Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Clinical Anatomy and Physiology

Journal homepage: https://www.ijcap.org/

Editorial

Ethical considerations of artificial intelligence (AI) in teaching and learning anatomy

Anupama Mahajan[1]*

[1]*Dept. of Anatomy, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, Punjab, India*

ARTICLE INFO

Article history:
Received 07-07-2024
Accepted 16-07-2024
Available online 20-07-2024

The term Artificial intelligence is defined as a machine composed of symbolic, logic based and knowledge based domains that can tackle all problems including perception, planning, knowledge, reasoning and communication.[1] Anatomy Teaching for MBBS students is done in Phase 1 in Medical Curriculum as recommended by NMC. As the subject has voluminous content, so to retain Anatomy knowledge for long term and because of paucity of cadavers with increasing number of Medical colleges, advanced AI techniques such as Artificial Neural Networks (ANN), Convoluted Neural Networks (CNN) or Bayesian U Net have been incorporated to expertise the students professionally in this subject.[2] Paucity of trained staff and usually overworked, allowing less time for innovations in curriculum development and research[3] lead to the use of

AI in Curriculum development, analysis & assessment – both Formative & Summative in form of Theory (Essay, short answer question, multiple choice questions) and Practical examination (objective structured clinical examination OSCE & objective structured practical examination OSPE) to test various domains of learning Anatomy.[4]

Students can use the Anatomage Table to virtually dissect a full sized cadaver on a touchscreen.[5,6] Virtual reality (VR) and augmented reality (AR) technologies illustrate multiangle visualization of anatomy structures on mobile devices and headsets.[7] Visual and Computer- assisted learning (CAL) has made Anatomy learning more logical and enhanced the relevance of Anatomy to medicine.[8]

The integration of Artificial intelligence (AI) in Anatomy Education represents a paradigm shift with vast potential to enhance learning experiences, Streamline teaching methodologies and improve educational outcomes. However, this technological advancement brings with it significant ethical considerations that must be addressed to ensure responsible and equitable implementation.

AI can revolutionize anatomy education by providing personalized learning experiences, offering real time feedback and enabling virtual dissections that reduce dependency on cadavers. These benefits can democratize access to high quality anatomical education particularly in regions with limited resources. However, it is imperative to ensure that these AI tools are developed and deployed ethically.

1. **Data privacy and consent:** AI system in Anatomy Education rely on vast amounts of data, including images and possibly personal health information. Safeguarding the privacy of individuals whose data is used is paramount. Robust consent processes and stringent Data protection measures must be in place to prevent misuse of personal information.
2. **Bias and fairness:** AI algorithms can inherit and perpetuate biases present in the data they are trained on. This can lead to unequal educational outcomes

* *Corresponding author*.
E-mail address: anupamasgrd@gmail.com (A. Mahajan).

https://doi.org/10.18231/j.ijcap.2024.014

and reinforce existing disparities. Developers and educators must ensure that the datasets used are diverse and representative to mitigate bias. Continuous monitoring and updating of AI systems are essential to maintain fairness.

3. **Accessibility and e quity:** while AI has the potential to make Anatomy education more accessible, there is a risk that it could exacerbate existing inequalities. Students in underfunded institutions or low- income regions may lack access to the necessary technology. Efforts should be made to ensure that AI tools are affordable and accessible to all students, regardless of their socio-economic status.
4. **Teacher- Student d ynamics:** The role of educators is evolving with the advent of AI. While AI can support and enhance teaching, it should not replace the critical human element in education. Teachers provide mentorship, emotional support and ethical guidance that AI can not replicate. The integration of AI should be designed to support educators not replace them.

1. Balancing Technological Advancement and Ethical Responsibility

The deployment of AI in Anatomy Education must strike a balance between leveraging technological advancements and upholding Ethical standards. Key Stakeholders including educators, developers, policymakers and students should be involved in the decision making process to ensure that diverse perspectives are considered.

1. **Ethical guidelines and regulations**: The development and use of AI in education should be guided by comprehensive Ethical Guidelines and Regulatory frameworks. These should address issues such as Data Privacy, consent, bias and accessibility. Regulatory bodies must ensure compliance and address any Ethical breaches promptly. For Example, a recent report by Human Rights Watch (2022) reviewed 164 EdTech products deployed across 49 countries concluded that 89% of them harvested personal data of students without consent and shared this data with advertising technology companies that impact negatively on the trust necessary for effective educational environment (Gubbins & MacCutain, 2008)[9] and hinder the transformative learning.
2. **Continuous ethical review**: As AI technology evolves, so too should the ethical framework governing its use. Regular reviews and updates of Ethical Guidelines are necessary to keep pace with technological advancements and emerging Ethical Challenges.
3. **Transparency and accountability**: Transparency in the development and deployment of AI systems is crucial. Students and Educators should be informed about how AI tools work, what Data they use and how decisions are made. Accountability Mechanisms should be in place to address any Ethical concerns or malfunctions.

2. Conclusion

AI holds great promise for advancing anatomy education offering innovative ways to enhance learning and teaching that include studying human variations, in healthcare practice, diversity & social justice, student support and student learning.[10] However, this potential can only be fully realized if ethical considerations are rigorously addressed. By prioritizing data privacy, ensuring fairness, promoting accessibility and maintaining the human element in education, we can harness the benefits of AI while safeguarding ethical integrity. Collaborative efforts from all stakeholders will be essential in navigating the ethical landscape and ensuring that AI in anatomy education serves the best interests of all students.

3. Conflict of Interest

None

References

1. Russell S, Norvig P. Artificial Intelligence : A Modern Approach. 3rd ed. Harlow, UK: Pearson Education Limited; 2010.
2. Ramesh AN, Kambhampati C, Monson JR, Drew P. Artificial intelligence in Medicine. *Ann R Coll Surg Engl*. 2004;6:334–8.
3. Estai M, Bunt S. Best teaching Practices in Anatomy Education: A Critical review. *Ann Anat*. 2016;20:151–7.
4. Savage TR. Artificial Intelligence in Medical Education. *Acad Med*. 2021;96:1229–30.
5. Anatomage Inc Anatomage Table 2022. Available from: https://anatomage.com/table/.
6. Martin LG, Mora CD, Henche SA. Possibilities for the use of anatomage (the anatomical real body-size table) for teaching and learning anatomy with the students. *Biomed J Sci Tech Res*. 2018;4:4080–3.
7. Chytas D, Johnson EO, Piagkou M, Mazarakis A, Babis GC, Chronopoulos E. The role of augmented reality in Anatomical education: An overview. *Ann Anat*. 2020;229:151463.
8. Zampieri F, Zanatta A, Elmaghawry M, Bonati MR, Thiene G. Origin and development of modern medicine at the University of Padua and the role of the "Serenissima" Republic of Venice. *Glob Cardiol Sci Pract*. 2013;2013(2):149–62.
9. Gubbins C, Maccurtain S. Understanding the Dynamics of Collective Learning: The Role of Trust and Social Capital. *Adv Dev Hum Res*. 2008;10(4):578–99.
10. Lazarus MD, Truong M, Douglas P, Selwyn N. Artificial intelligence and clinical anatomical education: Promises and perils. *Anat Sci Educ*. 2024;17(2):249–62.

Author biography

Anupama Mahajan, Director Principal cum Professor (Sri Guru Ram Das Institute of Medical Sciences and Research, Punjab, India)

Cite this article: Mahajan A. Ethical considerations of artificial intelligence (AI) in teaching and learning anatomy. *Indian J Clin Anat Physiol* 2024;11(2):66-67.