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Interactive e-learning lessons in patient-centred interview: an international multi-centred collaboration project piloted among dental and oral health students at the University of Otago, New Zealand

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Abstract

This study examines the integration of e-learning tools into the Bachelor of Dental Surgery (BDS) and Bachelor of Oral Health (BOH) curricula at the University of Otago, aiming to enhance pre-clinical dental education. Through a multidisciplinary approach, our research team developed interactive e-learning lessons for pre-clinical dentistry skills, which were piloted among 15 BDS and BOH students in 2022. Students' feedback was gathered through focus group discussions allowing for qualitative analysis of their experiences. The findings indicated a strong potential for merging curricula across both programs, as similarities were identified in the didactic and simulated learning experiences. Students reported overwhelmingly positive interactions with the digital materials, highlighting enhancements in their engagement and motivation while expressing their desire for more interprofessional education (IPE). Suggested improvements included increasing collaborative learning opportunities and refining content delivery. This study informs the necessity of integrating e-learning tools within dental curricula to foster a collaborative educational environment that effectively prepares future dental professionals. Ultimately, it underscores the significance of aligning educational practices with contemporary learning methods including interprofessional education to improve patient care outcomes.

Keywords: *dental education, curricula development, digital learning, dental students, oral health students, student experience*

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Introduction

Digital education refers to the use of digital technologies, tools and online platforms to enhance teaching and learning processes. It involves interactive content, virtual classrooms, and personalised learning experiences that go beyond traditional textbooks, making education more engaging, flexible, and accessible (Haleem *et al.*, 2022). While advances in technology and evolving teaching philosophies have traditionally driven the ongoing reassessment of effective teaching methods, the primary catalyst for change in the coming century is likely to be the evolving ways in which students learn (Alenezi, 2023). The COVID-19 pandemic forced health professions educators to rapidly shift from conventional in-person instruction to virtual teaching. However, there is limited evidence on how effectively online learning tools can be integrated into a blended learning model to enhance pre-clinical dental education and support students before their initial patient interactions.

As an international multidisciplinary and multi-centred team of researchers, led by dental and oral health professionals including specialists in oral radiology, periodontology and an enterprise education company with expertise in dental education, our overarching goal was to develop new teaching material to be incorporated as blended learning activities for students in the early stages of their dental and oral health clinical education. Furthermore, with shared funding and resources our desire for a curricula development in multi-professional learning environments had to purposefully align with current teaching practices, to future proof a high standard of learning by effectively educate a global dental and oral health workforce. The novel character of this project rests in evaluating the effectiveness of using e-learning material as instructions to enhance the learning of dental and oral health students. The aim of this study was two-fold; first, it aimed at investigating where and how e-learning material would be appropriately incorporated to enhance the Bachelor of Dental Surgery (BDS) and Bachelor of Oral Health (BOH) curricula within the Faculty of Dentistry at the University of Otago, and where courses had the potential to be merged across the programmes. Second, it explored students' experiences of using the digital e-learning material and allowed for modifications according to students' feedback, to better suit their learning preferences, to keep students motivated and engaged.

Materials and Methods

Prior to conducting the study, Māori consultation was sought from the Ngāi Tahu Research Committee and the study was granted ethical approval from the University of Otago Ethics Committee (D21/287).

To gain a deeper understanding of current teaching and learning practices the Otago team of researchers (HO, LA, SC & ATS) started by scrutinizing the curricula for simulated education through course outlines and learning objectives for each programme and year cohort within their institution. From a learner-centred approach, this stock-take informed opportunities for when students would benefit from digital learning in accordance with student learning outcomes from within each programme's respective curriculum. The Otago research team then investigated merging the various teaching and learning activities, including didactic teaching (lectures and tutorials) as well as the more interactive online simulated pre-clinical learning activities. This was undertaken to combine coherent teaching modules across the BDS and BOH programmes.

Concurrently, digital learning tools in the form of interactive e-learning lessons for learning pre-clinical skills in dentistry were developed by an international team of dental professionals and educational researchers involving all authors of this study and their respective affiliations. To trial the innovation and to investigate how students would respond to the e-learning material, and how it would possibly be further improved, the first e-learning lesson in a

series of four lessons focused on patient-centred interview and was piloted with a group of students from the University of Otago.

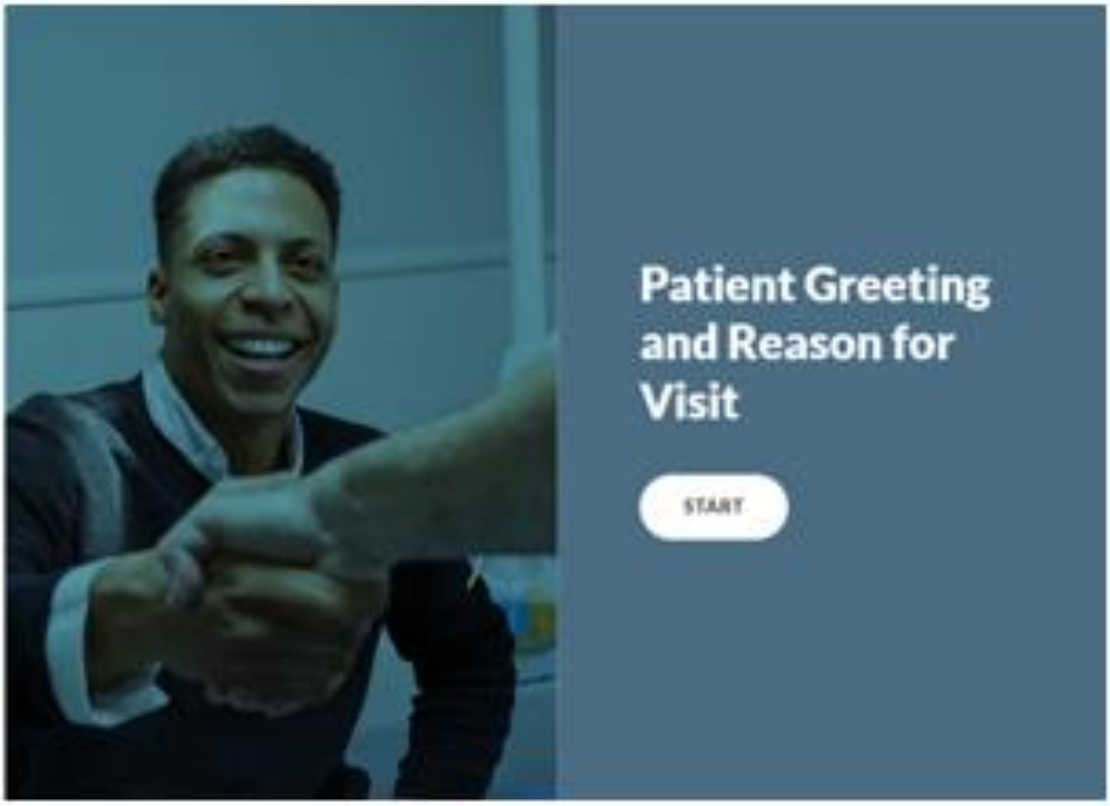

Figure 1. Image depicting the start page of the very first e-learning lesson on patient-centred interview named patient greeting and reason for visit.

Study participants and context of study

In the academic year of 2022, an email invitation was sent to all BDS and BOH students currently enrolled within the Faculty of Dentistry at the University of Otago, enquiring whether they would be interested in trialling a new educational approach for learning pre-clinical skills in dentistry by interacting with digital e-learning tools. Participants were self-selected and students who responded to the invitation were included if they were able to set aside appropriate time (approximately 30 minutes) to explore the material prior to attending a face-to-face focus group discussion (FGD) with a small number of peers, to discuss their experiences with using the tools. That way, students would be given the opportunity to give feedback on the material and highlight anything they deemed to be of importance for the outcome of their learning. Attending FGDs would be a chance for students to consider possible successes and potential barriers to learning pre-clinical skills when using digital e-learning tools. The email invitation included information about the study and a participant consent form for students to sign and send back by return email, whereafter study participants received access to the e-learning platform.

Approximately one week after being granted access to the e-learning platform, the FGDs with participants took place. Each FGD involved students from either one of the two programmes; to enable students to discuss issues or concerns freely without interference from students of the other programme. A semi-structured interviewing technique was used to ask participants open-ended questions during the FGDs (Table 1).

Table 1. Open-ended questions asked during focus group discussions with students.

Questions:
What were your overall impressions of the e-learning resource?
What was your favourite thing in the material, and why?
What did you think could have been done better?
Was there anything that you thought should be in the resource?
What difference would this have made to your learning if you had access to it in your pre-clinical year?
What were your impressions of the voice-over?
Do you have anything else you want to say about the resource?

The open-ended questions were designed to encourage participants to discuss their learning material in pre-clinical activities. The FGDs were held during students' lunch break with a light lunch provided and lasted for up to one hour. All FGDs were facilitated by HO and LA. Each focus group was carried out with students from either the BOH or BDS programme until a representative sample of students from both programmes had shared their views on the distributed material. Each FGD was audio recorded and transcribed verbatim. Analyses of the transcripts from the FGDs were carried out through a general inductive approach (Thomas, 2006) followed by qualitative content analysis (Elo *et al.*, 2014). The analysing process was initiated by HO and LA who individually read and coded the transcribed FGDs. They later met to discuss their individual coding to compare identified common themes and sub-themes. An audit trail of coding discussions was kept supporting rigour of the analysis process.

Results

Scrutinizing curricula

When scrutinizing the curriculum for BDS and BOH students, it appeared that much of the didactic teaching for learning pre-clinical skills and the pre-clinical simulated learning experiences were similar across the two programmes. This strongly indicated that merging such teaching activities would benefit both staff and students. Students would be able to sit in on lectures/tutorials together, and staff members would not have to teach the same topic twice. Furthermore, the curricula enlightened areas for improvements especially regarding the suitable timing for incorporating e-learning material with optimal inclusion for each programme and specific year cohort. For example, e-learning lessons about the initial interaction with a patient; how to great a patient and obtaining a thorough medical, social and dental history would be tailored for BOH1 and BDS2 students respectively, prior to students' first patient contact. After mastering the initial greeting of a patient and obtaining a thorough medical, social and dental history, students would learn how to assess their patients clinically. Such clinical assessment skills would start with an extra-oral examination of the head and neck followed by intra-oral examination of the soft tissues. Following consideration feedback from the students, all the assessment skills were prepared together by the international team of researchers and subject experts in the form of e-learning tools that would later be incorporated for dental and oral health students in each partner institution.

Focus Group Discussions

Altogether, 15 students across the BDS and BOH programmes volunteered to try out the material, resulting in five different discussion groups. The first group comprised three students from BOH3 and the second group was a combination of three students from both BDS4 and BDS5. The first two groups represented dental and oral health students who were experienced in treating patients compared with the last three groups that included more inexperienced oral health students who had

not yet started to see patients. These last three groups all involved students from BOH1. After the fifth FGD, data saturation was reached as no more themes could be identified. All participants were females except one male from the BOH programme. When students from the BDS and BOH programmes expressed their views and experiences with using the digital material as a supportive e-learning tool for learning skills in pre-clinical dentistry, the same three themes were identified within all FGDs. The three themes comprised (1) *evaluation of the resource*, (2) *ideas for improvements/enhancements* and (3) *perceived utility and application*. Each theme with common descriptive words articulated from students across the three FGDs are presented in Table 2.

Feedback from students attending the FGDs revealed overwhelmingly positive experiences from using the e-learning tools. Students near completion of their programmes experessed how helpful it would have been if these learning tools could have been available for them in their pre-clinical and early years of learning, prior to interacting with patients and starting their treatment of care. Students in the early years of their learning advised this would be a suitable complementary learning tool alongside pre-clinical face-to-face teaching.

Table 2. Three themes (1-3) with sub-themes identified from the FGDs.

(1) Evaluation of the resource (Overall impression)	(2) Ideas for improvement/enhancement	(3) Perceived utility and application
Helpful	Inclusion of a glossary	Learning at your own pace
Interesting	Videos embedded rather than linked	Useful for pre-learning
User-friendly	More information/reference links	Useful teaching tool
Eye-catching videos	Tests to be passed before moving on to next section	Useful revision tool
Needs instructions to have device sound on (for voice-over)	Ability to add student notes	Useful for reflection
Enjoyed seeing the tutors (familiarity, connection)	Summary notes	Suitable for learning together (BDS & BOH)
Attractive, well designed	List of apps or websites for further learning	-
Pop-up questions made students think	-	-

Students found the tool to be appealing and aesthetic. It was easy to navigate through the e-learning module, and they picked up on different learning styles:

I appreciated that you catered to each form of learning – both visual aid and those written aid as well which was quite good for me. (P1, BOH)

Students enjoyed the recognition of seeing their clinical tutor in one of the videos:

I love that [name of the tutor] was in it! I was like, I know you! I think the familiarity was helpful...It would be nice seeing familiar faces or hearing a familiar voice. (P2, BOH)

Ideas for improvements were expressed for both the content and the layout of the material, and one student suggested additional printed material.

I thought it would be cool to have a written version that students could take into clinic so that they don't have to watch a video in front af their patient. (P2, BDS)

Other students suggested enhancing the tool with 3D tooth morphology:

Tooth morphology is such a huge part of first year and that's one of the big things you really have to learn...like a model of a maxilla and a mandible and you just click the tooth and then you can 3D rotate it and it's awesome. (P2, BOH)

In addition, students from both programmes suggested including more interprofessional education (IPE) between the BDS and BOH programmes. One BOH student voiced that this kind of interprofessional education and collaborative learning, as well as sharing of patients, did not happen a lot within the Dental School. Furthermore, the participant questioned how students would learn how to work together in the real world, if they could not learn to work with each other during their undergraduate dentistry studies. Other students agreed that IPE would be suitable when sharing patients, to give them insight on what students from the other programme had been taught in lectures and pre-clinical activities, as well as increasing their confidence in recognising each professions scope of practice including limitations for providing care and knowing when to refer.

In the lectures we're told to always work as a professional team and that can often be quite confusing…The notes are completely different; the types of forms that are filled out are different so maybe using the tool to bring people together and everyone learn how referrals work. (P3, BOH)

Discussion

A limited number of students across all three-year levels of the BOH programme and more advanced students from the BDS programme (year 4 and year 5) at the University of Otago, New Zealand, expressed a high level of learning experience after piloting a digital tool for learning pre-clinic skills. Similar evidence of enhanced learning experience towards using e-learning in undergraduate teaching was found in a systematic review among undergraduate dental radiology students (Botelho *et al.*, 2019).

In terms of best practice to maximise simulation experience in dental education, and to enhance the efficiency of using virtual reality (such as e-learning) and simulation exercises (pre-clinic learning activities), Nassar and Tekian (2020) emphasised the importance of feedback and deliberate practice. The digital learning tools development for students in our study had an in-build mechanism to give instant feedback depending on how the student answered a specific question. This was referred from students themselves as the 'pop-up questions' that made them think. This mechanism of instant feedback is likely to have contributed to students' engagement and positive experience in using the tools including being user-friendly, having eye-catching features and a feeling of familiarity with the content.

Consistent with our study findings, in which students reported the tool to be effective for learning and revision, e-learning has been successfully utilised for real-time assessment and independent practice in simulated learning among junior dental students (Quinn *et al.*, 2003). Furthermore, a multi-centre study in Germany, reported that 90% of faculty staff viewed e-learning technology as being useful in gaining basic dental knowledge (Welk *et al.*, 2006).

Positive reception & engagement

Student participating in our study expressed how joyful it was when seeing their tutor

acting on the screen. From a student learning point of view, there are conflicting opinions in the literature in regards to familiarity and learning outcomes, with Lee *et al.* (2020) indicating that video modelling reduces learning effectiveness when students are seeing a familiar face, compared to Griffiths (2024) who presented results similar to our study findings, indicating enhanced student learning outcomes when seeing a familiar face in a video or hearing a familiar voice of an instructor. In addition, this familiarity created an additional layer of credibility and provided engagement and motivation among learners which was also evident among students in our study.

Curriculum merging potential

Irrespective of which programme or year level of study, all participants in our study agreed that e-learning would be convenient when learning pre-clinical dental skills, as well as being a useful tool for revision and reflection in the more advanced years of their dental education. Since both dental and oral health students have the same foundation of basic dental knowledge, it was appreciated that students also realised this connection.

Practical improvements suggested

When asked about the potential for incorporating interprofessional learning as a teaching modality, all students responded positively to learn with, from and about each other's' profession through IPE activities. Ideas for improvements raised by the students in terms of both layout and content of the e- learning tools were all very valid and manageable. These suggestions were later brought back to the international team of researchers to be further discussed throughout the continuation of the development process for the remainder of the e-learning material.

Strengths and limitations

A small number of study participants was a limitation of this study as only a few students from each programme (BDS and BOH respectively) opted to try out the e-learning tools. This self-selected sample poses limitation in terms of generalisability. In addition, this pilot only included one from a series of four e-learning lessons, so experiences from this one lesson might not translate to all content. However, similar ideas were brought up for discussion in each of the five FGDs, irrespective of their programme or level of learning and it was a strength that the same themes were identified from within all five focus groups. Therefore, target satisfaction for the number of participants was reached early on with no additional FGDs required. Another strength was that the FGDs were carried out with students from both programmes with a mix of student cohorts; from early learners with no previous patient experience up to an advanced level of learners, involving students who were soon to be graduating with lots of experience treating patients. Furthermore, given that student feedback echoed what was found when scrutinizing the curricula, in particular regarding the suggestion of merging content that are similar across both programmes, as well as to include more interprofessional education and collaborative learning, was another positive outcome from this research study, highlighting the appropriateness of collecting student voices via discussions in focus groups.

Conclusion

E-learning tools have gain positive reception among undergraduate dentistry students in a pilot project within the Faculty of Dentistry at the University of Otago. Scrutinizing the curricula for BDS and BOH students at Otago not only illuminated a need for incorporating the e-learning material into the curricula but also clarified in what year level of learning each of the e-learning lessons would be most appropriately incorporated. Learning together was highlighted during the FGDs and positively loaded as a way for students to interact across the two dentistry programmes, because students wanted to learn together and were curious to learn with, from and about each other's professions, ultimately in a blended learning

approach. This kind of interprofessional learning would not only enhance student learning outcomes within the education curricula, but would eventually serve as a vehicle for dental and oral health professionals to start working together to ultimately improve on patient care and treatment outcome.

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