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# Exploring the Affordances of Chatbots in Higher Education: A Framework for Understanding and Utilizing ChatGPT

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## ABSTRACT

This paper investigates the affordances of ChatGPT in higher education and examines how artificial intelligence (AI) technologies may reshape the learning function in higher education. This study utilizes a grounded theory approach to analyze data collected from six sessions of panel discussions with participants from US universities. The study presents findings in the form of a framework encompassing four categories of affordances that “mitigate challenges in traditional learning environments,” “enhance effective educational practices,” “transform traditional learning approaches,” and “negatively impact current effective educational practices.” The framework, including the affordances and sub-affordances, illustrates the potential impact of this technology on the learning function of higher education. This research contributes to the literature by establishing a foundation for understanding ChatGPT’s role in higher education and fostering further inquiry. Additionally, the findings can assist higher education decision-makers in formulating policies and strategies to capitalize on the opportunities presented by AI tools like ChatGPT while mitigating potential risks.

**Keywords:** Chatbot, ChatGPT, Artificial intelligence, Emerging technologies, Technology affordances, Technology-enabled learning

## 1. INTRODUCTION

Artificial intelligence (AI) and natural language processing (NLP) technologies have significantly advanced, with an unprecedented chatbot introduced by OpenAI, ChatGPT (Generative Pretrained Transformer), being one of the recent noteworthy developments that can engage in human-like conversations. OpenAI launched ChatGPT in November 2022, gaining one million users in just five days and reaching 100 million within two months after its public release, making it the fastest-growing consumer application (Hu, 2023). The extensive language model in ChatGPT is trained on massive amounts of data, can understand complex human language, and responds to questions in human-style writing. This ability concerns many in higher education because students may use it to complete their assignments and exams without fully engaging with the required educational resources. Subsequently, the tool can hurt learning goals, such as critical thinking, the ability to solve complex problems, and professional communication (Ali, 2023; King & ChatGPT,

2023; Lim et al., 2023). On the other hand, some argue that ChatGPT enables education by providing personalized learning that meets the needs of individual students (Benuyenah, 2023; Cano et al., 2023; Raman et al., 2023).

The academic community is still undecided about the proper strategy to deal with the tool, and there is a lack of consensus in academia about the potential impacts of ChatGPT on students (Dwivedi et al., 2023). Consequently, universities have adopted policies ranging from banning the tool to allowing students to use it in a controlled manner (Lim et al., 2023). Therefore, academia needs to understand the implications of ChatGPT in higher education. Subsequently, we raise our research question: “*What are the affordances of ChatGPT for the education function of higher education?*”

Affordances refer to the actions made possible by an object or technology (Gibson, 1986). In the context of technology, affordances are potential applications. For example, a smartphone’s affordances include making phone calls, sending text messages, and accessing the Internet. Similarly, the affordances of ChatGPT in higher education are the potential it

can offer in learning. Some of these potentials may be conducive to a vibrant learning environment, and some may preclude it (Dwivedi et al., 2023; Lim et al., 2023). Also, some affordances may fit the existing learning environments, and some may need a revamp to effectively fit into higher education.

Examining the affordances of ChatGPT helped us understand how they may contribute to higher education. Therefore, we collected data from panel discussions on ChatGPT and used a grounded theory approach to identify the affordance of ChatGPT for higher education (Corbin & Strauss, 1990). We analyzed data without preconceived hypotheses and searched for patterns, themes, and concepts to emerge from the data. We remained open to new insights and ensured their existing theoretical framework did not influence the analysis (Charmaz, 1983). The iterative data collection, research, and theory development helped us refine the theoretical approach, leading to a more comprehensive understanding of the subject matter. Subsequently, we developed a framework that shows four categories of affordances that ChatGPT provides for learning in higher education.

Given the potential of ChatGPT to impact higher education positively and negatively (Pavlik, 2023; Stokel-Walker, 2022; Terwiesch, 2023; Zhai, 2022), it is crucial to develop a comprehensive understanding of how it can change higher education. Subsequently, our study contributions are two-fold. First, by adopting the affordance perspective, we offer a comprehensive analysis of the different affordances of ChatGPT in higher education. Some of these affordances augment the existing learning enablers, and others, if actualized, may lead to the recreation of learning enablers or add new aspects to traditional classrooms. Subsequently, our work provides the necessary knowledge to envisage the future of higher education. Second, this work and similar studies can assist higher education decision-makers in tracking the ever-changing AI landscape and its consequences for higher education. The higher education market faces fierce competition, and major tech companies may employ AI technologies to disrupt the market and challenge traditional higher education institutions. Becoming familiar with the potential changes brings the vigilance that decision-makers need to improve foresight and create competitive strategies.

This paper's organization is as follows: Section 2 reviews the literature on the use of chatbots in education, their benefits and drawbacks, and signifies gaps that exist in the understanding of the impact of ChatGPT on higher education. Section 3 develops a research framework. Section 4 discusses the research methodology and data collection process, followed by Section 5, which discusses the findings. Section 6 concludes the paper by revising the results, elaborating on implications, discussing limitations, and proposing future research directions.

## **2. THEORETICAL BACKGROUND**

### **2.1 Literature**

Although traditional classrooms offer learners sensory richness, structured learning, and face-to-face interaction, they have limitations. For instance, they lack flexibility and can only follow a one-size-fits-all approach (Rosen & Salomon, 2007). Some classroom technologies have tried to address this limitation by offering virtual and remote learning and enhancing flexibility and accessibility (Hannay & Newvine,

2006). Nevertheless, the issue of flexibility and one-size-fits-all remains a significant challenge in higher education (Clayton et al., 2018; Rosen & Salomon, 2007). More recently, the advent of AI-enabled chatbots, especially the recent launch of ChatGPT, has initiated research on their potential to address these limitations. Academics believe that chatbot-assisted learning systems have the potential to provide personalization, instant feedback, and improved learning outcomes (Gupta & Chen, 2022). However, these technologies may introduce drawbacks, such as a lack of social interaction. Still, an appropriate strategy using such technologies could lead to successful implementation.

Chatbots, or chatting robots, are intelligent agents powered by AI and can have text-based human-like conversations with users (Gupta & Chen, 2022). Considering their significant impact on businesses and users, their deployment in various sectors is growing (Adamopoulou & Moussiades, 2020). As cost-effective and scalable solutions, chatbots excel in customer service by answering queries, resolving issues, and guiding users through service and sales processes (Nuruzzaman & Hussain, 2018). For example, in healthcare, chatbots deliver personalized health information, offer diagnoses, remind patients to take their medicine, provide emotional support, and aid medical decision-making (Adamopoulou & Moussiades, 2020). Moreover, they are used in financial systems (Beketov et al., 2018) and consulting services (Martínez-Miranda et al., 2019). They also serve as virtual personal assistants, managing scheduling, reminders, and basic writing and support services (Kimani et al., 2019).

A primary application of chatbots is in education (Adamopoulou & Moussiades, 2020), and researchers have studied how chatbots impact education from different angles. Language learning is a popular application of chatbots in education. For instance, students who study English feel more comfortable interacting with chatbots (Haristiani, 2019). Chatbots allow these learners to learn and practice (Haristiani, 2019; Haristiani et al., 2019; Marín, 2015; Ruan et al., 2019). They can augment teaching programming, physics, and chemistry (Katchapakirin & Anutariya, 2018; Pérez-Marín & Boza, 2013). In addition to their potential role in teaching specific subjects, chatbots can also customize course content based on each student's learning style (Latham et al., 2010). In addition, integrating them with learning management systems can support students regarding the course materials (Colace et al., 2018). They improve student engagement and enhance learning outcomes (Følstad et al., 2018; Winkler & Söllner, 2018). They also support self-regulated learning because they allow students to access resources and the required assistance in their preferred learning style and at their own pace (Adamopoulou & Moussiades, 2020; Gupta & Chen, 2022; Luo et al., 2022).

It is not just learning activities, as chatbots can also improve processes in the education system. For instance, the administration can use chatbots to enhance student support and help students with their questions about administrative services (Hien et al., 2018). They can also facilitate providing career counseling (D'Silva et al., 2020), provide support for student life (Peterson, 2016), and enhance diversity and equity in learning (Eicher et al., 2018). Despite the advances in chatbots and their implications for higher education, their implementation in higher education faces the barrier of the unfamiliarity of faculty members that can limit their use (Jia,

2004). Besides, they may have negative impacts on current higher education practices. For instance, they may reduce the quality of human interactions and inhibit interpersonal-skills development (Gupta & Chen, 2022), as well as raise concern for unethical use of AI in education, including issues of privacy, data security, and the potential for biased algorithms to perpetuate existing inequalities (Ungerer & Slade, 2022).

Despite the growing body of literature on how chatbots impact higher education, the literature is at its inception. Additionally, the literature still faces three gaps. First, the literature has focused chiefly on using chatbots in particular educational settings, as prior studies address how they can impact specific tasks such as tutoring or providing administrative help (c.f., Luo et al., 2022). Second, most studies focus on the potential benefits of chatbots for higher education, lacking discussions on negative impacts (Ungerer & Slade, 2022). Third, due to the limited capabilities of prior generations of chatbots, the literature does not consider the potential that new AI-enabled tools like ChatGPT 4.0 can provide (c.f., Adamopoulou & Moussiades, 2020). These gaps have resulted in the literature lacking a comprehensive framework reflecting both the benefits and drawbacks of chatbots in higher education (Dwivedi et al., 2023). Subsequently, to address these gaps, this study develops a framework that considers both the advantages and disadvantages of powerful AI chatbots, like ChatGPT, in higher education. This framework offers an in-depth comprehension of AI-powered chatbots' impact on educational experiences.

## **2.2 Affordance Theory for AI in Higher Education**

We employ the Affordance Theory to study the impact of ChatGPT on higher education. As Gibson (1986) defined, Affordance Theory examines the actions and possibilities an object or technology provides users within a specific context. In information systems (IS), the affordance perspective explores the outcomes emerging from the interplay between technology and its users (Oguz & Singh, 2017; Pozzi et al., 2014). This theory offers an integrative lens for analyzing the potential and limitations of AI-enabled tools like ChatGPT in higher education. It allows for a systematic exploration and categorization of various ways to utilize ChatGPT, and the outcome of this utilization can enhance or disrupt higher education practices. Consequently, Affordance Theory identifies both positive and negative implications of ChatGPT, facilitating an in-depth analysis.

While ChatGPT offers various affordances, their actualization depends on the implementation context and the compatibility between the actor and the action environment (DeSanctis & Poole, 1994; Gibson, 2014; Snow, 1992). Different actors may perceive unique affordances in an object; for instance, students might view ChatGPT as a convenient solution for finding assignment answers, while educators may consider it an assessment tool. Actualizing these affordances necessitates a goal-oriented actor with the required capabilities (Stoffregen, 2003). Goal orientation sets higher education apart from other contexts where people use ChatGPT. As goals are context-dependent, ChatGPT's affordances in higher education are specific to this setting. Thus, employing this theory enables researchers to comprehend the distinct impacts ChatGPT may have on higher education while accounting for the unique characteristics of such environments.

In examining the affordances seen in the natural world, Gibson (1986) proposes that people frequently want to change their surroundings with the affordances. The key idea in this proposition is that humans alter their environments, whether by highlighting the positive or downplaying the negative, to reap some benefits. How higher education has evolved by adopting various technologies aligns with this idea. It has used different generations of technology, like learning management systems, video recording and dissemination, and online classrooms, to address its shortcomings and enhance its practices in the past. Therefore, we expect higher education to find novel ways to create an altered environment using ChatGPT (c.f., DeSanctis & Poole, 1994).

## **3. RESEARCH METHODOLOGY**

### **3.1 Panel Data**

Panel discussions enable a structured conversation between invited experts who share their views and opinions on a specific topic. We collected expert opinions in panel discussion sessions and used an exploratory examination approach to analyze them (Percy et al., 2015). We chose panel discussion data for three reasons. First, a panel discussion brings a range of experts from different backgrounds. It helps capture diverse perspectives on the affordances of ChatGPT in higher education, which ensures a better understanding of the subject. Second, panel discussions engage participants in open dialogues and enable deep exploration of complex topics, especially when these topics are new. Third, panel discussions are a source of rich qualitative data for identifying themes and patterns and providing a detailed understanding of the phenomenon under study. Other researchers in information systems have also adopted collecting data from panel discussions when they study how new technologies impact behavior (Kroeze et al., 2011; Li et al., 2021; Mennecke et al., 2008).

Five-panel discussions (six sessions), which the authors could attend or access the data, were used to create the dataset for the study. These panel discussions focused on how ChatGPT and emerging AI tools may impact higher education. The data comprises 473 minutes of conversation, focusing on the impact of ChatGPT and AI tools on higher education. Table 1 provides a brief introduction to each panel discussion. We provide detailed information on participants in Appendix A.

### **3.2 Data Analysis**

We employed a grounded theory approach and went through three phases of open, axial, and selective coding to analyze the transcribed panel discussion data and categorize them into a codebook (Elo & Kyngäs, 2008; Strauss & Corbin, 1998). Three coders, the co-authors of this study, initiated the analysis by familiarizing themselves with the data. They then generated codes and assigned them to represent different concepts and categories in the open coding phase. They labeled relevant data as codes in the transcripts. This phase helped the coders identify patterns and relationships within the data. They then looked for the recurring concepts in the relevant data. They went through several rounds of categorization and data comparison to identify codes inductively and address the explorative nature of studying the new topic. They also modified and refined the codes by analyzing data from each further panel discussion. We provide an example of refining codes in Appendix B.

#	Title	Date	Duration (minutes)	Organizer	Participants		
					#	Discipline	Role
1	What might ChatGPT mean for higher education?	December 15, 2022	58	Future Trends Forum*	6	Social science and information systems	Faculties and administrators**
2	What might ChatGPT mean for higher education, continued	December 22, 2022	58	Future Trends Forum	4	Social science and information systems	Faculties and administrators**
3	ChatGPT and its Impact on Higher Education	February 22, 2023	119	San Francisco State University	6	Liberal arts	Faculties, students, and administrators
4	ChatGPT Panel Discussion	January 31, 2023	91	State University of New York	4	Philosophy and information systems	Faculties and administrators
5	ChatGPT, AI, and the Future of Higher Education	February 16, 2023	85	Johns Hopkins	4	Social science	Faculties and administrators
6	The WMU Professors Who Chat with Bots	March 28, 2023	62	Western Michigan University	4	Social science and information systems	Faculties and administrators*

\* The Future Trends Forum is a live video conversation space where Academics collaboratively explore the future of higher education.

\*\* Participating faculty members also hold administrative positions.

**Table 1. Characteristics of Data**

In the axial coding phase, coders organized the codes into broader themes, which helped them to create affordances. They also condensed codes based on the literature. They identified recurring themes by aggregating emerging codes. They interpreted panelists talking about features of technologies as affordances. For instance, “ChatGPT can provide unbiased assessment ...” talks about assessment, which is a potential feature of the technology and is an affordance.

In the last phase, selective coding, coders identified the core categories that represent the main themes (i.e., affordances and sub-affordances). They examined the relationships between the core and other categories to provide a refined understanding and develop a more coherent and integrated theory. This grounded theory process continued until we reached theoretical saturation, i.e., when no new concepts and themes emerged from the data, and the relationships between themes were well established. At this point, we developed a grounded theory that provides a detailed and coherent explanation of the impact of ChatGPT on higher education through affordances. We generated a model showing how higher education may use ChatGPT and have presented it in the Discussion section. Building on emerging findings from the three phases, we mapped the identified codes to a high-level framework showing how ChatGPT impacts higher education. Table 2 explains how we adhered to methodological data collection and analysis guidelines. Other IS researchers who study the affordances of new IT have adopted this approach (e.g., Steffen et al., 2019).

#### 4. DATA ANALYSIS AND RESULTS

Our exploratory data analysis identified four high-level affordances representing ChatGPT’s impact on higher education. We present the high-level affordances in Table 3, which provides a guideline to explore ChatGPT potentials for higher education and facilitates identifying sub-affordances and developing a more granular understanding of the impact. We

review each of these affordances and their sub-affordances in this section.

##### 4.1 Affordance of Mitigating Challenges in Traditional Learning Environments

According to our analysis, ChatGPT offers a range of sub-affordances that address challenges in traditional learning environments. Table 4 presents these sub-affordances and their respective illustrative quotes. The reader should note that these quotes are from educators. So, those discussions on how students can benefit from ChatGPT only reflect the faculty members’ understanding. Also, we focus our work on the learning aspect of higher education. Therefore, when discussing administrative tasks, we refer to supportive activities that faculty members must undertake for their classes.

One of ChatGPT’s key sub-affordances is the ability to reduce assessment challenges in higher education. As one panelist remarked, “[we can] create personalized learning plans for each student by analyzing their data ... and providing ... intelligent tutoring systems to provide ... personalized feedback and guidance.” This instant and personalized feedback fosters greater engagement and motivation among students, encouraging them to participate actively in their coursework. ChatGPT streamlines monotonous tasks, paving the way for more meaningful assignments and increasing students’ interest in course content and class requirements. Simultaneously, ChatGPT addresses diversity and inclusion, leveling the playing field by eliminating linguistic discrimination and allowing personalized learning experiences tailored to students’ unique backgrounds and needs. Furthermore, ChatGPT can improve accessibility for students with disabilities, for instance, by rewriting texts at a lower grade level for those who have difficulty reading.

Requirement	Description	Illustration
<b>Data Collection</b>		
Selection of panel discussions	We selected panel discussions based on their representativeness of the implications of ChatGPT in higher education.	Because many AI tools were initially launched in the US, we selected panel discussions involving faculty members in US universities. Subsequently, faculty members had more exposure to the tools during data collection.
The procedure of panel discussions	Panel discussions were led by open-ended questions focused on how ChatGPT impacts higher education (Schultze & Avital, 2011). This type of panel discussion helps maintain openness and enables the collection of in-depth insight into less-known phenomena. Scripted questions can limit the discussions and outcomes of the panel discussions.	Panelists in panel discussions start by introducing their familiarity with using ChatGPT and other AI tools in higher education. They then begin an open conversation to provide information about how ChatGPT impacts different dimensions of higher education.
Inclusion of multiple data sources	We included different informants and collected data across academic areas, including business, education, and art (Myers & Newman, 2007).	We collected publicly available data and documents to supplement our data sources.
Maintaining validity and reliability of data	To collect unbiased data, we were mindful of our prior experience, knowledge, and assumptions. Mindfulness helped us limit the impact of our previous knowledge about the topic on the collected data.	We avoided panel discussions with structured interview questions based on any theory. In addition, we maintained the integrity of the collected data by using word-by-word transcription for each panel discussion.
<b>Data Analysis</b>		
Triangulation of data	We used data triangulation by contrasting collected data from various panel discussions to ensure the integrity and consistency of our findings (Berg, 2009).	During the selective coding, we checked our findings with data collection sources, including panel discussions, collected documents, and publicly available data (Palvia et al., 2015, 2017).
Maintaining validity and reliability of codes	We considered two measures for the reliability and validity of our codes. First, we ensured consistency between coders (Landis & Koch, 1977). Second, we contrasted our codes with an experienced faculty member (Larsson, 1993; Wang et al., 2018).	Two coders coded the data. They contrasted the codes throughout the open coding process and iteratively revised them to ensure they had the same understanding of the data. Also, an experienced faculty member, who is not a co-author on this paper, coded half an hour of one of the panel discussions (close to 4500 words). We contrasted the results with our coding and found a few differences. We then discussed the differences and revised the codes accordingly.
Maintaining rigor and trustworthiness in our research	We adhered to the guidelines outlined by (Nowell et al., 2017) to systematize and enhance the traceability and verification of our analysis through a decision and audit trail. This approach guarantees that “another researcher with the same data, perspective, and situation could arrive at the same or comparable, but not contradictory, conclusions” (p. 3).	Data used in this study is available for reasonable requests.

**Table 2. Adherence to Methodological Requirements in Data Collection and Analysis**

Affordance Category	Examples
Mitigating Challenges in Traditional Learning Environments	Enhancing personalized learning: ChatGPT tailors content for students at different levels, promoting differentiated instruction and adaptive learning. Overcoming resource constraints: ChatGPT saves time for instructors and students, optimizing learning processes while reducing workload. Improving accessibility: ChatGPT supports students with disabilities, adapts content, and provides alternative learning materials, like graphic organizers.
Enhancing Effective Educational Practices	Encouraging deep learning: ChatGPT fosters critical thinking through guided work and content analysis, promoting meaningful engagement. Fostering creativity and collaboration: ChatGPT aids collaborative learning, idea generation, and diverse perspectives in group work. Enhancing writing abilities: ChatGPT provides personalized feedback and exposure to diverse genres and helps students refine their writing skills.
Transforming Traditional Learning Approaches	Active and lifelong learning: Emphasize student motivation and engagement to create adaptive learning environments that foster lifelong learning. Real-world issues: Integrating AI tools like ChatGPT to address disinformation, promote ethical tool use, and ensure equitable access. Innovative teaching practices: Utilize ChatGPT to incorporate diverse, interdisciplinary activities, enhance learning experiences, and support flexible teaching approaches.
Breaking Effective Educational Practices	Cheating obsession: Focusing on catching cheaters while neglecting improvements in teaching and fostering positive learning motivations. Stifling creativity: Relying on ChatGPT, limiting critical thinking, creativity, and diverse perspectives in the learning process. Unaddressed issues: Disrupting traditional teaching methods without tackling underlying student motivation and engagement problems.

**Table 3. A Framework for Four Affordances of ChatGPT for Higher Education**

Sub-affordance	Illustrative Quote
Reducing assessment challenges	“I would imagine that it [ChatGPT] would turn us to different forms of assessment that are less binary and that’s exciting yeah I think that’d probably be more engaging for the students.”
Enhancing engagement and motivation	“using ChatGPT as a tool to support student learning...creating conditions that make them want to engage in the work of our courses...some really basic suggestions when students are given a big assignment, have them spend 15 minutes in class making a plan for how they’re going to tackle that assignment.”
Overcoming resource constraints	“... the greatest constraint when it comes to helping students learn to write is not that we don’t know how to teach them, it’s not that students don’t want to write, it’s not the effort, it’s not that stuff, it’s purely one of resources time ... they have available to dedicate to their studies but also instructor time.”
Addressing diversity and inclusion issues	“[We should] fight for social justice by valuing linguistic diversity celebrating students diverse ways with words ... [we should also] give students access to linguistic tools and to the codes of power [even] beyond the classroom to make the world a welcoming place for all kinds of writers ... especially those whose English doesn’t conform to the machine.”
Serving as an extra set of hands for educators	“A lot of people talking about individualizing instruction and who has time for that and ... how could ChatGPT be used as an extra set of hands in the classroom to, you know, provide some of that one-on-one assistance to students and... neurodiverse individuals how this might be a tool to help them. “
Streamlining administrative tasks for efficiency and convenience	“I can have it summarize that transcript from the YouTube video. If I want a reading piece to accompany the video, I can have it pull vocabulary words out of it... Those are all things that would have taken me hours and hours to do before, and so I was just hesitant to do it.”

**Table 4. Sub-Affordances of Affordance 1 with Sample Illustrative Quotes**

Additionally, ChatGPT serves as an “extra set of hands” for educators, assisting in individualizing instruction and providing one-on-one support for students, including neurodiverse students. Panelists believe they can use ChatGPT to accommodate non-traditional learners, such as those working full-time, and help them learn more efficiently. An educator shared their perspective, stating, “this is exactly what I plan to

do with them... to help them figure out how does this tool help you not to save time so much but how to help you learn better.” Additionally, ChatGPT can streamline administrative tasks, enabling educators to save time by delegating tasks such as summarizing transcripts or managing grade books. By automating these responsibilities, educators can devote more time to teaching and facilitating meaningful learning

experiences for their students. One instructor said, “I don’t have to sit there with my grade book ... I am happy to pass that off to a machine.”

#### **4.2 Affordance of Enhancing Effective Educational Practices**

Based on our analysis, the affordance of enhancing effective educational practice has six sub-affordances, presented in Table 5, along with their illustrative quotes.

Self-directed and personalized learning is a crucial sub-affordance of ChatGPT, enabling differentiated instruction and adaptive learning. One educator stated, “I can use this technology to challenge students at their own level and give them feedback that is just-in-time and personalized.” As another educator explained, this personalized approach is further supported by question-and-answer (Q&A) style training, “I can use this technology to do a Q&A style training for students about a topic.” Encouraging deep learning through critical thinking exercises is another aspect of ChatGPT’s affordance. One educator noted, “processing going back and forth with [ChatGPT] is going to be very informative.” Additionally, as one educator commented, “it has the potential to facilitate collaborative learning” and inspire new research questions and outlines. Therefore, fostering creativity and collaboration is critical to ChatGPT’s potential in higher education.

Enhancing students’ writing skills is another sub-affordance. The technology enables students to “create [an] essay and then have ChatGPT check it to give ... feedback,” allowing them to practice and improve their writing before submitting assignments. Offering personalized assessment mechanisms is also a valuable aspect of ChatGPT. One educator shared their experience using ChatGPT to receive feedback on their writing, saying it “gave me excellent feedback like this is the type of feedback that I would give to a student.” This ability to provide nuanced and personalized assessments can help create more effective learning experiences. Finally, engaging students with real-world issues is a vital sub-affordance of ChatGPT. One educator argued, “if we’re not incorporating these tools and these capabilities into the classroom, we’re going to be doing a disservice to the students.”

#### **4.3 Affordance of Transforming Traditional Learning Approaches**

Our analysis shows that ChatGPT can transform traditional learning approaches through five sub-affordances. Table 6 presents the list of these sub-affordances and their respective illustrative quotes. By embracing the affordances of transforming traditional learning approaches through ChatGPT, higher education institutions can create more engaging and meaningful learning experiences for students while preparing them for success in an ever-evolving job market. One panelist emphasized the importance of student motivation, “thinking about what motivates students in a positive way is a more powerful way to approach ChatGPT in our teaching.” By incorporating AI tools in the classroom, educators can ensure students develop the skills necessary to succeed in a technologically driven job market. One panelist noted, “if you want to be competitive in the job market, you need to know how to properly work with AI because that’s just a new reality.”

ChatGPT allows educators to incorporate real-world technologies and knowledge from outside their specific areas of expertise into their courses. AI is “the ability ... for people to leave the silo of what they teach and incorporate things from outside that silo has just gotten way easier.” ChatGPT can also shift the focus of assignments from small-scale tasks to more significant, interdisciplinary projects requiring high-level critical thinking. The integration of ChatGPT into higher education also prompts a reevaluation of faculty value creation, urging educators to focus on cultivating meaningful relationships with learners. As AI technology advances, the role of educators is shifting from imparting facts and evaluating learning to nurturing meaningful connections with students. One panelist urged faculty members to consider “how human and important and valuable can you make your relationships with the learners so that you are doing that skill better than an advanced technology like ChatGPT that can mimic a very fake relationship.”

#### **4.4 Affordance of Breaking Effective Educational Practices**

Our analysis shows that ChatGPT provides several sub-affordances that can negatively impact learning. We present these sub-affordances and their respective illustrative quotes in Table 7.

As one panelist pointed out, “My perception of it is that ChatGPT is no different or can be no different than somebody using an essay mill,” raising concerns about the potential misuse of AI technology and its impact on academic honesty. Simultaneously, using ChatGPT may create a tunnel vision that limits the human tendency to explore options outside of ChatGPT’s suggestions, neglecting human creativity and voice in learning. One panelist highlighted the risks, stating, “There’s a risk that the use of AI could stifle creativity and individuality... there’s a risk that ChatGPT could perpetuate bias.” Other panelists noted the potential for AI to reinforce biases and discrimination in education, “ChatGPT could be used to reinforce biases and discrimination towards ...students from different cultural backgrounds,” exacerbating the learning divide between those with high and low access to technology. Moreover, implementing AI in higher education can limit human interaction within learning environments, negatively impacting the learning experience.

Disrupting traditional learning methods can positively and negatively affect the educational landscape. While some panelists argue that ChatGPT has the potential to change teaching approaches for the better, others express concern that the focus on catching students cheating with ChatGPT can create conditions that make students more likely to engage in undesirable behaviors. A panelist explained, “When we focus so much on catching students, on punishing students, we can really create the conditions that will make students more likely to engage in the behaviors that we don’t want to see.” Adapting to changing educational needs is essential for institutions and educators. Still, it may also present challenges, such as the accessibility of AI technologies like ChatGPT for different languages and the potential for the digital divide between various nations to widen the learning divide. A panelist remarked, “Tools like ChatGPT will further accelerate a learning divide for those who don’t have access... and so if you still don’t have Internet, yes, the divide’s worse.” Finally, as one panelist noted, “It raises lots of difficulties for how we can calibrate our trust in a tool.” The limitations of language



models, like ChatGPT, can pose challenges in using them effectively in education.

Sub-Affordance	Illustrative Quote
Providing self-directed and personalized learning	"I've been saying for at least a decade, maybe two, that um, one of the best ways we can teach, especially some of the more technical subjects like math, is to personalize the content to some of the interests of the students."
Encouraging deep learning through critical thinking exercises	"Having students do some guided work with ChatGPT ... having them analyze that in terms of how ... this look[s] different from what I would produce in response to this same prompt ... can be really powerful for students and can actually engage them into meaningful thinking around tools like this."
Fostering creativity and collaboration among students	"... we asked students on the first day of class they come up with some ideas and we all see them struggle right they sit there with an empty piece of papers ... why not just go to check GPT and say like I need five new ideas on digital healthcare but give me some ... so there's already some progress but even better you might look at these ideas and feel like well ... I can do better than that and now you started jumping into the water and you started being creative ... so I think it's a way of jump-starting [creativity and] prompting it."
Enhancing students' writing skills	"... you create your essay and then have ChatGPT check it to give you feedback and then show it to me ... before it even gets to me, they can go through and do several practice essays on their own with ChatGPT, and then now we're going to do this assignment, so there's so many different levels and possibilities."
Offering personalized assessment mechanisms	"I'm writing this other book ... I took one of the paragraphs and I gave it to ChatGPT. I said what do you think about my paragraph, and ChatGPT look at it and it gave me like excellent feedback ... This is the type of feedback that I would give to a student, something that got me thinking, wow, I could use ChatGPT to provide feedback to my students."
Engaging students with real-world issues	"[Making our students familiar with pros and cons of the system] is a way that we can actually arm our students to go out into a world that is right with disinformation and misinformation."

**Table 5. Sub-Affordances of Affordance 2 with Sample Illustrative Quotes**

Sub-Affordance	Illustrative Quote
Promoting active and lifelong learning	"Thinking about what motivates students in a positive way is a more powerful way to approach ChatGPT in our teaching." "... learning is lifelong. It doesn't end. It doesn't mean if you have a degree that you've become an expert. You have to keep coming back [to ChatGPT] and revisiting this and opening ... to new ways and new approaches."
Introducing new learning experiences	"[I think] it can really disrupt a student's education when learning their math facts and deploying their math facts in the class." "It gives the opportunity to students to search more and learn more that what we talk in class ... and they can adjust their learning based on where they [see themselves] in future."
Encouraging innovative teaching practices	"I can use this technology to ... incorporate more real-world technologies that I know nothing about into my classes ... the ability now suddenly for people to leave the silo of what they teach and incorporate things from outside that silo has just gotten way, way easier."
Promoting flexible teaching approaches	"When we develop assignments, we try to keep them deliberately sort of small in scope so that the student isn't trying to get their head around many new things, um, but I think if they are going to use ChatGPT to do smaller tasks, then we can shift away from this small scope programming assignments and start to assign larger potentially even interdisciplinary programming projects where now they really have to apply themselves."
Reevaluating faculty value creation in higher education	"... most of what you do probably in your day-to-day is really emerging as not that valuable ... probably almost all of it will need to change, and in fact, your role is going to be strongly questioned. So if you're looking at what you should be doing differently in your role, I think really, at the end of the day, you're looking at answering the question what can you do better than the most advanced technology, and it won't be imparting facts, and it won't be presenting curriculum, and it won't be evaluating learning, and it won't be preventing cheating and all those things ... what it is going to be is how human and important and valuable can you make your relationships with the learners."

**Table 6. Sub-Affordances of Affordance 3 with Sample Illustrative Quotes**

Sub-Affordance	Illustrative Quote
Undermining academic integrity and ethics	“[We will] encounter instances of students who use AI to support the work they’re doing in an assignment and they don’t cite that right, or they actually use AI to do part of the work of the assignment, and they don’t acknowledge that ...”
Neglecting human creativity and voice in learning	“No technology is neutral, but then this epistemic injustice element of we know it’s been trained on diverse data, but where is it going with all of that? What amounts of knowledge does it have no idea of, and if we keep using it, how is that going to potentially limit how we think?”
Obsoleting today’s crucial skills	“When I was at school, we had classes for handwriting, but I barely use my handwriting skills now. A similar thing will happen to writing skills, ... soon machines will write for us.”
Disrupting traditional learning methods	“Writing is both the expression of an idea and the exploration of an idea. The act of writing causes the writer to process the material both consciously and subconsciously.”
Limiting human interaction within learning environments	“Partly it’s a technological answer, but it’s also partly about [an intermediary] the relationship between instructor and students.”
Reinforcing biases and discrimination in education	“ChatGPT could ... reinforce biases and discrimination towards international students or students from different cultural backgrounds.”
Acceleration of learning divide	“Tools like ChatGPT will further accelerate a learning divide for those who don’t have access... and so if you still don’t have internet, yes the divide’s worse.”
Limitations of language models	“It produces these answers that are just remarkably fluent, remarkably grammatically written, and persuasive, but it’s very hard to know when it’s completely hallucinating and when it’s telling you something totally sensible if you don’t already know the answer independent of ChatGPT.”

Table 7. Sub-Affordances of Affordance 4 with Sample Illustrative Quotes

## 5. DISCUSSION

Two main camps exist among panel participants, offering differing perspectives on the potential of ChatGPT. The first camp is more skeptical, arguing that while AI has the potential to be a powerful tool, it has not yet reached the level of sophistication required to affect higher education profoundly. This group points to human-like language and thought limitations in AI systems, which have been proclaimed the precursors to artificial general intelligence (AGI) and believes that we are still far from AGI. They argue that these AI tools may have practical applications in domains such as computer programming or poetry composition, but they differ significantly from human reasoning and language use. Therefore, these systems are flawed and not easily fixed. They warn that we should be cautious in interpreting hyperbolic headlines and deciding about the fate of higher education based on the news.

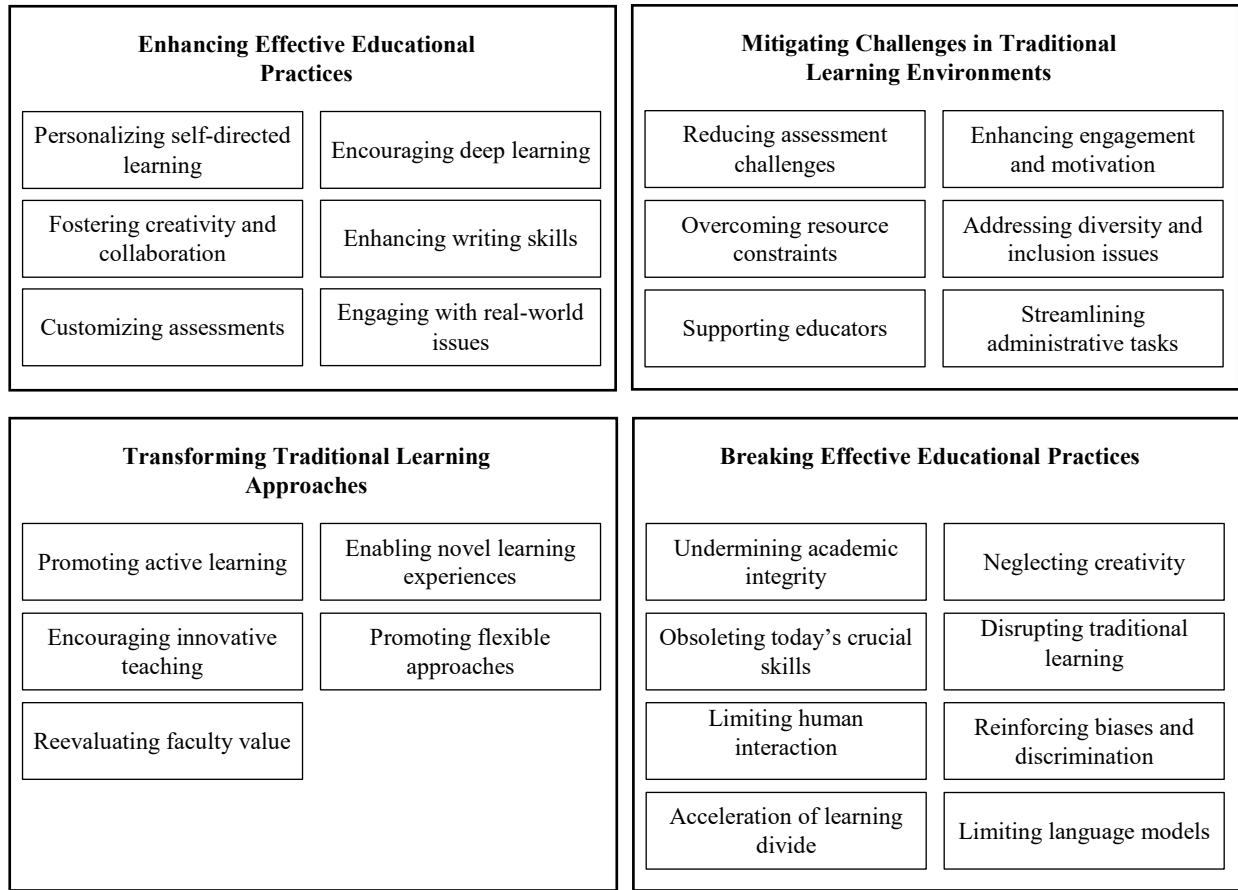
The second camp adopted a more pragmatic stance. They indicate that AI is here to stay. The immense investment in AI systems will gradually address its weaknesses and make it a powerful tool that can challenge the current stance of higher education. This group believes that AI advancements will continue to shape the educational landscape, and it is essential to identify and address the challenges and opportunities they present. They acknowledged that AI systems, including ChatGPT, have pros and cons but emphasized the need for higher education to adapt and prepare for the inevitable integration of AI technologies. They even believe that higher education can already see the impact of the system as students use it for writing and taking tests.

After a thorough analysis of panel discussions using various coding approaches, we found that our framework, presented in Table 3, conforms with the narrative of the members of both

camp. While the skeptics’ arguments primarily focus on the affordance of “breaking effective educational practices,” the pragmatists’ arguments are more diverse and concern all affordances. Accordingly, we present a more detailed view of the affordances of AI for higher education frameworks in Figure 1. Informed by the results of the analysis, we agree that AI technology has flaws; however, we have also witnessed its impact on our students. Therefore, it is essential to develop measures for mitigating its potential risks, including academic integrity concerns, biases, and the possible loss of human creativity and interaction in learning environments. We also believe in the importance of developing a practical approach for harnessing the current capabilities of AI, such as personalizing learning experiences, enhancing accessibility, and promoting innovative teaching practices.

### 5.1 Contribution to Research

The proposed framework in this research contributes to the literature in two ways. First, it provides a robust foundation for other information systems and educational technology researchers to continue investigating the impact of AI on higher education. AI in education is relatively new and few relevant studies address how ChatGPT may impact higher education. While there are insightful studies on how chatbots or other AI tools influence education (Adamopoulou & Moussiades, 2020), these studies are limited and often siloed in different disciplines. Our study presents a cohesive framework of the affordances of ChatGPT in higher education. It provides a more holistic understanding of the subject matter, a comprehensive view, and an integrative basis. Therefore, it transcends disciplinary boundaries and facilitates interdisciplinary dialogues, leading to collaboration between researchers from different disciplines and extending our understanding of AI’s role in higher education.



**Figure 1. Framework for Affordances of AI for Higher Education**

Second, our work provides direction for additional inquiry. Our proposed framework describes how ChatGPT and similar AI tools may change higher education. While research on technology-enabled transformation in higher education is abundant and continuously growing, the recent introduction of AI tools like ChatGPT and our understanding of how AI can play in this area are still limited (Dwivedi et al., 2023). Therefore, our framework can guide researchers toward areas that demand further investigation. The affordances of AI for higher education encompass a wide range of positive and negative potential impacts. These affordances have varying degrees of influence, ranging from incremental improvements to radical transformations. Our work shows this diversity and establishes the importance of understanding why outcomes may differ across users and applications. This understanding helps researchers identify the underlying reasons for apparent contradictions in the effects of AI applications.

**5.2 Contribution to Practice**

Our findings can serve as input for higher-education decision-makers to develop policies and strategies for ChatGPT. By incorporating them into their strategic planning processes, they can benefit significantly from our findings, allowing them to capitalize on the opportunities presented by AI tools while avoiding potential negative implications. The developed

affordances and identified challenges associated with AI tools inform decision-makers choices in revamping higher education. The framework enables proactive strategies to benefit from AI tools in enhancing higher education while mitigating AI's negative impact. Our work also emphasizes establishing clear guidelines, policies, and monitoring mechanisms to ensure that all stakeholders use ChatGPT ethically and responsibly.

Studies like this research help higher-education decision-makers monitor how AI impacts education and stay informed about the evolving AI landscape and its implications for higher education. This monitoring and awareness are essential because of the intense competition in the higher education market. For example, big tech companies can leverage AI technologies as potential rivals to traditional higher-education institutions. This awareness enables better anticipation and development of competitive response plans. One of the panelists outlines the importance of studies like this paper by noting that “ChatGPT isn’t giving us any new information about the need to modernize higher education, but it is probably taking away the delusion that those changes are still optional.”

**5.3 Limitations and Future Research**

The present research has several limitations that offer opportunities for future investigation. The first limitation is related to the scope of the study. The collected data can only

reflect the understanding of faculty members, which may introduce bias. For instance, AI tools could eventually make writing a preferential skill rather than a required one. However, faculty members participating in our panels focused on finding ways to protect students from the negative impacts of ChatGPT on the erosion of their writing skills. Additionally, our panelists had assumptions about how students engage with ChatGPT, which may not be accurate. Therefore, future studies can reinforce our framework (Figure 1) by incorporating insights from students, administrators, technology strategists, etc. Students' perspectives and how they utilize ChatGPT are vital for understanding how ChatGPT impacts their learning experiences.

Another scope-related limitation of our work is its focus on the training function of higher education, overlooking the research and administrative aspects. Future studies should explore how AI tools impact these dimensions. Additionally, data collection limits the scope of the study to the understanding of faculty members in US universities from how ChatGPT may change the future of higher education. Future studies could also benefit from collecting data from faculties and students outside the US higher education system. Additionally, investigating the potential impacts of ChatGPT on higher education institutions in other countries would provide valuable insights into cross-cultural differences and similarities.

Second, ChatGPT may have implications that affect society at large. For instance, it could impact the privacy and security of students and faculty members. Since the scope of these effects may extend beyond individual students, our work does not delve into broader societal impacts. Future research may examine how AI tools like ChatGPT affect society, including policy implications, legal considerations, and ethical concerns.

Third, ChatGPT is a relatively new technology, so its impact on higher education remains unclear. Future research should consider the contextual factors influencing ChatGPT's affordances, including the higher education environment and student and faculty characteristics. Exploring how actors and technology interact in the context of the environment and shape the evolution of ChatGPT's use and its effects on higher education provides a more nuanced understanding of AI's impact on academia.

Fourth, one inherent limitation of our study lies in its design to offer a high-level view of the affordances and sub-affordances of ChatGPT. While we aimed to provide an overview, we did not delve into each sub-affordance in extensive detail. Moreover, our broad generalization across higher education disciplines assumes a uniform impact of AI tools like ChatGPT. Recognizing that different academic fields, such as IS compared to social sciences, might experience and perceive AI's integration differently, there is a need for a more granular exploration. Future research should not only probe more deeply into the specifics of each sub-affordance and its implications for teaching, learning, and research but also discern the potential varied impacts across academic disciplines. Such investigations would significantly enrich our understanding, offering a more comprehensive and nuanced perspective on how AI tools like ChatGPT can shape the future of higher education.

Finally, the limitations associated with our lack of focus on actualizing the identified affordances are notable. Each identified affordance and sub-affordance, presented in Figure 1, are the potentials ChatGPT provides for higher education

actors. Nevertheless, these affordances are possibilities, and environmental and technological factors impact their actualization. Future studies can focus on understanding the factors that may lead to actualizing these factors by investigating the technology features and the characteristics of the higher education environment.

## 6. CONCLUSION

AI tools enhance effective educational practices through personalized learning, critical thinking exercises, fostering creativity and collaboration, and engaging students with real-world issues. This study uses an interpretive approach to analyze panel discussion data on participants' experiences and perceptions of AI and ChatGPT-assisted learning in higher education. Our findings show that AI tools offer various affordances that encompass both positive and negative potential impacts. These affordances have varying degrees of influence, ranging from incremental improvements to radical transformations. However, they may also present negative affordances, such as undermining academic integrity, neglecting human creativity, and reinforcing biases.

The framework and identified affordances presented in this study are far from final. That is because many of these affordances are yet to be actualized in the context of higher education. Nevertheless, our framework provides a starting point for future research, enabling scholars to systematically investigate the diverse affordances of chatbots like ChatGPT and their implications for teaching and learning in higher education. Subsequently, information systems and educational technology scholars may develop a new understanding of how AI may impact higher education.

The panel discussions illuminated the contrasting perspectives on the future of AI in higher education. While one camp expressed skepticism about the true potential of AI to revolutionize education, the other group advocated for a more practical approach that acknowledges the ongoing influence of AI and the need to adapt and prepare for its increasing impact. It is crucial to continue engaging in these critical discussions as AI technologies advance to ensure that the integration of AI into higher education is both practical and ethical.

We hope that future studies will find our findings helpful as they continue to investigate the future of higher education under the influence of new developments in AI.

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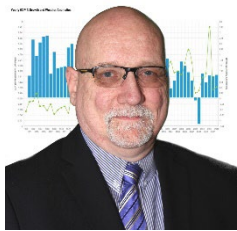
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**Michael Gendron** has over 45 years of industry and academic



experience in information systems. He has held positions such as Programmer/Analyst, Director of IS for a software development company, CIO for a large health maintenance organization, and research analyst for a state health department. He holds his Ph.D. in Information Science with

specializations in Information Decision Systems and Healthcare Policy and Management from the State University of New York at Albany. He is Professor and Chair of Management Information Systems at Central Connecticut State University.

APPENDICES

Appendix A. Detailed Information About Panel Participants

No	Title	Date	Duration (minutes)	Organizer	Participants		
					#	Discipline	Role
1	What might ChatGPT mean for higher education?	December 15, 2022	58	Future Trends Forum	6	Social science and information systems	Faculties and administrators*
2	What might ChatGPT mean for higher education, continued	December 22, 2022	58	Future Trends Forum	4	Social science and information systems	Faculties and administrators*
3	ChatGPT and its Impact on Higher Education	February 22, 2023	119	San Francisco State University	6	Liberal arts	Faculties, students, and administrators
4	ChatGPT Panel Discussion	January 31, 2023	91	State University of New York	4	Philosophy and information systems	Faculties and administrators
5	ChatGPT, AI, and the Future of Higher Education	February 16, 2023	85	Johns Hopkins	4	Social science	Faculties and administrators
6	The WMU Professors Who Chat with Bots	March 28, 2023	62	Western Michigan University	4	Social science and information systems	Faculties and administrators*

\* Participating faculty members also hold administrative positions

Table A1. Characteristics of Data

Name	Position	Description
Bryan Alexander MODERATOR	Faculty	A senior scholar and teaches graduate seminars Georgetown University
Brent A. Anders	Faculty & Administration	American University of Armenia Director of Institutional Research and Assessment PhD in Education (focus in online instruction and adult learning)
Rob Fentress	Administration	Virginia Tech Web Accessibility Solutions Designer, Instructional Designer
Philip Lingard	Administration	Founder, Was a consultant at London School of Commerce International Education Investment and Accreditation
John Warner	-	College of Charleston, Department of English (Website) Affiliate Professor, writer, consultant
Jess Stahl	Administration	Northwest Commission On Colleges and Universities Vice President Data Science & Analytics Doctor of Behavioral Health
Anne Fensie	Faculty	University of Maine Doctoral Candidate Adjunct Professor of Computer Science

Table A2. Participants of Panel #1

Name	Position	Description
Bryan Alexander MODERATOR	Faculty	A senior scholar and teaches graduate seminars Georgetown University
Barry Burkett	Administration	Sikanai Co-founder, CEO Instructional designer, Small business consultant
Caroline Coward	Administration	NASA Jet Propulsion Laboratory Library Group Supervisor, Librarian
Lee Skallerup Bessette	Administration	Georgetown University Assistant Director for Digital Learning



Brent A. Anders	Faculty & Administration	American University of Armenia Director of Institutional Research and Assessment PhD in Education (focus on online instruction and adult learning)
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**Table A3. Participants of Panel #2**

Name	Position	Description
Anastasia Smirnova MODERATOR	Faculty	SF State English Language and Literature Associate Professor
Anagha Kulkarni	Faculty	SF State Computer Science Associate Professor
Jennifer Traino	Faculty	SF State English Language and Literature Professor
Cristina Ruotolo	Faculty & Administration	SF State Humanities and Comparative & World Literature Professor and Department Chair
Carlos Montemayor	Faculty	SF State Philosophy Professor
Mikey Pagan	Student	SF State Comparative Literature Student
Eeshan Kumar	Student	SF State Philosophy Student

Held online by the College of Liberal & Creative Arts at San Francisco State University

**Table A4. Participants of Panel #3**

Name	Position	Description
Robert Griffin MODERATOR	Administration	Dean SUNY Albany
James Hender	Faculty & Administration	Rensselaer Polytechnic Institute Tetherless World Senior Constellation Professor of Computer, Web, and Cognitive Science and Director of the Future of Computing Institute
Billie Franchini	Administration	Director The Institute of Teaching, Learning and Academic Leadership at UAlbany
Jason D'Cruz	Faculty	Associate Professor Philosophy Department at UAlbany
Brian Nussbaum	Faculty	Associate Professor College of Emergency Preparedness, Homeland Security & Cybersecurity at UAlbany

Held in-person and online at the College of Emergency Preparedness, Homeland Security and Cybersecurity at the University at Albany SUNY

**Table A5. Participants of Panel #4**

Name	Position	Description
Tinglong Dai MODERATOR	Faculty	Professor of Operations Management Business Analytics, Marketing, and Health John Hopkins University
Pete Lawson	Administration	Librarian for Data and Visualization John Hopkins University
Christian Terwiesch	Faculty & Administration	Professor, Chair of Operations, Information and Decisions Department University of Pennsylvania
Jared Kaplan	Faculty	Anthropic - Co-founder Johns Hopkins University – Associate Professor (Physics and Astronomy)
Jenna Frye	Faculty	Senior Lecturer (Center for Leadership Education) Johns Hopkins University
Tom Lippincott	Faculty & Administration	Director (Center for Digital Humanities) Assistant Research Professor Johns Hopkins University

Held at the College of Emergency Preparedness, Homeland Security and Cybersecurity at the University at Albany SUNY

**Table A6. Participants of Panel #5**

Name	Position	Description
Gwen Athene Tarbox	Administration	Director, WMUx Office of Faculty Development and Professor of English
Sara Nelson	Administration	Assistant vice president for strategic initiatives, Office of the Provost, and Vice President for Academic Affairs
Kuanchin (KC) Chen	Faculty	Professor in the WMU Haworth College of Business
Autumn Edwards	Faculty	Professor in the WMU School of Communication
Chad Edwards	Faculty	Professor in the WMU School of Communication
Brian Gogan	Faculty	Associate professor, Department of English
David Paul	Faculty & Administration	Department of Philosophy

Held by Western Michigan University (WMU) School of Communication

**Table A7. Participants of Panel #6**

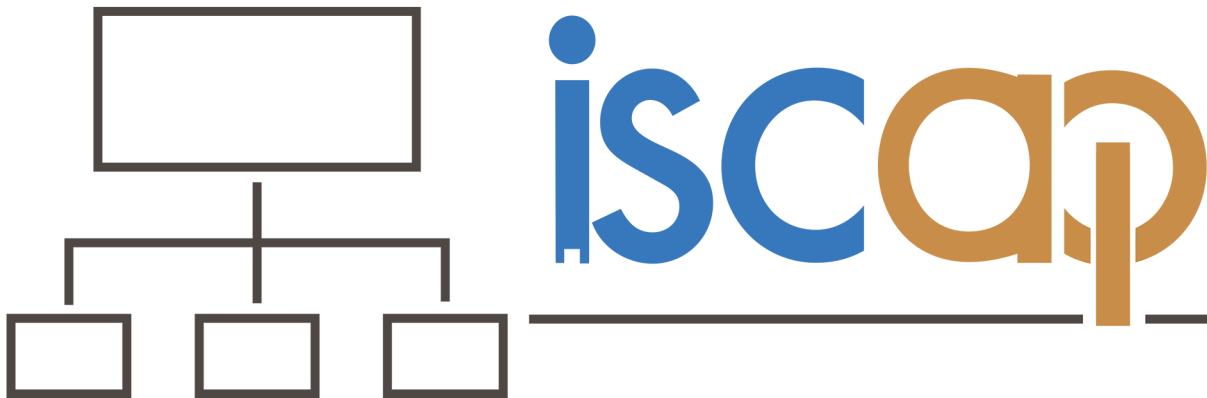
**Appendix B. Coding Example**

We refined initial codes and themes after several rounds of coding and following the contribution of an experienced faculty member. The following table provides an example of codes mainly related to parts of affordances 1 and 2.

Initial Codes	Initial Themes	→	Refined Codes	Refined Themes
Essay writing assistance	Chat GPT is a tool to help students write essays and generate outlines.	→	Writing Aid	Providing self-directed and personalized learning
Outline generation	Chat GPT is a tool to help students write essays and generate outlines.	→	Outline creation	Providing self-directed and personalized learning
Writing support	Chat GPT is a tool to help students write essays and generate outlines.	→	Writing Aid	Providing self-directed and personalized learning
Personalizing Education and Certification	Personalization in Learning and Certification	→	Edu Personalization	Providing self-directed and personalized learning
Accreditation process	Accreditation process and the need to adapt skills taught to students	→	Fast-Track Learning	Providing self-directed and personalized learning
Lack of flexibility in traditional classrooms	Availability of resources	→	Flexible learning	Overcoming resource constraints
Limited access to learning resources	Overcoming constraints	→	Limited Resources	Overcoming resource constraints
Assisting ESL Writers	Improving Learning Outcomes	→	Linguistic support	Addressing diversity and inclusion issues
Assisting Early Learners	Availability of resources	→	Early learner support	Providing self-directed and personalized learning
Chrome plug-in for displaying ChatGPT responses	Use of technology to enhance differentiated instruction	→	Q&A assistance	Providing self-directed and personalized learning
ChatGPT can summarize transcripts, pull vocabulary words, and create graphic organizers	Use of technology to support special education students	→	Accessible materials	Addressing diversity and inclusion issues
ChatGPT can rewrite texts at lower grade levels	Potential of technology to decrease workload for teachers	→	Accessible materials	Addressing diversity and inclusion issues
ChatGPT can generate scripts for plays and other classroom activities	Potential of technology to decrease workload for teachers	→	Material development	Serving as an extra set of hands for educators
ChatGPT can decrease workload for teachers	Potential of technology to decrease workload for teachers	→	Workload reduction	Serving as an extra set of hands for educators
Access to diverse perspectives	Outdated Curriculum and Teaching Methods	→	Diverse learning	Addressing diversity and inclusion issues
Writing Assistance	ChatGPT as a Writing Tool	→	Writing Aid	Providing self-directed and personalized learning
Personalizing Education	Personalization and Adaptation in Learning	→	Edu Personalization	Providing self-directed and personalized learning
Providing tailored learning pathways and resources	Enabling self-directed and personalized learning:	→	Custom learning	Providing self-directed and personalized learning
Facilitating student autonomy and ownership of learning	Enabling self-directed and personalized learning:	→	Flexible learning	Providing self-directed and personalized learning
Supporting ongoing feedback and reflection	Enabling self-directed and personalized learning:	→	Continuous feedback	Serving as an extra set of hands for educators
Formulaic Rubrics	Enabling self-directed and personalized learning:	→	Evaluation materials development	Serving as an extra set of hands for educators
Need for Nuanced Rubrics	Enabling self-directed and personalized learning:	→	Evaluation materials development	Serving as an extra set of hands for educators

Initial Codes	Initial Themes	→	Refined Codes	Refined Themes
Supporting students with different learning styles	Assistance and Support	→	Flexible learning	Providing self-directed and personalized learning
Facilitating communication between students with different linguistic backgrounds	Assistance and Support	→	Linguistic support	Addressing diversity and inclusion issues
Encouraging and supporting diversity in curriculum and content	Outdated Curriculum and Teaching Methods	→	Diverse curriculum	Overcoming resource constraints

## INFORMATION SYSTEMS & COMPUTING ACADEMIC PROFESSIONALS



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