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I-CReST 2025:094-062 – Enhancing Anatomical Understanding in Biology Education Through Integrated 3D Printing Technology Modules

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ABSTRACT

In the world of IR 4.0, 3D printing and 3D scanning stand as significant instruments. 3D printing, or additive manufacturing, is a process of creating 3D objects using layering method by referring 3D digital model. On the other hand, the 3D scanner is a device that captures real-life objects to convert them into a 3D digital model. Medical students without access to anatomy models often struggle with visualizing complex body structures. Sole reliance on 2D illustrations, textbooks, or digital resources leaves gaps in practical understanding, which tactile and visual teaching aids can effectively bridge. This project introduces an innovative approach to biology and medical education by using 3D scanning and printing technologies to create detailed organ models. Real organ structures are scanned to produce accurate, high-resolution 3D prints, which are then developed into interactive teaching modules. Through the development of high-resolution 3D-printed anatomical models derived from real organ scans, an interactive and tactile learning module was introduced into secondary school biology classrooms. Classroom implementation incorporated a game-based approach through activities such as the Organ Matching Game and the Build-a-Human-Body Puzzle. Students learning about human organ systems showed marked improvement when the module was used in class. Preliminary results indicate improved student engagement, enhanced spatial understanding of organ structure and function, and increased retention of anatomical knowledge. Students reported greater interest and confidence in biology, and teachers observed a measurable improvement in learning outcomes compared to conventional methods. This approach provides an ethical, scalable, and cost-effective alternative to traditional teaching aids, aligning with modern pedagogical practices and the demands of 21st-century education

Keywords: 3D scanning; Human organs; Medical education; Real to replica; Teaching teaching