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State of student perceptions of AI (circa 2024) in the United States

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Abstract

Artificial intelligence (AI) as a computing concept has been labored by researchers and industry professionals for over 70 years although it has really gained notice, popularity, and mass adoption in the last four. AI has progressed from an abstract concept constrained by the limits of computing processing to being used in everyday life almost without notice. Like many other industries, academia has been aware of and has studied AI yet was never really prepared for its integration. It was not until the introduction of ChatGPT in 2022 that universities began to see an impact and drafted policies regarding use. This study seeks to expand previous research by reporting recent survey results on college student perceptions and use of AI. The results from the survey were then analyzed to calculate the potential implications for integrating AI into university courses. The results of the study provide validation by demonstrating students are open and curious about the use of AI and therefore may be open to curriculum changes and while there are still ethical concerns, they seem to overshadow the negative.

Keywords: artificial intelligence (AI), generative artificial intelligence, AI applications, ChatGPT, perceptions

Introduction

The term and concepts of artificial intelligence (AI) have been around for close to 100 years depending on the reference. One rudimentary explanation of artificial intelligence is the computer's ability to process information just like humans if not better. This explanation can evoke terror in the uniformed as they have visions of robots and computers running the world. For example, some people consider the first introductory AI concept to be intelligent robots such as *Maria in Metropolis* or the *Tin Man* in the *Wizard of Oz*, which were films released respectively in 1927 and 1939 (Anyoha, 2017). Others consider the birth of AI back to the 1950s when John McCarthy organized a two-month workshop at Dartmouth College in the USA. In the workshop proposal, McCarthy used the term artificial intelligence for the first time in 1956 (Zawacki-Richte et al., 2019; Russel & Norvig, 2010, p. 17).

Many often point to the work of Alan Turing in 1950 as the real birth of concepts and applications in AI; Turing introduced his promising vision of a 'thinking machine' in 1950. AI research has advanced in many different fields and generated an increasing body of literature (Zhang & Aslan, 2021). For example, Clancy et al. (1979), through the Defense Advanced Research Projects Agency (DARPA), assembled a large handbook of graduate research on AI ranging from topics like natural language processing to speech recognition, AI programming & expert systems, AI applications in chemistry, medicine, and education.

Clancy et al. (1979) also investigated robots and documents creations such as SOPHIE (a sophistical instructional environment). Simmons and Happell (1988) provided a collection of artificial intelligence definitions. Kaplan and Haelein (2019) used a series of case studies to provide a framework to help organizations consider internal and external implications of AI. Kurzweil (1985) pontificated about the use AI and predicted that it would be ubiquitous by the end of the 20th century and provided clarification when it did not hold exactly as he predicted (Kapor & Kurzweil, 2002).

Even today, the term "artificial intelligence (AI)" is a broad term and inherently difficult to define as it continues to evolve, the crux of the definition refers to the ability of a digital machine to perform tasks commonly associated with intelligent beings, and its associated technologies are divided into various branches, such as computer vision, speech, machine learning, big data, and natural language processing (Wang, 2019; Chiu, 2021; Chiu et al., 2022; Xia et al., 2022).

New technologies continually shape educational practice (Rodway & Schepam, 2023) and entire new field of research regarding the study, predictions, and use of artificial intelligence has evolved and referred to as AIED or artificial intelligence education. This was an important leap as it started the process of moving away from an ITS paradigm domain to a new pedagogy that was a merging of IT, AI, and Education (Andrissen & Jacobijn, 1999). Hence, AIED refers to the use of AI (Artificial Intelligence) technologies or application programs in educational settings to facilitate teaching, learning, or decision making.

Research into adoption of Artificial Intelligence Educational (AIED) technologies by higher education institutions (HEIs) has predicted the industry to expand substantially including significant transformation in computer assisted education (Hwang et al., 2020; Luan et al., 2020; Luckin et al., 2016). This expansion has been backed by scientific and financial research companies such as Grandview Research Associates and Bloomberg. Grandview's reports that the AIED application market had a value of $1.8 billion in 2021 (Figure 1) and Bloomberg estimates the AI Educational market will expand to $25 billion by 2032 (Figure 2) and the overall global generative AI market to be $1.3 trillion (Figure 3).

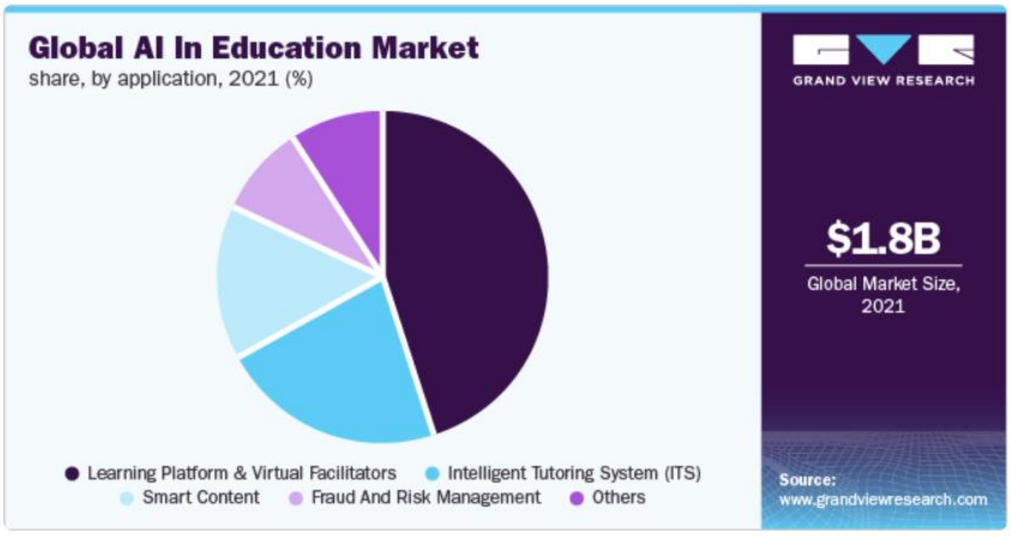
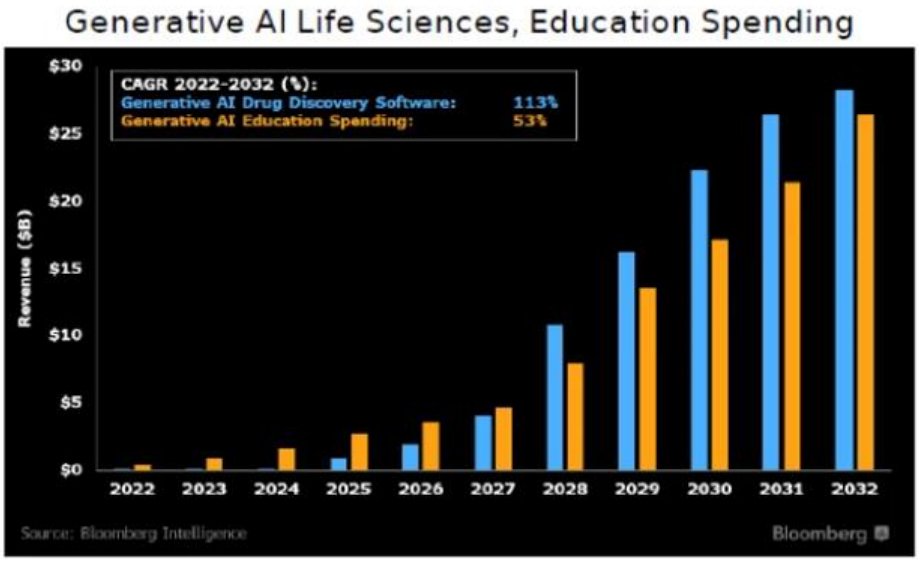


Figure 1: Global AI Application in Education Market (Grandview.com, 2022)



Source: Bloomberg Intelligence

Figure 2 Projected Generative AI Spending in Education (Bloomberg.com, 2023)

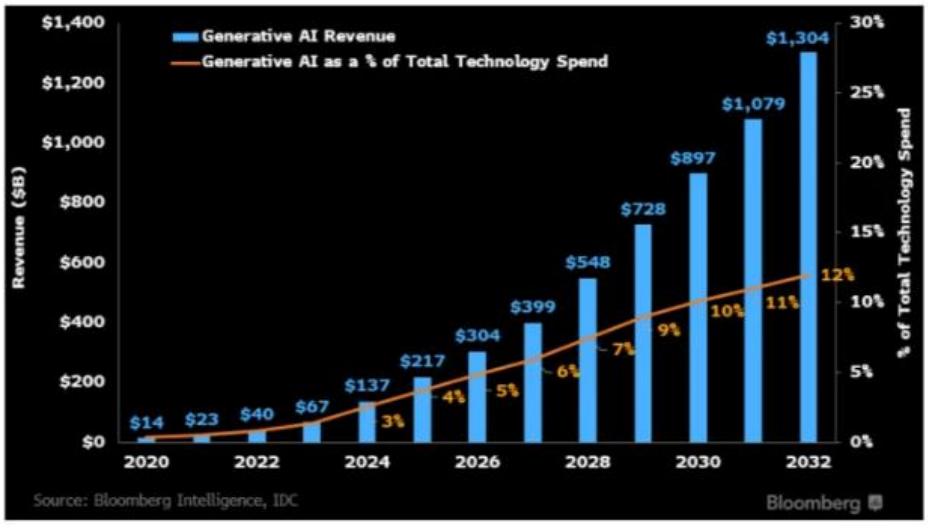


Figure 3: Generative artificial intelligence (AI) revenue 2020-2023 (Bloomberg.com, 2023)

AIED technologies adoption is expected to present challenges (Zawacki-Richter et al., 2019), due to issues with scalability and costs (Zhang & Aslan, 2021). There are also concerns over data privacy (Zhang & Dafoe, 2019), although some feel these problems also present an opportunity to enhance operational and educational practices of any organization that utilizes them, higher education or otherwise. (Yang & Evans, 2019). AI technologies that cater to students have captured the most attention from researchers, developers, educators, and policymakers (Ardelean & Veres, 2023). One of the main research questions, according to Zawacki-Richter et al, (2019), is where AI can find application in education, specifically within higher education. Luckin et al, (2014) discussed three areas where AI were active in education. The areas were personal tutors, intelligent virtual reality, and intelligent support for collaborative learning.

However, in order for any new technology to be adopted it needs to be accepted. Despite the wow effect and portrayal of AI in the movies, there is still reluctance for people to accept AI. Statista found in March 2024 that only (52%) had a (somewhat or very) positive opinion of AI (Figure 4)

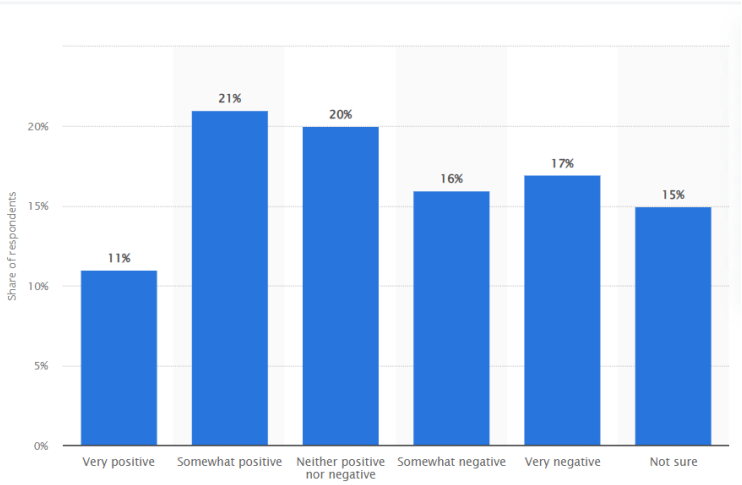


Figure 4: Adults' opinion on the effect of artificial intelligence (AI) on education in the United States as of March 2024 (Statista)

These perceptions most likely will change as applications such as ChatGPT become more pervasive and adopted globally. The release of ChatGPT in 2022 was a major milestone in the field of artificial intelligence and has since become one of the most popular large language model (LLM) tools. ChatGPT is a free to use tool that has a paid version with more advanced features, but the free to use version has become exceedingly popular and has already gained 180.5 million users (Demandsage, 2024). Its rise in use and popularity is even more remarkable when compared to adoption of previous technologies as shown in Figure 5).

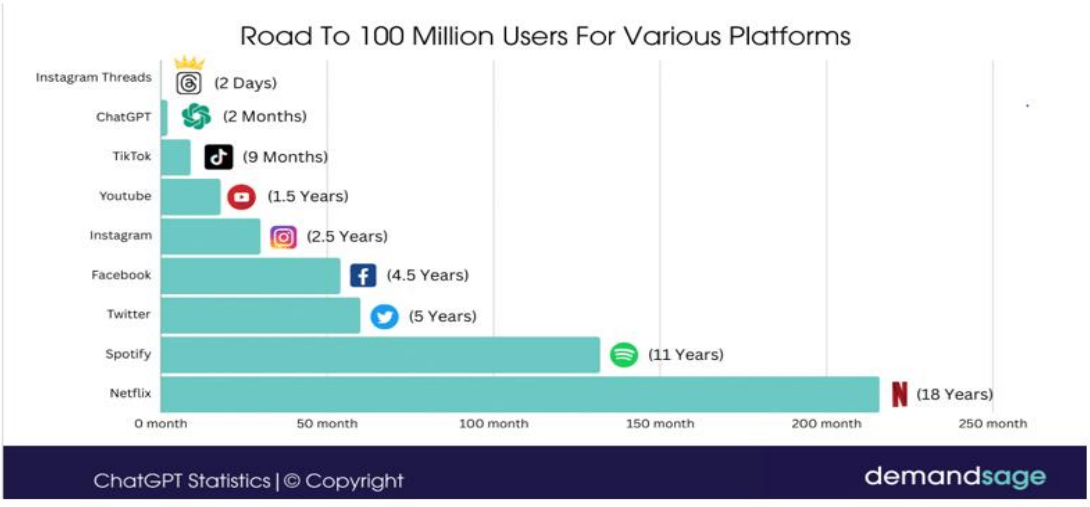


Figure 5: Road to 100 million users for various platforms.

The study seeks to contribute to artificial intelligence in education research by addressing questions specific to the scope of student adoption of AI tools and the extent to which students are aware of the educational

benefits accessing such a technological landscape provides. This study focused on university students on the West Coast of the United Stated and an aggregated questionnaire data from previous student AI perceptions studies from Estonia, India, England, Turkey, and Romania.

RQ1*: How well do students feel informed about AI?*

RQ2 *What do students feel about AI?*

RQ3: *Do the students feel AI can benefit the educational process?*

The rest of the paper is organized as follows: a discussion of literature, followed by the methodology and discussion of results. The paper concludes with limitations, future research opportunities and overall conclusion.

Literature Review

The following is a sampling of relevant literature regarding previous research efforts to sample erceptions of artificial intelligence as it relates to education. Kelese and Ayden (2021), conducted a survey to determine the perceptions of university students about the concept of artificial intelligence. The sample of the research carried out with the screening method consists of 130 fourth grade students studying in the Faculty of Education, Faculty of Arts and Sciences, and Faculty of Economics and Administrative Sciences of a university in Eastern Anatolia region during the 2018-2019 academic year. They found that university students focused more on negative aspects rather than positive aspects of artificial intelligence applications. They also felt that this might be a result of the perception that if something is too easy or not understood that hat students (and people in general) have more doubts and negative thoughts about the future of this technology are also quite common. They proposed that giving students lessons related to current artificial intelligence applications might help create some more positive perceptions towards AI and AIED.

Aredlean and Veres (2023) focused on delineating the viewpoints of university students pertaining to the concept of artificial intelligence. They created an online survey and administered it to university students in Romania. The survey sought to gauge students' level of awareness regarding AI, the sources they utilize for acquiring knowledge about AI, their feelings toward AI, and their perspectives on its potential impact across various domains. The results seem to support previous findings where people reported concern about AI displacing human roles, while offering benefits to other industries such marketing, education, healthcare. They also found subjects reported a diversity of range of feelings with curiosity being the highest.

Kumar and Raman (2022) surveyed 662 graduate students from a university in India to understand the student perceptions of the usage of Artificial Intelligence (AI) in higher education. They collected responses online and measured both quantitative and qualitative responses. Their results indicated that students have a perception that AI can be effectively used in teaching and learning processes, academic administration processes, but should be cautiously considered when applying AI to admission, examination and placements.

Loeste et al, (2021) attempted to address questions regarding AI by merging the term with emerging technologies or ET(s). They asked participants if they thought ETs such as AI will most likely have a strong impact on education just as past technological innovations had. They used written essays from 18 teachers and students and used deductive and inductive approaches with thematic analysis. The study found the teachers' perceptions related to ETs were based on general understanding of the technologies, that participants had mostly optimistic or positive feelings and expectations. They surmised that positive attuites

could be attributed towards novel technology and it appeared participants seemed ready to implement them. There was scare presence of negative aspects of ETs that could become inhibiting to AI implementation.

AI integration

Generative AI and LLMs have already proven their value in various industries across the globe leading to them being integrated by many companies and organizations (Civaner et al., 2022) Noy and Zang (2023) published their findings on productivity benefits of generative AI and found the average time taken to complete a written task was reduced by 40% relative to completing tasks without AI. The authors also found the quality of these written tasks had improved by 18% (Noy & Zhang, 2023). These numbers are quite astounding and document the significant improvements in productivity and quality of written work using generative AI. Students and instructors have positive opinions of ChatGPT and similar productivity tools. A consensus is that these AI tools help the user to complete tasks more quickly, find information more quickly and improve work quality (Firaina & Sulisworo, 2023; Fauzi et al., 2023).

Although the concept of learning through conversational means such as asking questions and receiving an educated answer is by no means uncommon, the use of AI to replicate these interactions provides students with new opportunities. Professors are simply not capable of answering every single question a student may have at any given time, generative AI provides a means of learning making this a significant learning tool (Pesovski et al., 2024). This method of learning allows students to easily receive feedback on problems they are having and offer suggestions for improving or correcting their work (Rahman & Watanobe, 2023).

Limitations of AI technology

Artificial intelligence will never be perfect, limitations will always exist in some form, but this statement is especially true in 2024 with the rise of large language models. Without these limitations the argument against implementing them into education would be much more insignificant and would make the process simpler. Technology always requires trial and error to make it more effective and it is the same for AI (Mullins et al., 2020). LLMs have only really been around for a few years so of course they are still very much in the process of being improved, vetted and we have already seen significant iterative developments but nowhere near enough to ignore the limitations they still hold (Wolf et al., 2023). Overlooking these limitations could result in various consequences regarding education which is why we need to embrace these limitations and acknowledge them so that users are aware rather than misinformed (Sharon et al., 2020).

The first limitation of LLMs is that they tend to generate content that can be biased or favorable towards or against specific groups such as cultures, religions, race, and others. This has to do with the actual source of the data since it gathers its data from content that is created by humans which naturally tend to explain things in a biased manner whether it be intentional or not (Ray, 2023). This also leads to LLMs associating certain key words or phrases in a negative connotation rather than neutral. In the context of ChatGPT it was found that content involving people with disabilities, homelessness, addiction, and other similar phrases are typically presented in a more negative demeaner since human generated content also tends to do this (Bender et al., 2021). Similarly, these LLMs may reflect common stereotypes that exist in human society such as certain professions or roles being associated with a specific gender or ethnicity (Ray, 2023). These biases are difficult to remediate or prevent since it would require new methods of training and gathering data for the AI to use.

Another significant limitation of LLMs is that the quality of the data itself can be questionable at times leading to “hallucinations,” a form of unintended output. Incorrect and misleading content is not entirely uncommon when using them and leads to misinformed users which can be especially concerning in the context of education. Users of LLMs often become over reliant on them and trust the responses without

using personal judgment or research to reinforce the validity of them (Nah et al., 2023). Students are especially guilty when it comes to this since they are oftentimes simply using the AI to get an assignment done quicker or answer a question they may not know. LLMs will respond in a confident and expert manner regardless of whether the information is correct which will make users overly trusting and misinformed (Meyer et al., 2023).

Methodology

This quantitative study sought to add to previous studies regarding perceptions of artificial intelligence as a technology as well as how AI could be accepted in the teaching, learning, and evaluation processes. The method of investigation was an online survey in which freshman and sophomore college from a university in the western United States participated for extra credit points in an Information Systems course were asked to answer questions on their perception of AI, most were a 5-point Likert (from Strongly Disagree to Strongly Agree), although there were one 10 Likert and one question where the respondent was provided a list. The questions were derived from some of the studies listed in the research review (Ardelean & Verse, 2023; Keles & Aydin, 2022, Jeffrey, 2020, Chan, 2023) and are listed in Table 1. Qualtrics was used to deliver the survey instrument online.

Table 1: List of Questions used in Survey

Question #	Question Text	Source
1	On a scale of 1 to 10, how informed are you about the concept of artificial intelligence?	Jeffrey, 2020
2	What sources do you use to learn about the concept of artificial intelligence (Internet, Books/Scientific Papers, social media, Discussions with family/friends, I don't inform myself about AI)	Ardelean & Verse, 2023
3	AI encourages dehumanization (Likert)	Ardelean & Verse, 2023
4	Robots will replace people at work (Likert)	Ardelean & Verse, 2023
5	The ethical use of AI is a major concern for me (Likert)	Jeffrey, 2020
6	AI helps with managing time more efficiently (Likert)	Chan, 2023
7	AI will impact the presidential election (Likert)	Created by Authors
8	AI helps to solve many problems in society (education, agriculture, medicine) more efficiently (Likert)	Keles & Aydin, 2022
9	When you think about AI do you feel Curiosity, Fear, Indifference, Trust?	Ardelean & Verse, 2023
10	On a scale of 1 to 10, how useful do you think AI would be in the educational process?	Ardelean & Verse, 2023

Results

110 students completed the questionnaire. Many of the respondents (75%) were first year undergraduates, (20%) sophomore, (3%) junior and (2%) were in their senior year. Gender identification was (61%) female and (49%) male. Table 2 shows the mean and standard deviation for the different question variables. Figure 7 shows the frequency distribution for the different source's students learn about AI, while Table 3 shows the frequency distribution for how the students feel about AI.

Table 2: Summary Statistics for Student Perception of AI

VARIABLE	MEAN	STD. DEV
INFORMED	6.79	2.02
DEHUMAN	3.15	1.03
ROBOREPLACE	3.45	1.15
ETHCIAL_CONCERN	3.75	1.02
SOLVE MANY	3.77	0.97
IMPACT_PREZ	3.11	0.99
AI_HELP	3.11	0.92
AI_ED_IMPACT	7.14	1.9

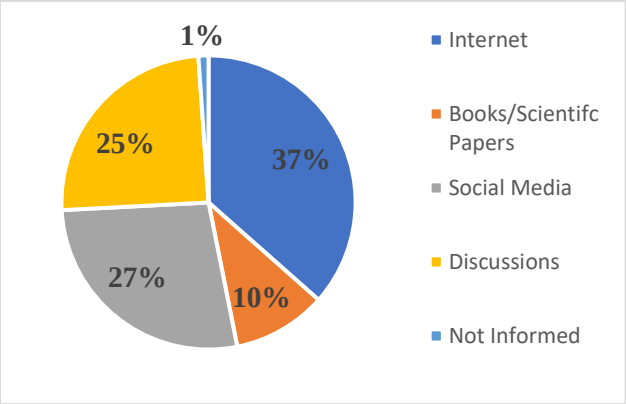


Figure 7: Sources for Learning AI

Table 3: Reported emotion for AI

AI_FEEL_EMOTION	PERECENT
Curosity	59%
Fear	17%
Indiffernece	22%
Trust	2%

Discussion

Overall, the respondents reported feeling very informed and were mostly positive. They obtained most of their information from the Internet and were not overwhelmed. In fact, they reported using the Internet in conjunction with discussion with friends and family. The main reported emotion when asked how they felt when thinking about AI was curiosity. Fear was quite low on the list. Yet some of the other results were mixed. For example, the participants reported relatively neutral when asked in AI was dehumanizing as well helping to manage time. While they did not report a high level of fear, there was a strong concern about AI being used unethically and some concern about being replaced by robots. Another high positive result was that students reported 7.14 (out of scale of 1-10) that AI could and would be useful in the educational process. This should be considered a very positive note considering the end scalar qualifier was extremely useful. There was one other question that is more representative of the timing of the survey. This specific question asked the respondent if they felt AI would or could impact the presidential election. At the time of this writing, this is of huge concern to the politics and pundits which some faction's attempting to use AI to induce fear. As one can see from the results in table 1 the respondents did not indicate that AI would have any impact on the upcoming presidential election.

Conclusion, Limitations, and Future Research

The intent of this study was to measure student perceptions of artificial intelligence. Previous studies had been conducted in the countries of Estonia, Turkey, England, and India which might not be indicative of school in the United States. The results of this study reinforce previous studies in that for the most part people seem to be receptive of AI concepts, technology, applications. They tend to be more informed about AI and get their information from many sources. Overall, the mood was positive with a slight portion of negative emotion. The study was relatively balanced between male and female, although the respondents were all students and of a young age. As such, these results might be generalized to the larger population. Similarly, the survey participants all attended a private university on the West coast so even as a student population these results might be different in public universities and community colleges were included. Likewise, samples from schools in the Northeast, South, or Midwest might also differ.

This study also had a limitation of a small sample. The size of 110 is large enough to be statistically valid yet it might not be as effective if one were to use the results for the purpose of integrating. In addition, this study only asked a few questions like global studies. Future research efforts should be enacted to further explore commonalities with the previous studies. Also, these questions only asked about the respondents feeling or perception without making any connection into any factors that might support these reported feelings. For example, does a student's GPA have any relationship towards their perception of AI? Does the input of new information have any correlation towards opinions or perceptions of AI? This study asked if AI could be useful in the educational process and more research is needed to determine and define what and how that usefulness would be implemented.

At the end of the day, time marches on and innovation continues. AI has been a topic of mind for decades and yet it is quickly becoming reality and part of our everyday lives. The results of the study provide validation by demonstrating students are open and curious about the use of AI and therefore may be open to curriculum changes and while there are still ethical concerns, they seem to overshadow the negative.

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