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Mobile learning in Dentistry: Challenges and opportunities.

Abstract

Introduction

The impact of mobile phones technology is changing the approach to learning and teaching in clinical dental education. The aim of this study was to understand the challenges, opportunities and attitudes that both dental undergraduate students in an English dental school and tutors experience when using electronic/mobile learning.

Materials and Methods

Six faculty members and 20 students agreed to take part in semi- structured interviews at the School of Dentistry, University of Birmingham. Topic question guides for the student interviews focussed on searching for information and how they used mobile learning. Questions also asked about the barriers encountered when accessing information on the internet, their own perspective on the term 'Evidence based' information and their use of mobile apps. The question topic guide for faculty was similar with greater emphasis on their attitudes to the introduction of such technology in clinical dental education.

Results

Students and tutors reported active use of mobile learning tools in dental education. However, students are in need of training and further guidance when searching for, evaluating and synthesising evidence based information on the internet Likewise, tutors need to learn the skills and knowledge of using mobile learning tools so that may provide effective to support students in their learning via accessing material through mobile technology.

Conclusion

The results from the study show that the participants need training workshops to ensure that students are not only accessing evidence based information on their mobile technology, but can differentiate between evidence based and non-evidence based information apps. The tutors in this study also require information on how to provide their students with advice on using mobile technology. Institutions involved with clinical dentistry should acknowledge such challenges.

Introduction

Whilst face to face teaching remains important in education, students prefer newer approaches to communication which give immediate feedback¹. However, use of instant access messaging may add to the workload of their tutors who are often not comfortable using such methods^{2,3}. The popular conception is that students are the experts in technology use and that these skills are universal across all students, leading them being referred to as the 'net generation'^{4,5}. The tutors are labelled 'old fashioned' and perceived as experiencing difficulty using such technology. Tutors are not perceived as being as proficient as their students in utilising the range of mobile and electronic tools available⁶. We argue that students and tutors face different challenges when using technology for learning and teaching. These difficulties relate not to the proficiency of how the technology is used but the quality of the information available^{7,8}.

This study explored the challenges and opportunities faced by students and tutors when using electronic/mobile learning tools in dental education. Additionally, this study considered students and tutors attitudes towards the use of mobile technologies in dental education.

Methods

The project received ethical approval from the University of Birmingham's ethics committee. Two draft topic guides were designed for interviews with University of Birmingham Dental School tutors and students, focussing on mobile learning tools and devices. Purposive sampling is the method used to recruit the participants in this study. The number of individuals needed to generate rich data was not predetermined and was decided whilst conducting the interviews. Students and tutors who had particular access to important source of knowledge, relevant to this research were approached.

The emphasis of the interview questions was on information and communication technologies used by students and tutors, and their attitudes towards using mobile learning tools in their teaching and learning.

The topic guide designed for students included questions related to their use of electronic/mobile tools and online platforms for dental studies;

- their choices of devices for connecting to the internet and searching for information;
- their choice of mobile computing/communication tools for education;
- potential barriers to accessing information on the internet;
- their perspective on the term 'Evidence based' information and apps, and
- any extra comments about use of electronic/mobile tools for their learning.

Tutors were asked similar questions as well as questions about their attitudes towards and use of electronic/mobile tools for teaching. This included questions around;

- teaching and research at the dental school on the use of electronic tools,
- the barriers they face when using their devices;
- factors that would encourage them to use their devices and online teaching tools/platforms in dental education, and

- their awareness of extra students curricula inside and outside of the classroom.

The interviews with tutors ended with questions on their views on the use of cloud computing platforms by dental students and tutors; their attitudes regarding lecture recording, and any extra comments not covered elsewhere in the interviews.

The interviews were semi structured, allowing some flexibility. Participants were informed that the interviews were optional and that they could withdraw at any time. The interviews were confidential and anonymous. Students and tutors were made aware that only the research team would have access to their names and transcripts for analysis purposes. Six faculty members and 20 students participated in the interview process. The interviews lasted 30- 45 minutes. Participants were informed prior to the interviews that they would be recorded and transcribed.

The interviews were not time-limited and participants were free to provide as many detailed answers as they wished. Interview responses were first saved as voice memos on the audio-recorder, and then transferred on to a laptop. The interviews were coded, based on the themes that emerged from the data when analysed. Each interview was transcript anonymised.

CAQDAS QSR-Nvivo-6 released in 2012 by QSR International, qualitative data analysis computer software was used to categorise the main themes. Once the process was over, the transcripts were emailed to participants to check and verify the accuracy of the transcripts from the interview.

Results

The results are presented in two sections. The first section outlines the results from student's interviews and the second section outlines the results from the tutor interviews. The results summarise data related to the barriers/challenges in electronic/mobile (E/M) learning and teaching, and the opportunities/advantages of E/M learning and teaching.

The interviews started with participants providing demographic information. These questions were important to students as they made them get used to the style and process of the interview. **Table 1** outlines the demographic data of students interviewed in order of year.

Student interview results

What would encourage you to use the internet more for Dental course and Research?

The majority of students felt that dental course related apps accessible on their smartphones would encourage them to use the internet more for the dental course. One student also felt that guidance on how to use them would also be needed once these apps were developed. The following comments are from students who felt strongly about dental related apps:

'Like for example we had a lecture yesterday but he didn't put everything on the handout but as I was copying it I couldn't listen to everything so when I got home the lectures were on the E-course so if I knew that the lecture was on their quickly on my phone I could have listened much better knowing it's all online so no need to copy everything.' (ST11).

What does evidence based apps/information mean?

Six out of 20 students did not know what 'evidence based' referred to and 4 students were unsure and guessed. The remaining ten students explained what evidence based apps meant to them but five understood the meaning of the term well and some explained:

'Literally it means professionals of dentistry basing all evidence on trials and making updates from trials and decisions and evidence with a lot of research and put together information basically well evidence based and trialled with peer reviews' (ST1).

'If the information has evidence behind it and not just created by anyone. if I was to go on to BDJ I don't look for evidence because I trust that they are safe but if I see a journal I recognise the name I presume it's ok to use so I don't always look for the evidence' (ST8).

Most students (15/20) did not know if their apps were evidence based or if the information they were accessing had evidence behind it.

Barriers when connecting to the internet to search for information

One student felt that using smartphone use at the dental school may look unprofessional and explained: *'I suppose there is some sort of stigma when using the internet on phones as people think your messing about but it's generally for learning'* (ST11).

The question aimed to find the most common barriers students faced when using their devices but one student felt that technology itself might be a barrier to her learning. She felt disadvantaged feeling she may be 'old fashioned' compared to other students. She commented: *'things like smartphones and iPad's I'm against bringing them in as a learning tool as I don't know how to use them well and it would put me at a disadvantage not advantage so I'd definitely need training and navigation whereas most people would take advantage for me I'm old fashioned'* (ST9).

Alternatively, another student felt he could master most problems he would face and he explained ways to overcome most barriers: *'I've played around particularly with these models and if you play around with it and do some research and time allowing you get used to these things'* (ST1).

Extra comments

Students were given the opportunity to provide extra comments or expand on things they raised during the interview. **Figure 1** highlights some of these comments. The themes were split in to three categories; internet use, and improvements needed; suggestions for improvements.

One student opposed the introduction of electronic/mobile learning as a core part of the course or an extra learning tool, fearing she would be the only student not skilled enough to keep up with the new devices and tools and explained: *'if they going the way towards using technology more as a learning tool then I don't think it's right because we are not all tech savvy just because most people have moved that way it doesn't mean we all have and I think if it's an additional tool its fine but I wouldn't like it if it's a core or essential part of the course I wouldn't be happy with it'* (ST11). She added that the main reason for participating was so she could explain how there are students who may be disadvantaged if technology became a core part of dental education.

Tutor interview results

Tutors interviews followed the same format as the student interviews. Of the sample (n=6) of tutors interviewed, all 6 tutors had access to the internet. **Table 2** shows the demographic data of all the tutors interviewed at the dental school, University of Birmingham UK.

Is there any factor that may change the way you use the internet in the future, from dental to personal more often/ personal to dental more often?

Use of apps was mentioned by one tutor, she explained was just beginning to get used to using apps on her iPhone and had many personal apps (such as communication apps). She did not look for dental related apps, preferring the desktop and laptop screens to her small iPhone screen when looking for information, adding: *'It's the nature of the work really rather than work load from a personal perspective I've used it consistently over the last few years.'* (T2)

One tutor mentioned he would use his devices more for dental course, if students were also encouraged to: *'we need interaction rather than giving students something that we provide, students already come with smartphones and use their own devices to engage in to teaching.'* (T4)

Is there anything you may start using in the future or that you have seen that you are interested in for your research and teaching?

One tutor stated she would only use something different if it added to her teaching and research, and would not use a tool or device, just because other members of the staff were. She felt that by using the basics such as email, word and excel, she had everything she needed, adding that she did not *'do all the whistles and bells'*. Three tutors felt that they would not use anything else in the future and were happy with their current situations. Being left behind was a concern that one tutor had, she explained that she was always the last one to know about new technology and tools such as WhatsApp which she started to use recently. She did not feel she needed anything extra and could do everything she wanted with the tools she had access to. However, one tool that she planned to look at was 'Nearpod', which was highly recommended by a fellow colleague. She explained: *'I can see it work in a small group situation where you don't have video facilities.'* (T6)

Is there anything that may prevent you from using your device for studies?

One tutor felt technology and tools should only be used if they help students with learning and tutors with their teaching and research. She described this as a potential barrier to teaching and learning; devices and tools should only be used if they added something new.

She stated: *'I am quite open to using new things in teaching if its adding to something.....If I think face to face talking to students is helping them then I don't think there's any use of using anything extra but if it helps students remember and retain information then I don't mind using it'. (T1)*

3.2.5 Tutor training

One tutor thought training should be offered to tutors related to electronic teaching, devices and mobile/electronic tools: *'As a lecturer you get told to deliver a lecture and you tend to do it in a way that I had it delivered to me as a student and that may be the done in the same way in the mainstream. When I started out as a lecturer, we had to go on the Postgraduate Certificate in Academic Practice (PCAP) and Associate Module but they didn't include details of different software's like Prezi'. (T2)*

However, although one tutor felt training was needed, another tutor suggested tutors would just 'pick up' on things: *'people just pick it up and you get into this huge machinery of training for this and that I just pick it up from other tutors etc'. (T1)*

The use of mobile devices to access non-evidence based information

One tutor showed admiration towards the use of mobile devices and its popularity amongst student, but concerns regarding the use of mobile devices and access to instant but unreliable information: *'We need to be aware that students are using lectures but also accessing information from elsewhere that may not be reliable or peer reviewed and it's a concern. As tutors, we need to be more aware of this'. (T3)*

Mobile devices; a distraction in my classroom

Although the majority of tutors approved the use of smartphones in the class, one tutor disliked the use of mobile devices in his class and explained how he dealt with it: *'I noticed that the students are using their devices in my class and can interrupt my lecture. They are using it to check there Facebook notifications but I will not ask any student to switch off their phone as they already know that they should have it switched off in the lecture'*. (T5)

Outdated information

One was concerned about students posting his lecture recording on DropBox, commenting: *'it's personal at the time and if it is played three four years down the line, things may have changed and I see a problem with that and if its material shared with university, its different but on a platform like that it can reach anywhere especially with patient information and records'*. (T3)

Discussion

Drawing on a previous study describing how undergraduate dental students use devices such as smartphones and laptops when accessing educational information⁹, this study provides a contemporary insight on challenges and opportunities in mobile learning in dental education, underlining the new ways that students and tutors are adapting to and using new technologies.

Students: Challenges

Social media: a distraction

Previously, educational researchers have considered the relative strengths, weaknesses and threats associated with the use of social media from a professional perspective^{10, 11, 12}. In the present study one student expressed her concerns regarding social media and explained that it had become such a distraction from her dental studies that she had no choice but to deactivate

her Facebook account. Although Social Networking Sites (SNS) may offer community based collaborative learning¹³, students do have concerns about potential effects on educational performance. Some of the risks associated with the use of SNS by dental students include reliability, lack of professionalism, student protection with regards to anonymity and patient confidentiality^{12, 14, 15, 16}.

Tutors may also be unaware of any extra activities such as IM on their devices which the students are using whilst listening to the tutor¹⁷. One solution recommended is that tutors could participate in this new way of learning using technology¹⁸. Similarly, one study found that mobile ICT use in the lecture hall is related to activities unrelated to their learning and concluded that understanding students need and use of mobile ICT in class could be used to inform and redesign classroom activities, through actively involving these technologies to support constructive alignment with learning outcomes¹⁹.

Unprofessional use of Smartphones

The interviews revealed that the laptop was the most popular device followed by smartphones. One student used the smartphone for information searches for instant information. Not using the smartphone in front of patients was her main concern and she mentioned that it was her priority that this did not happen. Students are reluctant to use smartphones on clinic and in the dental school as patients and tutors may think that students are distracted and not learning. Smartphone use may be stigmatised in the educational environment. In one study which surveyed physicians' and medical students' smartphone use in health care environments, it was found that participants would make the decision of using smartphones in such settings depending on a combination of three considerations including appropriateness of the behaviour in front of patients and how disruptive the behaviour may be²⁰. There is little research in this area and it would be interesting explore patient perceptions on the use of mobile/electronic tools on clinic.

‘Old fashioned’ and disadvantaged students

One student elucidated that she felt ‘disadvantaged’ and thought that she was ‘old-fashioned’ in regards to the use of technology at the dental school. She opposed the introduction of technology tools in the classroom and the clinic as she was not as confident using them as her peers. She felt other students were well advanced and tech savvy and that she would need considerable amount of training and navigation to bring her up to date. She took part in this interview primarily to voice these concerns, and showed high level of anxiety with the introduction of iPads at the dental school.

Other students were comfortable with the latest technology tools and gadgets and advised:

‘If you play around with it and do some research and time allowing you get used to these things and get confident’ (ST1).

There is a need for a more sophisticated understanding of how students are choosing to use technology. Researchers should not be tempted to base decisions on digital generation stereotypes and should try to understand other factors that may cause some dental students to feel left out or left behind. Not all students use technology tools provided by universities straight away and may need extra attention and training even for the basic use of multimedia tools.

Students are unaware of the term ‘evidence based’

Healthcare students require more training to successfully and efficiently search for evidence based information. Students have previously shown mistakes and poor search strategies when researching independently^{21, 22, 23}. In this study, students were asked to describe what the term ‘evidence based’ information/apps meant to them and how they trusted information on the internet. The results show students may lack adequate skills and knowledge to search for, evaluate and synthesise evidence based information on the internet, despite this being one of

the most fundamental issues in higher education. With the introduction of networked technologies and the Web, the production, intake and distribution of information have changed dramatically^{24, 25, 26}.

Students rely exclusively on well-known websites such as Google and YouTube etc. instead of using evidence based research tools. One student used YouTube for information and would check the reliability by the numbers of views, comments and likes related to the specific videos, which he felt was sufficient evidence for him to use the video for his studies, and check against lecture notes. These results show that dental students may lack the fundamental search skills to differentiate between misleading and non-evidence based information and information which has scientific approval. Students seem to have a tendency to select 'well known' databases that are 'liked' by their peers instead of researching adequately for evidence based information. Other studies have found that websites such as Google facilitate the majority of higher education searches^{27, 28, 29}.

Previous studies suggest dental students need specialist training and detailed instructions on online information searches and finding evidence based, and academically adequate information/apps. Providing such help earlier on in the first years of dental education may give students equal opportunity to succeed in their studies and training⁷.

Tutor: Challenges in E-learning

Tutors seem to use desktop computers because they have the statistical and analytical packages which require long hours of sitting at a desk and concentrating. Tutors may have difficulty viewing information and files on smartphones and iPads because of the small screens. In one study, when analysing the attitudes of practitioners and medical students towards smartphone use, found that smartphones may provide instant information, but users could be 'jet skiing' through the information instead of reading it properly³⁰.

Everybody needs to get involved

Tutors expressed concerns regarding some of their colleagues who are very tech-savvy and can almost '*go down their own tangent*' of electronic teaching. Tutors explained that it is important to share everything with other tutors and learn from each other. One stated she felt 'left out' sometimes when other tutors were advancing with their use of electronic tools and technology. If the university is to implement or take on a new digital based platform, all tutors needs to be involved. This suggestion was also made by other tutors.

Tutors and students should not be forced to use technology

Throughout the interviews, tutors were informed of new ideas and ways to communicate, teach and interact with students. One tutor stressed that it was really important to not force technology upon tutors and students as this would be off-putting. The tutor referred to the use of social media and explained that anything that is implemented in the future should be voluntary and not compulsory. In one study it is argued that there are many advantages of integrating E-learning in to education but stress that learning with technology tools is very personal and people 'will learn what they want to learn'. Furthermore, it is stressed that E-learning is based on a lot of interactivity and this cannot be forced³¹.

The use of YouTube and videos in dental education

Tutors were concerned that students may be accessing information through videos online, which may not be trustworthy and evidence based. One tutor recommended useful video links to students, that he thinks may be useful, but stressed that the problem arises when students look for videos on YouTube independently without guidance. Researchers have found YouTube is being used increasingly for dental and medical related videos, especially by professionals who share the videos with patients and public^{32, 33}.

Students: opportunities in E-learning

The usefulness of videos

In learning circles today, technology has transformed from being new and exciting tools to being incorporated into mainstream education. For example, the results show that it is normal for students to use video channels such as YouTube for further information and guidance after lectures. Such websites contain a vast amount of medical and dental related content and it is an easy medium to access for knowledge³⁴. Clips showing surgical procedures and treatments such as anaesthetic techniques were the most popular. It is unclear whether students understand that videos uploaded on YouTube and similar platforms have undergone peer review or not.

Using Mobile devices in the classroom

The classroom is where tutors will build a learning relationship with their students. A community is developed which motivates the students and the tutor is able to facilitate the learning progression^{35,36}. On the other hand, a classroom environment with minimum interactivity will lead to uninspired students which could negatively impact their learning³⁷.

The tutor is not the first point of contact now for questions as students have laptops and mobile devices with internet. Although there are many benefits of using electronic devices in the classroom, the tutor may be unaware of any extra activities such as IM which the students are using whilst listening to the tutor¹⁷.

The results show that there is an ever increasing dramatic wish-list generated by students who want the latest gadgets, software and E-learning packages for their training and practice.

Tutors and universities need to be able to match student's expectations³⁸.

Tutors: Opportunities

If you can't beat them, join them; use of smartphones in the class

Tutors explained that they are comfortable with students using smartphones and hand held devices in the class as students '*already come with these devices to the dental school*'. One tutor did not see any problems with encouraging students to use smartphones, and another agreed that smartphone use should not be completely rejected. In the past, smartphones have been described as personal digital assistant devices which are portable resources for healthcare students. For example, it is evident and vital for nursing students to use smartphones to have instant access to tallying their clinical times, clinical encounters and multiple reference collections^{39,40}. Dental tutors have repeatedly described the benefits of using smartphones in the class, including constant communication and information retrieval. Similar results have been found in the past which describe the use of smartphone tools to encourage students to self-direct their learning and research information on the go^{41,42}. One tutor suggested that if students were encouraged to use their smartphones in class, the university would not need to provide extra training as students would be harnessing the tools that they already use. This would eliminate the need for training in ICT. Similar suggestions were made for nursing students. Even though smartphones have the potential to enhance learning and teaching, careful consideration needs to be given to using the same device to interact around patients⁴³.

One tutor highlighted that if he could not explain something to students, it would always be better understood when students are away from class and interacting with each other on group chats, explaining the topic. WhatsApp has been utilised by students to contact each other and explain things that they did not understand from the tutor. We found in a previous study that dental students found WhatsApp to be very useful as it allowed them to check if the other

person had received and read the message, and then check if their contacts were online or not¹.

If students were missing in his class or running late, or even if a lecture was to be cancelled on the day, one tutor would ask students directly to WhatsApp fellow students, to update them. He added this was one way that he would utilise smartphones but only if it did not become a distraction to his teaching. In a previous study it was found that using mobile devices in class, increased class interactivity, interest level and was overall an enjoyable addition to teaching and learning¹⁸. Similar results were found with regards to tutors' attitudes towards mobile devices in class. Tutors explained they could easily manage the implementation of such tools and noticed an increase in the quantity and quality of questions received by students. These results support the idea that tutors may now be enthusiastic and motivated to implement mobile devices in their class, only if they can see the usefulness and if it is not a distraction.

Sharing ideas: Everybody needs to get involved

Tutors expressed concerns regarding some of their colleagues who are very tech-savvy and can almost '*go down their own tangent*' of electronic teaching. Tutors explained it is important to share everything with other tutors and learn from each other. One tutor clarified that she would feel left out sometimes when other tutors were advancing with their use of electronic tools and technology. If the university is to implement or take on a new digital based platform, all tutors should be involved. This suggestion was made by 2 out of 6 tutors. One study investigated the opinions of administrators and information technology specialists regarding E-learning and the future of dental education. Collaboration was deemed to be important to help with the innovations of electronic learning in dentistry and any meaningful technology advances are only achieved once there is a high degree of collaborative effort⁴⁴.

Limitations

The goal of using a purposive sampling technique was not to create a sample to make generalisations, but to focus on particular characteristics of the sample selected and their interests. The use of such a sampling technique means that the results cannot be representative of the entire population, or even other dental schools. Maximum variation sampling was applied in this part of the research. Saturation was achieved from the participant answers in the interviews. The purpose of the study and some of the questions had to be explained to the students and tutors in the interviews. This could have biased their responses through hearing about the study, its purposes and aims and the enthusiasm about the subject. These limitations of the research must be kept at the forefront. It is alongside these that any conclusions and recommendations must be considered and framed.

Conclusion

Student participants are proficient at using mobile technology. However, they are not good at simulating mobile technology such as evidence based dentistry. Tutors don't have the skills and knowledge to help their students in this area and the results point to the need for universities to direct their resources to searching for knowledge rather than concentrating on the technology.

Further research needs to focus on preparing tutors to teach dentistry with technology and train tutors to prepare students to learn and practice dentistry, in an information and technology rich society. Students are finding it difficult to search, evaluate and synthesise evidence based information, especially now with instant information available on the go.

Universities need to focus on improving information literacy amongst students and may need to integrate modules which can help students synthesise and find peer reviewed quality information online and through apps/videos.

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