As Cited by the Artificial Intelligence of ChatGPT: Best Practices on Technology Integration in Higher Education

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Abstract

The purpose of this study was to leverage the artificial intelligence of ChatGPT to produce a scholarly review of the research literature on best practices for technology integration in higher education. The researchers searched the ERIC database using the keywords "technology integration" and "higher education or college or postsecondary" and "best practices." Peer reviewed scholarly journal articles were selected spanning the past 15 years, that had a focus on emerging technologies as well as student and faculty development. The Review of the Research Literature and Results sections were combined in that ChatGPT produced most of that output.

It was found that emerging technologies should be embraced if they helped students learn, improved instruction, increased cooperative learning or collaboration, and were not contrary to the learning institution's mission. The researchers suggested that the writing produced by ChatGPT was adequate and human-like but not at the depth or desired level of a human scholar writing a review of the research literature. Also, they concluded that ChatGPT could be used as a tool, similar to the way a mathematician uses a calculator to solve complex problems, and that the ongoing evolution of ChatGPT was likely to produce better outcomes in the future.

I. Purpose

The purpose of this study was to examine the capacity of artificial intelligence of ChatGPT to produce a scholarly review of the research literature on best practices for technology integration in higher education with the interaction of human scholars.

ChatGPT went live in November of 2022 (Assaraf, 2022). The initial reactions from learning institutions were to block its students from utilizing it (GovTech, 2023). Censorship of a potentially powerful, emerging, and evolving technology could be doing a disservice to both students and teachers alike in any learning environment. Many scholarly studies on technology integration address how to incorporate an emerging technology into the learning environment to better develop students and teachers (Belt & Lowenthal, 2020; Johnson, 2014; Mitchell et al., 2017).

Since ChatGPT was an emerging technology capable of summarizing and synthesizing large blocks of complex text written by humans, the researchers in this study sought to leverage this ChatGPT capability to review the research literature on best practices for its own integration into the classroom.

II. Method/Data Selection

The researchers searched the ERIC database using the keywords "technology integration" and "higher education or college or postsecondary" and "best practices." The search was limited to "full text" available at the Stony Brook University Library and also "peer reviewed" scholarly articles. A total of 314 publications came up through this search. Dissertations and books were excluded from this study and only scholarly journal articles were included where the full text was available through the university library system. The researchers selected 12 journal articles that spanned the past 15 years that included topics, in addition to those cited in the ERIC database keywords search, covering faculty and student development with emerging technology in the learning environment.

The researchers used the ChatGPT feature called "Summarize for a 2nd grader" which "translates difficult text into simpler concepts" (OpenAI API, n.d.). While this feature could seem elementary to the initial observer, the researchers felt the feature could be used to produce a scholarly literature review comparable to one found in a traditional academic journal. Using the scholarly journal articles identified for this study, the researchers copied one to two blocks of text from each article that typically included the results, conclusion, and/or implications of the research sections. In doing so, this produced a four-sentence summary of each article that was written by ChatGPT. The "Summarize for a 2nd grader" feature summarizes blocks of text into two sentence summaries. However, ChatGPT would summarize larger continuous passages, typically over three paragraphs, into four sentences. If acronyms were part of the text, the researchers would fill those in so that ChatGPT could properly identify the words or terms and would keep the tense of the literature review in the past tense, to remain consistent. Each article would be reviewed chronologically, from the

oldest written to the most recent publication. The researchers would cite all of the journals included in this study.

For the synthesis of this review of the research literature, the researchers split the overall review into two blocks of text so that ChatGPT could produce an eight-sentence synthesis. Finally, the researchers concluded by applying the "Keywords" function of ChatGPT to this review of the research literature (OpenAI API, n.d.). The purpose of this was to produce the keywords typically found under the abstract of an academic article and to guide future research.

III. Review of the Research Literature/Results

Introduction: What is ChatGPT?

As described by itself, ChatGPT is "a natural language processing (NLP) model developed by OpenAI that is designed to generate human-like conversations" (OpenAI API, n.d.). ChatGPT was developed by OpenAI. ChatGPT is a highly advanced chatbot that leveraged its "Generative Pretraining Transformer"(GPT) technology to process, natural human inputs and respond by using all of the information it has to create a new response using all of its data points to generate a new response (OpenAI API, n.d.).

According to OpenAI's website and mission statement, they wanted artificial general intelligence (AGI) to benefit "all of humanity" (OpenAI API, n.d.). OpenAI had also developed an artificial intelligence-powered image generator, DALL-E2. DALL-E2, which created images based on descriptive user input. Images were generated from combinations of existing images to generate or create a new image based on the user's input prompt (OpenAI, 2022). ChatGPT used a similar process to employ all of the information it had received from text, media, and the internet to predict what information should come next. The feature that made ChatGPT more accurate than previous Chatbots was that it leveraged human feedback to reinforce its predictions. This resulted in new outputs that previously did not exist (Hughes, 2023; Ramponi, 2023).

ChatGPT could handle a myriad of different prompts. It could write an essay on the causes of World War II, for example. It could provide recipes for food based on items in one's refrigerator. It could generate policies and procedures that comply with state and federal regulations. It could create a new movie or TV episode script based on any situation. It could write a song and even provide suggested chords for the melody based on the style of music one inputed. ChatGPT could write computer code in several languages, and it could fix computer code that had an error (OpenAI API, n.d.).

For the purpose of this particular study, the researchers were applying ChatGPT to the field of educational research. The researchers explored the efficacy and implications of ChatGPT in the field of educational research, as well as the impact it might have on higher education. The researchers' professional discipline resided in the area of educational research, as it related to educational leadership, policy, and practice. That was also the rationale for using ChatGPT's capabilities to cover this particular topic in the research literature review.

Best Practices on Technology Integration in Higher Education

How did the research literature describe best practices for technology integration in higher education? According to ChatGPT, in its "Q&A" feature: "Research literature has described best practices for technology integration in higher education as focusing on the development of digital literacy skills, the use of technology to support student learning, and the use of technology to facilitate collaboration and communication" (OpenAI API, n.d.). The larger review of the research literature below included the journals identified by the researchers to be included in this study but paraphrased or summarized by ChatGPT.

According to the findings of Puzziferro and Shelton (2009), teachers needed to think about ways to help their students learn. They should make sure that the tasks they gave the students had a purpose, were related to real life, and involved different kinds of activities. The learning environment should use different kinds of media and give students a chance to work together and build relationships. Online education has changed the way people learn. To make it better we needed to be flexible and use new technology. We also needed to make sure we were doing things the right way.

Dagiene and Kurilovas (2010) found that Web 2.0 technologies were becoming more popular in schools and universities. Schools and universities needed to make sure that their teaching strategies and technology were updated so that students could use these tools. Teachers would help students use these tools and think about how to use the content that was created. It could be hard for teachers to use these tools, so schools needed to help them learn.

According to DiPietro et al. (2010), students in a class learned from each other and had to be respectful when giving criticism. They also had to be open and friendly with each other. This helped them to be successful in their class. Participants in this study found that using wikis as part of their preparation was helpful and it could be used in different fields. They realized that different fields have different ways to prepare for exams, but wikis could be useful in helping people work together and complete their programs successfully.

In a study on faculty development programs for nurse educators learning to teach online, the researchers made the following recommendations. We learned from a case study of faculty development workshops that it's important to create programs that meet the needs of different people. We also found that it was important for people to understand the workload of participating in the workshops and for there to be support from the institution. Technology and teaching skills have to be integrated and modeled. Finally, it was important to have leadership in place to help organize the workshops (Lee et al., 2010).

Howell et al. (2014) argued that Educational Leadership programs needed to help prepare school administrators to be technological leaders. This meant that faculty and students needed resources, training, and support to learn about new technology. College administrators needed to listen to the voices of faculty and students to understand the needs of 21st century classrooms. Leaders must have a shared vision of how technology could be used and must stay up to date with current trends. With the right support, Educational Leadership programs could help students learn about technology and become successful leaders.

Johnson (2014) identified seven principles of good practice for using technology as a lever in online instruction. According to Johnson, online classes could be a fun and exciting way to learn, but it was important for teachers to make sure the class was run well. Students liked to be able to learn at their own pace and have access to materials. Teachers should make sure expectations for communication, logging in, and participation are clear. Technology should be used to help students learn and be motivated. Teachers should be trained to use the technology, and upgrades should be made to help students learn better.

Technology was changing the way colleges teach. Higher education leaders were asking three questions to help them decide if technology could help improve the way students learn: 1) How could we preserve our core mission while using technology? 2) How could we use technology and best practices in teaching to help students succeed? 3) Could technology help us redesign or replace common introductory courses in a way that used teachers' expertise and helped students learn? We also needed to think about how technology affected quality, fairness, teachers, and the cost of college. Technology could be used to improve how colleges teach if it was used in the right way (Marcy, 2014).

Budhai and Williams (2016) showed that in online classes, it was important to figure out what your students needed and what their learning styles were. Teachers should also use different methods to teach different students and use technology to help teach and support the students. Online learning could be challenging, especially at the college level. Working together with a librarian could be helpful and could make online learning more enjoyable. Researchers were trying to find better ways to teach online so that students could learn better and have more fun.

Báez et al. (2019) found that online social work education programs were growing very quickly and technology was getting better. That meant that people teaching online courses needed to be prepared to use technology and teach in different ways. The Columbia University Institute provided classes to help instructors learn how to do this. They learned how to engage with students, use technology, and make sure values were kept. This would help ensure that students had a good learning experience.

According to Belt and Lowenthal's (2020) study, technology was being used more and more in teaching. There were ways for teachers to use technology to help their students learn better, like working together more and finding new ways of teaching. Technology could help teachers in different subjects and help students learn better. Teachers should keep exploring new ways to use technology to help their students.

Wuhib's (2020) study covered Wichita State University which was a big school with lots of students. They offered lots of online classes and used special tools to help teach the classes. The school had a team of people called the Instructional Design and Access (IDA) Team who helped teachers use the tools and teach the classes. They had a special lab for teachers to drop in and get help with their classes. The IDA team also held conferences and sent out newsletters to help teachers learn how to use the tools.

According to Ndebele and Mbodila (2022), technology was being used more and more in teaching and learning in higher education institutions around the world. This study showed that most academics understand the value of using technology in teaching and learning and were willing to use it. To help them use technology more, the institution needed to provide training and support, resources and tools like laptops, data, and other equipment. They should also have e-learning communities where people can share best practices and help each other.

Summary and Synthesis of the Literature Review by ChatGPT

Technology could help people learn in many ways. Teachers needed to know how to use the technology to help students learn. They could use different kinds of media, like videos and wikis, to help students understand the material. Teachers needed to be flexible and make sure their classes were up to date with the latest technology. They also needed to make sure they gave clear expectations and helped students learn at their own pace. Technology could be a fun and exciting way to learn. Technology was being used to help teachers teach and students learn better in colleges. Technology could help teachers find new ways to teach, work more closely with students, and help them learn better. Schools were providing tools and training to help teachers use technology and have better classes.

Keywords by ChatGPT

Keywords include digital literacy skills, student learning, collaboration, communication, Web 2.0 technologies, faculty development programs, nurse educators, Educational Leadership programs, seven principles of good practice, online instruction, core mission, best practices in teaching quality fairness teachers cost college technology lever online social work education programs.

IV. Conclusion

In conclusion, as this related to the performance of ChatGPT in writing a scholarly literature review, the researchers felt that ChatGPT needed more work. The writing produced by ChatGPT was adequate and human-like but not at the depth or desired level of a human scholar writing a review of the research literature. It certainly was useful in simplifying the large blocks of complex text written by scholars, and researchers could use ChatGPT as an aid for their research and writing. They would just need to be more controlling in modifying the writing produced by ChatGPT.

ChatGPT could be used as a tool for their work, similar to the way a mathematician uses a calculator to solve complex problems. The "Keywords" feature also did not work flawlessly. While some of the keywords it produced should be included, other keywords such as "nurse educators" and "Educational Leadership programs" more directly related to the titles of studies reviewed. Our assessment of ChatGPTfollows:

> ChatGPT was unique because it did not just perform a "copy and paste" of sentences from one source or multiple sources to answer an inquiry. Instead, ChatGPT combined, analyzed, and synthesized information, creating new sentences (OpenAI API, n.d.). ChatGPT wasn't perfect, with responses sometimes ranging from slightly misleading to completely wrong. Despite this, there was a sense of comparative decision-making in the ChatGPT algorithm that simulated creativity and connections that were lacking in previous A.I. Chatbots. ChatGPT wasn't going away; it was only getting more advanced, even as you are reading this article it is making better connections. To us what seems like "learning" was in actuality ChatGPT developing more accurate generative pre-training/predictive transformer responses (Hughes, 2023; Ramponi, 2023).

Educators were split on the use of ChatGPT in education as the New York City Department of Education banned ChatGPT access for all students and faculty stating, "while the tool may be able to provide quick and easy answers to questions, it does not build critical-thinking and problem-solving skills, which are essential for academic and lifelong success" (Korn & Kelly, 2023, para. 3). However, Professor Schiappa and Professor Montfort at MIT recently sent a memo to their fellow colleagues offering suggestions for these new technologies; including "construct your assignments to align with learning goals and the availability of these systems" (Schiappa & Montfort, 2023, pg 1).

Disruption technology is not new. For instance, when handheld calculators were new they were banned in some colleges and classrooms for fear of cheating or depriving students of learning (Bukowski, 1975). Now those same calculators are used as a lever to help us solve more complex math problems, tabulate algorithms, graph equations, etc. The evolution of the internet, search engines, and smartphones have given people access to all of the world's information in the palm of their hands. Assessments that focused on solely memorizing facts are almost obsolete in many areas of study; the shift has been toward the practical application of knowledge rather than rote memorization (ASCD, 2009).

Much like the calculator and the internet eventually redefined learning, could the next evolution of critical thinking be able to leverage the output of AI technology to achieve a higher level of creativity and understanding? Either way, it is clear that educators should consider embracing the technology and use it as an opportunity to rethink how they teach and assess their students; students should rethink how they learn, and perhaps more importantly why they learn. ChatGPT is the next major disrupter in the field of education. It's going to force educators and students alike to rethink our entire educational system.

The open architecture AI system of ChatGPT is an evolving learning system, especially as it continuously interacts with humans. Human beings will evolve and learn, especially as they interact with each other and this emerging technology. ChatGPT may become a form of cooperative learning that is encouraged in both K-12 and higher education. As a result, the researchers must conclude that ChatGPT should be a new integral part of teaching and learning.

V. Implications of the Research

Who wrote this article? While ChatGPT paraphrased or summarized the studies included in the Review of the Research Literature/Results section that followed the Introduction section, the researchers conducted the meticulous research on the ERIC database and downloaded the selected articles as it related to their study. The Review of the Research Literature and Results sections were combined because ChatGPT produced those results. The researchers chose the sections of the articles they fed into ChatGPT to produce its outcomes in the writing output. ChatGPT did much of the paraphrasing of the articles and wrote the summary section of the overall literature review. That's why the researchers chose to list ChatGPT as a co-author and not "the" author. The American Psychological Publication (APA) Manual Seventh Edition, which educational researchers use for formatting publications, may need to develop an Eighth Edition to include formatting for "as cited by ChatGPT." Until that time, researchers may need to continue to include ChatGPT as a co-author in their collaboration with it.

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