Significances and Prospects of Artificial Intelligence in Academic Writing and Clinical Pharmacy Education

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ABSTRACT

The ongoing academic discourse surrounding the utilization of artificial intelligence (AI) in research and education has been a topic of discussion since the introduction of ChatGPT in November 2022. This discourse primarily centers around ethical considerations, maintaining academic integrity, determining authorship, and the necessity for new legal frameworks. The implementation of AI has the potential to enhance time efficiency, enabling individuals to engage in more critical thinking. Additionally, its ability to recognize patterns within vast amounts of data can facilitate advancements in drug discovery, improve clinical decision-making, and aid in the development of guidelines, ultimately benefiting patient safety. Furthermore, AI is prompting a re-evaluation of the nature of learning and the purpose of education on a global scale. It challenges traditional teaching methods, necessitating a shift from memorization-based learning to the cultivation of critical, analytical, and creative thinking skills. Despite the opportunity to reconsider educational concepts within pharmacy curricula, several universities worldwide have chosen to prohibit the use of AI. This commentary provides a comprehensive overview of the ongoing debate, highlighting the potential consequences and opportunities for clinical pharmacy research and education.

KEYWORDS: ChatGPT, implementation, prompting

INTRODUCTION

The launch and rapid development of artificial intelligence (AI) models for public use in 2023 have been a prominent topic in the news. One of the key areas of discussion has been the use of AI in academic writing and publishing within the university and scientific community. This ongoing debate encompasses various ethical, practical, and philosophical aspects. Different universities worldwide have adopted varying approaches to incorporating these models into student assignments. While some institutions have chosen to ban their use, others have integrated them, and many have taken a more nuanced, case-by-case approach. This commentary aims to provide a summary of the existing debate and explore the consequences and opportunities for clinical pharmacy research and education.[1]

Significance of artificial intelligence in scholarly writing

The introduction of ChatGPT (Open AI) in November 2022 signified a significant advancement in the realm of generative AI models designed to aid academic research and writing. There exists a vast array of AI-powered tools that cater to different stages of the research process, from formulating research questions (e.g. Elicit AI) to analyzing scientific literature databases (e.g. Search Smart), conducting literature reviews (e.g. Litmaps, Consensus, Connected Paper, ResearchRabbit, Scite, OpenRead), interpreting data (e.g. ChatGPT4, ResearchGPT, Lateral), and structuring academic assignments, journal publications, and grant applications (e.g. Jenni.ai, Quillbot) [not an exhaustive list]. While these AI tools enhance efficiency, perform data analysis, identify patterns, draw inferences, and provide contextual information, they fall short in terms of intellectual reasoning, creativity, and developing novel theories. The effectiveness of these tools is contingent upon the breadth and depth of sources utilized, which are often undisclosed and vary significantly across different platforms based on the programmed functions.

The ongoing discussion within the scientific and academic community primarily revolves around ethical considerations related to academic integrity, particularly plagiarism. Critics argue that the utilization of AI in academic writing undermines the genuineness of scholarly work, potentially leading to plagiarism or the erosion of original thought and critical thinking abilities. The issue of claiming authorship for AI-generated content is also a widely debated topic since, from a legal standpoint, artificial intelligence models cannot be held responsible for the content they produce. The responsibility falls on the user of these models, but it becomes challenging when the process of information generation and its basis are not transparent. The level of human contribution in AI-assisted writing becomes intricate and emphasizes the necessity for adapting legal frameworks surrounding intellectual property (IP) to enable the definition and protection of IP in this new context. Considering the limited understanding users have regarding how these models generate their output, significant concerns arise regarding objectivity, biases, and fairness. There is a inherent risk of diminishing the quality of academic work and oversimplifying nuanced academic arguments, ultimately leading to a loss of innovation and novel critical thought.[2, 3]

In distinction, the utilization of AI tools has the potential to facilitate the advancement towards the unrestricted and open accessibility of research papers, thereby democratizing research and academic resources and creating a more equitable environment for all individuals involved. By streamlining various tasks in the research process, AI tools also allow researchers to save time, enabling them to engage in critical thinking, nuanced analysis, and intellectual processing. Moreover, the ability of AI to recognize patterns across extensive amounts of data can potentially lead to new insights in drug discovery and development, anticipate trends in pharmacy practice, enhance clinical decision-making, and contribute to the development of guidelines, ultimately benefiting patient safety and reducing healthcare costs.[4]

Impact of artificial intelligence on clinical pharmacy education

Institutions worldwide are actively exploring the integration of AI into curricula to enhance learning outcomes while upholding academic rigor. This integration is leading to a reassessment of the nature of knowledge, learning, and the purpose of education on a global scale. It challenges conventional teaching methods, necessitating a transition from memorization to the cultivation of critical thinking, analytical, and creative skills. The International Pharmaceutical Federation (FIP) advocates for a needs-based, outcome-focused approach in pharmacy education, allowing for advancements and innovations. Undoubtedly, the utilization of artificial intelligence models in student assignments, teaching, pharmacy curricula, and skill-based education qualifies as a significant innovation.[5, 6]

In a recent set of world café gatherings, organized with undergraduate pharmacy students at the University of Innsbruck, students articulated their firm expectation that the ethical and practical application of AI tools should be integrated into the pharmacy undergraduate curriculum [unpublished data], possibly mirroring the perspectives of many pharmacy students globally. Students even pondered the possibility of replacing lectures and face-to-face knowledge transmission with methods such as AI-facilitated learning in a flipped classroom style pedagogical structure, allowing university time to be focused on enhancing practical skills, applying knowledge in experiential settings, and cultivating critical analytical thinking skills.[7-9]

The skills-based learning approach for pharmacists has been a long-standing component of accreditation standards for pharmacy education worldwide over the last two decades. However, a recent study in 2020 comparing pharmacy education curricula from 16 countries and territories revealed significant disparities in content and emphasis, with not all countries having accreditation standards in place. Many curricula are described as fragmented, outdated, and static, with varying allocations of time between chemistry, physical science, and practice. Perhaps the introduction of AI could prompt a shift towards a more skill-based learning and teaching approach in all pharmacy curricula, incorporating peer collaboration, team-based learning, experiential activities, interdisciplinary education, and reflective self-assessment practices.[10-11]

Different assessment formats, such as open-book online exams with assertion-reason questions, objective structured clinical examinations with simulated/real interactions, and practice portfolio style assessments, should replace recall-based written and verbal assessments. AI also provides opportunities to reconsider research skills, enabling more data-driven analytical teaching and a flipped approach to teaching the structure of scientific papers, practicing good scientific writing, and developing a clear and concise writing style. Furthermore, AI may facilitate the development of personalized learning and intelligent tutoring systems, allowing tutors/lecturers to better identify and support struggling students, as well as helping students improve their time-management and planning skills.

It is crucial to prepare students and adapt curricula for the implications of AI on clinical practice in this new era of pharmacy practice and education. According to a recent paper by de Oliveira Santos Silva (2024), there is a need for the training of "disruptive" educators who are capable of "using teaching-learning methods adapted to the digital environment and educational processes suitable for stimulating the use of effective disruptive technologies." The paper argues that the pharmacy profession cannot afford to wait for the slow integration of digital technologies into pharmacy practice and education.[12-15]

It is intriguing to consider why numerous universities worldwide have prohibited the use of AI in pharmacy curricula, despite the potential it offers to redefine educational concepts. One can speculate that this decision stems from concerns about the rapid advancement of AI technology. By imposing such bans, academic and scientific institutions aim to create a space for thorough comprehension of the ethical and legal implications associated with AI, as well as the practical effects these innovative technologies may have on existing academic procedures. This approach allows for the establishment of comprehensive standards and regulations governing the use of AI in educational settings.[16]

CONCLUSION

The ongoing advancement of AI technology will inevitably spark ongoing discussions. It is crucial to conduct continuous research on the impact, advantages, and disadvantages of AI in academia to guide the development of new approaches and regulations in clinical pharmacy practice, research, and education as this revolutionary technology progresses. Despite the potential risks and uncertainties, AI could serve as a catalyst for pushing pharmacy education towards a more clinically-focused direction, aligning with the profession's goal of enhancing clinical pharmacy practice.

REFERENCES

[1] Friedrich S, Symons J. Norms for academic writing in the era of advanced artificial intelligence. Digit Soc. 2023; 2:48.

[2] Dwivedi YK, Kshetri N, Hughes L, et al. Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. Int J Inf Manag. 2023; 71:102642.

[3] Ahmer RM. Transformative potential of Artificial Intelligence in pharmacy practice. Saudi Pharm J. 2023; 31(9):101706.

[4] Ouyang F, Zheng L, Jiao P. Artificial intelligence in online higher education: a systematic review of empirical research from 2011 to 2020. Educ Inf Technol. 2022; 27:7893–925.

[5] Lo CK, Hew KF. A review of integrating AI-based chatbots into flipped learning: new possibilities and challenges. Front Educ. 2023.

[6] Dula CAC, Porter AL. Addressing challenges in skills-based education through innovation and collaboration. Am J Pharm Educ. 2021; 85(7):8788.

[7] International Pharmaceutical Federation (FIP). Competency-based education in pharmacy and pharmaceutical sciences: A FIP handbook to support implementation of competency-based education and training. 2022.

[8] Arakawa N, Bruno-Tomé A, Bates I. A global comparison of initial pharmacy education curricula: an exploratory study. Innov Pharm. 2020.

[9] Frenk J, Chen L, Bhutta ZA, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. Lancet. 2010; 376(9756):1923–58.

[10] Bramley AL, Thomas CJT. E-portfolios and Entrustable Professional Activities to support competency-based education in dietetics. Nurs Health Sci. 2020;23(1):148–56.

[11] Abeyaratne C, Galbraith K. A review of entrustable professional activities in pharmacy education. Am J Pharm Educ. 2023; 87(3):8872.

[12] Croft H, Gilligan C, Rasiah R. Development and inclusion of an entrustable professional activity (EPA) scale in a simulation-based medicine dispensing assessment. Curr Pharm Teach Learn. 2020; 12(2):203–12.

[13] Khalafalla FG, Alqaysi R. Blending team-based learning and game-based learning in pharmacy education. Curr Pharm Teach Learn. 2021; 13 (8): 992–7.

[14] Williams JB. Assertion-reason multiple-choice testing as a tool for deep learning: a qualitative analysis. Assess Eval High Educ. 2007; 31(3): 287–301.

[15] Zawacki-Richter O, Marín VI, Bond M, et al. Systematic review of research on artificial intelligence applications in higher education—Where are the educators? Int J Educ Technol High Educ. 2019; 16:39.

[16] Kamalov F, Calonge DS, Gurrib I. New era of artificial intelligence in education: towards a sustainable mutifaceted revolution. Sustainability. 2023; 15 (16):12451.