POST-PANDEMIC SUPPORT FOR SPECIAL POPULATIONS IN HIGHER EDUCATION THROUGH GENERATIVE ARTIFICIAL INTELLIGENCE

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Abstract

The sudden closure of schools in response to the COVID-19 pandemic prompted education authorities to quickly explore new teaching and learning methods. This disruption to traditional classroom settings led to the implementation of innovative strategies that assist educators and students in developing abstract thinking skills. In the wake of the ongoing impact of the pandemic on education, one crucial innovative approach that educators should embrace is generative Artificial Intelligence (AI). Generative AI represents a significant transformation in the education sector, offering human-like content tailored to meet the individual needs of students, educators, and institutions. While the integration of generative AI post-pandemic is inevitable, this chapter highlights the myriad opportunities it presents for the education industry, particularly in terms of the strategies it provides for colleges and universities to recruit and engage diverse student populations through personalized instruction and equal access to opportunities.

In the evolving landscape of post-pandemic education, technology that supports collaboration, critical thinking, and real-world educational connections is no longer considered a futuristic concept. While educational practices continue to evolve, the substantial entry of generative artificial intelligence into education is both distinct and unavoidable. With technological advancements come questions of digital equity and effective implementation. This chapter underscores how generative artificial intelligence can bridge these gaps by creating customized learning experiences that benefit educators and enhance access to knowledge.

The emergence of generative artificial intelligence as a technological support tool is poised to bring about significant changes in education. Generative AI has the potential to drive the necessary shift towards personalized instruction and meaningful student interactions. This chapter seeks to provide a comprehensive overview of the importance of exploring generative AI strategies as the education sector grapples with the repercussions of the COVID-19 pandemic. It presents insights into current and future opportunities offered by generative artificial intelligence to support innovative teaching practices, foster equitable growth, and facilitate the transition to educational systems on a global scale.

Keywords

Generative Artifical Intelligence (AI), Education, Pandemic Impact, Personalized Instruction

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COVID-19 triggered the largest disruption in the history of the education system (Pokhrel & Chhetri, 2021). Despite the heroic efforts of healthcare providers, educators, and communities, the pandemic necessitated alternative methods to traditional learning to curb the virus spread (Maatuk et al., 2021). The impact of social distancing measures on education led to institution closures and a shift to technology-based instruction (Abu Talib, Bettayeb, & Omer, 2021). Digital tools played a pivotal role in bridging physical distances, enhancing resources, and improving web-based instruction.

The pandemic accelerated the development of technology as a crucial tool in combating the disease, building upon innovations that began in the 19th century (Alghamdi & Alghamdi, 2022). E-learning emerged as a solution to help mitigate virus transmission, bringing significant changes to the education system and becoming a prominent academic focus (Abou El-Seoud et al., 2014). Although universities embraced e-learning, further research was conducted to explore its opportunities and drawbacks in higher education (Maatuk et al., 2021).

While web-based learning provided support during the pandemic, it also brought challenges. The existing economic achievement gap was exacerbated by e-learning, posing concerns for universities nationwide (Golden et al., 2023). Efforts to address these disparities included enhancements to instruction, accountability, learning standards, and student management (Huang, Crăciun, & Wit, 2022), aiming to narrow learning gaps and elevate academic instruction across all levels. As in-person education resumes, the continued use of digital tools remains crucial to support both teachers and learners (Pokhrel & Chhetri, 2021).

Looking ahead, universities must prepare for success by embracing innovative approaches, including Generative Artificial Intelligence (AI). Generative AI, a subset of artificial intelligence capable of producing human-like responses, holds promise for transforming education (Lim et al., 2023). As educators navigate the educational challenges stemming from the pandemic, generative AI enables personalized instruction and increased interaction with students.

Despite the resurgence of digital learning due to COVID-19, the concept of e-learning has evolved over four decades, with ongoing research highlighting its potential to enhance education at all levels (Baltasar Fernández Manjón, 2007). Researchers are now turning their focus to exploring the future impacts of generative AI on higher education. This chapter delves into current and future AI research, examines the integration of generative AI in education, and outlines future research directions for addressing special populations as the nation transitions to a post-pandemic world.

Exploration of Artificial Intelligence

Artificial Intelligence (AI) is a technological method that aids organizations in decision-making processes based on ideas, patterns, and knowledge (Ergen, 2019). The concept of AI can be traced back to ancient Greece and has evolved from a science fiction fantasy to a practical reality in the mid-20th century (Ergen, 2019). John McCarthy officially coined and defined AI as "the science and engineering of making machines" (McCorduck and Cli Cfe, 2004).

AI has seen challenges and advancements every decade since the 1950s, with machine learning (ML) emerging as a subset of AI. While AI encompasses tasks that typically require human intelligence to be performed by machines, machine learning specifically involves machines learning on their own through data (Kersting, 2018).

One of the most prominent methods within machine learning is pattern recognition for predictive purposes. Machine learning models have become a major advancement in AI, with applications in companies like Google, Amazon, and YouTube. Machine learning provides a way for computer users to tackle complex problems that may be challenging for human intelligence to solve (Bi, Goodman, Kaminsky and Lessler, 2019). For instance, in epidemiology, machine learning assists in analyzing complex datasets to create outcome models and predict probabilities (Bi, Goodman, Kaminsky and Lessler, 2019).

AI, despite its potential benefits in aiding predictions and generating valuable insights, can be intimidating for users (Kelly, Kaye, and Oviedo-Trepalacious, 2022). While AI is expected to expand into various industries, there is a need for clearer definitions of AI to alleviate fears and uncertainties among potential users. Business and corporate organizations are leading the way in AI adoption, with a significant number already implementing AI solutions globally, particularly for business and financial purposes (Brock, Kai-Uwe, and Von Wangenheim, 2019). Despite some user hesitancy, AI continues to gain traction across different sectors, demonstrating its potential to transform operations and decision-making processes.

Artificial Intelligence in a Post-Pandemic World

While the increased utilization of AI has brought about significant conveniences and reduced human interaction in efforts to curb the spread of COVID-19, studies mentioned earlier in this article indicate a preference for human interaction in specific industries due to a lack of understanding about AI. A study highlighted the challenges faced by the hospitality industry during the COVID-19 pandemic, prompting a digital transformation to enhance visitor confidence in using hospitality services (Gaur, Afaq, Singh, and Dwnedi, 2021). This transformation not only bolstered confidence but also enhanced convenience for travelers.

AI implementation extends beyond healthcare to industries such as education. Educational institutions have begun leveraging AI to address the gaps left by the pandemic. While the crisis posed numerous challenges for educational institutions, it also presented opportunities for the implementation of e-learning systems (Pokhrel and Chhetri, 2021). As the education system undergoes reconstruction, educators and learners must familiarize themselves with various online educational tools to facilitate growth and development (Pokhrel and Chhetri, 2021).

The integration of AI into teaching and learning has led to the widespread application of Artificial Intelligence in Education (AIEd) practices (Ouyang and Jiao, 2021). Intelligent tutoring systems, teaching robots, and human-computer interaction have become integral components of instructional design and implementation efforts (Chen et al., 2020). Over the past three decades, powerful tools enabled by AIEd have been developed, transforming traditional educational methodologies (Hwang et al., 2020; Holmes, Bialik, and Fadel, 2019).

While multiple industries have integrated AI, the healthcare sector still requires human interaction, albeit not for complex diagnostic or treatment decisions. Instead, AI plays a pivotal role in tasks such as managing electronic medical records, optimizing patient flow, and prioritizing urgency based on available information. A study by Armaud et al. (2022) concluded that AI is highly beneficial to organizations, particularly in emergency services management during global health crises or mass casualty incidents. AI has demonstrated its versatility across various industries. However, the education sector continues to explore ways to harness AI for the benefit of end-users, particularly students, who are the primary stakeholders in the learning process.

The Entry of Generative Artificial Intelligences in Education

Though artificial intelligence (AI) and machine learning (ML) have become ubiquitous terms, subsets like Generative AI have found their way into education. According to Lim et al. (2023), generative AI is defined as technology that leverages deep learning models to produce human-like outputs in response to stimuli. It stands out for its capability to generate unsupervised content and knowledge, distinguishing it from conventional machine learning approaches (Baidoo-Anu and Owusu Ansah, 2023). The automatic generation of digital content by generative AI surpasses mere response provision and can simulate human conversations (Lim et al., 2023). Kohnke, Moorhouse, and Zou (2023) assert that AI tools are becoming integral in education, necessitating a proactive approach to maximize their benefits and navigate potential challenges.

One prominent example of generative AI making inroads into education is ChatGPT, a chatbot that has piqued the interest of educators and professionals across various fields (Williams, 2023; Tate, 2023). ChatGPT excels at processing language to generate responses that mimic human conversation, opening up opportunities for tailored learning experiences through authentic interactions (Kohnke, Moorhouse, and Zou, 2023).

While ChatGPT presents numerous opportunities, it also poses challenges and risks to the education sector (Lo, 2023). Concerns regarding academic integrity and student learning have arisen due to its ability to produce human-like responses, potentially enabling students to use it to complete assignments and exams, leading to its prohibition on some international campuses (Sullivan, Kelly, and McLaughlan, 2023).

The issue of digital poverty is also brought to the forefront with the adoption of ChatGPT. Educators and learners must possess specific digital skills to ensure equitable instruction (Kohnke, Moorhouse, and Zou, 2023). The ongoing digital divide, characterized by uneven access to technology, persists beyond the pandemic (Golden et al., 2023). Limited exposure to generative AI diminishes the opportunities for underrepresented populations to leverage its full benefits.

Although research on ChatGPT and other generative AI tools remains limited (Sullivan, Kelly, and McLaughlan, 2023), the momentum of AI-driven technology continues to captivate the masses. While generative AI has demonstrated both positive and negative impacts, it is crucial to view it as a tool for enhancing learning and supporting students, rather than solely a risk for academic integrity (Sullivan, Kelly, and McLaughlan, 2023). Hockly (2023) underscores the importance of developing strategies to address and mitigate these potential drawbacks.

Generative Artificial Intelligence Support for Educators

Generative AI's impact extends beyond student support, as it is poised to assist higher education instructors in various administrative tasks such as enrollment, recruitment, data generation, policy creation, and budgeting. Given the heavy workloads faced by instructors and concerns about burnout, generative AI holds the promise of digitally addressing teachers' challenges to cater to the diverse needs of all students. The proficiency of generative AI in managing, analyzing, and identifying patterns provides teachers with AI-supported personalized learning experiences and opportunities for creativity (Kaplan-Rakowski et al., 2023).

While research on integrating generative AI is still in its nascent stages among professionals, the anticipated support it offers to faculty in higher education has garnered significant interest. The introduction of generative AI tools like Stable Diffusion and DALL-E has raised social awareness. For instance, Stable Diffusion can transform sounds into high-resolution images, showcasing the innovative capabilities of these technologies (Kaplan-Rakowski et al., 2023). With advancements like Stable Diffusion and DALL-E, generalized AI has the potential to alleviate the creative burden on educators by shifting it to technology.

Despite the promising prospects of generative AI for educators, its adoption necessitates substantial changes in instructional practices and learning processes (Ally, 2019). Wang et al. (2021) examined faculty members' attitudes toward AI applications in higher education and found that 70.4% of changes in the intention to

use AI were linked to attitudes toward implementation (Wang et al., 2021).

In a study by Kaplan-Rakowski et al. (2023) involving teachers who had used generative AI tools at least once, it was observed that teachers believed such tools could enhance teaching and learning, serving as valuable resources for students. Despite the relative novelty of generative AI, limited research on implementation practices exists. However, prior research suggests that technology implementation heavily relies on teachers' initial perceptions. While the future trajectory of generative AI remains uncertain, Kaplan-Rakowski et al. (2023) reported positive attitudes, underscoring the need for increased professional development for educators to enhance their understanding and perspectives on generative AI, aligning with the evolving research trends.

Generative Artificial Intelligence and Student Engagement

Special populations, defined by Fayed and Van Eck (2023) in the medical realm as underrepresented or minority groups, exhibit varied characteristics across different industries. In the education sector, the concept of special populations encompasses a diverse range of individuals. These may include gifted and talented students, English language learners, as well as those facing developmental or learning challenges, disabilities, or impairments (Baska and Van Tassel-Baska, 2021; Fayed and Van Eck, 2023). Before implementing generative AI technologies, it is crucial to understand the specific needs and nuances of these special populations (Su and Yang, 2023), as defining the term "special population" accurately can enhance student engagement.

In the context of special education, both educators and students have the opportunity to explore generative AI, particularly ChatGPT, and its potential benefits in the classroom. Understanding the functionalities of ChatGPT can aid in leveraging its capabilities effectively (Su and Yang, 2023). While research on the use of generative AI in educational settings remains limited, Su et al. have documented interactions with ChatGPT to elucidate its purposes and functionalities that could be beneficial for education. However, limitations such as its difficulty in grasping contextual nuances have been noted.

Furthermore, Su and Yang (2023) introduced the theoretical framework of IDEE, comprising steps such as Identify the Desired Outcomes, Determine the Appropriate Level of Automation, Ensure Ethical Considerations, and Evaluate the Effectiveness. This framework can serve as a valuable guide for integrating generative AI in education, catering to diverse special populations ranging from gifted and talented students to those with developmental challenges or disabilities (Su and Yang, 2023). The authors highlighted several benefits of utilizing generative AI in the classroom, including providing personalized guidance, acting as a virtual tutor for students and teachers, alleviating teachers' workload in responding to student queries, fostering an engaging learning environment, and offering valuable recommendations for educators. These advantages could prove especially beneficial amid nationwide teacher shortages, emphasizing the potential of generative AI to support diverse student populations effectively.

Generative Artificial Intelligence and Personalized of Instruction

Generative AI presents numerous opportunities for personalized instruction and educational enhancement within various industries. However, concerns and limitations persist, necessitating further exploration and understanding. Recent studies shed light on the potential and challenges associated with the integration of generative AI in educational settings.

Kim and Park (2023) conducted a study on the feasibility of an AI system utilizing a generative model, specifically ChatGPT 3.5 turbo model, to provide personalized responses tailored to individual users. Their research emphasized the importance of addressing user preferences to enhance satisfaction with the AI-generated responses. While the study demonstrated promising results when user preferences were considered, a limitation was noted regarding the sample size of participants.

In another study, Ahmad, Murugesan, and Kshetri (2023) discussed how large language models like ChatGPT could support grading systems for essays and exams. While the use of AI for grading purposes offers potential efficiency gains, concerns such as academic integrity, lack of human interaction, and limited personalization capabilities were highlighted as challenges.

Bahrou, Anane, Ahmed, and Zacca (2023) utilized the PRISMA framework to review 207 research papers on generative AI in education. Their findings underscored the potential of generative AI in shaping curriculum designs and learning outcomes tailored to the needs of educators. The researchers recommended integrating generative AI into various educational content areas to foster student engagement and critical thinking.

In conclusion, while generative AI holds significant promise for personalized instruction and educational advancement, educators must navigate potential pitfalls such as plagiarism and lack of creativity. By proactively engaging with the tools and understanding their capabilities, educators can harness the benefits of generative AI to enhance teaching effectiveness and student learning experiences.

Generative Artificial Intelligence and Establishing Equitable Opportunities

Generative AI indeed offers both opportunities and challenges when it comes to creating equitable opportunities and addressing specific gaps among special populations. By harnessing the power of Generative AI, storytelling

and creative opportunities tailored to the needs of special populations can be facilitated, provided that the AI has access to sufficient information and context.

Baskara (2023) emphasized the integration of technology in education and highlighted the potential of Generative AI in addressing gaps, trends, and challenges in education through storytelling. By combining literature and insights from various sources, educators can better understand the current trends and arguments surrounding the use of Generative AI in educational settings.

Soubutts et al. (2023) demonstrated how Generative AI can offer equitable opportunities for older adults to engage with technology and enhance their learning experiences. The study focused on various themes such as enabling expression and creativity, facilitating communication, and supporting the design process for projects. This research underscores the importance of leveraging technology, including Generative AI, to promote socialization and creativity among special populations.

However, educators should be mindful of potential challenges associated with the management of Generative AI technology. Lim et al. (2023) pointed out concerns such as resistance to adoption, overreliance on AI as the primary source of information, and fears of negative impacts on classroom management. It is crucial for educators to engage in discussions across disciplines to explore the opportunities and limitations of Generative AI in education and to ensure responsible and effective integration of this technology into teaching practices.

While some may be hesitant to embrace Generative AI in education due to lack of understanding or concerns about its implications, it is essential for educators to stay informed, collaborate with peers, and explore how Generative AI can be leveraged to create inclusive and engaging learning experiences for all students, including special populations. By proactively addressing challenges and maximizing the benefits of Generative AI, educators can unlock new possibilities for personalized instruction and student empowerment in the digital age.

Conclusion

The COVID-19 pandemic brought to light numerous challenges within the US education system, exposing socioeconomic disparities, unpreparedness among educators and administrators, and the struggles faced by traumatized families. However, amidst these difficulties, Generative AI emerged as a potential solution with opportunities to support various special populations within the education sector.

Generative AI, although still in its early stages of adoption, holds promise in generating text, images, and assistance tailored to specific content areas. By leveraging human input to generate responses or visuals, Generative AI can be applied in diverse fields such as epidemiology for disease progression predictions and the travel industry to enhance trust among travelers. While concerns exist about the potential replacement of human interaction, particularly in industries like healthcare, where Generative AI is slowly being integrated for tasks such as patient chart management and clinic operations.

In the education sector, Generative AI stands to make a significant impact by offering tools like DALL-E for image creation and grading assistance, thereby increasing efficiency and alleviating the burden on educators, especially amid persistent teaching shortages. Educators have seized the opportunities presented by Generative AI to enhance their skills in online education tools, instructional design, and implementation, particularly benefiting special education students. By enabling end-users to input prompts into programs like ChatGPT, Generative AI facilitates personalized responses based on human input, fostering equitable opportunities for diverse learners.

Despite its potential benefits, Generative AI faces hesitancy and challenges in adoption, particularly in education, stemming from a lack of knowledge and concerns about creativity, plagiarism, and reliance on AI for solutions rather than fostering critical thinking. Future research should focus on developing theoretical frameworks to guide the ethical and pedagogical use of Generative AI in education, addressing issues like cheating and maintaining the integrity of the learning process.

In conclusion, Generative AI serves as a valuable tool across industries, including education, offering opportunities to enhance workflow, productivity, and quality of life. Researchers and early adopters must work towards promoting the informed and responsible use of Generative AI in classrooms, emphasizing its potential to augment learning experiences while preserving the essential role of human interaction and creativity in education. By navigating the challenges and leveraging the possibilities of Generative AI, educators can unlock new avenues for personalized instruction and student empowerment in the digital age.

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