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Research In-Progress

Revolutionizing Medical Training: Sustainable and Cost-Effective 3D-Printed Training Simulators Using Plant-Based Biodegradable PLA

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Introduction: Utilization of 3D printing technology in medical education has significantly expanded, offering innovative solutions for cost reduction and sustainability in the production of instruments, training tools and medical simulators. However, our expertise as medical professionals are often lacking when it comes to the software and hardware required for developing these tools. In our study, we collaborated with engineers to address the limitations in our training modules, to develop and implement polylactic acid (PLA) 3D-printed simulators to enhance medical training.

Methods: We used Dassault Systems SolidWorks to design surgical and laparoscopic instruments, specialized equipment such as trocars, laryngoscopes, training boxes and medical simulators focusing on specific procedures, with EOS EOSINT P 390 and SOVOL SV01 PRO 3D-printers using plant-based biodegradable PLA. The simulators were used by 72 medical students and residents over a four-month period. Throughout this period, iterative modifications, enhancements, and eliminations were made based on feedback from each testing session, addressing instances where the equipment failed, did not perform as expected, or when students requested the incorporation of additional tasks. Additional equipment needed for construction of the simulations was purchased separately online.

Preliminary Results: Our preliminary results indicate that the development cost ranged from 12 to 65 USD/simulator, depending on the quantity of PLA required and the purchase of additional equipment necessary for assembly. The trainees expressed high satisfaction and reported positive outcomes from their training sessions.

Next Steps: The low cost and eco-friendly nature of these simulators underscore their significance. It is crucial to conduct further testing of 3D printing capabilities across various institutions with diverse socioeconomic backgrounds to better understand the limitations and challenges of these simulators, utilizing a larger participant base and more comprehensive outcome measures. Additionally, this technology empowers trainees and trainers to create customized tools tailored to the specific needs of their institutions.