Digital Dentistry in Undergraduate Curriculum and the Fourth Industrial Revolution

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In October 2016, the National Academies of Sciences, Engineering, and Medicine, held a meeting to consider the Fourth Industrial Revolution (IR4.0) and its likely social and economic effects.[1] The meeting also explored the cross-sector collaboration between government, universities, and industry needed to accommodate emerging developments in the key technologies of the IR4.0, namely, artificial intelligence, virtual reality (VR) and augmented reality (AR), and the Internet of Things.[1] Digitalization, being one of the important elements of the IR4.0, is also a rapidly expanding field and becoming a face of the modern dentistry.[2] Many types of digital technologies are being practiced in dental education recently, including web-based knowledge transfer and e-learning, digital surface mapping, dental simulator motor skills, intraoral scanning, digital radiography, and surveys related to the penetration and acceptance of digital education.[3] Simplified interactions between human and computer have caused a profound progress in VR- and AR-based dental training.[4]

The idea of inclusion of digital dentistry components in dental education is not new though. Chatham et al.[5] conducted a survey in a year 2014 of 11 UK dental schools to determine the degree to which digital dental technologies have been introduced into the undergraduate curricula. Forty-five percent of the schools did not teach digital dental technology in their curriculum. Of the 55% of schools who did teach digital dental technology, 50% gave lectures or demonstrations, while the other 50% allowed practical involvement by the students.[5] Schlenz et al.[2] evaluated students' perspective on the implementation digital training modules in the preclinical curriculum. The students were exposed to computer-aided learning (CAL) approaches for the digital analysis of tooth preparations in prosthodontic preclinical practical sessions at the Justus Liebig University Giessen, and the results revealed a positive perspective of students on the implementation of digital dentistry. However, most students preferred evaluation of preparation by dental instructors.[2] Zitzmann et al.[6] carried out a randomized controlled trial at a dental school in Switzerland and analyzed total 50 inexperienced dental students' perceptions of the difficulty, applicability, and preferences of digital and conventional implant impressions. Majority of them (72%) preferred the digital approach using intraoral scanning (IOS) to take the implant impression to the conventional method (12%) or had no preference (12%). The authors also concluded with an interesting perspective that dental students with no clinical experience were very capable of acquiring digital tools, indicating that digital impression techniques can be included early in the dental curriculum to help them catch up with ongoing development in technologies used in dentistry.[6] Zitzmann et al.[3] recently published a systematic review to investigate current penetration and educational quality enhancements from digitalization in the dental curriculum. The review revealed that the digitalization revolutionizes dental education to help prepare future

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dentists for their daily practice. With industrial revolution, the future dental education will be dominated by the interactive e-learning possibilities, AR and VR to stimulate an enjoyable experience with 24/7 facilities. With newer technologies, different dental simulating equipment and devices are securing place in the undergraduate curriculum. Introduction of the Moog Simodont VR dental trainer was one of them being used for the preclinical curriculum in the direct restoration module of the operative dentistry course in the Hong Kong University.[7] The results on selected group of 32 undergraduate students revealed that the use of the Moog Simodont significantly improved the satisfactory performance of students.

Factually, digital healthcare companies that survive in the market will lead the change and will reorganize the healthcare sector.[1,8] The computer-aided design/computer-aided manufacturing (CAD/CAM) of dental appliances and prostheses is now widely used around the globe.[4] Inclusion of digital dentistry components in undergraduate curriculum will make a graduate well prepared for IR4.0 and rapidly changing healthcare sector to serve the society in better way.

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