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When to use ChatGPT: An Exploratory Development of a 2x2 Matrix Framework

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Abstract

ChatGPT is having an impact on students, and information systems (IS) and computing academic professionals alike. Our goal for this paper is to help faculty and students know the conditions in which generative AI such as ChatGPT should or should not be used. To that end, we describe the development of a 2x2 matrix. On the horizontal axis we have the faculty member, and on the vertical axis we have the student. The faculty member is dichotomized into being there to just give a grade or being there to teach a skillset. The student is similarly dichotomized into being there to just get a grade or being there to learn a skillset. This dialectic expresses the real and important tension between the actions and intentions of faculty and students, and we use it to develop a framework as to when each should use ChatGPT. For each of the four quadrants of the 2x2 matrix we discuss three challenges facing IS and computing education: 1) cheating by students, 2) career readiness of students, and 3) faculty response. Important directions for future research are also provided.

Keywords: Information Systems Education, Generative Artificial Intelligence, ChatGPT, Cheating, Career Readiness

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When to use ChatGPT: An Exploratory Development of a 2x2 Matrix Framework

David R. Firth, Adam Gonzales, Michelle Louch and Bryan Hammer

1. INTRODUCTION

The impact of generative AI such as ChatGPT on higher education is evolving by the minute. A search of YouTube about ChatGPT reveals a myriad of "how to" videos, such as "10 ChatGPT Hacks | THAT TAKE IT TO THE NEXT LEVEL!!!" (Hayls World, 2023) with over 546,000 views, and "ChatGPT Tutorial - A Crash Course on Chat GPT for Beginners" (Twarog, 2022) with 5.8 million views. The "how-to" of ChatGPT has been well addressed by the non-academic community. Less well addressed is when to use ChatGPT. The research question for this paper was: from a student and faculty perspective, when should each use generative AI (such as ChatGPT), or not? It is our contention that understanding when faculty and students should use generative AI is an important step to understanding how to incorporate, or ban, generative AI in the classroom.

2. PRIOR RESEARCH ON GENERATIVE AI IN THE CLASSROOM

We first note that the corpus of prior research in this field is expanding quickly, and keeping up with it and including it in a paper is more difficult and complex than usual. Van Slyke et al. (2023) note that we "currently lack in-depth knowledge about how ChatGPT and related tools might influence IS education in the next five years." They go on to structure their research around the three challenges facing IS Education: 1) cheating by students, 2) career readiness of students, and 3) faculty response, for instance in how to write questions for exams. We use these three challenges to frame our discussion of prior research on generative AI as it relates to faculty and students.

Challenge of cheating by students

At the 2023 Information Systems & Computing Academic Professionals (ISCAP) conference, Dr. Sue Brown of the Eller School at the University of Arizona gave the keynote speech, "Challenges and Opportunities for IS Teaching and Research in the Age of GenAI" (Brown, 2023). She noted that "over 43% of college students have used AI, with between 20% and 40% having used it for

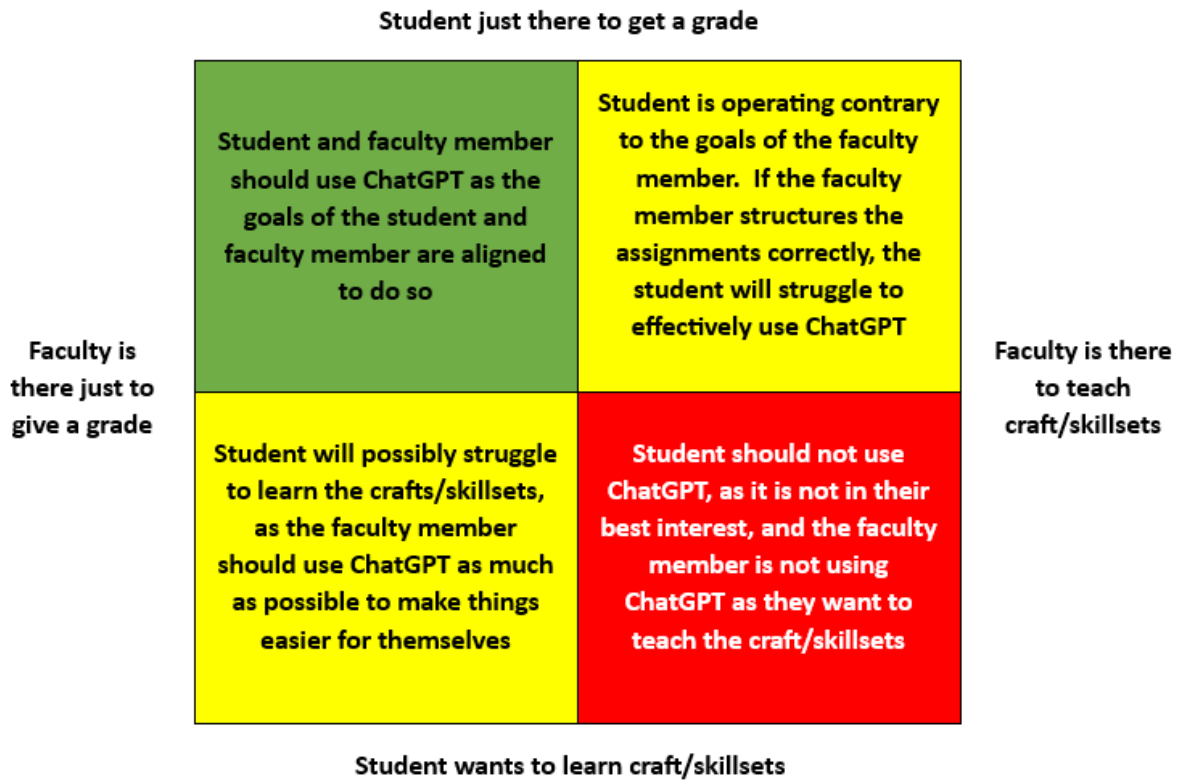
graded assignments," and that "51% of students see using AI tools for assignments as cheating."

On the topic of cheating, a "desire to get ahead" has been found to be an important motivating factor (Simkin & McLeod, 2010). The degree of academic preparation, and the student's perception of opportunities to cheat has also been found relevant (Hongwei et al., 2017). This seems particularly relevant in the context of this paper, as both degree of preparation and the opportunity to cheat are highly influenced by ChatGPT. As noted by Van Slyke et al. (2023), ChatGPT is very good at handling lower-level skillsets tasks, which means that a student who has not put in the time and effort to be prepared would find ChatGPT highly useful. Similarly, the fact that ChatGPT is free and easy to use provides students opportunity to cheat on assignments that are not proctored by faculty.

Challenge of career readiness of students

"Numerous studies have highlighted the importance of relational and professional competencies for the information systems (IS) profession" (Tyran & Tyran 2020). Prior studies have also shown that students' behaviors, skills, and knowledge levels are important themes for graduates when they enter the workforce (e.g. Faisal et al., 2021).

Emerging research has also shown that the ability of generative AI to automate and augment what graduates can and will do at work covers a wide array of industries, including "marketing and advertising, retail, healthcare, banking and finance, news and media, e-commerce, social media, legal services, hospitality, telecommunications, and government" (Sirithumgul, 2023). This means that students who have a solid understanding of AI concepts and tools will have an advantage when it comes to contributing to the integration of AI technologies in business (Chen & Quin, 2023). A generative AI career-ready student is important because "organisations have realised positive benefits from AI projects" (Raftopoulos & Hamari, 2023).



Faculty Response

Van Slyke et al. (2023) discuss faculty response largely with respect to how to develop, deliver and grade assignments, projects, and exams in the context of students’ ability to use generative AI to generate answers and deliverables.

Brown (2023) noted in her keynote that this is not the first time that a new technology has permeated the classroom, and faculty have had to make decisions on whether to ban or incorporate it. Though there are many examples, one of the clearer ones is when graphing calculators emerged, and the subsequent upheaval around when or when not to use these when teaching mathematics. As we now know, graphing calculators have been fully integrated into the high school classroom.

In sum, the currently limited prior research on generative AI has focused on the three challenges facing IS Education: 1) cheating by students, 2) career readiness of students, and 3) faculty response. The literature on cheating by students is substantial, and we believe can be used in the context of generative AI, as we will show. We will also incorporate the challenges of career readiness of students, and faculty response to generative AI as we describe our 2x2 framework on when to use ChatGPT.

3. 2x2 MATRIX FRAMEWORK CREATION

This paper aims to provide guidance for students and professors on when to use ChatGPT. With these two dimensions, to us it was natural to develop a 2x2 matrix with students on one axis, and professors on the other. The 2x2 matrix provides a simple to understand, easy to explain, and useful way to introduce a complex topic to students.

When it comes to developing a 2x2 matrix, Lowy & Hood (2004) say to “create a 2x2 matrix that expresses a real and important tension in your life ... 2x2 modeling is characterized by discovery and **Figure 1: When to Use ChatGPT 2x2 Matrix**

unpredictability.”

It is our experience with students that they can, simplistically, be broken into two types: those who are in class to learn, and those who are in class to just get a grade. We have also observed this with our faculty colleagues: some are there to teach the skillsets that are important and relevant for the class, others are there to just give a grade. This is the “real and important tension” that we decided upon to form the ends of our two axes (Lowy & Hood 2004).

As we were developing the “important tension,” we tested the 2x2 we had developed on 18 MBAs in the Generative AI section of a weekend Digital Economy course to validate its usefulness, as well as to solicit qualitative feedback during class discussion. All 18 of the students were live via Zoom. From the feedback we received, we refined the 2x2 matrix to the axes presented in this paper and used it again in the Generative AI section of a class of 74 business students in a graduate-level Introduction to MIS class. This class had 32 of the 74 students on Zoom with the remaining 42 students participating asynchronously from the live-on-Zoom recordings

as well as custom-made recordings. Shortly after, we used the 2x2 matrix in the Generative AI section of an undergraduate-level Introduction to MIS class, populated by over 100 sophomores of all majors, to subject it to a rudimentary test of generalizability across business students and both graduate and undergraduate students.

The *When to Use ChatGPT 2x2 Matrix* is presented in Figure 1 on the previous page. On the horizontal axis we have the faculty member, and on the vertical axis we have the student. The faculty member is dichotomized into being there to just give a grade or being there to teach a skillset. The student is similarly dichotomized into being there to just get a grade or being there to learn a skillset. It is important to note that on the horizontal axis, when we say faculty, this can also mean just one or more classes by the faculty member, or one or more assignments in a class. That is, we can use this at different levels of abstraction. The same is true for a student on the vertical axis. A student could be just there to a just to get a grade for a class, or there just to get a grade for a particular assignment in a class.

Checked-out/Checked-Out (top left)

We have tested out this 2x2 matrix in class, as discussed previously, and when we do, we start with the upper left quadrant: The faculty is just there to give a grade/the student is just there to get a grade. We call this “checked-out/checked-out” as we think it reflects the fact that the faculty member, in just wanting to give a grade, is checked-out of their teaching responsibilities, and that the student is also checked-out of their learning responsibilities. We color coded this quadrant green, meaning that both the faculty member and student should use ChatGPT as much as possible. It is in both of their interests to do so. We again note that although we have labelled this “faculty,” the 2x2 matrix here is just as useful at the “class” level of analysis and the

“assignment” level of analysis. By this we mean it is quite possible that a faculty member has just one class of several that they teach for which they determine that they are there for, or their preference is to “just give a grade.” Further, an otherwise engaged member of faculty might have an assignment, or several, that is there just to give a grade to.

The intent of this paper is not to give justifications for the reasoning behind the faculty member’s choice to “just give a grade” for the class or just for the assignment. We also do not intend to give ethical reasons as to why this is appropriate or inappropriate, leaving that to a future paper (see Section 5 on future research).

We will provide speculative reasons for this for a faculty member which include: a) they have been assigned to the wrong class or subject, b) they have no knowledge of the class or subject and no interest in acquiring that knowledge in order to teach it, c) the department, college or university has policies or other factors in place that mean they don’t care about or measure the faculty member’s quality of instruction, d) the faculty member has other life issues that are impacting their ability to deliver the proper and appropriate instruction, e) the faculty member has other university issues that are impacting their ability to deliver the proper and appropriate instruction, f) the faculty member has determined that this is just one class (for instance, a colleague is on sabbatical) that they will only ever teach once, and does not want or care to put in the time or effort to instruct properly, and g) the faculty member has determined, for their own reasons, that the class is irrelevant to students. This list is not exhaustive, but we believe that the length of the list does provide evidence that there are situations and reasons for a faculty member to “just want to give a grade.”

On the student axis, the top left quadrant represents a student who “just wants to get a grade.” As for the faculty axis, it is important to note that this could be at the class level of analysis, that is there is a particular class that the student just wants to get a grade for. Additionally, this could be at the assignment level within a class, that is the student just wants a grade for a particular assignment within a class.

As with the faculty member, we believe that there are reasons why a student might be taking the class or completing the assignment “just to get the grade.” Many of these reasons align with the findings of Miles et al. (2022). For instance, a student might just want to get a grade because the technology (including ChatGPT) facilitates the

ability to get a grade. This could be a least-effort reason on the part of the student, or a try-the-new-technology out for a more effort-based student. The teaching environment could be a factor, including that the student has realized that the faculty member is just there to give a grade. Prior research has shown that the level that a student sees the investment in their learning by their faculty member impacts the level of cheating by the student (Andersen & Andersen, 1987; Ashworth et al., 1997; Stearns, 2001; Rabi et al., 2006).

Pressure to get a specific grade is another reason to just get a cheat. Pressure to succeed and/or fear of failure are related to cheating (Abdolmohammadi & Baker, 2007; Jeergal et al., 2015). Research on collegiate athletes has shown how this behavior manifests in this element of the student body. NCAA rules for participation in athletics for Division I student-athletes require a student to meet academic eligibility, which includes maintaining a minimum grade point average, and a steady progress toward completing their degree. This is also true for non-Division I athletes. A recent study on Division I student-athletes reports that the most at-risk for "just getting a grade" are those who view their main reason for attending college as mostly athletics, are majoring in business, and are in a high-profile men's sports such as football or basketball (Yukhymenko-Lescroart 2023). A full 20% of Division I student-athletes attend college exclusively for athletic reasons (Yukhymenko-Lescroart, 2022). The NCAA reports that over 25% of college athletes study business (Mikrut, 2022). Given this information, the university's business school is a likely nexus point for students who succumb to the pressure to cheat to just get a grade.

Checked-in/Checked-in (bottom right)

When we use this 2x2 matrix in class we next move to the lower right quadrant: the faculty member is there to teach a craft or skillset, and the student is there to learn a craft or skillset. We call this "checked-in/checked-in" as we think it reflects the fact that the faculty member is checked-in to wanting to teach skillsets to students, and that the student is also checked-in to wanting to learn skillsets for their future career. We color coded this quadrant red, meaning that neither the faculty member nor student should use ChatGPT.

At our universities, faculty response to when to use ChatGPT in class is across the board, from outright banning it, to promoting its use (Tallman, 2023). As part of the research to support this

paper, we performed interviews with those on our campus who banned ChatGPT use in the classroom to better understand their reasoning. We found that the major underlying reason for banning ChatGPT use by students is that the faculty member wants to teach the craft or skillset associated with the class that they are teaching. For instance, the faculty member for an undergraduate class on writing noted that the majority of students in the class were wanting to head to law school, and "given the amount of writing that will require, teaching them how to write properly is going to be a fundamental skill for them" (Shearer, 2023). For the faculty member in this situation, the key here is that it is not about the end product, the output of the writing. Instead, in this quadrant it is about the teacher teaching, and the students learning the skillsets of the process of writing (in this instance). The faculty member here was adamant that the class was about making sure the students were career ready, and the faculty response was to do that by banning the use of ChatGPT.

One issue does arise in this quadrant: when ChatGPT is part of being career ready, and how to use it is a skillset. We coded this quadrant red, as a signal to not use ChatGPT, but if the intent of the faculty member is to teach the skillset of using ChatGPT to students who want to learn it for their careers, then obviously ChatGPT needs to be used.

Checked-in/checked-out (top right)

The top right quadrant is where the faculty is there to teach the craft or skillsets, but the student is there to just get a grade. We call this "checked-in/checked-out" as it reflects the fact that the faculty member is checked-in to wanting to teach skillsets to students, but that the student is checked-out and just wants to get a grade. In this quadrant, the student should use ChatGPT whenever they can get away with it in order to earn the grade. We color coded this quadrant yellow, as this quadrant is one in which the faculty member needs to pay attention.

Using ChatGPT for assignments and other gradable tasks is the prevalent student response in this box. We believe that a big issue here comes back to Brown's (2023) contention that a key to understanding students' use of ChatGPT when the faculty member believes they should not be, is to understand why students cheat. Prior research has found a major reason students cheat is that they do not consider what they are doing to be cheating. This is based on students' lack of understanding of what constitutes

academic misconduct, cultural differences frequently arising from international students, and a cheating culture which has normalized cheating so that it is not considered cheating anymore (Miles et al., 2022).

ChatGPT use by the student when it is not the intent of the faculty member for students to use ChatGPT can be entirely unintentional due to ignorance (Brimble & Stevenson-Clarke, 2005, Chen & Qin, 2023). The faculty response to this would be to include syllabus language on what is expected from students around the use of ChatGPT. We have provided a copy of what we use in Appendix A. We specifically refer to this item in the syllabus, and also include a reference to this in every assignment that the student could possibly use ChatGPT for. Given our approach to letting students use ChatGPT, we also specifically tell students that if they use ChatGPT, they must provide the stream of prompts they use to develop their ChatGPT answer in an appendix or footnote to their answer.

The fact that the use of ChatGPT to entirely generate an assignment answer is plagiarism may not be understood by international students because of different cultural beliefs as it relates to ownership of ideas (Busch & Bilgin, 2014; James et al., 2019). The faculty response to this would be to include syllabus language specific to plagiarism, and what it means. Faculty might consider which courses, and when, plagiarism is covered in their college as they try to understand which quadrant in our 2x2 matrix students are in.

Most difficult of all when it comes to faculty response is when there is a culture of cheating which has been normalized to the level that it is not considered cheating anymore. Though we do not find research around the normalization of a culture of cheating in any particular student population, the prior discussion on collegiate athletes suggests an area where this may be more likely to exist. This highlights that where a student is in our 2x2 matrix may be a product of the institution, as much as an inherent aspect of the student themselves. This would therefore require an institutional-level response which could easily be out of reach of the faculty members.

When it comes to career readiness and faculty response (Van Slyke et al. 2023), if the student is there just to get a grade, then there are at least two interventions that the faculty member, who cares about teaching the skillsets to be career ready, can follow. One is that faculty members will need to develop assignments and

assessments that are not able to be completed by ChatGPT, which is no easy task. This requires extra work by the faculty, including learning the tools themselves in order to know and test that assignments cannot be completed by ChatGPT. Van Slyke et al. (2023) suggest "mini-in-class assignments to effectively assess students' ability to evaluate and analyze content," but how do you prevent or limit the use of ChatGPT during these mini-assignments? And what about the impact on the faculty member of the extra grading created by many mini-assignments?

The other path for faculty members is to teach the ChatGPT skills that employers are looking for. At a basic level, one element of this comes down to "prompt engineering," and a focus on the how to use ChatGPT to get the answers that the student, or faculty member, or employer, wants. This has led to the development by faculty of in-class and out-of-class assignments where the use of ChatGPT is the whole point (e.g. Firth & Triche, 2023).

Checked-out/checked-in (bottom left)

The bottom left quadrant is where the faculty is there just to give a grade, but the student is there to learn craft/skillsets. We call this quadrant "checked-out/checked-in" as it reflects the fact that the faculty member is checked-out and should use ChatGPT as much as possible, but the student is checked-in and wants to learn the skillsets to be successful in their career. We have color coded this quadrant yellow, as this quadrant is one in which the student needs to pay attention. From the faculty member aspect, because they are just there to give a grade, there is likely little incentive to structure learning delivery or assessment any differently in a ChatGPT environment. The faculty member should use ChatGPT as much as they can. For a student who wants to learn the craft or skillset, this might be very frustrating.

From a career readiness perspective, this faculty member is already likely not engaged with making sure students are career ready. Van Slyke et al., (2023) note that "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." This is a "non-vigilant" group of faculty, so you are going to get an increasing gap between what students need and what is being taught. That is, in this quadrant, things get worse over time.

From a faculty response perspective, Van Slyke et al., (2023) note that "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." Again, in this quadrant, faculty won't respond.

As a result of the faculty in this quadrant being "non-vigilant," two issues arising are: 1) what to do with this faculty member, and 2) how to help the student. For the faculty member, the primary issue is that the department faculty, chair, dean or others in the college need to identify the faculty member. The next issue would be to determine what is the reason for lack of engagement with students, or the use of ChatGPT to merely generate content without much thought or effort. The reasons could be wide ranging from mental health issues, physical health issues, over focus on research be it a personal choice or an institutional directive, stress from either internal or external sources, and other factors, and we do not one is in this paper other than to note that it would be important to figure out what the underlying issue is for this faculty member.

If the impact on the mission of the department is sufficient to be worthy of effort, then the next step is intervention. "Successful intervention begins with identifying users and appropriate interventions based upon the patient's willingness to quit. The five major steps to intervention are the '5 A's': Ask, Advise, Assess, Assist, and Arrange" (Agency for Healthcare Research and Quality, 2012). This paper does not focus on interventions.

From a student perspective, if they find themselves in a class where the faculty member is just there to give a grade, but the student is there to learn a skillset, then the first step is for them to confirm if the class is required to graduate. If it is, then the student needs to complete the class, and make sure they do what they can to earn a good grade. If the class is an elective, even one relevant to the student's chosen career path, then we recommend not taking the elective. Instead, we recommend the course of action suggested by Friedman (2004), "you should figure out on campus who the best teachers are, be they Greek Mythology, Calculus or Russian Literature, and take whatever class they are teaching, because you learn to learn by learning to love how to learn, and you learn how to love how to learn from great teachers." All of this means that students need to be engaged with other students in their major, so that they can have their finger on the pulse of who the best

teachers are, and who are there just to give the grade.

4. DISCUSSION

The left-hand side of our 2x2 matrix is the most novel and leads to the most useful and interesting additions to the current literature, because it relates to a type of faculty that is not frequently mentioned in the literature: faculty who are there just to give a grade. A recent search of the literature (December 2023) using the term "disengaged faculty" was sparse in its results and had very little to say about teaching. Hillinger et al. (2022) discuss "faculty disengagement mechanisms that were related to their reticence towards misaligned and externally imposed policies." Huston et al. (2007) focus on how interactions amongst colleagues impacts disengagement and disillusionment. Finally, Boice (1986) examines the impact of faculty development programs have on neglected middle-aged, disillusioned, disengaged faculty. We discussed in our checked-out/checked-out quadrant that a checked-out faculty member who is just there to give a grade may not consider themselves as disillusioned in any of the ways described by the literature briefly cited above. For instance, faculty members who just give a grade to ensure that members of the university's sports teams can continue to play, as described by the New York Times (Thamel, 2006), may consider themselves to be very engaged in their university.

An additional contribution from this paper is the dissection of the types of students into those taking the class or completing the assignment just to get a grade, and those students taking the class or completing the assignment to get the skillsets needed for their future career. On the right-hand side of the 2x2 matrix, where the faculty member is wanting to teach the skillsets, this dichotomy helps faculty members to consider that there are two different types of students, potentially in class at the same time, seeking different outcomes. Knowing this, and taking it into consideration, can impact how class activities and assessments are modified. For instance, knowing that a student is there for the skillset might mean an assignment can be given outside of class, as their goal is to improve themselves and put in the time and effort to do so, be it with or without the use of ChatGPT. This is in contrast to the recommendation that faculty move to a flipped pedagogy and then use class time for assessment and activities (e.g. Van Slyke et al. 2023). With our dissection of the types of students into those taking the class or completing

the assignment, a flipped pedagogy might not be the best strategy, or might be the best strategy but only for some of the students.

5. FUTURE RESEARCH

The 2x2 matrix that we present here, and the commentary and discussion that has flowed from the four quadrants, suggests several avenues for future research. One is how we might determine whether or not a student is in class, or completing the assignment, just for a grade or is instead there in order to learn a skillset for their future career. In discussions with the university colleague that banned ChatGPT because they want to teach the skillset of writing to future lawyers (Shearer, 2023), he acknowledged that he doesn't know what the split is between these two different types of students in his class. We discussed assessing students in some way to determine this, but this brought up the issue of whether or not a student would be truthful in disclosing this information (what student is going to tell their professor they are just there for the grade?), and whether this student determination would hold up for every point of the semester, when the pressures of the class, or other internal issues such as health, or external issues such as family arise.

One is the issue of ethics and how it influences when a member of faculty or student might choose to use ChatGPT, or not. The current research in this area is very preliminary. For instance, Zhang & Zhao (2023) find that the use of ChatGPT influences the overall well-being of students and faculty. They also find that there are two types of students, those that just use ChatGPT to get the output, and those that use ChatGPT to improve their critical thinking skills to get better results. This aligns with our dialectic for students who just want to get a grade, and those who want to learn the skillsets. What is still not clear is what the antecedents are that drive these students to these different outcomes. Future research should focus on understanding drivers on both the student and faculty sides.

6. CONCLUSION

We are operating at a wonderfully interesting time when generative AI tools such as ChatGPT are changing the way we deliver education. Our 2x2 matrix shows that we need to understand our students in a different way than we currently do. Are they in class or completing the assignment just for the grade, or to learn the skillset? Similarly, we need to understand our IS faculty colleagues along the same dimensions: are they

delivering content just for the grade, or to teach the skillsets? Put together, this leads to different outcomes as to when to use ChatGPT for the faculty, and for the student.

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Appendix A: AI Policy for the syllabus, from Dr. E. Mollick, Wharton Business School

III. AI Policy

I expect you to use AI (ChatGPT and image generation tools, at a minimum), in this class. In fact, some assignments will require it. Learning to use AI is an emerging skill, and I provide tutorials in Canvas about how to use them. I am happy to meet and help with these tools during office hours or after class.

Be aware of the limits of ChatGPT:

- If you provide minimum effort prompts, you will get low quality results. You will need to refine your prompts in order to get good outcomes. This will take work.
- Don't trust anything it says. If it gives you a number or fact, assume it is wrong unless you either know the answer or can check in with another source. You will be responsible for any errors or omissions provided by the tool. It works best for topics you understand.
- AI is a tool, but one that you need to acknowledge using. Please include a paragraph at the end of any assignment that uses AI explaining what you used the AI for and what prompts you used to get the results. Failure to do so is in violation of academic honesty policies.
- Be thoughtful about when this tool is useful. Don't use it if it isn't appropriate for the case or circumstance.