Developing 3D Modeling for a Virtual Patient Simulator for Skill Training in Dental Patient Assessment

M.I. Rishard[1], A.M.F. Shalha[1], S.P.D.D.S. Weerasinghe[1], N. R. Chandrasiri[1], D. Leuke Bandara[1], U. Jayasinghe[1], T. Jayarathna[2], R.G. Ragel[1]

[1]*University of Peradeniya, Peradeniya, 20400, Sri Lanka*
[2]*Western Sydney University, Sydney, 2751, Australia*
**upuljm@eng.pdn.ac.lk*

Patient assessment is an essential basic skill that needs to be developed by a dental student. With the issues faced during the pandemic, the trend is to develop more innovative, learner-centered approaches to provide such skills. Traditional dental training, rooted in hands-on patient experience and physical models, has limitations such as limited exposure to diverse dental issues and potential real-world consequences from mistakes. In contrast, our 3D virtual patient simulator offers diverse clinical scenarios and safety from real-world mistakes. Although virtual simulation is a possible option, 3D modeling to simulate different clinical presentations is challenging as well as could be costly. The goal of this project is to propose an affordable, and realistic approach in developing a 3D virtual patient simulator with the use of Unity game engine and Blender. The Unity game engine was used to add interactivity, and Blender was used for exact 3D modeling. A comprehensive 3D dental clinic model was developed which allows students to switch from an extraoral to an intraoral perspective, simulating real-world dental examination. Furthermore, to enhance the authenticity, various dental instruments were incorporated thoroughly designed in Blender to replicate their real-world counterparts. The application is also equipped with different investigations including radiographs corresponding to different clinical cases. In the next phase, the system will be designed to work with haptic technology, transitioning the simulator to a Virtual Reality (VR) environment enabling students to gain tangible feedback. Evaluation metrics have been integrated to grade students based on their interaction within the application. Preliminary results show that the 3D modeling used offer an affordable, and realistic approach to develop a virtual patient simulator which could facilitate in bridging the gaps in current dental training methods, with the potential of providing a cost-effective and realistic training platform. The introduction of such technologies in the dental education sector could revolutionize the learning experience and better equipped students for real-world practices.

Keywords: Dental training, 3D Modelling, Virtual patient simulator, Learner centered approach

Acknowledgement: We extend our gratitude to the University Research Council for their financial support (Multidisciplinary Grant 339).