



DIGITAL PEDAGOGY AND PLANT SCIENCES: TRANSFORMING BOTANY EDUCATION THROUGH ARTIFICIAL INTELLIGENCE

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ABSTRACT Botany education is experiencing a significant transformation due to rapid advances in digital technology and artificial intelligence (AI). This paper critically examines the integration of AI-enabled digital pedagogy in the teaching and learning of plant sciences. It discusses virtual laboratories, digital herbariums, intelligent tutoring systems, and AI-based plant phenotyping tools that enhance conceptual understanding, practical exposure, and research aptitude among life science students. The study emphasizes the relevance of these tools in higher education, particularly in developing countries, and proposes strategies for effective curriculum integration.

KEYWORDS : Digital pedagogy; Botany education; Artificial intelligence; Plant sciences; Life sciences

INTRODUCTION

Botany forms the backbone of life sciences and plays a crucial role in agriculture, biodiversity conservation, environmental management, and biotechnology. Traditional methods of botany teaching rely on classroom lectures, laboratory practicals, and seasonal field visits. While effective, these approaches face limitations such as restricted access to plant material, infrastructural constraints, and limited student engagement. The emergence of digital education platforms offers new opportunities to overcome these challenges and modernize botany education.

Digital Tools in Botany Education

Digital microscopes, virtual laboratories, online floras, and electronic herbariums have revolutionized access to botanical resources. Students can study plant morphology, anatomy, taxonomy, and physiology using high-resolution digital images and simulations. Virtual field trips allow learners to explore ecosystems that are otherwise inaccessible due to geographical or financial constraints.

Learning management systems facilitate interactive teaching through quizzes, discussion forums, and multimedia content, promoting continuous assessment and self-paced learning.

Artificial Intelligence Applications in Plant Science Learning

AI-based image recognition systems are increasingly used for plant identification, disease diagnosis, and phenological studies. In educational contexts, AI-driven adaptive learning platforms personalize instructional content based on individual learner performance. Automated assessment tools provide immediate feedback, enabling students to identify knowledge gaps and improve learning outcomes.

Challenges and Ethical Considerations

Despite its advantages, digital pedagogy presents challenges such as the digital divide, inadequate infrastructure, limited faculty training, and data privacy concerns. Ethical considerations related to AI usage, algorithmic bias, and equitable access must be addressed through institutional policies and capacity-building programs.

Future Prospects and Conclusion

The integration of AI-enabled digital pedagogy has the potential to redefine botany education by making it more interactive, research-oriented, and inclusive. Strategic implementation of digital tools, faculty training, and curriculum reforms can prepare students to address complex biological and environmental challenges.

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