

ASCILITE 2024

Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

Orthodontics Online Simulations as Teaching Tools

Shazia Naser-ud-Din

University of Melbourne School of Dentistry

Mark Robinson

Managing Director, St Andrews Lean Consulting, Scotland, UK

Traditional teaching methods in orthodontics employ static photos posing immense challenges as the learner is unable to conceptualise the changes in different planes that affect final tooth positions in the upper and lower jaws following treatment. Furthermore, the protracted treatment time of orthodontics ranges from 12 months (simple cases) to 36 months (complex cases) thus adding yet another dimension “patient growth” especially children often referred to as 4th Dimension of Time. Previous work at UQ with SBLi (Scenario Based Learning interactive <https://youtu.be/PUlanl15CFc?si=vDf8JwFjHixtzol7>) (Naser-ud-Din, 2015) has shown that creating online teaching tools incorporating multimedia to address the concepts of dynamic change and is impactful for student learning on demand with global accessibility. Online asynchronous learning have three key strengths: firstly, flexibility for updating with contemporary software by learning designers and academics; secondly, ease for formative assessment for large cohorts and thirdly, international presence for potential commercialization. Feedback at UQ for postgraduate orthodontic students was overwhelmingly positive as students found interactivity highly engaging and appreciated the self-regulated aspect of it akin to that found in other publications (Hakami, 2021; Khoo et al., 2023; Naser-ud-Din, 2016). However, simulation creation is expensive (Kröger et al., 2017) and thus, it is essential to explore cost-effective teaching tools that are sustainable with the dental industry partners and easily translated into clinical practice. With advent of 3D simulations in Orthodontics, current literature is limited (Ho et al., 2022; Karanth et al., 2024; Sipiwaruk et al., 2023) and future best practices will require initiatives to enhance teaching recommendations. Moreover, LEAN an essential component for success in major industries who observe consistent success such as in aviation, and other professions have added value of efficiency, effectiveness, convenience and comfort. Hallmarks to improve outcomes and safety.

The aim of this project is to complete 5 essential orthodontic chapters for the Doctor of Dental Surgery (DDS) students at MDS in (years 2-4) by introducing 3D simulations for orthodontic treatments start to finish; embedded in H5P teaching assessment tool. At present, limited number of such modules have been created with original clinical cases by the primary investigator (SN). Interactive online digital assets are valuable and need to be based on sound principles of Heutagogy for self-directed learning. Furthermore, LEAN foundation creates effectiveness and efficiency of delivery of core content. Essentially this project is aligned with Advancing students education strategy 2023-30 of the UoM P-9 “remove barriers to innovation and forge new partnership models between professional and academic”. At the time of writing there is lack of integrated 3D simulations for education in Orthodontics, thus addressing a gap to create interactive learning environments that are translated to clinical practice in dentistry. Thus utilizing in future CAD/CAM (Computer assisted Design Computer Assisted Manufacture) with efficiency and confidence for the graduate learner. The CAD/CAM tech is now widely incorporated by industry partners in dental technologies into mainstream Dentistry providing precision and speed. Refinement of these three modules will pave way as huge potential for commercialization under the banner of UoM with InnovateEd in near future. Moreover, the LEAN will assist in providing future sustainability.

Keywords: 3D simulations, CAD/CAM, Clinical preparedness, concepts, efficient learning mode, LEAN in Higher Education

ASCILITE 2024

Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

References

- Hakami, Z. (2021). Comparison between virtual and traditional learning methods for orthodontic knowledge and skills in dental students: a quasi-experimental study. *Healthcare*.
<https://doi.org/10.3390/healthcare9091092>
- Ho, A. C. H., Liao, C., Lu, J., Shan, Z., Gu, M., Bridges, S. M., & Yang, Y. (2022). 3-Dimensional simulations and student learning in orthodontic education. *European Journal of Dental Education*, 26(3), 435-445.
<https://doi.org/10.1111/eje.12718>
- Karant, D., Arqub, S. A., & Dolce, C. (2024). The applications of digital technology in postgraduate orthodontic education. *Seminars in Orthodontics*. <https://doi.org/10.1053/j.sodo.2024.03.003>
- Khoo, E., Le, A., & Lipp, M. J. (2023). Learning Games: A New Tool for Orthodontic Education. *International Journal of Environmental Research and Public Health*, 20(3), 2039. <https://www.mdpi.com/1660-4601/20/3/2039>
- Kröger, E., Dekiff, M., & Dirksen, D. (2017). 3D printed simulation models based on real patient situations for hands-on practice. *European Journal of Dental Education*, 21(4), e119-e125.
<https://doi.org/https://doi.org/10.1111/eje.12229>
- Naser-ud-Din, S. (2015). Introducing Scenario Based Learning interactive to postgraduates in UQ Orthodontic Program. *Eur J Dent Educ*, 19(3), 169-176. <https://doi.org/10.1111/eje.12118>
- Naser-ud-Din, S. (2016). Bewertung von unterschiedlichen asynchronen Lehrstilen für das E-Learning in der Kieferorthopädie FAU - Naser-ud-Din, Shazia. *Quintessence Publishing Deutschland DJKFO*, 1(0945-7917 (Print)).
- Poblete, P., McAleer, S., & Mason, A. G. (2020). 3D Technology Development and Dental Education: What Topics Are Best Suited for 3D Learning Resources? *Dentistry Journal*, 8(3), 95.
<https://www.mdpi.com/2304-6767/8/3/95>
- Sipiyaruk, K., Kaewsirirat, P., & Santiwong, P. (2023). Technology-enhanced simulation-based learning in orthodontic education: a scoping review. *Dental Press Journal of Orthodontics*, 28, e2321354.
<https://doi.org/10.1590/2177-6709.28.3.e2321354.oar>

Naser ud Din, S., & Robinson, M. (2024). Orthodontics Simulations as Teaching Tools. In Cochrane, T., Narayan, V., Bone, E., Deneen, C., Saligari, M., Tregloan, K., Vanderburg, R. (Eds.), *Navigating the Terrain: Emerging frontiers in learning spaces, pedagogies, and technologies*. Proceedings ASCILITE 2024. Melbourne (pp. 65-66).
<https://doi.org/10.14742/apubs.2024.1422>

Note: All published papers are refereed, having undergone a double-blind peer-review process. The author(s) assign a Creative Commons by attribution license enabling others to distribute, remix, tweak, and build upon their work, even commercially, as long as credit is given to the author(s) for the original creation.

© Naser ud Din, S., & Robinson, M. 2024