop (Strich et al., 2021; Langer et al., 2019). Ultimately, AI becomes a tool similar to that of a calculator, eliminating certain tasks, and freeing up students, faculty, and employees' time so that they can focus on more value-added tasks.

AI as trusted partner (augmentation): Finally, humans can partner with AI-enabled tools, tools that become a trusted partner with whom one can collaborate. Rather than simply automating tasks, students, faculty, and practitioners can use AI tools as patient, always-available tutors, career coaches, and

collaboration partners. Students can use AI-enabled tools and chatbots as virtual tutors. These tools can support student learning by providing recommendations and feedback to students as they navigate the learning environment (Hwang, 2003). In online environments, AI tools can improve students' engagement, motivation, and learning because they can create a richer learning environment for students. Research has found that the use of these tools can improve learning outcomes (Hwang, 2003; Langer et al., 2016; Fletcher & Morrison, 2014). In addition, the more human-like these tools are, the more likely that students will interact with these tools as they would if they were interacting with another human (Nass & Moon, 2000; Behrend & Thompson, 2011).

In this scenario, faculty will consult AI tools when designing courses and curricula, deciding on assessment approaches, and evaluating and commenting on student work. They may use AI bots as surrogate students when testing new instructional methods. In addition, students and faculty can partner with these tools separately and together to co-evolve learning processes. This co-evolution will support the development of stronger questions, answers, and learning objects that take advantage of the vast processing capabilities of AI and the creativity of humans. These partnerships have the potential to develop creative and innovative learning processes. Further, practitioners can use AI tools to help them design architectures, ensure alignment of IS activities and strategies with those of the organization, assist in requirements elicitation, and help with other non-routine tasks. Partnering in this way by using a combination of human and AI inputs should lead to more effective and accepted outcomes than when AI alone is used (van den Broek et al., 2021; Wang et al., 2016).

AI as competition: The final scenario is one in which AI fully replaces faculty and practitioners. For instance, universities in the United Arab Emirates are beginning to use ChatGPT to introduce "AI educators" into their education systems. Students learn by interacting with AI teachers, tutors, and career coaches. Rather than delivering content and assessing student work directly, faculty play a limited, different role by focusing on activities such as curriculum development, program management, and mentoring. In this scenario, many professions are replaced by AI tools, especially for roles that are largely technical and not stakeholder facing (although AI tools can also help improve efficiency for stakeholder facing activities). There is also reduced demand for IS faculty and professionals. This scenario can be threatening to faculty as it will reduce the number of faculty overall and fundamentally alter what faculty are and the role they play in universities. In fact, futurists have predicted that in the next five years AI-enabled robots may begin replacing faculty in some courses (Houser, 2017). We can also envision a shift to faculty increasingly acting as "co-learners" with students, rather than imparters of knowledge. As a co-learner, a faculty member moves from "teaching what I know" to collaborating with students to create opportunities to develop learning in new, previously unexplored areas. This approach allows faculty and students to work together to create, discover, or invent knowledge³.

We are reluctant to put a stake in the ground by predicting which one of these outcomes will come to dominate IS education, but we are prepared to state that we believe there is little possibility that the "little to no impact" scenario will be correct in the long run. Even in the short time, we have been working on this editorial, we have seen significant enhancements in ChatGPT with the launch of GPT-4. Sam Altman, the CEO of OpenAI, has publicly stated that he expects a 10X annual increase in the capabilities of tools like GPT (Klein, 2023). Even if this is overly optimistic (or pessimistic), it is almost certain that barring some existential event, the capabilities of AI tools will increase at a rapid rate. Ultimately it is impossible to accurately predict the trajectory of the effects of these tools on IS education, but we anticipate that there will likely be elements of each of these scenarios as these tools evolve. However, it is clear that we are already moving out of the "little or no impact" scenario to the "AI as tools" scenario. It seems to us that the larger question is the pace at which we will move through the scenarios. Whatever the timeframe in which these tools are widely adopted, IS educators need to be prepared for the changes this will bring. Adapting to the increase in AI tools could be seen as being akin to an action research project in which faculty need to be highly responsive and adaptable as the capabilities of AI tools evolve rapidly. This may require looking as far into the future as is practical, being on the lookout for new opportunities while creating contingencies to guard against serious detrimental impacts.

In summary, we believe that there will be impacts from AI tools, so it is foolhardy to bury our collective heads in the sand and pretend that AI tools are yet another passing technology fad. AI tools are here to stay, and their impacts will be considerable. As IS educators, we should do what we can to be ready for

³ We thank the Editor-in-Chief for bringing up this possibility.

the coming changes. With that in mind, we turn attention to potential responses and the likely consequences thereof.

5 Potential Responses

In this section, we describe a range of potential responses from IS faculty to the existence of AI tools and the potential effects of these tools, ranging from ignoring their presence to fully embracing them. After each potential response, we discuss the challenges and likely consequences related to each response. The scenarios below are not intended to represent the entire universe of potential responses, but rather a range of likely potential responses.

Do nothing: One possible response is to essentially do nothing; no changes are made to the curriculum, teaching methods, or policies. This response implies several assumptions. First, this response assumes that AI tools are largely a passing fad and are unlikely to bring about any meaningful changes to IS education or the profession and that AI tools are not likely to replace the need for human expertise, even for routine tasks. Further, this response also reflects an assumption that AI tools are not useful for improving the efficiency or effectiveness of IS education and that AI tools also represent no threat with respect to their misuse by students.

Challenges and Consequences: Since there are no actions involved in doing nothing, we do not anticipate any related challenges. However, we do anticipate serious consequences of this approach. To be pointed, we believe that the “do nothing” approach is foolhardy and irresponsible. Fortunately, it is unlikely that many IS faculty will do nothing in response to the increase in AI tools, although the response of some faculty may be minimal. It is our contention that AI tools will reshape the nature of information systems education and work; in fact, it seems clear that this is already happening. So, to do nothing is inappropriate and would be akin to ignoring the Internet in the 1990s. At best, doing nothing would be shortsighted and those who respond minimally (or not at all) are in danger of falling significantly behind the innovation curve. If IS educators fail to respond, we risk a metaphorical wild west where students employ AI tools in ineffective and inappropriate ways, staking out the territory before rules are put into place. In addition, students with lower self-efficacy or strong ethical codes may also choose to ignore these tools, leaving them less prepared for the workforce of the future...an even worse outcome than if faculty ignore them.

Prohibit the use of AI tools: IS educators may respond by banning the use of AI tools in the classroom. This is an approach already taken by many instructors and educational institutions. Such a response conveys the assumption that AI tools are not legitimate learning aids, but rather are a means for engaging in academic dishonesty or bypassing necessary learning activities. In other words, this response implies an assumption that AI tools are a threat to student learning rather than a learning aid. A less obvious implied assumption is that AI tools are not likely to be useful for carrying out the work of IS professionals, so there is no need for students to learn how to properly use such tools. Further, a prohibition response assumes that it is possible to effectively police the use of AI tools.

Challenges and Consequences: There are at least three significant challenges with the prohibition response. First, faculty will be engaged in a never-ending game of catch-up, with new capabilities continually emerging, often requiring new ways to detect and block the use of the tools. Second, detecting tools will always be imperfect, even if they are up-to-date. This leads to serious ethical issues, especially in the case of false positives, which are reportedly common (Fowler, 2023). Even if the accuracy problem is solved, there will still be a continual arms race with students and AI tools developing ever more sophisticated ways to defeat the detectors. The third challenge concerns another ethical issue, our failure to prepare students for the new reality of AI tools. The prohibition response would be akin to banning the use of calculators in the 1980s. It might work for a while, but it will not in the long run, and it certainly will not prepare students for the reality of their careers, which is ethically questionable. In addition, by doing this we may be neglecting our responsibility to prepare our students to not only learn course content but also to be prepared to grow and learn throughout their career. We see this approach as a losing battle in the long run although this approach may allow an instructor to take advantage of others' experiments with AI tools.

Allow limited use of AI tools: Another possible response is for IS educators to allow limited use of AI tools within prescribed guidelines. This approach represents a middle ground between ignoring or prohibiting the use of AI tools and fully embracing them. This response assumes either that effectively prohibiting AI tools is difficult or impossible, or that there are limited legitimate educational uses of AI tools.

In addition, it begins to acknowledge the importance of AI to students' future careers. However, developing specific guidelines and methods for ensuring that the guidelines are followed will be challenging, as discussed below. Developing such rules and methods assumes that it is possible to anticipate all possible uses of AI tools, which is unlikely given their rapid evolution. This approach may even limit the most profitable experiences these tools offer as students and faculty innovate with these tools.

Challenges and Consequences: There are three main challenges to allowing the limited use of AI tools in the classroom: establishing proper limits, helping students understand those limits, and enforcing the limits. As AI tools evolve, determining appropriate use is likely to be a moving target. Further, there are various ethical and practical perspectives to be considered in determining what is appropriate. For example, what may be inappropriate from an educational perspective may be useful from a professional development perspective. Consider the use of AI tools to generate code. This seems acceptable from a practitioner's perspective because programmers are increasingly turning to these tools to improve productivity (Yellin, 2023), but it may impede the educational process if students do not understand the fundamentals of programming or of a specific language. In addition, faculty, and students from around the globe will bring many different ethical worldviews to the learning environment making consistency and acceptance of policies very challenging.

Once IS educators understand appropriate boundaries communicating these to students may also prove challenging. It will be important for students to not only understand the boundaries, but to also understand why those boundaries were established. In an evolving world, simply understanding today's ethical boundaries is not sufficient. For example, the common prohibition of "no outside help on assignments" may be unrealistic and even unwise in a highly dynamic environment. Thus, we may need to transition to a focus on ethical reasoning rather than blackletter rules. Instructors may also need to rethink their own ethics. Consider, for example, the ethics of using AI to provide feedback to students. Currently, such use may be inadvisable, but as capabilities improve, it may be that the use of AI feedback is not only acceptable, it is proper. The main consequence of this response is students who are well prepared for the IS profession with respect to the effective, ethical use of AI tools. However, the potential efficiency and effectiveness of learning gains may not be fully realized.

Embrace AI tools as legitimate learning aids: The final response is to fully embrace AI tools as legitimate learning aids by integrating them into the curriculum and teaching students how to effectively use such tools. This response implies several assumptions. First, this response assumes that AI tools can be used legitimately to help students learn. It also assumes that these tools can effectively enhance student learning. This response may also imply an assumption that AI tools will change the nature of IS work and IS careers, necessitating that students learn how to use such tools. Further, the use of these tools must be considered in light of learning theories and taxonomies such as Bloom's. Using Bloom's taxonomy as an example, we would need to understand how AI can support each level of learning, where it poses risks, and how to design tools and activities that maximize the potential of AI as a learning tool while minimizing its risks.

Challenges and Consequences: A major challenge of this approach is helping students know how to effectively use AI tools as learning aids, not as ways to simply avoid work. Faculty have long had to walk the line between guiding students and telling them the answers; the situation will be similar when embracing AI tools. Students must be taught to avoid the temptation of taking the expedient route, which provides short-term benefits, but will ultimately harm them.

In addition, faculty will need to encourage students to be skeptical of the work produced by AI tools, although the degree of appropriate skepticism may change as tools evolve. If tools become more reliable, less cross-checking may be required. Currently, from our own experience, we know that although AI tools can be quite helpful, they are often wrong. We, as faculty, are trained to think critically and bring a healthy skepticism to our work. Students, however, typically have not had the benefit of such training to the same degree. On the contrary, students, and even experts, will accept what a computer produces as being true and correct, even when it is inaccurate (Will, 1991). In a dynamic environment such as our new AI-enabled learning environment, it is important to have a healthy skepticism, which may mean fighting the tendency to uncritically accept the output of information systems. As a result, faculty will need to help students overcome any inclination to uncritically accept the output of AI tools, which may be a challenge for faculty and students. It may be useful to remind students that they are ultimately responsible for their work. Excuses like "But ChatGPT told me this was the answer" will not absolve students of their

responsibilities. Faculty need to help students understand this reality; faculty also need to model proper skepticism and accountability in their own use of AI.

As noted earlier, we also have an obligation to teach students how to think through the ethics of using AI tools. This will not be as simple as providing hard-and-fast rules. AI tools are rapidly evolving, so a rule-based approach seems doomed from the start. Establishing rules will simply be a never-ending battle, one in which faculty will always be behind. Because of this, it may be useful to consider collaborating with students to design new guidelines and approaches to ethical reasoning.

A further challenge comes from the evolving nature of AI tools. This is another situation in which faculty will always be playing catch-up; this seems inevitable. In addition, dealing with the evolution of AI tools may become something of a time sink for faculty. Especially early on, it will be extremely difficult to stay current on the vast array of tools that will emerge. Further, many of these tools may seem promising, but may ultimately disappear. So, it will be challenging to decide which tools are worth investigating. Fortunately, IS faculty are well acquainted with the challenges of emerging technologies.

Finally, embracing AI tools is likely to require significant changes in how we help students learn and how we evaluate that learning. Not only will we need to adapt content to accommodate the use of these tools, but we will also need to rethink and redesign learning activities and assessments. This is likely to be a major challenge that will involve considerable time and effort.

Given that we are potentially at the cusp of what could be a revolution in IS education, we believe that the Association for Information Systems (AIS) has an opportunity to take a leadership role in the acceptance and deployment of these tools by faculty and students. For example, AIS could develop plans that link the use of these tools to the model curriculum and examine how they can be best used to improve learning outcomes. They can also partner with other professional organizations to develop standards of use. This will help AIS become a thought leader in the use of AI tools in the classroom and contribute to its reputation in both the academic and professional arenas.

6 Discussion

Although the impacts of AI tools on IS education is unclear, these tools will almost certainly have significant effects. We strongly suggest that IS educators learn about AI tools and their potential uses and impacts in the classroom. IS education will be irrevocably affected by AI tools such as ChatGPT, as will the practice of information systems. Given that we are in the early stages of a potential transformation of both IS education and practice, now is the time to plan our responses individually and collectively.

In the paper, we have delineated a range of possible future scenarios and discussed a similar range of responses by IS faculty. We acknowledge that as a disruptive technology, ChatGPT may raise concerns such as replacing jobs in the education industry. However, we believe it creates opportunities as well. Disruptive technologies can cause stress (Nastjuk et al., 2023). However, no disruptor or stressor is universally negative (Lazarus & Folkman, 1984). Instead, the stress associated with new tools such as ChatGPT depends on how individuals view their relationship with the demand. Whereas some might view ChatGPT as a threat to their status quo, many view it as an opportunity for growth. Thus, like many other cutting-edge technologies, ChatGPT may be viewed as a double-edge sword.

Our position, however, is that the best response is to embrace AI tools as legitimate learning aids. Our position is based on two fundamental perspectives, practicality, and ethics. From a practical perspective, we believe that it is folly to ignore or prohibit the use of AI tools. It seems clear that there will be impacts from these tools, so ignoring them is not a viable option. In addition, prohibiting use is likely an exercise in futility that at best would result in a proverbial arms race in which students find new ways to obfuscate use as soon as faculty find ways to detect use. The time and effort spent by both groups is better spent elsewhere.

Two core ideas form our argument from the perspective of ethics. First, our duty as IS educators is to prepare our students for successful careers as IS professionals. It seems clear to us that AI tools will reshape the way in which IS work is done. Therefore, preparing students for future careers means preparing them to responsibly use AI tools. In addition, some of our graduates will be involved in building new AI tools, so it may be worthwhile for faculty to also consider helping students understand the ethics of AI more broadly. Embracing these tools as legitimate learning aids is an important step toward helping students understand how these tools will affect their careers. As noted earlier, AI tools are likely to change rapidly in the near future, which reinforces the need to constantly reconsider what constitutes responsible

use of these tools. This is another argument for focusing on developing ethical reasoning skills in faculty and students. Second, given the current educational capabilities of tools such as ChatGPT, it seems irresponsible to deny students the use of these learning aids. For example, having ChatGPT act as a tutor for learning coding may have tremendous positive consequences for student learning. Why deny students the use of such tools?

We recognize that our position is based on several assumptions. First, we assume that AI tools will increasingly impact the way work is done, especially in information systems. We also assume that prohibiting student use of these tools is not viable in the long run. Further, we assume that IS faculty can develop ways to effectively use AI tools as legitimate learning aids that will have positive effects on student learning. Finally, we assume that IS faculty have a responsibility to ensure that students are prepared to use AI tools ethically and effectively, giving them the capability to succeed in an increasingly AI-powered world. Although these are admittedly assumptions, we believe them to be well-founded.

Faculty must recognize that their responses will not occur in a vacuum. Students will be reacting to how individual faculty respond based, in part, on how other faculty respond. For example, if one instructor in a department bans the use of ChatGPT, but another instructor integrates its use, students are likely to react negatively to the first instructor. This does not mean that all faculty must react in the same way, but it does mean that reactions should be intentional and the reason for the choice should be well thought out and transparent. This will allow faculty to explain the reasoning for their responses, which may help mitigate negative reactions due to differences in how AI tools are used across courses and faculty.

The need for coordinated reactions will go beyond information systems departments. Students will be comparing the responses of IS faculty to those of faculty in other departments. IS faculty, as the relative experts in information technology and its impacts, may consider helping faculty from other areas think through how they should react to the presence of AI tools in their courses. Inconsistencies that are not understood and seen as reasonable may draw negative reactions from students. We acknowledge that coordinating responses will be challenging, but ignoring the consequences of a lack of coordination is ill-advised.

Although individual and local responses are necessary, we also believe that we should respond collectively as a discipline. Professional associations such as the Association for Information Systems (AIS), the Association for Computing Machinery (ACM), and the Institute for Electrical and Electronics Engineers (IEEE) should provide leadership roles for collective responses. They can help in several ways, including establishing guidelines and standards for the use of AI tools in education and practice, offering workshops to help computing educators better understand the tools' capabilities and weaknesses, and facilitating scholarship related to the use of AI tools in education and practice. In addition, professional associations can promote and facilitate knowledge and experience sharing among faculty and practitioners.

7 Recommendations

Based on the current and projected state of affairs, we can make several suggestions for IS faculty. These are discussed below.

7.1 Become Educated

Our first recommendation is that faculty should take the time to become educated in several important areas. First, it is important to learn the general capabilities of emerging AI tools such as ChatGPT. This will be an ongoing task as the tools are evolving quickly, a multitude of tools are being released each month, and the capabilities of existing tools are constantly evolving. Without understanding the tools' capabilities, it will be difficult for faculty to develop appropriate use guidelines. Second, faculty should learn about how other faculty are using AI tools in their courses. Finally, we recommend that instructors spend some time pursuing social media, news outlets, and blogs to stay abreast of how students are thinking about and using AI tools in their education. We find Reddit to be especially useful for this as its culture of anonymity leads students to be more open about how they are using AI tools.

We also strongly encourage faculty to experiment with the tools, especially widely known tools such as ChatGPT, Bard, and Bing. These tools are widely available and accessible, so they are likely to be the ones most used by students. As an aside, we personally find ChatGPT to be helpful in a variety of ways for our research and teaching. Even simply playing with the tools can give a sense of their capabilities. For

example, one author used ChatGPT to generate dad-style jokes for use as cognitive breaks during class sessions. Students typically groaned appropriately, and sometimes even laughed.

7.2 Decide on Response

Faculty must also decide how they want to respond to the threats and opportunities of AI tools. As noted earlier, we strongly recommend embracing these tools as legitimate learning aids, but other faculty may feel differently. Regardless, we believe that it is critical to settle on a response before taking further steps. The response approach will guide decision making and actions for future steps. In particular, the approach will determine policies, student training (if any), and learning activity revisions.

We caution faculty to make sure that their approach aligns with departmental and institutional policies. Students are likely to be confused about how to legitimately use AI tools for class activities and inconsistent policies will only add to this confusion. When an individual instructor's policies differ, it will be important for that faculty member to clearly indicate their policies and to explain why their approach differs from those of their colleagues.

7.3 Develop and Incorporate Use Policies

Instructors must clearly communicate their policies in their syllabi and other appropriate locations (such as learning management systems shells). The goals of these policies are to provide students with clear guidance and guardrails that can govern their use of AI tools. We reiterate the importance of being very clear regarding these policies. Unclear or poorly thought-out policies will only serve to confuse students and make enforcing policies difficult. We strongly recommend giving students clear examples of appropriate and inappropriate uses. Again, this is a rapidly evolving area, so it is likely that policies will similarly evolve. Further, a degree of flexibility may be necessary as it is unlikely that policies will be perfect in their initial iteration.

We strongly recommend that any sanctions included in one's policies be guided by principles of restorative rather than retributive justice. Restorative justice is generally thought to be more effective and more appropriate for educational settings (Kara & MacAlister, 2010; Fronius et al., 2016). We believe that restorative justice's emphasis on learning and growth aligns well with the goals of education. Restorative justice also focuses on promoting ethical behavior because ethical behavior is right and just, rather than out of a fear of punishment. Further, restorative justice is likely to promote a climate of collaboration and openness, while retributive justice often fosters an adversarial, "us versus them" climate that is characterized by dishonesty and secretiveness. Finally, a restorative justice approach may simply be more appropriate in an emerging area without clear, static, well-established guidelines and rules. Students may not fully comprehend what is correct behavior in the domain of AI tools, so it seems unreasonable to take a hardline, retributive approach.

7.4 Modify Class Activities and Assessments

The new reality is that students are going to use AI tools, regardless of any attempts at blocking their use. So, it is important for instructors to evaluate class activities and assessments in light of this new state of affairs. At a high level, we strongly recommend not only thinking about how AI tools *can* be used but also thinking about how they *should* be used. In other words, consider how activities and assessments can be modified in ways that encourage the ethical and effective use of AI tools. This may not be appropriate in all cases, but when it is, we encourage instructors to consider using activities and assessments that help students learn the proper use of AI tools.

The introduction of AI tools may also call for a reconsideration of flipped pedagogies that allow assessments and activities to occur during class times rather than outside of class. Conveyance tasks, such as lectures, may be more appropriate for outside-of-class meetings, reserving class time for activities and assessments, which will also allow for better monitoring. This will likely require work on the part of the faculty, but we believe that the idea is worth considering⁴.

We encourage faculty to consider taking several more specific steps regarding assessments and activities, as outlined below.

⁴ We acknowledge that this approach will not work for asynchronous online courses.

- Increased use of higher order thinking oriented activities and assessments: There is a clear need to move away from activities and assessments that rely on simple declarative knowledge and towards those that require analysis, synthesis, and evaluation (à la Bloom).
- Contextualize assessments and activities: AI tools will not have knowledge of things that occur in class, or come out of a student's personal experiences. Assessments and activities can be contextualized to require students to connect class content with specific discussions or experiences. For example, instead of asking "State the advantages and disadvantages of enterprise systems." One might ask "Using an example from our class discussions, discuss the advantages and disadvantages of enterprise systems." The latter requires students to make connections across concepts and experiences, which not only negates the ability of AI tools to provide full answers but also strengthens learning and understanding through those connections. Activities can also be contextualized to integrate students' personal experiences. This approach has similar benefits to contextualizing class content. For example, rather than asking "What are the rules for good passwords?" an instructor may ask, "Using one of your personal passwords as an example, assess whether the password meets the requirements for good passwords discussed in class. (Do NOT include the actual password in your answer!)" This revision requires students to be able to apply the rules rather than simply regurgitating them. Even without the use of AI tools, contextualization may improve learning and assessment quality. Reflection-based activities and assessments are also useful. The reflections not only require going beyond responses that AI tools may provide but may also improve learning (Peltier, et al., 2005).

7.5 Educate Students

It is also important to educate students on the ethical and effective use of AI tools. As noted earlier, students will use AI tools to complete their work in their careers. Therefore, it is important to help students understand how to use AI tools properly and effectively. Several elements should be included:

- Introduction to key AI tools and their capabilities and limitations
- Discussion of guidelines and guardrails for ethical AI use (These must align with institutional guidelines and policies.)
- Demonstration of proper use of AI tools
- Interactive, low-stakes activities that require students to use AI tools

This list is not exhaustive, but it is likely that any training should include these elements. Of course, it may be challenging to integrate AI tool training into already crowded classes. Further, it is inefficient for all faculty to create their own training plans and materials. So, a collective response may be appropriate. However, it is important to keep in mind that some aspects of this training will be course specific. For example, different tools and guidelines may be in place for a programming class than would be in place for a conceptual course.

8 Conclusions

Generative AI tools such as ChatGPT are poised to transform information systems education, demanding effective individual and collective responses from IS educators. In this paper, we described several challenges resulting from the introduction of AI tools and delineated a range of possible scenarios for the future of IS and discussed various response strategies. We argue that IS faculty embrace AI tools as legitimate learning aids and that the Association for Information Systems take a leadership role in determining our collective response to the threats and challenges from ChatGPT and other AI tools. In addition, we make several concrete recommendations for how IS faculty can respond effectively to the increasing presence of AI tools. We strongly believe that such tools will change the face of IS education and the practice of information systems. We, as educators, have a responsibility to not only help students navigate how to effectively use AI tools in their learning but also to help them learn how to utilize such tools ethically and effectively in their future careers. Ultimately, we stand at the cusp of tremendous potential disruption; we must equip our students with the knowledge and skills needed to navigate what will be a vastly different world responsibly and ethically.

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