

**The uptake of electronic/mobile
technologies in dental education at the
University of Birmingham**

by

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ABSTRACT

Abstract

Aim: The aim of this study was to gain a better understanding of the uptake of new mobile technologies and how they are utilized by staff and students in dental education.

Methods: A questionnaire was distributed to undergraduate students at the University of Birmingham, Dental School. Follow up one-to-one interviews were conducted to gain an insight into some of the topics covered through the questionnaires. Tutors were interviewed to understand both their attitude and understanding towards the use of electronic/mobile technologies.

Results: Laptops are used by students mostly in a comfortable sit down place/area where they can ‘concentrate’ on their work. It is apparent that smartphones are more convenient for students to learn and as a resource to advice patients on their clinic. They are using them on the go in preference to any other device and use the support of mobile tools such as phone apps. Emails are used by health students for more formal messages and Instant Messaging and social networking sites are used for shorter messages. Students thought that changes were necessary in the way that they communicate and research their studies. They considered this as an ideal way to improve their experience as health students and practitioners.

Conclusion: There is an all-embracing use, by both tutors and students of mobile learning tools such as instant messaging, social media, and cloud based platforms, E-books and mobile apps. Learners wish to embed tools such as instant messaging in their learning areas but not without the approval of their respected tutors. Institutions should be aware of such changes and look to adapt their learning practices to mobile technologies.

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Preface

The work of this dissertation has been undertaken over the last three years (February 2012 – February 2015) in the University of Birmingham, Dental School. During this period some of the materials in this paper has been published and presented to scientific meetings.

Published papers

Dental students' uptake of mobile technologies

Khatoon, B¹., Hill, K. B¹., & Walmsley, A. D¹

1 School of Dentistry, The University of Birmingham, St. Chad's Queensway, Birmingham, UK
Published in the British Dental Journal, (2014); 216 (12), 669-673.

Can we learn, teach and practise dentistry anywhere, anytime?

Khatoon, B¹., Hill, K. B¹., & Walmsley, A. D¹

1 School of Dentistry, The University of Birmingham, St. Chad's Queensway, Birmingham, UK
Published in the British Dental Journal, (2013); 215 (7), 345-347.

The dos and don'ts of social networking in dentistry

Khatoon, B¹., Hill, K. B¹., & Walmsley, A. D¹

1 School of Dentistry, The University of Birmingham, St. Chad's Queensway, Birmingham, UK
Published in *Dental Update*, (2014) 41(8): 690-696.

Instant messaging: Responding to the challenge in dental education

Khatoon, B¹., Hill, K. B¹., & Walmsley, A. D¹

1 School of Dentistry, The University of Birmingham, St. Chad's Queensway, Birmingham, UK
Journal of Dental Education, (2015) (in press).

Conference presentations/meetings

2014 **92nd General Session and Exhibition of the IADR, Cape Town**
Oral presentation on 'Mobile Learning and Dental Education'.

2014 **U21 Social Media Meeting, Fudan University, Shanghai**
Harnessing social media use within education.

2013 **Bath Conference (BSODR)**
Poster titled 'Mobile Learning and Dentistry' presented at the British Society for Dental and Oral Research.

2013 **ADEE Annual Meeting, University of Birmingham**
Discussing the theme of Electronic Learning at ADEE.

The author of this thesis has been awarded the following:

- British Dental editors forum Annual Young Communicator of the year award (2014)
- Accreditation as an Associate Fellow of the Higher education academy
- 20 masters level credits for completing the Academic Practice Groups Introduction to learning and teaching in higher education for doctoral researchers.

List of acronyms

E-learning	Electronic learning
M-learning	Mobile learning
IM	Instant messaging
SNS	Social Networking Sites
SM	Social media
CAL	Computer aided learning
CAD	Computer aided design
CAM	Computer aided manufacturing
CPD	Continuing professional development
MCQ	Multiple choice questions
App	Application
GDC	General Dental Council
BMA	British Medical Association
NMC	Nursery and Midwifery Council
HCPC	Health and Care Professions Council

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CHAPTER ONE:

INTRODUCTION

1.1 Introduction

Mobile devices and tablets are becoming more popular than the traditional information devices such as desktops and laptop PCs, and are the dominant platform for knowledge access on the internet. An example of this takes place in educational environments such as school field trips, where information is readily downloaded by students to help with their studies (Church *et al.*, 2007). Mobile phones are powerful small computers, which readily communicate with the internet via wireless/communication technologies. This allows an individual to be in contact with the world whilst on the move. In order to understand how new technology is being used to help students and tutors with their studies and teaching/research, it is important to embrace cognitive science and findings related to learning. The on- demand nature of e-learning insists on re-visiting learning theories and understanding some of the differences compared to classroom/traditional learning (Clark 2002).

1.2 Understanding how we learn

When new technologies and ways of teaching are introduced in an institution, the focus should be on supporting student's attainment of the necessary attitudes, skills and competencies (Van Dinther *et al.*, 2011). This cannot be simply done by showing and demonstrating then expecting students to eventually get a grasp of things. E-learning and M-learning is something new in education today and finding a relationship between the psychology of learning and E-learning, has provided a new platform for previous theories and ideas to be re- evaluated, so that students can accept E-learning as well as the traditional way of learning. Performance and learning outcomes are hugely impacted by the learner's choice of manner in which they approach the learning situation (Cassidy 2004).

A good understanding of how the mind/ brain functions and how new information is stored by using the body and brains different processes is important as a base, before developing any new material or technical work. Also, to understand how disabilities arise, and how this may affect the learning outcome of students (Fischer and Daley 2007). There are many theories about how the brain works and how students learn. Educational institutes need to pay close attention to these theories as well as students' skills, attitudes thoughts and beliefs when it comes to the learning process. Such research and human behaviour investigations are known as 'cognitive theories' (Schunk 2003; Pajares 2006). Other factors in the area of psychology and the history of learning overall, includes motivation, environment and emotions (O'Regan 2003; Hodges 2004).

1.3 Cognitive Education

Cognitive education has many definitions in different departments but for educational purposes, it is defined as an approach that takes into account the findings of cognitive research and diverts this knowledge towards learning. If the brain is well understood in relation to learning and teaching, universities and educational places can develop very up to date and effective programs and policies (Talkhabi and Nouri 2012). Cognitive science and findings should be embraced as it gives an insight on how the brain actually works, and by learning the functions of the brain in relation to learning, material and teaching methods can be moulded so that students can learn effectively, especially with E-learning and M-learning (Clark, 2002). Over the recent years, so that students can learn more in depth, cognitive education is focussing on ways in which many authoritative and influential ideas can be understood as well as the student given responsibility for their own learning. This responsibility would mean that students become 'knowledge builders' (Bereiter 2002; Scardamalia and Bereiter 2006). Students' careers later in life will benefit greatly when they

learn naturally and focus on creating ideas for themselves at an early stage which will help and improve their future. The difference between the two is that cognitive approaches focus on knowledge construction, whereas traditional approaches focus on knowledge transmission. Reasoning is a priority for cognitive approaches and for traditional approaches it is more about memorisation. Learner centred and collaborative cognitive approaches may sometimes be much better to use when new methods are created for teaching compared to teacher directed and competitive traditional approaches. When students are the main focus, methods of teaching and learning will automatically bring out a positive outcome, as priority will be given to the students learning (Bereiter 2002).

1.4 Different learning theories

Over time, psychology has gone through many changes and different thoughts and findings have formed theories, which can be applied to many projects within education. Behaviourism is the first theory. It is believed by behaviourists that behaviours build up as a result of external surroundings and this could happen by reinforcement and repetition. Mental activity is not taken into account by behaviourists and they believe that learning is altered by changes in behaviour (Cust 1995). Mobile devices can provide the feedback and reinforcement instantly which is propounded by behaviourism (Naismith *et al.*, 2004). The next theory originating in the 1960s and 1970s is cognitive. Cognitive theorists believe that human performance is very much determined by thinking processes. It is believed that successful learning can be achieved by the capability of learners wanting to obtain a good understanding of the subject and relating it this to their personal experiences. Learning and interaction work together for successful outcomes. According to cognitive theorists, knowledge may include background information that students may already have about a particular topic (Glaser 1984). The difference between both theories is that behaviourists believe learning outcome is going

to be effected greatly by behaviour and environment change whereas cognitive theorists believe that it will be determined and affected by having a good understanding and having good skills. The latest theory is constructivism and it is defined as believing that students will look out for knowledge and 'construct information' whilst keeping in mind the past learnt data and experiences (Shuell 1986). Compared to behaviourism, it is believed that people will learn from the environment and act accordingly rather than simply having a reaction to the environment. Cognitive theorists and social constructivists are in agreement. Constructivism demands simulation, immersive environments and rich media. Mobile devices and electronic platforms enable such experiences through gaming environments, virtual reality etc. (Naismith *et al.*, 2004).

Overall, E-learning and M-learning can be related most closely to the constructivist's ideas as compared to traditional learning the new technology is pushing students to become work-based learners, self-directed learners, and independent learners, with simulation in a problem based environment.

CHAPTER TWO:

BACKGROUND

2.1 Mobile learning

Mobile learning may be defined as the delivery of information and communication technology via portable wireless devices including small communication and computing devices (Hameed 2003). It may also be termed M-learning. Interaction such as instant messaging and blogging offers flexibility, providing a variety of ways of communicating. This is ideal for distance learning as teachers and students can keep in touch with each other (Corbiel and Corbiel 2007).

Advances in technology have also led to the traditional lecture being challenged, as not only can it be recorded and reviewed many times later, but students and teachers may discuss the contents away from the lecture hall. Students quickly search via smart phones for information and therefore educational material should be designed to accommodate for such styles of access. The aim is to direct the learner to educational material in a structured manner (Cobcroft *et al.*, 2006). It is said that learners are more community orientated, open-minded and are ready to experiment. Learners appear to have a very enthusiastic attitude and a desire to try out new technologies. These characteristics of the mobile learner are leading to the powerful changes brought about by this concept of M-learning (Oblinger 2003, 2004).

By the end of 2011, there were around 6 billion mobile phone subscriptions in the world (BBC News, 2012). This provides powerful evidence that people are becoming more digitally advanced than ever before. All generations are interacting with the technology and the often quoted age group gap may be less noticeable than before.

A mobile phone has become an essential requirement to living and students like to use it not only for recreational purposes, but also for education. There are still many technological barriers, as phones do differ in ability, depending on the age and brand that is purchased. For

example, some phones may have multimedia capabilities such as video recording, conferencing and downloadable mobile applications, whilst others may only be text enabled (Ramluchumun *et al.*, 2010). The boundary between its use for recreation and educational purposes is blurred and may lead to difficulties in uptake for specific teaching and learning applications.

2.2 Changes in Technology

The use of devices in medical and dental education dates back to the 1970s with the use of computers. Such computers were large and bulky, had telephone links to remote terminals and were very expensive to run (Grigg and Stephens 1998). It was stated that teachers were the key medium for education and that information technology was only useful by assisting teachers to find different ways of teaching (Yip and Barnes 1999). It is interesting to debate how much this has changed today. Information Technology has always been in a state of change and has rapidly progressed from being used only for word processing with a desktop PC, to being used for sharing and transmitting data electronically to anyone, anywhere in the world (Greenwood *et al.*, 1997).

The predicated vision for 2005 included supplementing course material via uploading to an intranet. This would allow information to be quickly updated instead of the need for traditional classroom teaching (Preston 1996). There was much excitement about the use of emailing and potential teleconferencing for dental and medical students (Laurillard 1993). Whether this excitement is still present following the overload of emails is open to debate. The Computers in Teaching Initiative Report of UK (1998) found that there was a lack of good computer software in dentistry, and the amount of information available on the internet was poorly managed. The main barriers to computer aided learning (CAL) included concerns

that it was time consuming, expensive and teachers needed a different style of training to use it. There was little or no reward for developing and circulating such material and therefore teachers were reluctant to invest in the medium (Yip and Barnes 1999). Many of these factors are still present, in spite of the rapid developments in technology that are taking place.

A major change in Dentistry associated with computers occurred in 1970 when Dr. Francois Duret, created the concept of dental computer aided design (CAD) and computer aided manufacturing (CAM). His vision was to combine physics and the computer to alter dentistry altogether (Crawford 1988) and CAD/CAM was used to produce a finished crown for cementation by a micro-milling machine. Dr. Duret pointed out at the time that:

“It is not necessary for dentists to know the physics, just to be familiar with the computer software.”

In 1988, dentistry was looking towards exciting possibilities using computers. These included one appointment crowns, no adjustments needed, no temporaries needed and no impressions. Stainless steel crowns were also promising which would ‘fit like gold’ (Crawford 1988). Such predictions have come to fruition as it is possible to produce crowns that are “milled” to fit dental preparations (Groten *et al.*, 1997).

Computers have been used to assist dental education assessment in many different specialities. For example, the format of multiple choice questions and answers lends itself well to their use with computers. Early computer systems that were available for programming allowed development of simple examination testing. They equipped students to test their diagnostic skills when studying the subject of orthodontics. The system ran on a micro-computer with a disc drive. The programme consisted of seven alternative answers being shown for each question. Students enjoyed this method of learning for testing their

ability, and studies showed that they requested such formats in preference to studying alone using books (Stephens 1986). This is an early example of students driving the need for more exciting methods of learning, which is often in variance to the teacher's perception of this situation.

The first electronic educational packages were termed CAL (computer aided learning) and they were made available to students as a learning tool in dentistry. They were more complex than simple text or multiple choice questions and allowed the teaching of treatment options (Grigg and Stephens 1998). The use of CAL was perceived as a positive learning tool, which would change many aspects of dental education in the future. It was predicted that students would be able to take away lecture notes on a floppy disk and edit the material on their own computers whenever they liked (Preston 1996). Technology has undergone amazing modifications with regards to such interactivity, as students may not only take away lecture notes from the class but can download lecture notes from the internet or even use 'live video conferencing'.

Nevertheless, to make all this possible, the internet has been the key to bridging such predictions and the actual system use. Over time, students have come to enjoy the use of video conferencing; emailing, downloading files etc. and these tools have become a routine and a natural practise in learning spaces (Zimmerman *et al.*, 1986).

In the past, evaluation of several interactive computer aided learning programmes have taken place. One such example of a CAL programme is 'Wears the Tooth' which was designed for the topic of tooth wear and erosion. Fifty dentists took part in completing a questionnaire which examined the programme (Perryer *et al.*, 2000). It was found that 84% preferred it better than books, 98% would prefer it to audio tapes and 86% preferred it to reading journals.

Such programmes were relatively easy to navigate (68%). Such findings demonstrate that dentists are keen to try out new systems and programs, which allow them to keep up to date with the latest technology. It is interesting to note that such systems and programs are very different from the traditional ways of learning, which dentists had experienced in their undergraduate years.

Other changes in the way material is delivered to students, is shown by the 2005 case study where North American Dental schools introduced a mandatory laptop programme and student experiences were analysed. Overall, the positive feedback from students included email communication with other students and tutors, and good access to power point presentations. However, students found that the quality of software was poor and carrying laptops to classes was a burden (Hendricson *et al.*, 2006). Such reports on the use of technology do date quickly and with the ever evolving technology and devices, today, students can take advantage of light and easy to carry, tablet devices such as the iPad.

The first reported introduction of CD-ROMs (compact disk read-only memory) was in the mid-1980s and the Phillips Company developed the technology. In dental education, many CD-ROMs were developed by different organisations and bodies including a set of pioneering programs by the Department of Health for England. One example is The Dental Communications Programme. It consists of helping students to understand the stages of the initial diagnosis of a patient and this is done through animations, role plays, multiple choice questions and answers. The main goal of the disc is for it to be used as an interactive programme, which would help with building a better relationship between dentists and patients, through the development of communications skills (Eaton *et al.*, 2008). In the UK, dentists are required to complete continuing professional development (CPD) and in the past, CD-ROMs were widespread to provide access to such platforms when aiding the development

of skills. The usefulness of CD-ROMs in the early history of computer based learning in dentistry is that it combines both face to face instructions and electronic learning for CPD. For students, CD-ROMs can give a good overview of a course before they attend lectures (Eaton *et al.*, 2008).

The most popular medium for delivering teaching material is the internet (Walmsely *et al.*, 2003). However, just like anything else, the internet is a way of learning which may work for some and not for others (Ess 2000). Using the internet as a method of learning in dentistry is interesting. With a combination of both face to face and online learning, the education system has many more changes to come (West 2004). Today the internet is used for many reasons and students can keep in touch with fellow students and with tutors through social networks, emails, blogging, video conferencing, webcasting and many more exciting new ways, which are still continuing to develop and improve (Reynolds *et al.*, 2008a). With the use of the cloud computing resources, issues such as memory capacity and processing speeds can be resolved, as these resources are external to the mobile device (Kailas *et al.*, 2010).

2.2.1 Blogs

An example of how improved communication may take place between teachers and students is via social networking tools such as Blogs. Blogging is a communication tool which can be used to supplement the course material in dental education. Blogging is free to use and very easy to navigate (El Tantawi 2008). Concise discrete pieces of information called posts make up a blog. Reversed-chronologically in order, these posts have permanent links marked, to which referrals can be made (Boulos *et al.*, 2006). In a study, using free online software, a blog was established where students could give feedback about the course. Teachers also

posted multiple choice and true/false questions as a learning exercise and it allowed students to freely answer them. Overall, the blog was a success within the dental school, as there was a statistical difference in the examination performances between students who used the blog and those who did not. Students used the blog to practice examination questions and enhance their understanding of dental terminology (El Tantawi 2008). Another interesting observation is that the multiple choice questions (MCQ) and short answers were favoured and this has not changed since the observations reported by Stephens in 1986. The only change is the mode of access, as now students can access such assessments online.

The advantage of using a blog is that the user does not have to be involved with the technical aspects of the medium and does not need to be an IT expert. They can directly focus on the material or the question etc. rather than worrying about any technical obstacles (Wise 2005). ‘Transparent technology’ is the phrase given to blogging as the learner can see through the complex environment, which can often distract students from the main aims such as technical faults, and focus directly on the work needed (Wheeler *et al.*, 2005). Students post the comments using nicknames or their real names and this allows the teachers to reply to the students about anything they want to discuss. However some may argue that commenting on the blog and just visiting the blog, also referred to as ‘lurking’, is still considered as participating (El Tantawi 2008).

Blogging within dentistry is one of the many popular ways of communicating online, without having to sit face to face and converse. As comments from students are visible to other students or teachers, this may create a sense of vigilance when students are posting answers online. It is a good communication tool between teachers and students (Williams and Jacobs 2004) but it cannot be assumed that all students will participate in blogging. During an email, the conversation is often personal and is primarily a one to one conversation between students

or the student and the teacher. A blog or discussion board on the other hand, is open to view by many people. In spite of such limitations, blogging provides the opportunity to share thoughts openly, and for students to learn collaboratively. However, such tools may prove to be barriers for the shy students, who may not wish to participate, when invited to activities online such as blogging. Students find blogging more useful for interacting with teachers rather than undertaking course related exercises and activities. Students and teachers view social networking sites differently. Teachers may not often respond to students, when they are trying to find help or guidance for their work through social networking sites. This suggests that students may be adapting to using social networking as a way of interacting with teachers (Chretien *et al.*, 2009). Blogging however, if led by teachers and structured well, can be used for reflective practice and students can benefit by the interaction (Fischer *et al.*, 2011). Blogging can be used to interact with students and teachers on international collaborative projects. One example of such a project is known as the International Peer Review (IPR) project. The University of Columbia took the lead by developing an ePortfolio project. A number of dental schools internationally took part in creating the project and it was designed to help exchange of learning between students and it focussed on 'operative dentistry pre-clinical simulation'. Such projects can test and maximise the potential of activities like blogging. Three hundred and eighty four dental students took part in the online peer review. It was found that interaction was maintained and collaboration of the universities was also continuous (Gardner *et al.*, 2012). Today students can enjoy writing blogs for free, about any part of their learning or personal lives and the latest platforms provide them the tools needed to share their thoughts with the online world. These include WebCT, Blogger, Penzu, Tumbler, WordPress etc.

2.2.2 E-Portfolios

The use of personal portfolios promotes reflective learning and the electronic format is very much liked, as it allows files such as reports, solutions, graphics, experiments etc. to be stored online. Such electronic portfolios, also termed E-portfolios can be used by students and tutors to save a collection of completed work in an organised manner (Batson 2002). An E-portfolio assignment was introduced to 16 students as part of an operative clinical simulation module (Gardner and Aleksejuniene 2008), Blogging was used to conduct the E-portfolio assignment. The E-portfolio assignment required students to analyse seven operative procedures, by taking photographs and then critically reflecting on them. Overall students felt that the E-portfolio is a useful experience but time consuming. Students agreed that technical skills were required to gain a good experience with E-portfolios. It is stated that lifelong learning may benefit from the by the use of E-portfolios and such skills may be developed first at student level (Gardner and Aleksejuniene 2008). One student expressed:

“The e-portfolio assignment allowed me to learn the material to a deep level of understanding; I believe I achieved a higher pass in the module because of completing the E-portfolio assignment”.

It is important to take into consideration that E-portfolio learning will not suit all learning styles and so not all students will be fond of it (Gardner and Aleksejuniene 2008).

To add to this, different learning styles may be analysed for this type of learning. For example, two dyslexic students using an E-portfolio system called ‘Pebble-pad’ gave positive feedbacks. These portfolios were used to personalise their learning and the students felt that having control over their own learning and the creativity that went into making their own E-portfolios helped them enhance their thinking, writing and learning experience (Hughes *et al.*,

2011). One student explained:

“I have learned new ways to lay out work, which has made it much easier for me. Having struggled for years as a dyslexic learner student, I feel that pebble pad has allowed me to be at the same level as everyone else and in some cases ahead of them. I’m sure you can imagine what this has done to my confidence and self-esteem.”

Reflective thinking is engaged when students use E-portfolios as part of learning. Cohn and Hibbitts (2004) proposed that E-portfolios should not be the only model limiting people. A personal web space should be developed, which provides for lifetime and beyond. Such proposals need careful consideration when new systems are developed for learners to fully benefit from the internet as a medium for learning.

2.2.3 Smart phones

The mobile generation has swept everything before it. Whilst we were once linked to our desktops, now we enjoy mobility with our laptops but this is only short-lived as mobile devices such as smartphones are becoming smaller, versatile and more powerful. The latest technologies that revolutionise our workplace include subjects that could only arise from a Science Fiction Novel. Such concepts such as 3D printing, Cloud computing, and the “Internet of Things” are now becoming a reality but what do they mean? What does the future hold for dentistry, our students and our patients? Our lifestyle is changing as mobile technology blurs work and leisure. We are constantly in touch and when social media is added to the equation, it becomes very difficult to distance oneself from the outside world. In dentistry our own practice and education is heavily reliant on such technology. We are able to access the latest updates and our learning needs are delivered to our Internet enabled devices.

Information technology in dentistry has received much attention over the years. Griggs and Stephens (1998), reviewed the impact of computers in dental education. In 2003, Walmsley *et al.*, (2003) showed how the internet was changing teaching in a dental school and this was followed by a review of all dental technology by Reynolds *et al.*, in 2008. What these papers have shown is the change in technology, which has rapidly affected our access to information. However, has the dental workplace really changed radically over this time period? How have sophisticated smart phones and mobile technology, influenced our approach to learning and teaching dentistry leading to patient care? As there have been many changes in the use of technology over time, such changes in generations and the way people accept such changes needs further attention.

2.3 Changes in Generations

2.3.1 Societal Changes

Generation X describes the cohort of individuals born between 1963 and 1981 and Baby Boomers are the body of people born between 1945 and 1962. Are there tensions between the two generations? The potential clash occurs when department heads and senior personnel in health care are baby boomers and the juniors are generation X (Bickel and Brown 2005).

When this was recognised Generation X were recruited to more leadership roles to bring some freshness within institutes. Generation X will be industrious only if a favourable life work balance is in place but baby boomers are loyal to their host institution. Generation X will question authority whilst baby boomers respect authority. In contrast the newer Generation Y, the so called millennium generation, are the people of today and want something in return for what they give. Training is valued and they are much more practical and hands on. They have a mind-set to challenge things and want proof for everything presented (Morton 2002).

Technology has grown up with the millennium generation and it is an everyday part of life

whereas previous generations would need special training to keep up (Salopek 2003). As technology demands adaption and change all the time, out of all generations, our current students are ready to drop their current possessions for something that is better; they are more adaptive to change (Bushnell 2001).

2.3.2 Technology - D to E to M

Desktop computers are large, bulky machines but are still placed comfortably on top of desks, which suits previous generations (Grigg and Stephens 1998). Early on, teachers were seen as the key medium for education. Information technology was only used to assist teachers in obtaining different methods of delivering course information. In dental education whilst Desktop (D- learning) was established, students were not fussy and did not question new techniques, as they were not demanding. Similar to their teachers, they were slow to embrace the new technology, as more traditional methods of learning were still available. As new methods of delivering materials emerged, students were happy to try out new ways of obtaining information (Grigg and Stephens 1998). These included electronic books (Pollard and Davenport 1994) and image libraries with explanatory notes and hypertext (Turner and Weerakone 1992). The mobility factor was just starting and electronic learning since then, has become more embedded in the planning of dental education.

Today, learners are hungry for new themes and ideas. When it comes to devices and gadgets, the cooler, the better (Oblinger, 2004). The traditional lecture is being challenged, as not only can it be recorded and reviewed many times later, but students and teachers may discuss the contents away from the lecture hall. Students quickly search the internet for information and therefore educational material should be designed to accommodate for such styles of access.

The aim is to direct the learner to educational material in a structured manner (Cobcroft *et al.*, 2006).

The leap from D-learning to E-learning could not be possible without the use of the internet. Students can access the course material and other information at any time and away from the place of study (Walmsley *et al.*, 2003). Previously the validity and quality of the information provided from the internet was questioned (Schleyer *et al.*, 1999; Downes 1997). As there was no guidance from tutors, the dangers were that students may make their own judgments and interpretations of the information presented, which may not always be correct (Johnson and Schleyer 1999). Similarly, more recently, the GDC guidelines have been enhanced to include regulation on the use of Social media in dental education and practice (General Dental Council, 2014).

Access to information continues and mobile technology offers advantages over traditional methods of educational delivery, as it provides instant information through applications (apps) and mobile friendly websites. Furthermore, for patient care, advice is available through a variety of apps, ranging from instructions on how to brush your teeth, to what to do if you have a toothache. (iTunes, 2013). Do we know how effective such delivery methods are and do they lead to changes in how well information is accessed? Whilst technology changes are making our professional life more exciting, there is still the need for high quality evidence based material, to ensure that we teach and practice dentistry to the highest standards. Quality peer reviewed material should always underpin the technology, to enable that we deliver the highest standard of teaching possible. It is important to highlight the advantages and disadvantages of some of the mobile device tools, such as smartphone apps, as this will help better understand the use of such tools in dentistry.

2.4 Smartphone applications

The smartphones of today are powerful computers with large memory, good screen displays and the availability of applications, also known as apps (Boulos *et al.*, 2011). There is an app for just about everything today and students can download them easily for different educational subjects (Boulos *et al.*, 2011). There are more than 7,000 health care apps documented (Kailas *et al.*, 2010) with the ability to support Multimedia software applications, which can be used to help with giving health care advice on spot and telemedicine (Noel *et al.*, 2004). In February 2010, the Apple App store had 4000 apps available to download and mobile health was one of the top ten 2012 apps (Gartner Research: 2010). This has increased to 7,136 at the Apple store, Google Android at 1,296 followed by blackberry at 338 (Boulos *et al.*, 2011). Gartner research (2014) predict that by 2017, apps would be the most popular mobile computing tools for users worldwide and that mobile apps will be downloaded more than 268 billion times. Within dental education, there are apps available for practitioners/tutors, students and patients but it is often difficult to determine whether these apps peer reviewed and how it is possible to assess the quality.

2.4.1 Applications for students

The smart phone allows attractive user features including high quality 3D models of tooth, pulp and root canal systems to be viewed on the phone. The app “3D tooth” is available in different languages and includes an encyclopaedia. However whilst this app is attractive there is no immediate evidence base listed in the actual application details (AppAnnie, 2013). This is a recurrent theme on many apps used in the health/dental specialty. Although there is good information available through apps, evidence of peer review, research undertaken or reference of articles, which would validate the application, is often not present. Certain apps such as

‘Common dental drugs’ are available on the leading Smartphone application websites.

However, this application is a part of the health science bookstore, and was created as the electronic version of the ‘Handbook of Commonly used Drugs in Dentistry’. The application allows students to access up to 12 fields of information on each drug (HS bookstore, 2011).

Whilst this is more reliable, the price tag on this application is more expensive than those applications which are not part of a book store or well acknowledged website. Does this mean that to gain valid information, there is a price to pay? There are other examples such as ‘Endodontics’, (Dental Press International) which allows users to download electronic versions of their booklets. Institutions may be required to be more proactive in guiding students to the correct sources for information access. More importantly, dental school departments need to focus on evidence based applications which will equip students with the knowledge they need to become successful practitioners later.

2.4.2 Applications for Practitioners/tutors

There are applications based on a social networking idea which allows the dental team to interact with each other. ‘ACE dental world’ allows practitioners to keep in touch with each other and has many features such as blogging, forums, sending and receiving private messages and creating profiles. There is also a feature which allows users to view articles and also post articles to show others (iTunes, 2012). Some companies have adapted their material successfully for use on the mobile platform; ‘C and M dental’ is an application which uses animations to illustrate specialist dental precision attachments. Although working in this specialised area the use of the media provides an excellent example of a well-designed app. Collaborated with the University of Bern in Switzerland, the application shows not only animations but also clinical videos of the procedure. Probably a product that shows the future of how dental computing may look like is ‘Dental Assistant HD lite’. This is an app which

allows dentists to keep records, profiles, contact information and appointments with them all the time on their smart phones. This app is only available for Apple products (iTunes, 2011).

Overall there is a need for research to be carried out to find out how students are using their smart phones and how much of an effect phone applications smart and websites are having on their dental studies. There are plenty more applications available for professionals and patients than students. There is a lack of in-depth research on students and their use of applications. There is also a need of a system to be put in place, which will help students to be directed towards the correct ways of accessing information such as through applications.

Although it can be argued that students can use the same applications as developed for professionals, students would still need to start from the basics before they can start sharing the same information as practitioners. It may be the case of simply spreading the word or tutors may start promoting good educational applications for students to download. Overall the constant updating of technology is reshaping the future of dental education. It is impossible to ignore such developments and there may be some necessity to make slight changes to the traditional dental education practices. One such advance in technology, which has recently become a favourite amongst students, is through communicating information instantly via instant messaging platforms.

2.5 Instant messaging

A constant challenge is anticipating the next technology that students will adopt, to help with their education (Junco and Cotton 2011). There has been research focussing on internet in dental education (Walmsley *et al.*, 2003; Straub-Morarend *et al.*, 2011; Papadopoulos *et al.*, 2013; Marya *et al.*, 2013) but the advances in technology are challenging traditional email communication as students adopt tools such as instant messaging. An instant messaging (IM) service is an app or tool which allows users to communicate with each other when online,

simultaneously. It is generally used via internet connections which are free of any charges. Users can create different contact lists such as a 'Buddy list' and it also allows them to sort their conversations into several different groups of their own choosing. The most popular feature is the ability to check to see who is online and offline (Bakker *et al.*, 2007). This has a distinct advantage over traditional email as it instantly allows users to know if the other person has read and received the message.

Social media technologies like IM have improved communication immeasurably (Tutty and Klien 2008). The majority of students will look to their smartphones to help them with everyday life and this naturally embraces teaching and learning. Communication between students and tutors may be improved via IM, as there are no limits on time and location, although the drawbacks of this accessibility will not be accepted by everyone (Malti 2013).

Students are chatting to each other instantly and long conversations are put through with a few short cut words on instant messaging apps, this is also creating social identities. Students are apprehensive that their tutors and parents do not understand them as they are not aware or comfortable with this new way of communicating (Lewis and Fabos 2005).

2.5.1 Negative effects and multitasking

The views on the academic use of instant messaging are generally negative and may be the result of the limited amount of studies focussing on different types of instant messaging tools (Junco and Cotton 2011). Researchers often cite spending time on the internet and becoming distracted as a criticism to linking web based tools to student activity (Kubey *et al.* 2001; Malany 2004-2005). Students will attempt to multi-task and examples include talking on the phone whilst driving, texting in the class or IM through assignments (Junco and Mastrodicasa 2007; Bowman *et al.*, 2010). Such multitasking may have negative effects on educational

outcomes as some studies suggest that IM and concentrating on University work at the same time is not ideal as students are not giving their full attention to one activity. This leads to reduced educational outcomes, as internet use will have a negative effect on cognitive processing (Jackson 2008; Gordan *et al.*, 2007). One study concluded that students who take their laptops into the classroom will be sending IM and checking emails. Such students will perform poorly in subsequent examinations as they were not concentrating in the class (Fried 2008). A more recent study examining the impact of off-task multi-tasking with technology on real-time classroom learning, found that participants who did not use any technologies in the lectures outperformed those who did use some form of technology. Moreover, participants in the Facebook and MSN messaging conditions performed poorly compared to the control group who used paper and pencil (Wood *et al.*, 2011).

This contrasts with other studies which have not found any negative effects on educational performance of IM with particular reference to its use with Facebook (Pasek *et al.*, 2009). Instant messaging is now a more popular student communication tool than emails (Horrigan and Rainie 2005; Carnevale 2006). Students may use IM up to 16.3 hours per week (Morgan and Cotton 2003).

2.5.2 Face to face vs. instant messaging

IM tools and apps are used to maintain strong relationships with others and although they are not communicating face to face, users tend to make more of an effort when online. This may be because they wish to take part and make use of the many features offered by instant messaging platforms. These benefits include getting replies and answers to questions immediately in a similar manner to face to face (Wellman 2004). Research in the past suggests that online communication may be used to maintain face to face communication rather than replacing it (Wellman 2004; Baym 2002). A benefit of IM is that users can think

about what they want to type as their responses are given more attention and can be reviewed again, whereas when meeting someone in person, it is instant and there is not as much time to stop and think (Madell and Muncer 2007). IM in education supports the enhancement of online participation in classrooms (Hrastinski 2006). This can only be effective though if students are actually using IM for education and not for personal networking and pleasure (Contreras-Castillo *et al.*, 2006).

2.5.3 Educational use of instant messaging

When tutors are using IM, students appreciate the advantage of having a connection with their tutors instantly, and waiting for important advice (Jeong 2002). Not having to be formal on IM is something students thought worked well and saw the potential of IM software's in distance learning. Furthermore, student to student relationships via IM has been highlighted as very important and so is the learning that occurs in this environment (Katz and Rezaei 1999). Higher education teachers will often be out of touch and may not fully understand the way the current generation of students are learning (Fry *et al.*, 2009).

Learners are changing and adapting quickly to new technologies and this impacts educational practices. Although there is nothing wrong with teaching students the traditional way, tutors could benefit from using these new tools, which may help bridge the gap between the teacher and the learner, therefore benefitting everyone (Malti 2013).

Within medical education, previous findings report that medical students were very familiar and used instant messaging and social networking tools frequently for personal use, but there was lack of knowledge and skills in how to use these new technologies for their education (Sandars and Schroter 2007). Interestingly, a recent study examining medical student's online technology needs, found that students used IM and social networking sites such as Facebook,

highly for personal use but not for education or learning activities. Students felt that mobile learning and its related tools were more useful for clerkship curricula (Han *et al.*, 2014). It is important to understand the prevalence of social networking sites and its use by students, tutors and practitioners.

2.6 Social networking sites

Social networking sites (SNS) such as Facebook, Twitter, Myspace, LinkedIn etc. are integrated into everyday life (Pempek *et al.*, 2009). Part of their appeal is that they are both intriguing and addictive because the user has the power to influence their personal connections and relationships with other people. They can then watch connections take place between others and also become any character they wish by simply creating a profile. The versatility extends to the ability to create multiple identities online, within a few minutes (Veletsianos and Kimmons 2012). Not only can SNS users access unlimited information on the internet, but can also produce similar material themselves which can be shared globally with people in an instant (Buzzetto-More 2012). However the drawback is that once it is posted then it is often not possible to retract it. Some commentators have likened this to digital tattoos. In this analogy SNS may hold intimate comments, be intriguing to view but sometimes lead to serious mistakes which like a tattoo cannot be removed (May 2013).

Mobile computing devices such as smartphones and iPads allow communication and access to SNS anywhere at any time (Khatoon *et al.*, 2013). These tools and devices allow instant communication removing previous natural barriers such as distance (McCarroll and Curran 2013). The medium is changing rapidly and SNS have had to become mobile-friendly following competition from innovative mobile apps. Instant messaging features such as the app 'WhatsApp', have forced SNS to provide users with the same mobile friendly tools.

The increased use of SNS by students has encouraged education authorities to look at ways to link the medium with learning and teaching, and therefore tap into the advantages of improved communication (Olson *et al.*, 2010). Whilst dental education has successfully implemented electronic learning in a blended style within the dental curriculum, mobile learning is now being introduced and evaluated (Mayberry *et al.*, 2012; Arnett *et al.*, 2013). The challenge for educators is the best way to incorporate educational content into the use of the medium (Arnett *et al.*, 2013).

The use of SNS may have potential drawbacks which relate to what information is placed on line. Health professionals have a duty not only to themselves but also to patients, to maintain a professional profile when discussing material. The ability for information to be moved around quickly and to be sent out from the immediate circle of communication, could lead to inappropriate material being posted. Comments or pictures can quickly be taken out of context and put both users and organisations into difficult and sometimes embarrassing situations. Therefore at the same time as the SNS are used, specific guidelines are required to enable users to share information in the correct manner (Jeremy *et al.*, 2011).

2.6.1 Social media guidelines

Within the United Kingdom, the General Dental Council (GDC) standards handbook for dental students and practitioners now includes guidelines for SNS. The guidelines have clear set boundaries and promote cautiousness when professionals/dental students are communicating outside normal work hours via SNS (GDC 2014).

Guidelines are provided for SNS specifically for health professionals/students. Excerpts from those guidelines are outlined in **Table 1** and are taken from four of the main healthcare related authorities; the General Dental Council (GDC 2014), British Medical Association (BMA

2011), Nursery and Midwifery Council (NMC 2012) and the Health and Care Professions Council (HCPC 2011). The guidance is similar although there are differences between the organisations/authorities on how to adhere to these SNS standards. The grey area is in the area of “*Maintaining boundaries*” where accepting a friend request from patient’s ranges from “*thought about carefully*” (GDC 2014) to “*should be ignored*” (NMC 2012). All of the guidelines highlight maintaining patient confidentiality and behaving professionally. Information posted, discussed or mentioned should not allow patients to identify themselves or others. The guidelines have taken into account the most of the main SNS. As the medium is rapidly changing with the introduction of newer sites/apps, this may provide difficulty in the interpretation of these guidelines (Khatoon *et al.*, 2014).

Organisation/Authority	Patient confidentiality	Maintaining boundaries	Defamation	E-professionalism
General Dental Council ¹¹ Guidance on using social media	Ensure that information posted about patients is anonymous and the patient cannot identify or be identified. Do not discuss dental treatments and care with patients on SNS.	The relationship with patients must be maintained with appropriate boundaries. Friend requests on SNS by patients should be thought about carefully.	The online image of you can have an influence on your professional life and others. Any photo/media posted online could potentially impact the profession of others also.	When offline or online, behave professionally and 'presume everything you share online will be there permanently'. Manage privacy settings accordingly.
British Medical Association ¹² Using Social Media: practical and ethical guidance for doctors and medical students	'Doctors and students have a legal and ethical responsibility to protect patient confidentiality'. Guidelines for patient consent must be followed if any medical cases are to be discussed or shared on SNS.	Material posted on personal profiles with friends could be shared and viewed by anyone. Maintain a boundary between professional and personal life as this is often 'blurred' by SNS. Friend requests should be carefully considered.	Personal and professional comments online may result in defamation which could lead to legal action by organisations /companies etc. Anonymous profile posts can be traced back to the author.	Material posted on SNS could affect the public confidence in the medical profession and although it is not illegal, doctors and medical students are expected to behave professionally at all times and respect the profession.
Nursery and Midwifery Council ¹³ Social networking sites	Students/nurses/midwives may jeopardise or risk registration if they share confidential material and information on SNS or post inappropriate comments. Mobile phones should not be used in the workplace.	Do not pursue a relationship with a patient even if they are out of your care and any friend requests on SNS such as Facebook should be ignored.	Avoid defamatory comments or activities on SNS about patients/colleagues/organisations that could effect their reputation.	Privacy settings should be adjusted accordingly. Behave responsibly and professionally and do not distribute sexually explicit material on SNS as this could risk registration.
Health and Care Professions Council ¹⁴ Focus on standards- Social networking sites	Actions will be taken against a registrant who has put confidential information about a patient on SNS. Always act in the best interest of patients and respect confidentiality.	Registrants are free to use SNS as part of their everyday life but within the set standards.	Defamatory comments that could harm reputations and activity on SNS should be avoided against patients, colleagues and organisations.	Behave with 'honesty and integrity' and ensure that any activity on SNS does not damage public confidence in health professionals.

Table 1: guidelines for students/health professionals when using social networking sites

2.6.2 Maintaining boundaries

Some educators will be uncomfortable in maintaining an online profile on a SNS and consider it as an intrusion of privacy. They may find it difficult to maintain a professional and private relationship (Andrejevi 2005). Furthermore; such insecurities are real barriers and prevent professionals and educators from utilising the benefits of SNS. This will create a divide between enthusiastic young students, who appear to have little or no concerns, and adult educators who will not share their viewpoints (Hargittai and Walej 2008). There is an increased awareness and promotion of SNS within education, with faculty members and practitioners starting to become confident in the use of SNS for their workplace. With experience they are also able to maintain an 'e-professional aura' online (Valetsianos and Kimmons 2012). This does require careful management and self-surveillance whilst on SNS. One tutor reports that she feels her students need to also follow guidelines, and the best way to exemplify this is to show them how she behaves on SNS herself. She managed to demonstrate this through safeguarding the boundary between her professional and personal life. Subjects that were not discussed online included 'partying and dating', and she cited these as good examples of how to maintain the boundaries (Valetsianos and Kimmons 2012).

As the new General Dental Council standards have only just taken effect in September 2013 (GDC 2013), the changes in the use of SNS in dentistry has not been evaluated and whether this will effect issues such as privacy, plagiarism, and relationships online between patients/students and dentists/ tutors.

2.7 Rationale

On attempting to explore Electronic/Mobile learning in education, the literature review uncovered little research focussing on the use of such tools and technology in dentistry. No study prior to the present one, examined the attitude and activity of dental students and tutors related to mobile tools, platforms and communication tools. This area therefore became the research foci of this thesis. The fundamental purpose of the present study was to understand how dental students are using mobile devices/tools for their education and how it is affecting their performance at undergraduate level. Additional areas that were analysed part of this research were social media, mobile apps, instant messaging and tutors attitude and understanding of mobile/electronic learning and teaching.

2.8 Aims and Objectives

Aim

The aim of this study was to gain a better understanding of how new technology is being used to help students with their studies.

Objectives

- Firstly the study sets out to look at student's attitudes and understanding towards electronic learning and its use in their dental studies:
- To identify how devices such as desktop computers, laptops, smartphones and iPads are being used by students for their education.
- Students' attitude towards the way they currently communicate with fellow students and tutors.
- The use of mobile apps and electronic tools for their studies.

The next part of the study seeks to understand tutors' views towards electronic learning and the use of technology in their teaching and research and tutors views regarding students use of such tools:

- To identify how devices such as desktop computers, laptops, smartphones and iPads are being used by tutors for their teaching and research.
- To record Tutors' attitudes towards the way they communicate with students and their use of Social networking sites.
- To understand the introduction of new technology or electronic tools used by tutors in their teaching and research.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter is in two parts. The first section gives an overview of strategies in social research, methods in social research and analysis. The second section describes a timeline of the enquiries undertaken. The chapter describes a mixed methods research approach implemented and addresses the issues related to validity, reliability, ethics and credibility. There is a demonstration of the thoughts behind the questions asked, the way these questions were interpreted, and a detailed description behind the choice of methods and the analytical approach. The influences on choice of methods and analysis are highlighted. Finally, this chapter concludes with a reflection on the influence of the researcher involvement in data collection, and the impact of other faculty members involved.

Section 1

3.2 The nature of Social science research

Logic and observation are the two pillars of science. To understand the world scientifically, it must make sense and resemble that which is observed. The three major aspects of the overall scientific enterprise are:

- theory;
- the collection of data; and
- data analysis.

Both logic and observation relate to these major aspects and are essential in social/ educational research (Babbie, 2013).

An introduction to the understanding of the different views about what research is has always been considered a good starting point in social research. Before any kind of inquiry can be carried out, understanding the different views and the fundamental philosophical issues of

ontology, epistemology and axiology is very important. Ontology provides the understanding of one's own views and the views of others regarding the nature of reality. Epistemology would be the understanding of ways to know about reality. Axiology would be the different values that may support analysis along with many other differences. Such an understanding will help put together the ingredients in social research. These would include determining the kind of research carried out, the questions asked and the methods used (Arthur *et al.*, 2012).

3.2.1 Strategies for social research

In order to put together a good research, the social researcher must make strategic decisions and choose the best suited methods. There are advantages and disadvantages associated with every step taken. Approaches are often chosen as 'fit for purpose' as they are selected based on their appropriateness in the investigation of specific problems, phenomenon's or questions. Tight constraints on time and money in small-scale research often mean that the key decisions around choosing the methods need to be made very carefully, and well in advance, before the start of the project. This means that there is often no space for doing U-turns, once a particular approach is adopted. Some of the key decisions about social research strategies and the approaches adopted revolve around contemplation over relevance, feasibility, coverage, accuracy, objectivity and ethics (Denscombe, 2007).

In order to guide the research towards its intended aims and to ensure that its products are well received and useful, a judicious choice of methods needs to be made. The purpose of the next two segments is to analyse the chosen approach in this research, which was developed as the research evolved: the grounded theory. Phenomenology was the second approach, of which some parts were adopted in this research. An understanding of the different approaches helps towards making the choice of selecting the analytic approach, which would align the

anticipated product of study, with the researchers existing knowledge, motives for engaging in the research and assumptions (Starks and Trinidad, 2007). Where appropriate, the adopted techniques and methods used in the data collection and analysis phase will be clarified.

Figure 2 depicts the similarities and differences between the grounded theory and phenomenology. The hourglass figure illustrates the greater differences at the beginning and then at the end.

Figure 1: similarities and differences between Phenomenology and Grounded theory (based on Starks and Trinidad 2007).

	Phenomenology	Grounded theory
History	European philosophy.	Sociology
Philosophy	an essential perceived reality exist with common features.	the concepts grounded in the data are examined and theory is discovered.
Goal	The meaning of the lived experience of a phenomenon are described.	an explanatory theory of basic social processes is developed.
Methodology Formulating a research question	‘what is the lived experience of [the phenomenon of interest]?’	‘How does the basic social process of [X] happen in the context of [Y environment]?’
Sampling	The phenomenon of interest has been experienced by these people.	The phenomenon has been experienced by these people under different conditions.
Data collection: Interviewing strategy	Participants describes experiences And interviewer probes for clarity.	Participants describes experiences interviewer probes for clarity.
ANALYTIC METHODS	Accounts of the phenomenon identified; gathered in to discrete categories; taken together, they describe the core commonality and structure of the experience.	Open, axial and selective coding: concepts are examined across their properties and dimensions; a core category is created through the development of an explanatory framework which is integrates the concepts.
Audience	Practitioners, clinicians and those who need to understand the lived experiences of the phenomenon of interest.	Researchers and practitioners who seek explanatory models upon which to design interventions.
Product	A thematic description of the pre-given ‘essence’ and structures of lived experiences.	Theory is generated from the range of of the participants’ experience .

3.2.2 A Modified Grounded theory

Grounded theory can be described as a method of qualitative inquiry in which, an iterative practice is developed to ensure that data collection and analysis jointly inform and shape each other (Charmaz, 2012). The reason why the grounded theory was chosen as the most appropriate approach in this research was because the goal was to explain the social processes, studied in the environments in which they took place. This is often quoted as the purpose of using grounded theory when developing explanatory theories (Glaser and Strauss, 1967). Grounded theory examines social processes which include the causes of certain behaviours and attitudes, the environments, the possibilities, the consequence and the conditions (Strauss and Corbin, 1998). The careful observation of behaviour and speech practices adopted through this approach, mean that the researcher can acquire information of social realities (Starks and Trinidad, 2007). In this research, the grounded theory has been modified to some level. It would be fair to say that certain aspects of the phenomenology approach have been adopted along the way. Similarly, many researchers have tended to ‘adopt and adapt’ the grounded theory. However, there are certain basic ideas associated with this theory which are fairly constant (Denscombe, 2007). This includes the method of collecting data and analysing hand in hand. In many other research traditions, data is first collected and then the analysis takes place afterwards. Grounded theory approaches tend to collect data that best suit the research problem; for example interviews, and analysing the data at the same time. At the beginning of the research, the research problem may point towards one research method for data collection. However, as the research progresses, it may become apparent that a new method of data collection may be necessary to adapt. This could be a result of certain research questions and experiences which influence the choice of methods. In grounded theory, this interchange between analysis and data collection is often referred to as

‘theoretical sampling’ (Arthur *et al.*, 2012). For example, in the current research project, the analysis of the completed surveys merited further face to face interviews, as some of the questions needed further thought and explanation.

Figure 2 illustrates the similarities and differences in two approaches. It would be fair to admit that certain aspects of the phenomenology theory did play an important role in data collection and analysis. With regards to the phenomenology approach, students and tutors lived experiences of using different device and tools were analysed. This could be applied more specifically in the face to face interviews. At the same time, both the grounded theory approach and phenomenology can be related to the interviewing strategy. Participants described their experiences and the answers were probed for further detail and clarity. With respect to the desired audience in both approaches, the current research findings would be useful for those who need to understand the lived experiences of using such tools, as well as those who seek explanations upon which interventions may be designed. The sampling techniques in grounded theory and phenomenology, recruit participants who have experienced the phenomenon under study (Starks and Trinidad, 2007). It is also true therefore that in both approaches, to generate rich data sets, it is not always necessary to analyse large samples and concepts. This was exemplified in the data collection phase when sample selection stopped once data saturation was reached.

Although both the grounded theory and phenomenology were not completed combined, it is true to say that the grounded theory was slightly modified with the support of the phenomenology approach. However, using different qualitative approaches in one study can often be feared to cause ‘method slurring’, and this may prevent researchers to use more than one theory. Annelles (2006) discusses the potential of using more than one theory, and concludes that it is important to consider vital factors which determine if there is a good ‘fit’

of the approaches. This is not solely down to the research question and problem, but also whether the theories work well with each other. Researchers should ensure the maintenance of the integrity of each approach. Similarly, using quantitative and qualitative methods in one study merit careful consideration. These will be discussed in the next section.

The most important part of the research, in which the combination of the two theories was evident, was the process of coding, sorting, identifying themes and relationships and drawing conclusions. It would be fair to state that this is the segment of the research which adapted the analytical methods from both approaches. In **Figure 2**, this section is specifically highlighted, as it was the point where the grounded theory approach was slightly modified. The results were clustered into categories to describe the commonality and the structure of the experience. This was done through coding the information through the examination of different properties. Unlike the Discourse Analysis Approach, where the role of the analyst's views is to examine his own place in the discourse, the phenomenology and grounded theory approach both foster for a bracket view to be taken by the analyst.

3.3 Bracketing in qualitative research

The extent to which the research used the bracketing method is questionable. Bracketing is used in qualitative research to avoid tainting the research process by minimising deleterious effects of preconceptions (Tufford and Newman, 2012). It is often impossible to be objective and collect data without any preconceptions. However, certain techniques were adopted to minimise such influences on the research. First of all, the interview transcriptions were sent to participants, so that they could ensure that their answers were correctly interpreted. Secondly, the results and discussion section used quotes from the transcripts which exemplified the emerging issues and concepts which were dominant in the narratives. It would have been

problematic, and the results would have been biased if quotes were selected randomly, which were deemed as important, because of any predetermination. The themes which emerged from the data were a result of students and tutors emphasising them in the interviews, but were also a result of constant prompting of questions (Appendix II and IV), and therefore at this point, there is a recognition of researcher determinism in the data.

Cutcliffe (2003) suggest the writing of memos throughout data collection and analysis, as a method of bracketing. This would mean that the researcher would acknowledge and foreground any preconceptions before and during the research (Glaser 1998). Another method of bracketing suggested by Ahern (1999) is beginning a reflexive journal, prior to defining the research question. The researcher would have the opportunity to identify presumptions and the journal would be maintained. This would enhance the researchers' ability to withstand a reflexive stance.

3.4 Qualitative methodology

Data which cannot be reduced to numbers is often collected, analysed and interpreted through qualitative research methods (Murphy *et al.*, 1998). This data relates to the behaviours and concepts of those people involved. Research in education demands intricate consideration and cannot be studied or elucidated in simple terms. Thus, qualitative research methods are used which allow the researcher to gain a better understanding of educational problems and shed light to some of the problems, trends and attitudes in teaching and learning (Anderson, 2010).

3.5 Methods in Qualitative research

As with any research project, the researchers would need to identify clear research objectives and this would help choose the best methods for application. Anderson (2010) highlights a

number of methods of assembling information concerning human attitudes and behaviours, these being:

- face-to-face interviews;
- telephone interviews;
- focus groups;
- case study notes;
- video recordings of lectures, class assignments, laboratory performances etc.;
- images (conversation snapshots on mobile platforms);
- Diaries and video diaries;
- Observation notes;
- Press clippings; and
- Photographs
-

The largest return regarding the quality of data and response is generally believed to be achieved through face-to-face interviews. However, this process can be time consuming and costly. One way to overcome this is through telephone interviews. However compared to face-face interviews, such approaches may suffer from sampling inadequacies (Hochstim, 1967).

3.6 Face to face interviews

Conversations with a purpose are classed as qualitative interviews. Conversations can be based on sequences or can be casual. In health care research settings, semi-structured interviews are most often used instead of structured interviews as there are a few practical constraints due to research agendas, time, financing and access. Relevant and representative issues are allowed to be expressed through interviews which allow participants and researchers to talk about behaviours and their understandings (Stewart *et al.*, 2008).

During an interview which is over the phone or face to face, the interviewee should listen actively for changing tones of voices and stumbles and hesitations. Face to face interviews are different as body language can be observed to understand the meanings (Edmund and Brown 2012). **Figure 3** shows the two way process of active listening. For the purpose of the present study, interviews were the most appropriate method to analyse the proposed areas.

Figure 2: two-way process of active listening. (Taken from Edmund and Brown 2012)



Figure 3 suggests that a smooth conversation between the participant and interviewer can result in a good interview with a comfortable atmosphere. If there is no flow present, the interview may be disorientated with no flow and may leave the interviewer with disorganised results and the participant feeling uneasy.

3.7 Validity and reliability in interviews

It is unwise to think that in any research, the threats to validity and reliability can be completely erased. Rather, it is the consideration given to validity and reliability throughout a piece of research, which can mitigate such threats. Validity and reliability can be applied to both qualitative and quantitative research. The issue of validity was first introduced in quantitative research by Cronbach and Meehl in the mid-20th century (Kvale, 1996). Validity is defined as an important key to effective research, without which the research is worthless and invalid. In qualitative research in particular, validity may be addressed through the researchers objectivity in the research as well as the honesty, richness, scope, and depth of the

data achieved. Reliability is concerned with accuracy and precision, it is the synonym for replicability and consistency over time, groups of respondents and instruments. Similar data from similar respondents over time will be yielded through a reliable instrument for a piece of research (Cohen *et al.*, 2000). For the purpose of the current study, it the reliability and validity of interviews which needs some attention. The question is ‘how do we test or maximise the validity and as a result the reliability of a qualitative study?’

Campion *et al.*, (1998) explain that in order to enhance the reliability and validity in interviews, and to then make useful predictions and decisions, ‘structuring’ is very important. The structure of the interview will enhance standardisations and helps the interviewer determine the questions to ask and the way to evaluate the responses. In an interview, there isn’t a specific stage where one can address or determine the point when validity can be assessed. It is the entire process which needs attention throughout the research (Merrick, 1999; Kvale, 1996; Gaskell and Bauer, 2000; Flick, 2002). There are many characteristics of the interviewer, which have been reported as sources of bias in the interview. The characteristics of the respondent and the fundamental content of the questions have also been recognised as potential causes of bias. More particularly these would comprise:

- The interviewer’s expectations, opinions and attitudes;
- The interviewer tending to see the respondent in her own image;
- Seeking answers from the respondent which would support any preconceived notions;
- The respondent misunderstanding the questions;
- The interviewer misunderstanding the answers (Cohen *et al.*, 2000).

Lee (1993) and Scheurich (1995) found that the interviewer’s race, gender, religion, sexual orientations, status, social class and age can in certain situations be potent causes of bias. As interviews are an interaction between humans and are interpersonal, it is unavoidable that the interviewer will have some effect on the data and the interviewee (Hitchcock and Hughes,

1989). Fielding and fielding (1986) comment that even the most refined surveys are a result of manipulated data which has been derived from asking someone at some point. Denscombe (1995) adds that neutrality on the part of the interviewer is a 'chimera'. Furthermore, Oppenheim (1992) suggests some of the possible causes of bias in interviews which need careful consideration:

- Not adhering to sampling instructions leading to biased sampling;
- Poor rapport between interviewer and interviewee;
- The interviewer changing the question wording;
- Biased probing and poor use of prompting;
- The sequence of questions being altered;
- The interviewer being selective when interpreting the recording of transcripts/data.

There are many sensitive issues in interviews which can often embrace *transference* and *countertransference*. Scheurich (1995) describes transference as the projection of the interviewees' feelings, desires, needs, fears and attitudes on to the interviewer.

Countertransference is the same process reversed. One example in the current research, is the issue related to the competence in using electronic platforms and mobile tools. Students and tutors may feel embarrassed in interviews to share their true feelings towards the lack of skills, capability and training in using certain IT related tools.

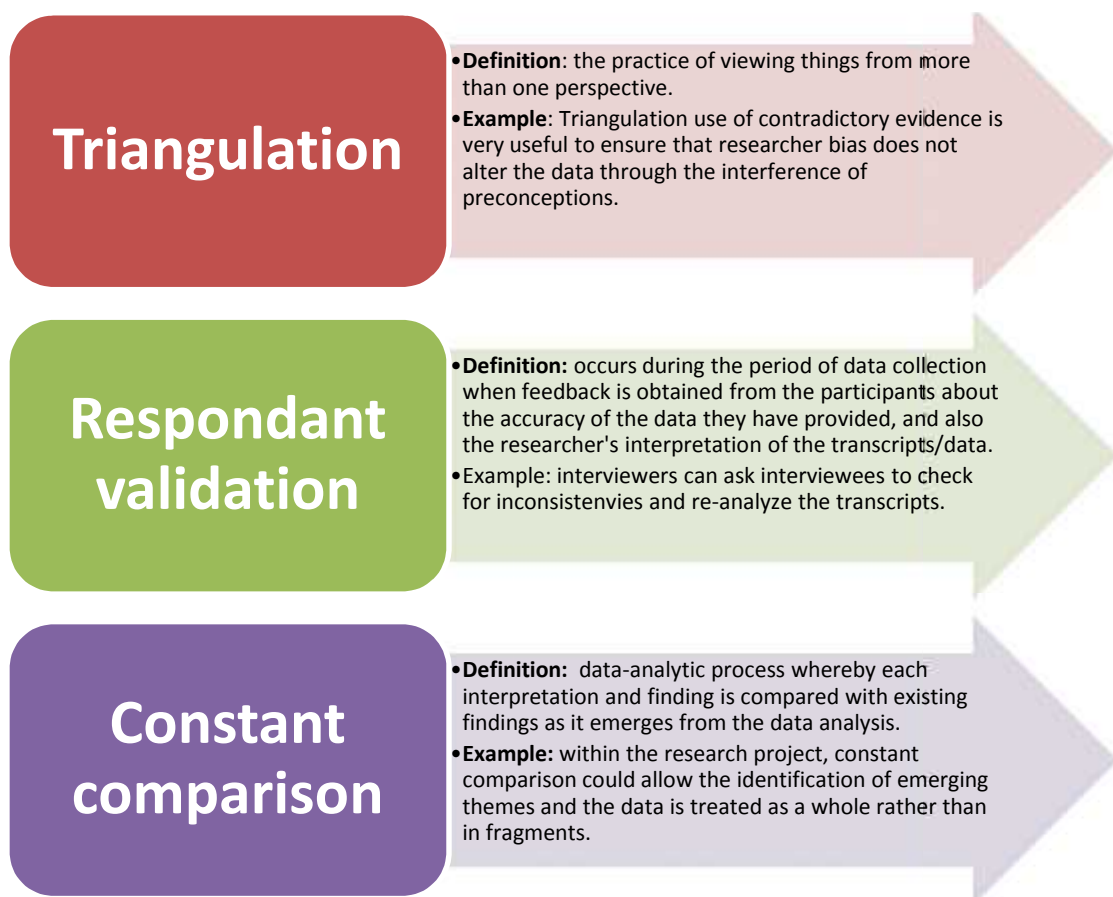
3.8 Controlling Reliability and Validity

Reliability could be controlled through ensuring that all the respondents are asked questions which are exactly the same and have the same format, sequences of words and questions. The interview would be highly structured (Silverman, 1993). This is one precaution which was taken during the interviews in the current study. Some have argued however that such structuring is misreading the complexity and open-endedness of the interactions in interviews (Scheurich, 1995).

Silverman (1993) suggests that each interviewee must understand the interview questions in the same way and this is extremely important to enhance reliability. Some of the ways that this can be maintained is through careful directing of the interview agendas; extended use of closed questions; training of interviewers and inter-rater reliability in the coding of answers. For the current research project, training was undertaken at the NatCen training centre for in-depth interviewing skills.

Anderson (2010) explains that although qualitative research is critiqued for being biased and lacking rigour, there is an increasing association of reliability and validity in qualitative research. **Figure 4** exemplifies some of the ways in which validity can be verified through a number of techniques.

Figure 4: Substantiation of validity in qualitative research (based on Anderson, 2010)



3.8.1 Methodological triangulation

Methodological triangulation was the form of triangulation adopted in the current study, as alternative methods were used. The findings from the qualitative methods, which were the interviews, were compared with the findings of the second method (quantitative) which was the surveys. The benefits of accruing to this form of triangulation is that the findings can be verified by comparing the data produced by the two methods, and the findings can complement each other by adding new and different themes about the topic, from what is already know (Denscombe, 2007).

3.8.2 Respondent validation

Students and tutors were given the opportunity to check through the transcripts and analyse the data that was recorded. Respondent validation allowed the participants to check the accuracy of the data gathered, add or take away anything from the transcripts, comment on the emerging themes recognised, and check to see if these themes are fair and reasonably reflect their attitudes and behaviours.

3.8.3 Constant comparison

The results from the questionnaire and the interviews were compared constantly throughout the analysis and discussion phase. Comparison between the current results, and those found by previous studies have also been made. Throughout the analysis phase, coding was used to compare the results. The following three types of coding techniques were applied:

- *Open coding*: organisation of data in the initial phase to make sense of it
- *Axial coding*: categories are interconnected
- *Selective coding*: developed a story that connected the categories with each other.

3.9 Qualitative data analysis

The analysis of qualitative data is based on a sense of realizing things and making new theories from the data assembled. It comprises the movement from specific features of the data towards more comprehensive conclusions. There are four guiding principles upon which the analysis of qualitative data is based:

1. Any conclusions drawn from the data should be firmly rooted in the data
2. There is a need for careful and meticulous reading of the data before explanations are given.
3. Any unwarranted preconceptions need to be avoided at all times.
4. An iterative process should inform the analysis of data. This would include a process that constantly moves back and forth comparing the data and codes, before any generalisations are made, and theories are developed (Denscombe, 2007).

3.9.1 Software and qualitative data analysis

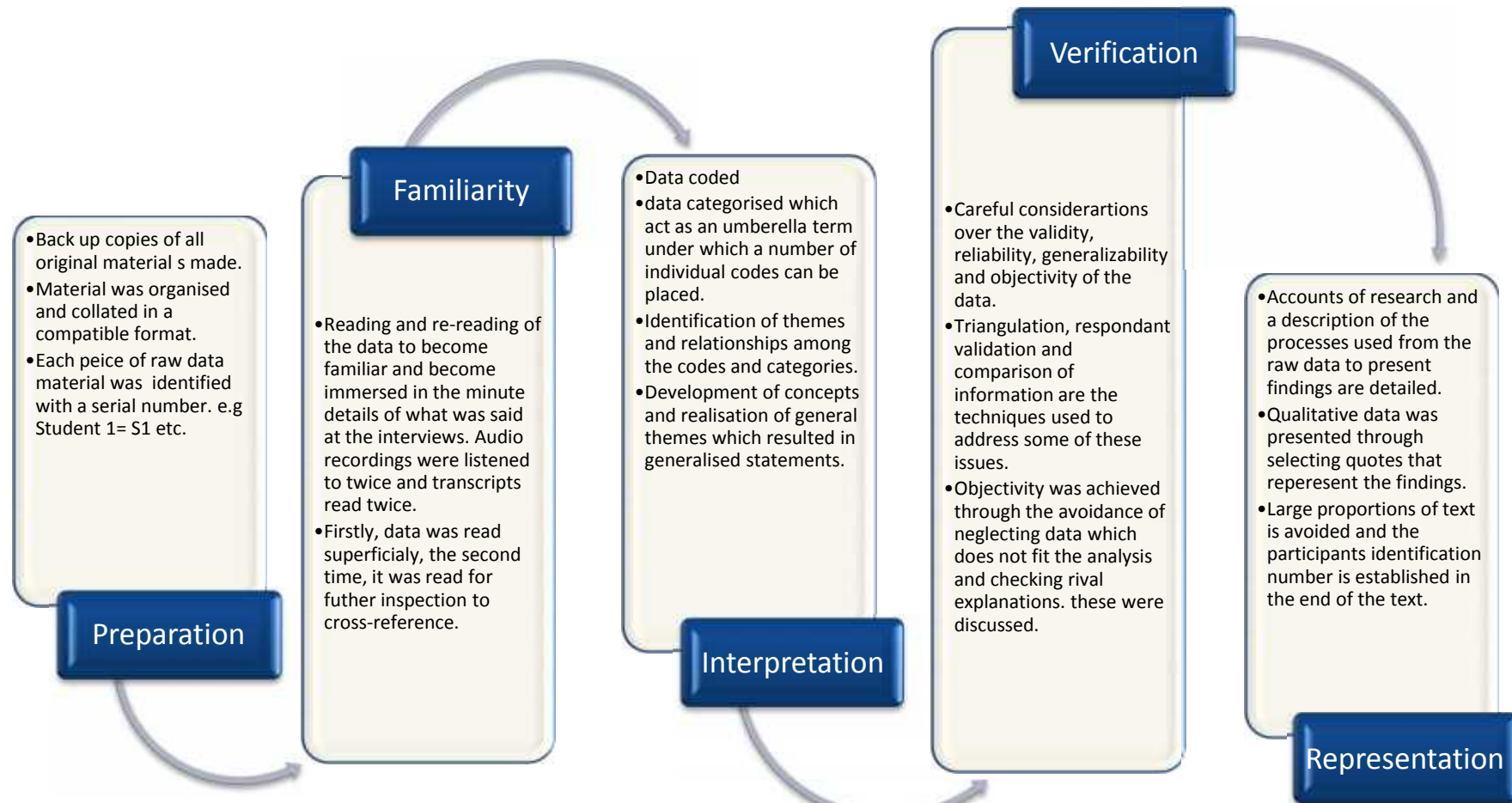
Computer-Assisted Qualitative Data Analysis (CAQDAS) help researchers deal with the sheer amount of data which needs to be analysed, once collected. For interviews, NVIVO is the most popular. Whilst there are many benefits of using CAQDAS, there are some perils too (Arthur *et al.*, 2012). This is why some may decide to use paper-based analysis. Fielding and Lee (1998) report that one issue identified, with using CAQDAS over the traditional paper-based analysis, is the feeling of being distant from the data. Researchers felt closer to the field notes and to the words of their participants when using paper-based analysis. Approaches such as phenomenology, grounded theory, interpretative phenomenological analysis, framework analysis, template analysis etc. all tend to analyse data thematically or use a code and retrieve methods. Such analytic approaches are well supported by platforms like NVIVO

(Arthur *et al.*, 2012). Overall, there are several considerations to examine before one decides to use software or not. For the current research it was decided to use Excel as a platform to input data and create codes and categories for analysis (Appendix VII).

3.9.2 The process and preparation of qualitative data for analysis

Figure 5 illustrates the process of qualitative data analysis and the preparation. These are the procedures used in the current research to analyse the data. In logical order, the five stages involved in the analysis phase were preparation of the data, familiarity with the data, interpretation of the data, verification of the data and the representation of the data.

Figure 5: The process adopted for qualitative data analysis (based on Denscombe, 2007 and Anderson, 2010).



3.10 Quantitative methodology

Quantitative methods are best to address questions of calculation, compensation, and relationship between variables, measure conclusions, predictions and frequency. One example of this is questionnaires/surveys.

Questionnaires should be carefully designed and developed. When using choice format, the actual achievement does not get extracted from the minds of the participants. Questionnaires that are biased can ruin the results. Getting feedback in a written format is useful but very time consuming and the results cannot be easily analysed. Categories that are used for questionnaires need to be carefully considered so that useful information is present. Precise questions for questionnaires will provide valuable information which can be used for further improvement. Often, follow up surveys are not conducted which would help institutions determine the effectiveness of the courses online (Tham and Jon 2005).

The wording of questionnaires is something very important to consider. Keeping questionnaires brief and direct is the most desired way to put together the questions. The words used in questionnaires may be interpreted in different ways so therefore, it is the responsibility of the person in charge of putting together the questionnaire, to use the correct words in the questions. The trialling of questionnaires is the next stage and needs to be done before the main study. This will insure that only a single piece of information is collected for each statement and that the questions are interpreted and understood well (Arthur *et al.*, 2012). The questionnaires distributed in the current study were piloted before the main study (Appendix VIII).

Questionnaire data can be collected in four major ways. These include paper-based, face-to-face, by phone and computer-delivered. For the purpose of this research, the questionnaires

were first administrated through an online platform (SurveyMonkey), but the low response rate resulted in the administration of questionnaires for the main study to be paper-based. However, the questionnaires were still compiled and analysed through the online platform. The advantage of paper-based questionnaires is that they are tried and tested, well established and easy to administer to small samples. Off copies are simple to run. However, the cost of paper and data entry is high. The returned questionnaires may be lost in transit and the overall process is time consuming (Arthur *et al.*, 2012).

The questionnaires were a starting point in which the main themes were identified. The interviews were linked to the questionnaires and were a follow-up attempt to analyse some of the data gathered in more detail.

3.11 Validity and reliability in questionnaires/surveys

Belson (1986) perceives the validity of questionnaires from two viewpoints. First, the honesty, accuracy and correctness of returned questionnaires and secondly, whether the people who did not take part in the research, would have given the same distribution of answers as those who did participate. Belson (1986) suggest that the question of accuracy can be checked through the intensive interview method. This method would allow familiarisation, probing, challenging and temporal reconstruction. The way that the accuracy was tested for the main part of the study using questionnaires, was through piloting the questionnaire first and reconstructing the questionnaire if needed. the problem of non-response or low response rate can be tackled through several strategies suggested by Hudson and Miller (1997). The strategies suggested and used in the current research involve:

- The importance of the questionnaire and the research aims stressed;
- The benefits of the potential findings and how they apply to the group targeted;

- Features of the questionnaire itself altered after the pilot study (length of questions);
- Encouragement to participate by a friendly third party.

At the beginning of each questionnaire, there was a summary provided to explain the aims, benefits and background of the study and the purpose of the questionnaire. The friendly third party used in this study was a faculty member who was present at the time that the paper-based questionnaires were completed and encouraged students to take part. This resulted in a high response rate.

3.12 Analysis of quantitative research

This research did not entail statistical analysis of quantitative data. The analysis was restricted to the use of basic descriptive statistics which were straight forward, yet rigorous in the way that the data was organised and presented. A succinct and precise way of analysing the data was used and this was by:

- The organisation of the data;
- Summarisation of the findings;
- Display of the evidence;
- Description of the profile of findings;
- The exploration of connections between differently parts of the data.

3.12.1 Types of quantitative data

Quantitative data most often takes the form of numbers. When social researchers want to use quantitative data, it is a necessity to be clear about the type of numerical data that is going to be used in the study. Stevens (1946) highlight four types of measurements which provide the distinction between different numerical data. These are called ratio, interval, ordinal and

nominal. Descombe (2007) comments that the particular kind of numerical data used will need to be considered carefully and the possibilities and limitations associated with this kind of data would need a high degree of understanding.

For the purpose of this research, it is fair to say that the survey provided ordinal data which was based on counts of things assigned to specific categories. Furthermore, as the survey comprised tick-box questions, where students were provided with a fixed number of possible options, categorical data was produced. For each section, related to the different devices, students were presented with a Likert scale question, which asked them to provide feedback on the usefulness of the availability of the internet on their device, based on a scale of strongly agree to strongly disagree. The middle value represented a neutral response (neither agree nor disagree). The advantages of categorical data are that in the analysis phase, the level of consensus or agreement between students can be quickly assessed. Appendix VIII illustrates some of the figures which can be used to present categorical data.

3.12.2 Summarising the findings

Contingency tables were used to summarise the categorical data. These tables provided further summaries of the responses to the questions through percentages. Statistical analysis such as standard deviation and the mean were not chosen to summarise the data because some of the data were not continuous. The purpose of the survey was to examine the proportion of students using different electronic platforms and tools and not to compare different groups. The aim was not to make correlations. Even though, some of the findings did show differences in year group and age, it was something that became apparent from the results later on and it was not a measure purposefully sought.

3.12.3 Presentation of tables and charts

Tables and charts were used to present the findings and convey the information in a concise manner. Good tables and charts rest on the ability of the researcher to have the skills to:

- Not drown the reader with information overload and present enough information;
- Use visual clues and appropriate presentations to help the reader interpret the table or charts;
- Use the most suitable kind of tables and charts for the purpose at hand (Denscombe, 2007).

It was ensured that certain information was always included in the tables. This was the headings, the response rate and the categories. The highest chosen number or percentage for each question, presented as a table was highlighted. Both bar charts and tables were used to present the data. The reason for using bar charts was because it allowed for the presentation of results in an effective way. Stacked bar charts were used to present some of the data as they were an alternative to using pie charts. They were used to show clearly the relative proportions of the factors that make up the total.

3.13 Qualitative vs quantitative

Qualitative and quantitative research techniques have different parts to play in the investigation of behaviours, attitudes and understandings, with each being appropriate to different roles. Neither method offers a ‘magic’ way out to any of the current health care education related issues. It is possible with qualitative research to investigate complex sociological problems in greater detail and with more depth than many quantitative projects allow. However, quantitative approaches are less criticized for being biased and lacking rigor than qualitative. Qualitative methods involve the researcher ensuring that all the data collected through for example interviews, is in a readable and meaningful format and does not

reflect their own preconceptions or prejudices. **Table 1** highlights the differences between qualitative and quantitative methods.

Table 1: Quantitative vs Qualitative methods

	Qualitative Research	Quantitative Research
Objective	<ul style="list-style-type: none"> • Gain an understanding of the fundamental reasons or motivations. • Discover trends or provide awareness into the setting of a problem. 	<ul style="list-style-type: none"> • Enumerate data and simplify results from a sample from the population of interest. • Quantity the occurrence of a particular incidence, view or opinion in a chosen sample.
Role of researcher	<ul style="list-style-type: none"> • Researcher and their biases may be known to the participants in the study, and participant characteristics may be known to the researcher. 	<ul style="list-style-type: none"> • Researcher and their biases are not known to participants, and participants characteristics are hidden from the researcher.
Sample	Most often a small number of non-representative cases.	Usually a large number selected randomly and represent the population of interest.
Data Analysis	<ul style="list-style-type: none"> • Non-statistical; Text analysis. • Description, analysis and thematic development • The larger meaning of findings. 	<ul style="list-style-type: none"> • Statistical; data can be expressed as numbers. • A comparison of group, relationships and among variables.
Reporting and evaluating research	<ul style="list-style-type: none"> • Flexible and emerging • Reflexive and biased 	<ul style="list-style-type: none"> • Standard and fixed • Objective and unbiased
Strengths	<ul style="list-style-type: none"> • Issues can be examined in detail. • Interviews for examples can be guided/redirected by the researcher in real time. • Sensitivities and complexities about the research subjects and/or topics are discovered. • Findings can be transferred to another setting. • Useful for describing complex phenomena. 	<ul style="list-style-type: none"> • Can generalise research findings when it has been replicated on many different populations. • Useful for obtaining data that allow quantitative prediction to be made. • Less time consuming • Research results are relatively independent of the researcher. • Useful for studying large number of people.
Weaknesses	<ul style="list-style-type: none"> • Research quality profoundly reliant on the individual skills of the researcher. • Maintenance, assessment and demonstration of rigor are difficult. • It generally takes more time to collect data compared to quantitative. 	<ul style="list-style-type: none"> • Knowledge may be too abstract for direct application to situations and individuals. • Large data sets may become unmanageable to restrict the scope. • The researcher may be influenced by confirmation bias.

3.14 Rationale for choosing surveys and interviews vs focus groups

It is accepted that for a very complete response, interviews and focus groups are more like to provide the depth of information that may be useful. Both methods would have allowed the participants to talk about the different areas of interest. However, the reason why surveys and interviews were the chosen methods is because they allowed for emphasis on different issues. Participants were asked directly about how they felt about the different issues in E-learning and M-learning and this would not have been possible through focus groups. This is because participants may not have shared the same emphasis and the group dynamics may imply an emphasis that is misleading. Results cannot be generalised beyond the groups taking part. However, for the current research, it may have been useful to have focus group meetings before the survey and interviews, to get a greater understanding of some of the issues and attitudes towards E/M learning at the dental school. This would have been especially beneficial before the interviews. Conducting the surveys and then following up one to one interviews worked well as students had the opportunity to emphasise on their choices in the survey. With focus groups, students could've felt reluctant to share certain information or felt too shy. For example, students may not have opened up about the difficulties they face when using certain platforms etc. They may have felt embarrassed sharing this information with the rest of the group.

3.15 Mixed methods approach

Along with qualitative and quantitative research, mixed methods research is increasingly becoming a third recognized major research approach, attached to research practices (Bazeley, 2006). There are many names given to this third methodological movement. Some of these include: Integrative research (Johnson & Onwuegbuzie, 2004), blended research (Thomas, 2003), ethnographic residual analysis (Fry, Chantavanich, & Chantavanich, 1981), multi-

method research (Morse, 2003), and mixed research (Johnson, 2006; Johnson & Christensen, 2004). For more than a century, the supporters of quantitative and qualitative research approaches have argued and disputed (Ayer 1959). Both sets view their research approaches to be the 'best' and ideal choice for research (Howe, 1998). The purpose of mixed methods approaches is to not replace either of the mentioned approaches, but to minimise the weaknesses associated with each method and draw from the strengths. Research methods should follow research questions in a way that they obtain useful answers for the phenomena in question (Johnson and Onwuegbuzie, 2004). The aim in the current research was to collect data through surveys and then interviews which would result in a mixture or combination. This would hopefully end with complementary strength and non-overlapping weaknesses.

The overall strengths of this approach are that it allows researchers to feel more confident about their outcomes. It also provides a platform, where one is free to capture a problem in new ways. However, there are some shortcomings to consider. First of all, the replication of such strategies is difficult, and this is most often considered to be a very important part of scientific research. Secondly, such an approach may prove to be extremely time consuming. Finally, the researcher needs to ensure that both qualitative methods and quantitative methods are represented in a significant way.

Overall, the use of a mixed methods approach proved to be successful in the current study. However, if there was more time, focus groups would have been set up to understand the issues, attitudes and behaviours, before the interviews and before creating the surveys. This would have informed the questions used in the survey and interviews.

3.16 Sampling and generalising

So far, the importance of the appropriateness of different methodologies in research has been discussed. However, the quality of a piece of research does not only stand on the methodology alone. The suitability of the sampling strategy adopted, plays a very important role in a high quality piece of research (Morisson, 1993).

Sampling decisions need to be taken as early as possible, in the overall planning of the research. Researchers are often prevented from gaining information from the whole population, when considering factors such as time, expense and accessibility (Cohen *et al.*, 2000). In qualitative research, sample size depends on five things:

- The nature of the topic;
- The scope of the study;
- Quality of the data;
- The study design; and
- The use of shadowed data.

Purposive sampling is the method used to recruit the participants in this study, as this involves those people who have experienced the phenomenon under study. The number of individuals needed to generate rich data was not predetermined and was decided whilst conducting the interviews. This was dependant on the goals and purpose of the study. These were to find the different trends, attitudes, behaviours and adoption towards and of electronic/mobile learning tools and platforms. It is fair to say that both the phenomenology and grounded theory sampling techniques played a role in this part of the research. The reason for this is because phenomenologists are interested in common features of the lived experiences, and it is sufficient to gather this data from only a few numbers of individuals who are experienced this phenomenon (Starks and Trinidad, 2007). For example, the use of SNS was investigated.

This section of the research questions aimed to understand participants lived experiences in its use. Similarly, an example of the use of grounded theory sampling techniques would be the investigation of tutors *and* students attitudes and understanding towards electronic/mobile learning. Grounded theory relies on theoretical sampling, and therefore participants who have differing experiences of the phenomenon are recruited. In the current research, the aim was to investigate the uptake of mobile/electronic tools in learning and in teaching.

In quantitative research, statistical sampling is used most often as the research is concerned with the similarities and differences. To maximise validity and generalisability, this is the best sampling technique to adopt. A precise number of samples can be determined before the collection of data and this depends on the level of accuracy and probability that is required in the research.

Non-probabilistic sampling is an alternative approach, which identifies specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied. Behaviours relevant to the research will be available to explore as informants identified will enable this (Cohen *et al.*, 2000).

In the current research, students and tutors who had particular access to important source of knowledge, relevant to this research were approached. As mentioned earlier, such sampling is generally purposive or purposeful. Generalisability is less important in purposive sampling and it is important to therefore acknowledge that the current research results cannot be generalised to an entire population. An unknown proportion of the entire population was not sampled. However the collection of rich data was given the upmost importance.

3.17 Ethical approval

3.17.1 Introduction

For studies involving human participants, it is the author's responsibility to gain ethical approval from the relevant professional organisation. Throughout the study, the following guidelines must be adhered to:

- The minimization of risks to human participants,
- Adequate procedures placed to ensure the privacy and confidentiality of participants,
- A plan to monitor the data and the safety of the participants,
- Informed consent sought and documented,
- Use of safeguards to protect vulnerable populations.

There is a possibility that the variability and potentially the generalizability of the study results could be affected, if human participants in a study are not treated in accordance with an accepted set of ethical standards (Kanter, 2009). Social scientists not only have a responsibility to search for the truth in their research, but also to act in a way which would preserve their own dignity and of others (Cohen *et al.*, 2000). Ethics has been defined as:

A matter of principled sensitivity to the rights of others. Being ethical limits the choices we can make in the pursuit of truth. Ethics say that whilst truth is good, respect for human dignity is better, even if, in the extreme case, the respect of human nature leaves one ignorant of human nature (Caven, 1977:810).

This study gained ethical approval at the start of the research process. Appendix VI is the application for ethical review which was submitted to the University of Birmingham, ethics committee, and prior to data collection.

3.17.2 Formal ethical considerations

The need to respect and exercise a duty of care in relation to the students and tutors was vital. In this study, all participants were over eighteen and did not have declared vulnerabilities. At the time that the surveys were distributed and interviews commenced, it was ensured that the research did not interfere with their studies. Tutors were consulted to find out about any exam periods or time of pressure, under which students may have felt stressed if taking part in the study. Whilst asking tutors, it was ensured that student's identities were not revealed to the tutors. Students from the fifth year of undergraduate dental studies were not asked to complete the survey as the tutors advised that fifth year students had already left for summer vacation.

Other steps which were taken to make sure that ethical principles were followed included obtaining consent from students and tutors at the start of the interviews. This was recorded using a voice recorder. Before the interviews students and tutors were reminded that they could withdraw from the interview process at any time, how the information they provide will be used and the purpose of the research.

Students were assured of confidentiality and that their information and answers would not be shared or discussed with tutors. Similar information was given to tutors before their interviews commenced. Each tutor and student was given a number and letter to identify their transcripts. Names and contact details are not disclosed anywhere in the research.

Once the transcripts were ready, participants were offered the opportunity to check them and make sure that their comments and answers were interpreted correctly. They were given the opportunity to add, amend or delete information. Such a process helps with ensuring that the facts are correct and that participants did not say things '*in the heat of the moment*'

(Denscombe, 2007). In practice, nobody changed the transcripts, and in this case agreement was assumed.

3.17.3 An ethical framework

It was important to not write a story for the participants in this research and therefore throughout the interviews, the interviewee's comments were listened to very carefully. The data was presented in context as far as possible, and at appropriate lengths. Quotes are therefore used in their novel form and where they are relevant to the topic in discussion. In the discussion and results write up stage, common words used such as 'ers'. 'ums' etc. were removed. This was because such words were not central to the data and added to the length of the quotes, without any purpose.

Overall, although there is no code of practice which can anticipate or resolve all problems encountered in research, Cohen *et al.*, (2002) explain a few advantages in fashioning a personal code of ethical practice. These include:

- The researcher is established as member of the wider scientific community who shares an interest in its values and concerns;
- The researcher becomes aware of the duties towards the participants, and to those problem areas where there is a general agreement of what is acceptable and is not acceptable.
- When principles codes of ethics guide the researchers behaviour, the researcher may find that the same thing can be done in alternating way, which may be more ethical or less unethical, in morally challenging situations.
- Discipline will be added to the researcher's awareness. The researcher should aim to strike a balance between discipline and awareness.

Section 2

3.18 Methodology for Questionnaire

The method chosen to carry out this research was designing a questionnaire. This was the chosen method because precise and direct questions could be put together which students would be able to answer easily. Students could fill out a questionnaire and did not have to come for any meetings. This allowed a higher response in a short amount of time for the research. The questionnaire was cost effective as setting it up online was free. Survey monkey, which is a database online, allows you to design and analyse your questionnaire. As the questionnaire was already piloted, it was decided that because of the slow response to emails, the questionnaire was delivered to students at the end of their lectures. Students were given directions as to which sections to fill out if they were relevant to them as the pilot study showed that students may not understand the structure of the questionnaire. The results were then manually entered into Survey Monkey. Questions were close ended so students could move through the questionnaire quickly. Open ended questions were included at strategic points in the questionnaire allowing students to provide further comments and reflections about a specific topic or question.

3.18.1 Literature

The questions were designed by looking at a number of different examples of surveys from previous research papers (Walmsley *et al.* 2003; Williams 2004; Maha and Tantawi 2008; Walmsley *et al.* 2009). These papers were used to design the demographic data questions at the beginning of the survey. The aim was to provide ideas for the layout and formatting of the questions. Most of the questions were taken from Survey Monkey as the site has examples of questions that can be used to create surveys (Survey Monkey, 1999). Questions on

applications used on smartphones and iPads were designed by directly taking them from Survey Monkey.

3.18.2 Structure of the Questionnaire

The same structure was used for the main study as with the pilot study questionnaire. This was because the pilot study successfully addressed all the areas aimed and did not need changing

Section A: The questionnaire started with an introduction outlining the aims of the study and why it was important for the dental school. The first section was designed to find out the demographics of participants and these included gender, age and year of study. In the same section an additional three questions were added which determined the use of and access to the internet overall. Students were asked how much internet they used for dental course and for personal reasons. The final question in this section asked if they use an E-book reader as recently there has been an increase of sales with E-book readers. If students answered yes to this question, the questionnaire would take them automatically to the E-book reader section. If students answered no, they got directed to the next question which asked students to choose their top choice of device they used to access the internet.

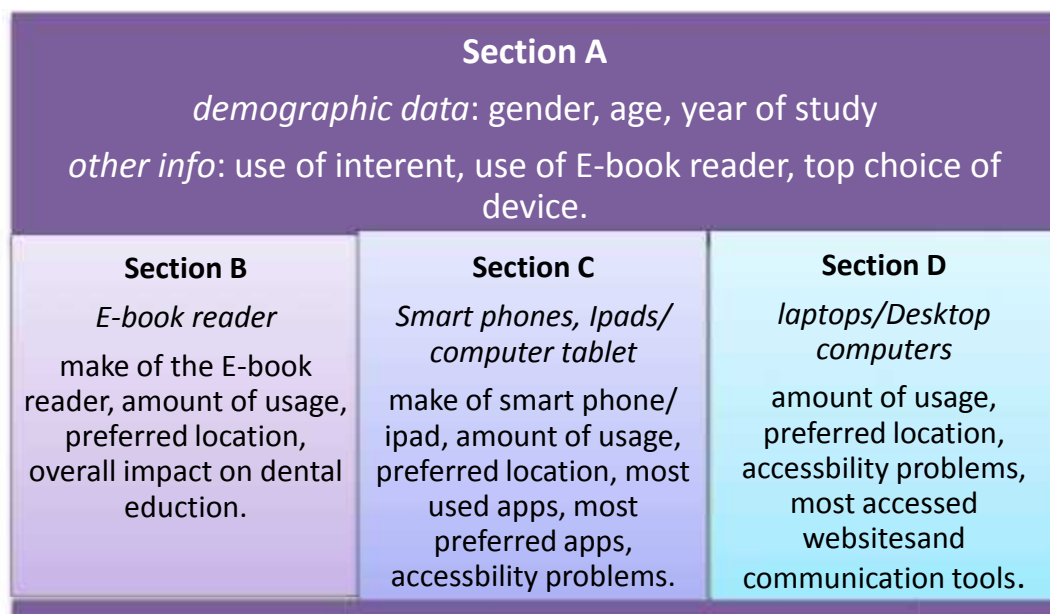
Section B: The second part was designed for students who used an E-book Reader it was aimed to use this section to find out where students preferred to use E-books readers. As it is a new technology tool, students were asked about any problems they would have with using an E-book reader and they could choose up to three answers. The final question in this section was if students felt that using the E- book reader had resulted in them reading more dental related books or less.

Section C and D: The next part of the questionnaire was the main body and was based on:

- Smartphones,
- iPads,
- laptops and;
- Desktop computers

As students chose their top choice of device for accessing the internet, they got directed to the relevant section. All three sections started by asking students to identify the model or make for the device they used. For example the model of the smart phones is Apple, Blackberry, Android, Windows and other. Each section allowed students to specify the model or make if it was not listed. Both the smart phone and iPad related questions focused on applications (apps). The desktop and laptop section was separate as applications are not associated with these devices. At the end of all the sections for each device, a few questions were directly concerned with accessibility problems that students may have when using the different devices. The following figure gives an outline of the design and layout of the questionnaire.

Figure 5: Structure of the questionnaire



3.19 Pilot study

3.19.1 Rationale for sample selection (pilot)

Faculty members were asked to give a few names of students from their classes in years 1-4. A total of 29 students' names were provided, who were emailed the survey through the online platform SurveyMonkey. The reason why students were using this method was because the aim was to explore and examine the usefulness of the questionnaire, and identify the questions which needed revision.

3.19.2 Sample selections

Twenty-nine students were selected from 4 years of clinical undergraduate studying at the University of Birmingham. A link to the questionnaire on Survey Monkey was emailed to the students with directions and an option to opt out if they wished to not take part. The age range selected was from 19-25 years. Both males and females were included in the study.

3.19.3 Response rate

For the pilot study, 29 students were emailed with the survey. In the first attempt, 11 students replied and completed the questionnaires. Emails were sent out a second time for reminding students about the questionnaires and requesting them to reply with the completed survey.

The result of the second reminder was that 3 more surveys were completed. In total 14 students took part in the pilot study. The issues with emailing the questionnaires were that the student's response to the emails was very slow. The returned questionnaires showed that some of the students might have been confused about the order of the questions, as some of the sections were not answered.

3.20 Main study- the questionnaire

3.20.1 Rationale for sample selection (questionnaire)

The pilot study revealed that using SurveyMonkey to email students was not sufficient to get a high response rate. Students were not taking part in the survey and/or were not reading their emails. This was revealed when faculty members were asked to enquire about the delivery of the email to their email accounts. Therefore, it was decided that to get a higher response rate, students would be given the choice to complete the questionnaire at the end of their lectures. The lecturer allowed me to distribute the questionnaire to students who were willing to take part, and who were available at the time of distribution in the lecture hall. As students who are accessible at the time were approached, and all accessible students were approached, this would mean that that convenience sampling and consecutive sampling techniques have been applied in this part of the research,

3.20.2 Sample selection

Students were given the choice to answer the survey at the end of their lectures from year 1-4 at the University of Birmingham, School of Dentistry. The age range selected was from 18-25 years and above. Both males and females were included in the study. The questionnaire was distributed to students at the end of their lectures or emailed to them.

3.20.3 Response rate

It was not possible with the timing of the study to survey the final year students as the survey was done near the end of the academic year. A total of 270 questionnaires were completed. There was a 100% response rate for the main study as students were given the opportunity to

complete questionnaires at the end of lessons and were given clarification when they did not understand the sections.

3.20.4 Strengths and weaknesses in sample selection

The method chosen for selecting students at the end of their lectures worked well as there was a 100% response rate. The advantage of approaching students in this manner was that students could clarify any confusion regarding the questions and there was a low chance of misinterpreting the questions. However, the researchers presence at the time that the questionnaire was completed may have led to some bias, with regards to truthfulness.

Furthermore, the presence of the lecturer could have influenced student's decision to take part in the survey or not.

3.20.5 Rationale for data analysis (Questionnaire)

For both the pilot study and the main study (questionnaire) the responses were analysed on SurveyMonkey. The difference between the pilot study and the main study for the questionnaire was that the data collection method changed for the main study. However, as the pilot study data was easily viewed and analysed on the SurveyMonkey platform, it was decided that the main study questionnaire results should also be analysed on SurveyMonkey. The platform was used for analysis in the following ways:

- Browsed individual responses
- Created and exported charts and figures
- Used filters rules to focus on specific subset of data based on certain criteria that was defined. For example, the number of students from year 2 who used the internet for personal reasons compared to dental course related work.
- Open ended responses were viewed in the question summaries area for further analysis.

- The platform allowed a comparison between rules through a cross-tabulation of data. This helped with comparing the answer choices to one question across the rest of the survey. This tool was helpful when comparing the answers for the different sections on devices.

SurveyMonkey was the chosen platform because it allowed the creation of the questionnaire online, the distribution of the questionnaire through emails, filter and cross tabbing as part of the analysis and provided downloadable figures and charts to illustrate the results.

3.21 Methodology for student interviews

After free-associating different themes on online communication, a draft topic guide for the interviews was designed. The aim of the interviews was to focus on Mobile device related communication activities. The topic guide included all the themes that were decided on when putting together questions. These included:

1. Use of internet for personal reasons and dental studies
2. First and second choice of device used to connect to the internet and search for information
3. Most used internet communication tool
4. Different ways of communicating with different groups of people
5. Improvements needed when communicating with tutors
6. Phone brand
7. Different kind of apps used by students (study, personal, communication)
8. Mobile computing/communication tools engaged on Smartphones
9. How often the devices access the internet
10. The most preferred place when connecting to the internet
11. Barriers when connecting to the internet to search for information
12. Students perspective on the term 'Evidence based apps'
13. General Dental Council standards in relation to social networking
14. How students trust information on the internet
15. Any extra comments not covered elsewhere

3.21.1 Consent for interviews

For participation in the one-to-one interviews, students' consent was sought before and during the interview, recorded on audio tape. Students were assured that their answers are confidential and their names and information will not be used or displayed. Before the start of the interviews, students were told that their interview would be recorded and if they were happy to go ahead with this the interview continued. Students were given the option to have the results emailed to them once the process was over.

3.21.2 Rationale for sample selection (student interviews)

Students were given the opportunity to leave their names and email addresses at the end of their lectures to indicate that they wanted to take part in the second part of the research, which was the interviews. Only students who had already completed the questionnaires were given the opportunity to leave their names. In order to include students from the 5th year, faculty members recommended students who would be willing to take part in the interview process and would have the time. These students were therefore recruited through convenience sampling method.

3.21.3 Sample size and selection

A total of 20 students agreed to take part in the interview process and were recruited via email. Students were interviewed at the Dental school, University of Birmingham. Students were selected from years 1-4 and the aim was to have students from each year group. This was achieved by making students aware of the study as a whole class and anyone who wanted to participate left their name and email address. Only students who answered the questions in the survey were approached through emails.

3.21.4 Sample Framework

Only students who took part in the survey (stage 1) were emailed to take part in the second stage of the project. A number of students from all five year groups were approached to get a breadth of all years.

3.21.5 Strengths and weaknesses in sample selection

The decision to interview students who had already completed the questionnaire was made because the questions in the interview related to the questionnaire results and the results would be representable. The inclusion of students from the fifth year was intended to collect data from students at the final stage of dental education. Unfortunately fifth year students could not be included when distributing the survey as they were away. Asking fifth year students to participate in the study may have its drawbacks. As these students did not complete the survey prior to the interview, the comparison between results using both methods cannot be termed as triangulation, with regards to the fifth year student interviews.

3.21.6 Pilot interviews

The first three interviews with students were pilot interviews and it was intended to make changes to the topic guide and interview guide if any changes were needed. In practice, the interview topic guide and interview guide did not need amendments.

3.21.7 Rationale for interview questions

Some questions were descriptive as they asked students to describe things which needed further insights. Some of the types of questions which were included in the interview process were grand tour questions; which led to larger explanations. Mini tour questions were used to follow up grand tour questions. Structural questions were asked to help understand the relationship between things and categorise groups of like things or like processes. Some questions related to the different devices were contrast verification questions as they focused on one characteristic on one device and then asked participants to explain or think about other devices etc. which shared the same characteristics.

The questions were mostly open-ended, neutral and understandable. Students started the interview by answering straight forward questions and then the interview proceeded towards more challenging topics. This was done so that students felt at ease and relaxed. It also helped with build their confidence and build rapport.

3.21.8 Rational for interview processes

Students were assured about anonymity and confidentiality. This could have increased the likelihood of honest answers, and is also a fundamental aspect of the informed consent process. The interview was conducted away from the distraction and at the dental school which was more convenient for participants. Establishing a good relationship with students before the interview was important to have a positive effect on the development of the interview. During the interviews it was important to be familiar with the structure and the materials etc. This helped with making the interview feel a natural process and not a rehearsed process. Other important skills included adopting open and emotionally neutral body language. For example nodding, smiling and encouraging noises. The strategic use of silence

was highly effective in encouraging students to elaborate and clarify their answers further. Throughout the first few interviews, it became apparent that probing remarks such as '*what do you mean by that?*' and seeking clarification by repeating the participants answer, helped understand their responses.

3.21.8 The length of the interviews and process

The interviews were recorded with a digital voice recorder (Olympus VN-713PC) to avoid missing any points and also to prevent interviewee distraction, whilst making notes. Once the question was asked, students were given time to provide a detailed answer if they so wished. There were no time limits on the interview and generally lasted up to half an hour. At the conclusion of the interview, students were given a chance to add anything that had not been covered and was related to the main themes discussed.

3.21.9 Data collection, processing and statistical methodology

The information gathered from students during the interview was categorised on a voice recorder. The voice memos were then organised on a laptop by taking out the interviews and sorting them into different folders. Students were given a specific ID which identified their age and year of study. The interview recordings were then transcribed individually word for word into scripts. The transcripts were then used to highlight codes and categories with the main themes being categorised again.

3.21.10 Rationale for Data analysis

Qualitative data often provides the researcher with a sea of information which is often multifaceted. One bit of data connected to another bit, is often the way to make sense of such overwhelming information. Researchers often use data analysis software tools that utilise the power of modern computing to supplement their own human senses (Meyer and Avery, 2009). For the current research, the data gathered from the interviews with both students and tutors was analysed through the use of Microsoft Excel. Its ability to handle large amounts of data and the facility to display the data in different ways, allowed the data to be analysed in a simple and sufficient manner.

The excel worksheet template was developed prior to entering the data. The margins were set at '0' and the page orientation was 'landscape'. Columns were created with headings for the participants ID numbers, the different codes and responses. Separate face codes for age, year group and the access to the internet were created. This is further exemplified in **Figure 6**.

	A	B	C	D	E
1	Respondents	Demographic Data	Access to the internet	Use of internet for personal or studies	Factors that may affect use of internet (studies and personal)
S1		age 22 in year 5	yes	More for Personal: Email, Facebook, Social network Dental: YouTube for Clips on Surgeries and Ecourse	More interactive software needed: watch them and stream them and tables to different things interactively. Podcasts: 'They should record lectures as sort of thing'. pg2 ln5
S2		age 22 year 3	yes	More for personal: Email and watching Tv as I don't have TV. Dental: I don't really need it at the moment as it is mainly practical and not much research. I use the Ecourse alot and Dental update and emailing Tutors.	depends on work load, more work load in Internet for me and if more of the study in
S3		Age 18 year 1	yes	More for personal: social networking, surfing Dental: Ecourse	app and twitter link: 'maybe linking ecourse like methods that students would use may linked to twitter or something like or have app or something' pg2 ln1.

(Figure 5: Screenshot of the Excel worksheet for student interviews demonstrating the codes)

The text from the transcripts were converted to a table format (Table > Convert > Convert Text to Table). Each response was transferred over to the Excel spreadsheet in separate cells, when the table was copied and pasted.

Once the data was inserted in to an Excel spreadsheet, each row defined a codable unit and each column defined an attribute of that unit. For example, the codable unit would be student 1, and the defined attribute would be their age, use of SNS, most used internet communication tool etc. Appendix VII are the screenshots of the Excel spreadsheet assembled for data analysis. **Figure 7** demonstrates some of the categories identified once the columns and rows were in place.

Mobile Computing/communications	Frequency of Use of Internet	Preferred place to use devices	Barriers	Knowledge of GDC standards and Social networking	How do you treat the
taking photos and making videos and transferring them through sky drive. Take pictures of pages of a book so i can look back at it as i can't really hold pictures to the clinic so only take pictures for that reason	two to three times a week why? not used to the new phone yet but will be using it much more when i am	laptop is mostly at home and sometimes in uni but have Desktop computers if needed a computer at uni. Smartphones to anywhere on the go...	Smartphone: Battery life. Wireless connection is a problem as i don't use 3G and only wifi. Sometimes the license is not brilliant on the phone as if you try to click on one link it opens another. I can zoom in etc but navigation is not good. Best app for source to	6 principles dentists follow the patients interest and there is something about using the internet but i haven't read it yet.	if they are well and think its ok to use from websites like out where proper Enough guidance if
instant messaging only getting hold of people when there is no signal to ring.	daily but laptop most often for internet as it is much faster than smartphone	Laptop: at home mainly Smartphone: at the dental but never use desktop computers not happy with them	no problems with laptop but with yes. We have to consider patient confidentiality and act professionally online. We have to reference every information we get from the internet and not just anything on the internet.		stick to well known stay away from we
e-books, emails, instant messaging, transferring files - Dropbox, transferring files is pretty useful so when we have pictures sometimes on our phones or lecture notes we transfer files on dropbox and we use that its quite good for studying like peer sort of learning' apt 1st23.	most of the day for both personal and studies	Laptop used in the room and medical school, smartphone used outside anywhere. Would consider using iPad as laptop is too bulky but its too expensive. If i had said id still use smartphone as its more portable and compared to laptop also as i wouldn't use the tablet only at home as i have a desktop there but otherwise literally everywhere.	internet connection, battery life, loading takes too long.	been given a book to read and had a few assignments. Gps and done that for the internet given.	stick to the books reinforce in the list
e-books, videos, email, instant messaging, transfer files from one place to another, play interactive games via internet, transfer photos etc in the future would like to use. There is one thing is considered and i want to get that they recommend which is a really good Storage SD card for cameras but quite a lot of dental photography is could require a decent size of card but the images we will be taking are a very high resolution and at certain stages some of them are quite RAW and that's literally when you've taken a picture' apt 1st21.	every all the time what? Just cuz i literally have nearly everything on there that's instant and immediate use i can access online and is got 1000 it and its very very convenient		mainstream most problems faced particularly with these models and if you play around with it and do alot of research and time allowing you get used to these things and get confident and the only annoying thing is it doesn't have 3g only wifi and the thing you can do you can get a phone and you can do a thing called flutter where you get your phone and use the wireless signal and it gets picked up from those	guidelines i have read which tell you that our whole life is professional basically. A lot of information on how to behave on social networking sites up the GDC website is really informative and easy to use, gives a lot of guidance as to how to use the internet professionally. there are other dedicated websites and for guidance the royal college of general practitioners has a traffic system on highway GDC.	reference its often referenced

(Figure 6: Screenshot of the Excel worksheet for student interviews demonstrating the categories)

Category labels were created after reading and re-reading the responses one question at a time. Once the exclusive category titles were listed, an assigned code for each category was used to help with working with the different categories.

3.22 Methodology for elite interviews with Tutors

During the process of carrying out this research, students addressed topics and ideas which involved their tutor's approval. It was therefore considered appropriate to extend the current study to examine tutors attitude and understanding towards mobile/electronic learning and teaching. This would give an overall understanding of the position of electronic/mobile learning and teaching in dental education. Tutors from the University of Birmingham, the School of Dentistry were approached and asked to participate in a face-to-face interview.

3.23.1 Topic selection

A topic guide was designed after evaluating students' responses and was then used to interview tutors. The aims were to address all the areas that students responded to and to explore new themes that emerged from the interviews and questionnaires. There was an addition of some questions related to students' activities, tutors' perceptions and possible barriers to the adoption of electronic tools and platforms in dental education. The main subject heading in the topic guide which was similar to that for the students included:

1. Use of Internet for personal reasons and dental course
2. First and second choice of device used to connect to the internet and search for information
3. Most used internet communication tool
4. Different ways of communicating with different groups of people
5. Improvements needed when communicating with students
6. The use of instant messaging to communicate with students
7. Comments regarding the use of Social networking sites by students and tutors

8. Phone brand
9. Different kind of apps used by tutors (research/teaching, personal, communication)
10. Mobile computing/communication tools engaged on Smartphones
11. Mobile computing/communication tools that help with teaching/research
12. Tools that may be used in the future for teaching/research and tools which have recently been introduced to tutors teaching and research methods.
13. Barriers that prevent tutors from using their devices for teaching/research
14. Factors which would encourage tutors to use devices more for dental education
15. Awareness of extra activities that students are engaged in inside or outside of classroom
16. Comments regarding the use of Cloud computing platforms by students and tutors
17. Comments regarding lecture recordings in class
18. Any extra comments not covered elsewhere

3.21.2 Consent for interviews

For participation in the one-to-one interviews, tutors' consent was sought before and during the interview, recorded on audiotape. Tutors were assured that their answers are confidential and their names and information will not be used or displayed. Before the start of the interviews, tutors were told that their interview will be recorded and if they were happy to go ahead with this, the interview continued. Tutors were given the option to have the transcripts and results emailed to them once the process was over.

3.21.3 Rationale for sample selection (tutor interviews)

Tutors were selected through the suggestion of faculty members who were involved in the supervision of this research. Tutors who had particular access to important source of knowledge, relevant to this research were approached. Such sampling is generally purposive or purposeful, also known as judgemental and selective.

3.21.4 Sample selection and size

A total of 6 tutors agreed to take part in the interview process and were recruited via email and face-to-face meetings. Tutors were interviewed in their offices, at the Dental school, University of Birmingham. Tutors were selected from different ages, research backgrounds and teaching specialism.

3.21.5 Sample framework

The sample framework was set up to take in to account an outline of academics at different career progressions including senior staff, lecturers, assistant lecturers and members of the IT committee. Both male and females were approached and those who were and were not involved in the IT development of software's, platforms and tools for undergraduate education.

3.21.6 Strengths and weaknesses in sample selection

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. This is a type of purposive sampling technique which aims to capture a wide range of perspectives. The aim was to include tutors in the interview process who exhibit a wide range of behaviours, experiences, attitudes and understandings towards e-learning and m-learning. The reason why this sampling technique was adopted is because it allowed the identification of common themes across the sample and it was possible to gain a greater insight in to e-learning/ m-learning, from all angles.

3.21.7 Pilot interviews

The first two interviews with tutors were pilot interviews and it was intended to make changes to the topic guide and interview guide if any changes were needed. In practice, the interview topic guide and interview guide did not need amendments.

3.21.8 Data collection, processing and statistical methodology

Data collection in this study involved gathering information from tutors in form of taped interviews. Following the interviews, the recordings were transcribed into scripts and categories were developed. The categories were further coded to synthesis different themes.

3.21.9 Rationale for data analysis

The data was analysed similarly to the analysis of student interviews. Microsoft excel was the chosen platform. Appendix VI illustrates the screenshot taken from excel

3.22 The influences on the conduct and outcomes of the study

3.22.1 Researcher influence

It is possible that students were inclined to provide answers in the questionnaires and interviews which they thought will impress or suit the researcher. Throughout the interviews, the body language and the facial expressions of the interviewer may have influenced participants to provide answers which impressed the researcher. For example, if participants did not have much to say about a certain platform, the researcher may have unknowingly looked disappointed. This could lead to participants potentially answering questions untruthfully. Secondly, participants may have background knowledge on the study, the researchers and the purpose. This may have influenced participants to provide answers which will be of interest to the research and not be honest.

3.22.2 Faculty member influence

This research was supervised by two faculty members. The questionnaires were introduced to the participants by naming the faculty members involved in this research. This knowledge may have influenced students to provide answers which would support the research, teaching and attitudes of the faculty members involved. Participants may have been influenced in interviews and when completing the questionnaires, by having knowledge about the involvement of the faculty members in this research and their enthusiasm towards the use of electronic learning/mobile learning. One of the faculty members involved in this research is a regular user of SNS. This may have influenced participants when answering questions related to SNS and communication.

3.22.3 Distribution of iPads

Students from the 3rds and 4th year of UG studies at the University of Birmingham, dental school have been provided with iPads for feedback from patients. The purpose of the iPads is to provide feedback to tutors regarding patients experience when being treated by the students. As these iPads were distributed after the survey, this part of the results was not affected. However, the interviews took place after the distribution of iPads. It is important to acknowledge that this may have influenced student's responses in the interviews regarding their choice of devices. Nevertheless, the interview questions were tailored to provide further insights into some of the information students provided through the questionnaires, prior to the distribution of iPads.

CHAPTER FOUR:

RESULTS

Section 1

4.1 Questionnaire results

4.1.1 Demographic Data

The results show that 28% (n=75) students were female and 72% (n=195) were male. Out of the 270 students who responded, 42% students were between the age group of 20-21, 32% were between 18-19, 24% were between the age group 24-25 and 1% were 25 and over. Sixty five students were from the 1st year, 77 students were from the 2nd year, 60 students from the 3rd and 68 students responded from the 4th year.

4.1.2 The N value

The N value for these set of results varied as students answered questions which overlapped and students were only allowed to answer two sections per survey. This was because the purpose of the questionnaire was to find out the top two chosen devices and the related information.

4.1.3 Usage of internet

Out of the 270 students, 264 students had access to the internet. The results show that more (31%) students used the internet somewhat more often for personal reasons in a typical weekday (n=60). Closely followed by 28% (n=55) students who use the internet about an equal amount for dental course and personal reasons and 25% (n=50) students who use it much more often for personal reasons.

4.1.4 Top chosen Device

Students were asked to choose their first choice of device they use to connect to the internet and search for information. More than half of the students (55%) who answered this question use the laptop computer to connect to the internet and search information (n=145). The second most popular device is smart phones as 33% (n=88) students chose this as their top choice of device. iPad/Computer tablets were chosen by 8% students and 3% students chose desktop computers as their first choice of device.

Only 16 students used an E-book reader and 6 students use their E-book reader once a week. Most students (n=7) students chose the home to be the most preferred place when using their E-Book reader. Overall, 3 out of 9 students disagreed that the E-book reader had a positive impact on their dental academic experience in general (33%). As there was only a small group of students who use an E-book reader, further analysis will not be continued.

4.1.5 Laptop/Desktop computer

The results showed that 77% (n=175) students use the laptop/desktop twice or more times a day to access the internet. It was found overall that **79%** (n=178) students strongly agreed that the internet on their laptop/Desktop computer has had a positive impact on their dental academic experience overall. Twenty percent (n=45) students agreed to this statement and three of the students were neutral. None of the students disagreed with this statement.

4.1.6 Smartphones

The second most popular device used for internet and searching for information chosen by students is smartphones. Smartphones were also the second choice of device after they chose laptop/desktop computers as their first choice (41%).

It was found that 48% of the students (n=87) preferred to use mobile websites for finding information on their smart phones. Thirty seven percent of the students (n=67) preferred to use both mobile websites and mobile apps.

Overall, the results show that **55%** (n=96) students strongly agree that having internet on their smart phone has had a positive impact on their dental academic experience. Twenty nine percent students agreed to this statement (n=50).

4.1.7 iPad/Computer tablet

Out of 262 students, 21 students chose iPad as their first choice of device to connect to the internet and 22 students chose iPad/computer tablets as their second choice of device.

The results show that 62% (n=25) would prefer to use an internet link on iPad for finding information compared to 20% (n=8) students who would like to use an iPad/computer tablet app for finding information.

Overall, the results show that **55%** (n=22) students strongly agreed that having internet on their iPad/computer tablet has had a positive impact on their dental academic experience in general. Thirty three percent students agreed with this statement and 13% (n=5).

4.1.8 Table captions

The tables and figures on the following pages illustrate some of the main findings from the questionnaire. Each caption details the questions asked and indicates the number of responses for the specific question. As students were asked to answer questions related to their top two chosen devices, the captions are detailing the number of responses for each question rather than the number of students who answered the question. The number of responses exceeds the number of students because the questionnaire allowed students to select up to two device. Therefore, students could have possibly answered the same question twice but in relation to a different device each time. It is important to highlight this as it is not to be assumed that this figure demonstrates the number of students who answered this question. In tables **2, 4, 5** and **7**, the most popular or preferred answers are highlighted with a light blue font. This was important as it illuminates the main findings illustrated in the tables.

Q: “Do any of the following stop you from using the *internet on your laptop/desktop computer?* (449 responded)”

Figure 6: (responded n=449)

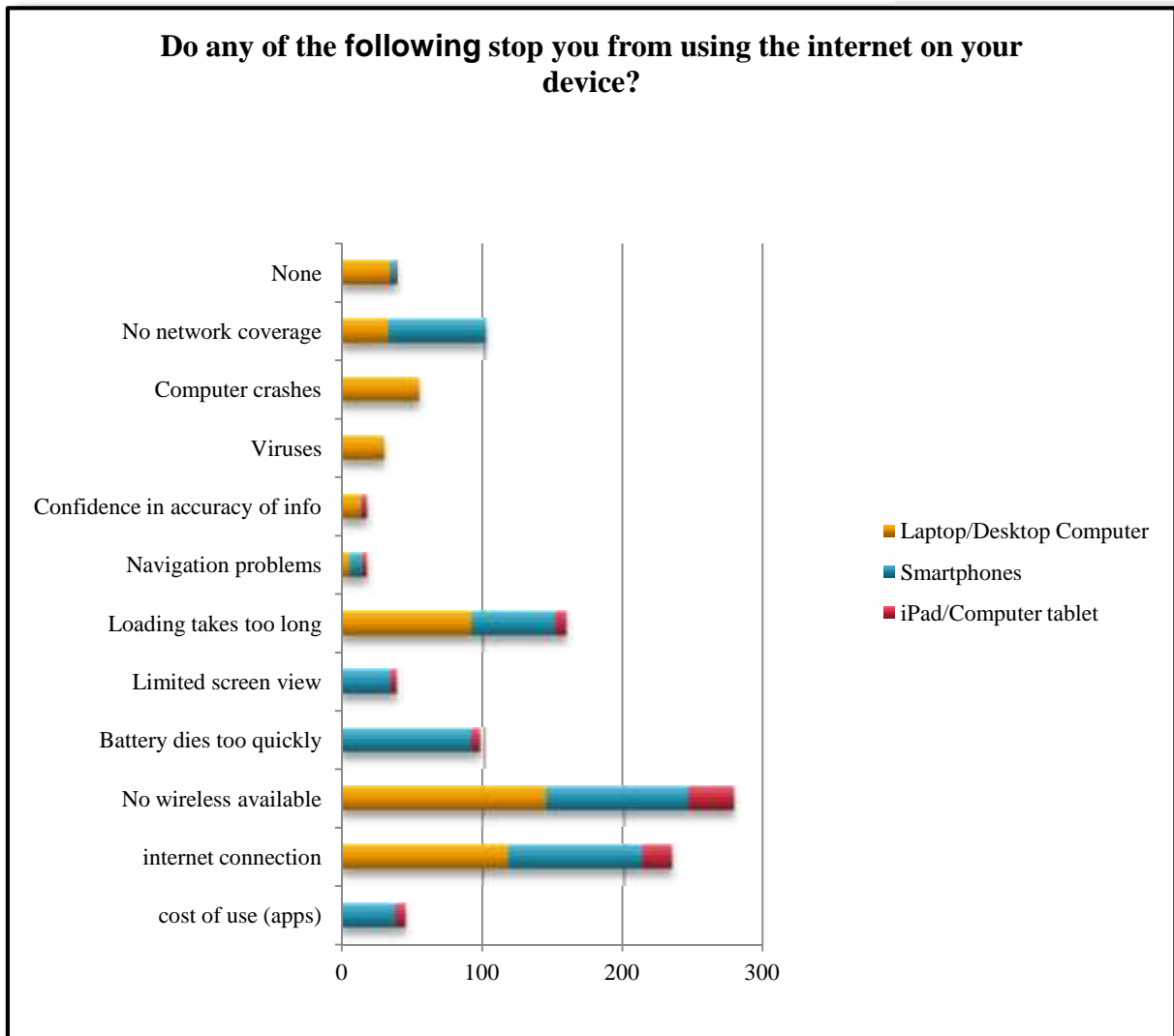


Figure 6 shows that on all three devices, students found no wireless available and internet connection was the top problems they faced which stopped internet search. For laptops, five students chose ‘other’ and left comments: “*only use it at home as laptop is too bulky to carry around*”, “*mobility-too big to bring around with me*”, “*heavy to carry around*”, “*harder to read long documents*”, “*no insurance outside my house*”.

4.1.8 Comparison between devices

The following figures and tables illustrate a few questions used to show a comparison between laptops/ desktop computers, iPad/computer tablets and smartphones.

Q: “Where do you most prefer to be when you use the *internet on your device*? (449 responses, 361 skipped)

Table 2: students most preferred places to connect to the internet

Answer Choice	Laptop/Desktop Computer	Smartphone	iPad/computer tablet
Bookstore	0.4% (2)	0.2% (1)	0
Friends home	6% (29)	4% (16)	0
Home	48% (215)	24% (106)	5% (23)
Library	13% (57)	5% (23)	0.4% (2)
Outside of university (coffee shop, pub etc)	3% (15)	10% (47)	0
Work	8% (17)	2% (8)	0.2% (1)
University/faculty	25% (114)	25% (112)	1% (4)
Anywhere with a connection	14% (65)	31% (140)	4% (18)
None	0	0.2% (1)	0
other	0	0.6% (3)	0
Answered questions	228	181	40

Table 2 illustrates that overall 77% (n=344) students use their device to connect to the internet at home. Furthermore, students using a laptop/Desktop device (48%) use their device at home much more than students with iPad/computer tablet (5%) and smartphones (24%). Out of the 40 students who use the iPad and answered this question, the home (n=23) and anywhere with a connection (n=18) seem to be the most preferred place to use the internet. The top two most preferred place for Laptop/Desktop computer users are Home (48%) and University/Faculty (25%). For students who use Smartphones, anywhere with a connection (31%) and University/faculty (25%) are the top two most preferred places. Overall out of the students who use smartphones left three comments after selecting the 'other' option. One student preferred to use their smart phone on the 'train' and one student 'whilst travelling'.

Q: “Which of the following top THREE sites do you use most to access dental subjects on your device? (445 responses, 365 skipped)”

Table 3: responses from students after selecting the ‘other’ answer choice.

Device	How often do you use your device to access the internet?
Responses	
Laptop/Desktop Computer	13 students commented: “ <i>E-course</i> ” (referring to the University of Birmingham dental E-course) “ <i>British Dental Journal</i> ” “ <i>Dental update</i> ”
Smart phone	2 students commented: “ <i>Medline</i> ” 2 students commented: “ <i>YouTube</i> ” “ <i>British Dental Journal</i> ”
iPad/Computer tablet	2 students commented: “ <i>E-course</i> ”

The results show that the most accessed site by students overall is ‘Google’ (79%). The second most used site by students to access dental subjects is ‘Wikipedia’ (58%) and the third is University sites (38%). **Table 3** shows that Fifteen out of 22 students who left comments opted for the university site ‘Ecourse’. The results do not show a big difference between the devices and the choice of website to use to connect to the internet. However, twelve percent students (Laptop users) compared to 4% (Smartphone) and 2% (iPad) are using ‘Google scholar’ to access dental subjects. University websites are used more by students through a laptop/desktop (27%) compared to on smart phones (7%) and iPad/computer tablet (11%)

Q: “Which of the following top TWO *internet communication tools do you use most often* on your device?” (440 responses, 365 skipped this question)

Table 4: responses to the top two communication tools students use most on devices

Answer Choice	Laptop/Desktop Computer	Smartphone	iPad/computer tablet
Blogs	1% (6)	0.2% (1)	0.2% (1)
Email	47% (206)	30% (134)	7% (30)
Instant Messaging	3% (15)	17% (76)	2% (8)
Web Boards	2% (9)	0.2% (1)	0.4% (2)
Chat rooms	0.6% (3)	0.6% (3)	0
Social Networks	44% (193)	27% (120)	8% (34)
Newsgroups	1% (6)	0.4% (2)	0.6% (3)
Other	0.6% (3)	0.2% (1)	0
Answered questions	225	175	40
Skipped questions	45	95	230

Table 4 shows that the top two most used internet communication tools by students on their devices are Email (84%) and social networks (79%). Blogs (2%) and chat rooms (1%) are the least used internet communication tools by students. Instant messaging (23%) was the third most popular internet communication tool out of the answer choices that were provided to the students. As well as the overall preference of email and social networks, individually students using all three devices opted for email and social networks. Two students who use laptop/desktop computers use 'YouTube' as an internet communication tool.

4.1.9 Applications and mobile computing/communication activities.

The following graphs and tables show a comparison between Smartphones and iPad/computer tablets in relation to mobile applications (apps) and mobile computing/ communication activities and preferences when using/accessing them for dental studies and personal reasons.

Q: “Which of the following THREE would you find useful on your Smartphone or iPad/ computer tablet to access at any time (216 responses, 324 students skipped this question)”

Table 5: Applications and web link ideas most useful to access at any-time.

Answer Choice	Smartphone	iPad/computer tablet
Multiple choice questions	50% (107)	14% (31)
Dictionary for dental education	56% (122)	13% (29)
Stress management for students/staff (yoga app etc)	11% (23)	1% (2)
Description and illustrations of tools in dental practice	32% (70)	7% (15)
Advice for you to give to patients to overcome dental fears	14% (30)	2% (5)
Help with PowerPoint presentations and multimedia effects	3% (7)	3% (6)
Help with oral presentations and tests	23% (49)	5% (10)
Personal portfolio	7% (15)	3% (7)
Instant messaging/ social networking with fellow students and staff	16% (35)	6% (12)

Table 6: responses from students after selecting the ‘other’ answer choice.

Device	Which internet communication tools do you use most on your device?
Responses	
Smart phone	<p><i>“diary/access to appointments etc”</i></p> <p><i>“E-course app”</i></p> <p><i>“advice for patients on smoking, diet, explaining procedures”</i></p> <p><i>“descriptions of dental procedures”</i></p> <p><i>“personal portfolios with timetables”</i></p> <p><i>“I have limited internet access”</i></p>
iPad/computer tablet	<p><i>“E-book reader to access all textbooks for free”</i></p>

Table 5 shows that students chose ‘multiple choice questions’ (64%) and ‘Dictionary for dental education’ (70%) as the top choices for apps or web link that they would find useful to access at any time. The third most popular app/web link idea students chose was ‘Descriptions and illustrations of tool in dental practice’ (39%). Although students chose these apps as the top three favourites, students were keen on some of the other ideas also as students who used Smart phones found ‘Help with oral presentations and tests’ (23%), ‘Instant messaging/ social networking with fellow students and staff’ (16%) and ‘Advice for you to give to patients to overcome dental fears’ (14%). Overall, ‘Help with PowerPoint presentations and multimedia effects’ (6%) was the least popular idea students selected as an app or web link on their device. **Table 6** shows that one student would like the ‘E-course’ to be available as an app.

Q: “In a typical weekday, do you use the Internet most often for Dental course, for personal reasons, or about an equal amount on both?” (196 responses, 76 skipped this question)

Figure 7: (196 responses)

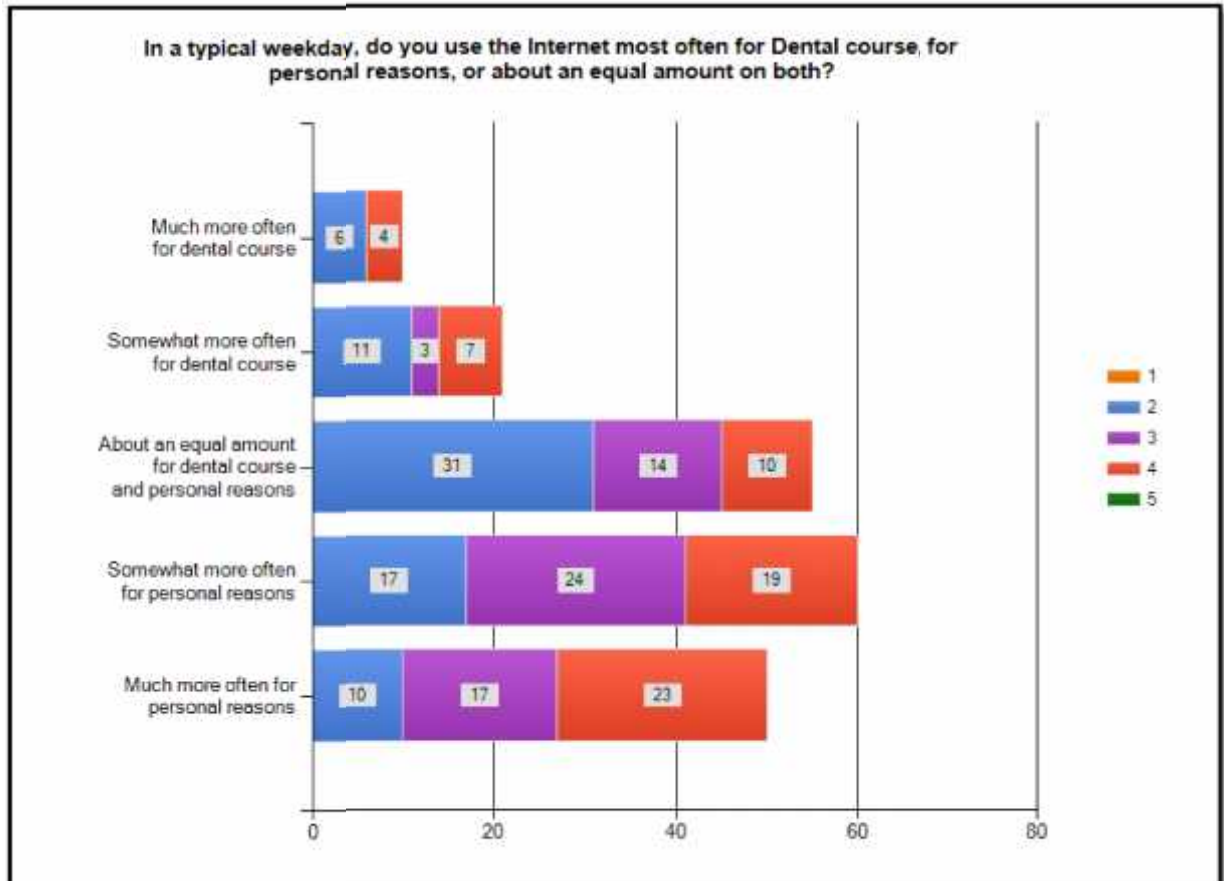


Figure 7 shows that most students from the second year use the internet about an equal amount for both dental course and personal reasons. Compared to these results, the majority of the students from the third year use the internet somewhat more for personal reasons and the 4th year students are using the internet much more for personal reasons. The survey also revealed that aged 18-21 use the internet about an equal amount for dental course and personal reasons and somewhat more often for personal reasons. Compared to these results, students aged 22-25 use the internet much more often and somewhat more often for personal reasons.

Q: “Which of the following devices is your *FIRST* choice to use to connect to the Internet for searching information?” (261 responses, 8 students skipped this question).

Figure 8: (261 responses)

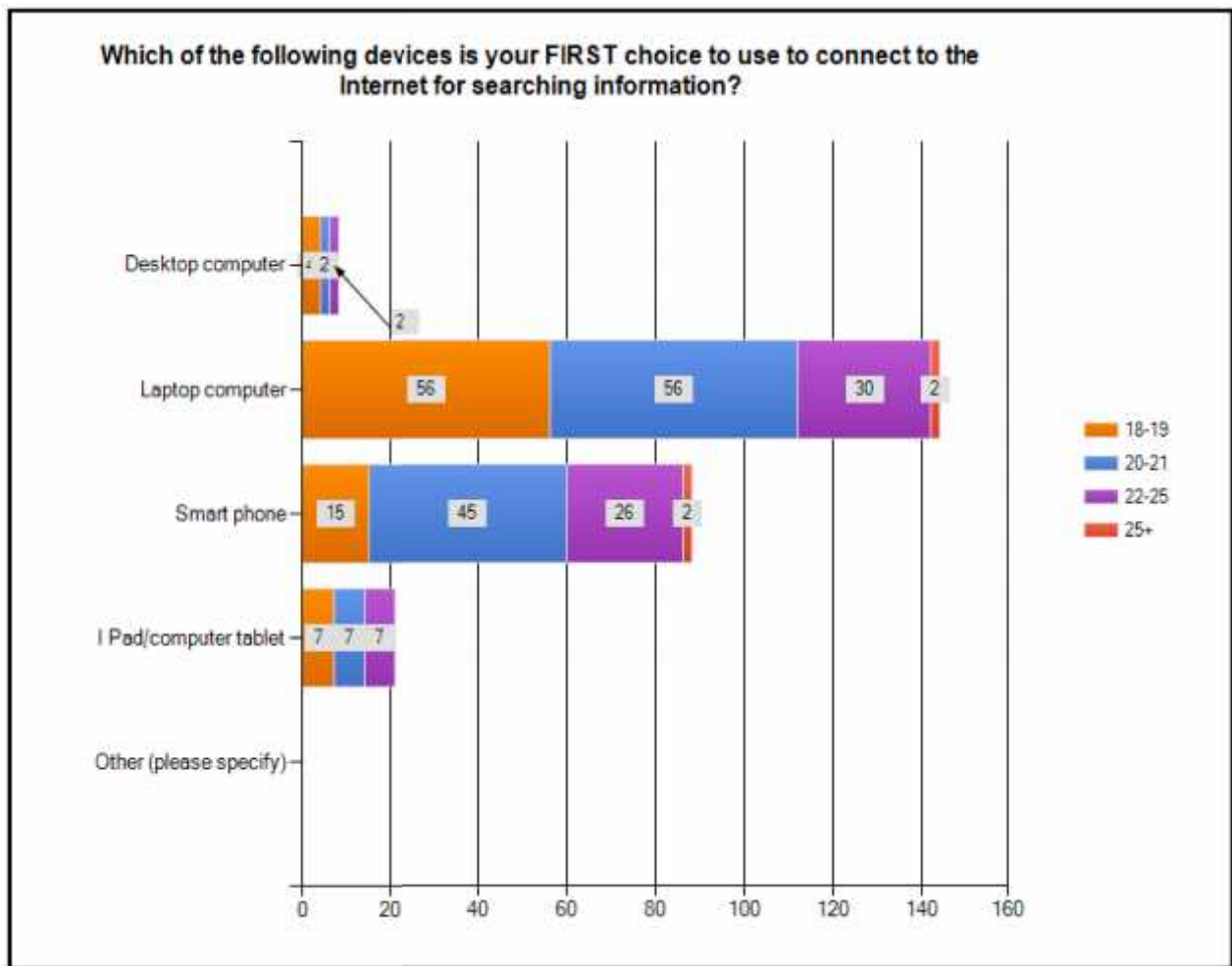


Figure 8 shows that the majority of students chose laptops as their first choice and smartphones as second. Most students between the ages of 18-21 chose laptops as their first choice and the majority of students between the ages of 20-25 chose smartphones as their first choice of device to connect to the internet.

Table 7: first choice of device to connect to the internet according to year of study

	Which year of study are you in?					
Answer Options	1	2	3	4	5	Response Percent
Desktop computer	3	2	1	2	0	3%
Laptop computer	46	48	22	29	0	55%
Smart phone	12	16	33	27	0	34%
I Pad/computer tablet	1	9	3	8	0	8%

Table 7 shows that students from years 1 and 2 of their dental studies chose laptops as their first choice of device and students from the 3rd year chose smartphones. Students from the 4th year chose both laptop computers and smartphones equally.

Q: “Are there any other comments that you would like to make about the use of the *internet* on your device?”

Figure 9: extra comments students made at the end of the questionnaire



Section 2

4.2 Student interview results

4.2.1 Demographic data

Of the sample (n=20) who volunteered to be interviewed, all twenty students had access to the internet. At the start of the interview, students were asked to give more information about their background including year of study, age and if they had access to the internet. This question allowed students to get more comfortable at with the interview process. **Table 8** shows the demographic Data of all the students that were interviewed in order of year. All students were interviewed at the dental school in Birmingham except one student, who was interviewed at the main Campus, University of Birmingham.

Table 8: summary of background of students interviewed.

	Year of Study	Sex	Age
Student 1	BSD 1	Male	18
Student 2	BDS 1	Male	18
Student 3	BDS 1	Female	19
Student 4	BDS 1	Female	18
Student 5	BDS 1	Male	19
Student 6	BDS 1	Male	18
Student 7	BDS 1	Female	18
Student 8	BDS 2	Female	19
Student 9	BDS 2	Male	19
Student 10	BDS 2	Female	20
Student 11	BDS 2	Female	19
Student 12	BDS 3	Male	22
Student 13	BDS 3	Female	20
Student 14	BDS 3	Male	20
Student 15	BDS 3	Female	20
Student 16	BDS 4	Female	21
Student 17	BDS 4	Male	23
Student 18	BDS 5	Male	22
Student 19	BDS 5	Female	23
Student 20	BDS 5	Female	22

4.2.2 Use of internet for personal reasons and Dental Course

The purpose of the question asking students to choose how they use the internet was to find out the different activities they engage in online and how much of their time is spent online for dental studies. Although this question was asked in the questionnaire, students were asked again as it led in to the next few questions. Thirteen out of 20 students used the internet more for personal reasons and 6 students used it equally for both personal and dental. One student used the internet mainly for dental studies. Students were asked about the activities they classed as spending personal time and dental course related time online. All 20 students used social networking sites and emails in their personal time. Some of the reoccurring social networking sites were Twitter, Facebook, Flickr, Instagram. Some of the other reasons for personal use of the internet included Emailing, Shopping, Skype calling and watching catch up TV. One student did not use Social networking sites as she explained: '*Social media can be a distraction from work for me*'. She added that she deactivated her Facebook account to be more focussed on her studies.

For Dental studies, the majority of the students used the internet for the Ecourse and search engines for research. Many students used YouTube for clips on surgeries and treatments such as anaesthetics and techniques. One student commented: '*I take my laptop to lectures and Google anything I'm not sure about*' (ST8). The students explained that they use the internet whilst in lecture for extra guidance.

4.2.3 Factors that may affect use of internet for studies and personal reasons

Students were asked to think of factors that may in the future or have been affecting their use of the internet. Most of the students thought that as work load increases, they will be using internet more for dental course than personal reasons. Some student suggested audio

recording of lectures to be loaded on the Ecourse which would make them use the Ecourse more. Two students suggested an application link for the Ecourse which will help them access it more easily on their phones. One student suggested: *'more interactive software is needed so that we could watch videos, download them and stream them and labels to differentiate between things interactively'* (ST18). Accessibility was again emphasised by another student as she thought that changing her device affected how she used the internet: *'since I've got myself an iPad I feel I use the Ecourse more now as I can pop it in my handbag, its more accessible. Whereas if I did that with my laptop it would be harder as turning it on etc. so it seems more accessible'* (ST20).

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

Once students gave a list of factors that could change the way they use the internet, students were asked to think of reasons or ways that could encourage them to use the internet more for their studies. The majority of students felt that dental course related apps accessible on their smartphones would encourage them to use the internet more for 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:

'I feel like an app for the E-course would be really good because it's easy to access so you can click on the app and lectures will be available obviously I know not everything can be available but maybe an app for each module because everything on one might slow the app down.'

'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 there quickly on my phone I could have listened much better knowing it's all online so no need to copy everything.'

'So we had an assignment for anatomy where we had to draw but everything was on the E-course but I was quite confused and if knew it's not online I could have asked him whilst I was there' (ST11).

Another student felt that an app for communication between students and tutors would benefit her studies: *'So if there was like a nice easy app for like to discuss things with tutors and other students like a slim down version of the web board on E-course and you can choose your speciality and narrow down and ask tutors. So I could get in touch with tutors that use it' (ST17).* Mobile devices were the main devices associated with the use of apps in the future and laptops were not an option: *'if we had a device like a iPad and if they had a good evidence based app like an anatomy app that was good for us and so we don't have to go find it ourselves so we need more guidance' (ST10).*

4.2.5 First and second choice of device used to connect to the internet and search for information

The next section concentrated on finding out which devices were most popular amongst students when using the internet and for what reasons. The purpose of this question was to find out how preferences may have changed from the past and which different factors may have an effect on the way students use technology for studies and personal time. The top two most popular devices amongst students were laptops and Smartphones. Students who chose laptops gave reasons for their choice by comparing their device to desktop computers and smartphones. Twelve out of 20 students chose laptops as their first choice and the majority chose Smartphone as their second. Four students chose smartphones, 3 students used iPad/tablets and 1 student chose desktop computers. The main reasons for using laptops as

first choice when connecting to the internet were bigger screen compared to smartphones, faster use of internet, portable compared to desktop computers and can have many windows open at the same time as one student explained: *'we have physical keyboard so it's easy to search for information and bigger screen and you can have like many windows open and you can't really have that on the Smartphone obviously if you're out and about then Smartphone is portable it's much easier to check information'* (ST9).

Smartphones were the second most popular device because students appreciated that they could use the device anywhere at any time when connected to the internet. Compared to other devices, smartphones were chosen because they are lighter and easier to carry around at all times. Students commented: *'I can use my smartphone instantly like in clinic when I don't understand or hanging around the building waiting to go home I could just check for information obviously when no patients are around'* (ST18). Another comment included: *'Laptop is for long work and sit at home with and Smartphone is out and about/checking things quickly on clinic'* (ST12).

One student explained the advantage of having a Smartphone in the lecture hall: *'used for quick searches especially in lectures, if I don't understand anything, quickly check on internet whilst in lectures'* (ST13).

The three students who chose iPads/ computer tablets as first choice of device commented: *'The iPad at the moment is just convenient and more compatible and no booting time and easy to use basically'. 'I mean its mobile when I'm moving between lectures I can do things like check emails update files on the internet, read stuff off, for a work device its unparalleled I can even read journals off it'* (ST16). Students who chose iPad as their second choice preferred this device over a Smartphone because it has a bigger screen and just as easy to carry around. One student gave in depth advantages of his Nexus seven tablet by explaining

many ways he can use it just like the laptop such as having access to files and downloading the 'Microsoft King' app which allows the user to use the Microsoft features such as Word, Excel and PowerPoint.

4.2.6 Advantages and Disadvantages of the top two used devices

Students were asked to give more in-depth answers when answering the previous question on devices and the answers helped with the formation of **Table 9**. The table gives a list of advantages and disadvantages that all of the students mostly agreed on as they gave the same answers.

Table 9: Advantages and Disadvantages of most popular devices.

	Laptop	Smartphone	iPad/tablet
Advantages	<ul style="list-style-type: none"> • Easy to type. • Can carry around anywhere. • Bigger screen, easier to navigate. • Good for printing documents. • Can open multiple windows. • Best for typing long pieces of documents. 	<ul style="list-style-type: none"> • Can be used instantly. • Can use anywhere as small to fit in pocket. • Best for social networking as instant messaging. • Faster to use internet. • Does not need charger all day. • Best for quick searches. 	<ul style="list-style-type: none"> • Not as quick for typing as a laptop or desktop computer. • iPad is much more lighter than laptop to use anywhere. • Best for E-books and quick searches. • No booting time. • Easy to carry around.
Disadvantages	<ul style="list-style-type: none"> • Too heavy and cannot be carried around. • Not instant. • Cannot be used everywhere. • Needs charger all the time. • Can get too warm to use whilst it's sat on my lap. 	<ul style="list-style-type: none"> • Does not look professional. • Phone can be a distraction away from work. • Harder to navigate. • Cannot print documents. • Cannot open more than one window. 	<ul style="list-style-type: none"> • Cannot print documents. • Cannot use Microsoft word, excel, PowerPoint.

One student commented on her Smartphone and iPad: *'The fact that the phone is always in my pocket and handy and always available so if I want to quickly look at an app I can do so before I talk to my clinician etc. like now on my iPad we have the app of the BNF so it's quite good for that rather than getting a book'* (ST15). Another student explained: *'The iPad at the moment is just convenient and more compatible and no booting time and easy to use basically and the phone it's just convenient and again its jus there and I can connect to Wi-Fi and there is no extra charge- handy small and can take it anywhere'* (ST16).

4.2.7 Changes that could be made to the devices for best use

At the end of the questions on devices, students were asked if they could think of any changes they may make to the way they use their devices to get the best out of them for their dental education. Nine out of twenty students felt they could make changes and the remaining 11 felt they were using their devices to the best that they could for their studies. One student had only recently purchased his first Smartphone and felt that he needs to increase the usage of the Smartphone as he gets used to the device. He felt he might start using it as much as his laptop for research. One student who used the Nexus seven for nearly everything felt he had already tweaked his device considerably to fit his needs which included downloading the Microsoft office app. Another student explained: *'if you can have flash on the iPad that would be useful because a lot of videos and animations are flash but I know you can buy an app where you can use flash in the browser but I haven't done that yet'* (ST16).

The use of more E-books was thought to be a good idea amongst a few students than searching for books in libraries as this may save time. Shortcutting of websites to more user friendly web-links was an improvement one student felt he could make: *'I've shortcutted the websites I use a lot so on my home screen instead of always searching for the E-course and websites I just go on that tab and it comes up straight away but on the laptop you would have to open up explorer and go through all that'* (ST20). With the addition of a keyboard to the iPad, one student felt he may be using it much more: *'I will be replacing laptop with iPad as first choice of device; You can do more and much, lighter to carry around and you can do everything on it and I have bought a keyboard for it now but screens kind of limited though'* (ST14).

Throughout all the interviews, students found dental related apps to be very useful for their studies and would like more apps to be available. One student explained: *'Download more apps related to dental education on both devices. Textbooks are too heavy to carry around so try getting more codes for books and web-links'* (ST4).

4.2.8 Most used internet communication tool

All students chose emails, social networking and instant messaging as their first choices of communication. Eleven students chose emails as their first choice, 6 students chose smartphones as their first choice and three students chose instant messaging. Students were asked to give explanations about their choices. For emails, many students felt that laptops were best for typing long and formal emails and short emails/ quickly checking emails were best done on smartphones and iPads. One student commented *'sometimes you can't be bothered to take out iPad to look at it so I use phone and if I have big files to download I use iPad and for a quick glance it's the phone'* (ST16).

One student felt that the smartphones have helped her reach her emails much quicker than on her laptop, she explained: *'Well I don't carry my laptop around all the time and I feel the email you have to check regularly and I feel before the smartphone I used to miss out on things such as first come first serve and by the time id get home id already missed out and it was too late so I feel the smartphone has definitely helped me'* (ST20). The smartphone seems to be the most popular device when it comes to communication as it is more instant and one student explained: *'With all them it is my phone because like its instant messages and emails its straight through to my phone so I can easily reply etc. even with social networking the apps are there and its always mainly on me'* (ST13).

Mobile devices seem to provide the comfort students feel they need when it comes to social networking and instant messaging as they can hold the device and type the replies instantly with the other hand. All students who mentioned instant messaging referred to the communication app called 'WhatsApp' and some referred to Facebook messaging. Instant messaging was preferred on smartphones by all students and one student explained that he instantly messaged on his computer tablet also. He explained how he managed to message the same way on both smartphone and computer tablet: *'I use the 'tap talk app' I think which is a communication app that lets you sync two devices via Bluetooth so you can essentially type on one and get the other one to send it for you'* (ST6).

One student felt that to give quicker replies and to read messages quickly, the smartphone was best as it was always in the pocket and there was no need to load the laptop and wait for the laptop to turn on. The main social networking apps mentioned by students were Facebook, Twitter, Instagram and Skype, WhatsApp was the most mentioned instant messaging app and some students who use the iPhone used iMessage also. As social networking sites develop easier and user friendly apps, smartphones seem to be the most popular device to use when communicating via social media: *'With emails, social networking and instant messaging it's on my phone because like its instant messages and emails its straight through to my phone so I can easily reply etc. even with social networking the apps are there and its always mainly on me'* (ST15)

4.2.9 Different ways of communicating with different groups of people

The most preferred way to communicate with friends and family was social networking and WhatsApp. With students, some students preferred emails, if they were not too close to them and the rest of the students used instant messaging such as Facebook and WhatsApp. Students

seem to communicate with each other on WhatsApp because they can do group work with each other and share files. One student mentioned: *'Students would be instant messaging and with the ones like I'm doing group with them so we like to do group presentations we can do group work and exchange files through Facebook messaging'* (ST15). Another student again explained how WhatsApp is used for group work: *'We have got in our groups I think 12 no 6 groups per year so there is twelve of us in a group and we have our own WhatsApp group and someone will always reply'* (ST13). Facebook messaging was another popular way to communicate with fellow students for group work. All 20 students communicated with tutors through emailing.

4.2.10 Improvements needed when communicating with tutors

Students were asked to think of ways that may improve the way they communicate with tutors if they thought that improvements were needed. Thirteen out of 20 students felt that they wanted to communicate with tutors through instant messaging if this was possible in the future. The main reason for this was because they felt this would be more instant and sometimes they cannot tell if the tutor has received or read their emails, which is possible via instant messaging such as WhatsApp. Three students felt that emailing was adequate for communicating with tutors and two students felt they needed more face to face meetings. Three students mentioned the E-course as a good way to anonymously communicate with tutors and felt that this was good enough except one student who felt it was slow. One student felt that as he communicated with fellow students through Facebook, maybe tutors could also be contacted, he suggested: *'It sounds bad but if they were on Facebook or a way to communicate with them through Facebook. I think it would be easier because you wouldn't have to search through the university emails or anything and it would be fast and instant and*

can be used on any device. Whereas I cannot send emails on my phone and only receive and WhatsApp would be better than Facebook as it is instant' (ST12).

Instant messaging was mentioned by nearly all of the students at some point and instantly messaging tutors was a very popular idea as students commented: *'if students and tutors were happy WhatsApp would be good so that you know they have received the message'* (ST16). Another student suggested: *'Tutors should get WhatsApp because it's instant. Obviously the tutors might get annoyed but if messages are coming through and you're on the same kind of level it should be ok. Emails are more formal and WhatsApp is more informal that's probably why they don't do that but if you have a question for a tutor instant messaging is the best way'* (ST5).

Although the majority of students suggested instant messaging and Facebook messaging, 3 students felt it may be too personal and thought they may feel uncomfortable. Students explained: *'Emails is a good way for tutors its more official but I wouldn't be texting tutors that would feel weird I mean on our E-course you've got the web boards and discussion boards and I think are really good because its anonymous but id still choose the emails'* (ST17).

Face to face meetings were ways that two students felt could improve the communication they have with tutors at the moment, which was emails. One student suggested that they would benefit from a read receipt when emailing their tutors as she felt that: *'I suppose one thing when your emailing people you can't see when they have read it or not and its difficult when you want to follow up you don't want to pester them so if there was a read receipt so you know they have read it etc. and if not you can follow up. The only way is through having*

numbers but that's not very professional and I don't know if there would be a way of doing that. If they could find a way then it would be good' (ST15).

As students have the E-course to ask anonymous questions, one student suggested that she would like to have small group meeting with tutors to ask questions also: *'actually speaking to them in person more like maybe small group teaching like SGTS in year one and two if you could have them but not with a set agenda so you go and just ask questions so its time you've got with the tutors, sometimes on emails you can't get the point across and get the response you want' (ST8).*

One student felt that the new smartphones and tablets allow him to access emails instantly anyway and explained: *'Text messaging would be good but the idea of having a work phone and personal phone it could be hard work but I've seen people do this. Emails are convenient too especially with the new mobiles they much more instant so the new mobile phone devices seem to deliver email messages more instant and work well' (ST1).*

4.2.11 Different kind of apps used by students (study, personal, communication)

Out of 20 students, 11 students had an iPhone, 2 students had Nokia, 5 students had Samsung and 2 students had Blackberry. Students were asked about the different apps they use on their mobile devices and were given three different categories to help them differentiate. These were study related, communication and personal. The most downloaded apps were communication apps which included WhatsApp, Viber, Tango and Skype. Students referred to personal apps when they mentioned downloading social networking apps and 17 out of 20 students had social networking apps on mobile devices. The rest of the students either had old model phones or their phones were not compatible for downloading apps. Students were asked about any study related apps they may have downloaded in the past. Eight students used

dental anatomy apps, which were downloaded, from app stores on their phones. One study used YouTube for studies as he watched clinical videos on his YouTube app on the Smartphone. Another student explained how he used the app 'iStudy pro': *'the app is called iStudy pro and you can put all your assignments the due dates, it'll tell you when they are due and you can put in your class schedule. I also have my timetable on my phone and the calendar app'* (ST3). One student stressed that the university needs to put together more dental related apps and he used web-links to access information online and added: *'I downloaded many apps that are web-links for online revision materials but university needs to put together a dedicated app for students'* (ST1).

Most students throughout the interview mentioned the importance of the E-course and how they used it for their studies. Nearly all of the students felt that they would benefit from an E-course app which would be compatible on mobile devices. One student expressed: *'the website is absolutely amazing and I can't say anything about it but the app would be nice although the website does work well on many devices too'* (ST1).

Many students used apps to save their work and used them instead of USB sticks. One student explained the benefit of Google Drive: *'Google drive or any other cloud based thing because I lose quite a lot of portable storage devices so cloud has been a great option for me especially with Wi-Fi everywhere and I think a good reader for journal for like an eBook reader or a very good web browser is essential'* (ST1).

4.2.12 What does evidence based apps/information mean?

The purpose of this question was to find out how students trust the apps or web-links they download from app stores. 6 out of 20 students did not know what the term 'evidence based' referred to and 4 students were not sure and guessed. The remaining ten students gave

explanations of what evidence based apps meant to them but 5 students understood the meaning of the term well and explained:

'If the information has been properly found out rather than someone just putting it on the internet' (ST15).

'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).

'When data has been gathered from different sources. I don't really check if I have evidence based information or apps but now I will' (ST18).

'The information they provide you is referenced as to where its comes from and then you can follow that to them and it's from extended knowledge and it's based on work and trials rather than just putting something together' (ST14).

'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).

Once students gave their explanations of what they thought evidence based meant, they were asked to refer back to their study related apps or web-links and if they thought their apps were evidence based. 15 out of 20 students did not know if their apps were evidence based or if the information they were accessing had evidence behind it. Some students gave explanations about how they thought their apps were evidence based:

'Well for certain things you can judge based on like academic things you can see who might have reviewed it who it has been written by. you will know if it's been published like I don't

know by British Medical Journal but if you want to look in general you would have to see who has created it and the process behind that' (ST8).

'I don't know but they do have reviews and they have ratings and people comment on it and there's little intro about it I feel like that if something is evidence based it should say it' (ST11).

Some students felt that they needed guidance from university to understand how to find evidence based apps or web-links.

4.2.13 Mobile computing/communication tools engaged in on Smartphones

The purpose of this question was to find out how students are using new Smartphone tools to communicate or maintain the standards they have always kept to during their studies. The most used computing/communication tools were emails, instant messaging and transferring files and watching videos. Emailing was used to send work to their personal address so that it is a form of back up for any important documents. 'DropBox' is an app that allows users to store files and photos and seems to be a good replacement for the USB sticks. With the use of other software students have found ways to edit files. Some students explained the benefits:

'Transferring files is pretty useful so when we take pictures sometimes on our phones of lecture notes we transfer files on DropBox and we use that its quite good for studying like peer sort of learning' (ST1).

'DropBox for transferring files on all devices easy way to sync work and view on all my devices' (ST3).

‘Through emails, it can be sent to people and with DropBox you have to make a shared folder and DropBox is more of a backup and saved work is on there and I have it on my phone and computer as I can email myself the work again and have it anywhere I like’ (ST2).

‘DropBox for transferring files instead of USB, with the use of iCloud on iPad, work can be edited’ (ST1).

‘ With DropBox you can access it from anywhere and that’s very useful and what happens in our lectures is that one guy records the lectures and he puts it on his DropBox and we share it’ (ST4).

Watching videos for extra help and clinical videos seemed to be a popular choice amongst some students. One student explained that he felt watching videos is the same as sitting in lectures and commented: *‘basically if you sit in the lecture and you watch the lecture you don’t really interact in lectures so it’s the same with the YouTube video that’s the way I learn like I just take notes’ (ST5).*

Sharing work on WhatsApp was again mentioned when asked about communicating/computing activities. One student explained that she benefited from WhatsApp being a free communication app: *‘You can group messages and talk about work and it’s also free to chat and transfer files which is good and show pictures’ (ST10).*

4.2.14 How often the devices are accessed to use the internet

All 20 students accessed the internet frequently during the day and sometimes over ten times. Students felt they were addicted to the internet and with access to the internet on their smartphones, which were in hand all the time, internet use was normal. Students commented:

'I use the internet nearly all the time because I literally have nearly everything on there that's instant and immediate use. I can access online and I've got used to it and it's very convenient' (ST1).

'Every day because I'm an obsessed email checker' (ST4).

One student explained that she does not use the internet as much as others as she felt that she does not feel the need to constantly check her emails and as she did not use social networking sites anymore, this reduced her usage: *'When in university I use the internet on my breaks and when at home for research so three times a day maybe because don't crave technology like others'* (ST8).

4.2.15 The most preferred place when connecting to the internet

Students generally tend to keep laptops and iPad at home and use the Smartphone anywhere at any time. Students felt that the laptop was too heavy and bulky to carry around and the iPad was too expensive to take out for some students. The Smartphone was convenient for them to use outside the home. Some of the reasons that students gave for keeping their laptops and iPad at home were:

'My laptop is used inside room and medical school as it's too heavy. smartphone is used outside anywhere. Would consider using iPad as laptop is too bulky but it's too expensive. If I had an iPad I'd still use smartphone as it's more portable and compared to laptop also as no word available on iPad' (ST2).

'iPad and laptop at home as too heavy and iPad too expensive to take out a lot and smartphone anywhere at any time' (ST3).

'At home with laptop too big to carry to university, worried as too expensive, I could get a smaller one but then I don't see the point as I have my phone. Can be anywhere with phone but phone can be a distraction' (ST11).

One student made use of the smartphone in the lecture hall and explained: *'laptop is in my room, university, and lectures for quick searches on phone as its instant' (ST7).*

Nearly all of the students who had a smartphone used their phone to access the internet anywhere that they could find a connection. The laptop is preferred in a more sit down place and the smartphone is used anywhere *'Laptop is for long work and sit at home with and smartphone is out and about/checking things quickly on clinic.'*

4.2.16 Barriers when connecting to the internet to search for information

Twelve out of 20 students felt that the battery life on their devices and having no network coverage on the Smartphone were the main barriers. Laptops would be difficult to use if there was no or poor Wi-Fi available for students to connect to. Students felt that on their smartphones, having limited screen view was a barrier they faced compared to the big screens on their laptops. One student felt that using a smartphone 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).*

Another student felt uncomfortable bringing her iPad to university or outside the home as it is an expensive device and she felt that keeping it in a locker would be the only way she would consider using it outside the home. This proved to be a barrier for her to using the iPad as much as her Smartphone.

The question aimed to find the most common barriers students had to face when using their devices but one student felt that technology itself might be a barrier to her learning. She felt disadvantaged as she explained that she may be ‘old fashioned’ and not as advanced as 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).

On the other hand, another student felt he could master most problems he would face and he explained ways to overcome most barriers: *‘I’ve played around with particularly with these models and if you play around with it and do some research and time allowing you get used to these things and get confident and the only annoying thing is it doesn’t have 3g only Wi-Fi and the thing you can do you can get a phone and you can do a thing called tether where you get your phone and use the wireless signal and it gets picked up from these things and it gets used like that but you can play around with things and you can get around these problems’*(ST1).

4.2.17 GDC standards and social networking

All 20 students have read or heard of the GDC standards but only half of the students (n=10) read or heard of the standards related to social networking. Out of the ten students, 6 students gave full explanations about the Do’s and Don’ts of social networking as a dental student.

Some students explained:

‘Social networking section, we need to make sure that you’re not really like you have to make everything private anyway but that’s not necessarily enough so you should watch your

content so even your friend and family can report you to the GDC so basically won't say anything online that you won't say to the patient' (ST5).

'Maintaining patient confidentially I think you could use that in a sense like social networking sites you should never put anything to do with work on there and just like your computer device should be locked so not anyone can access it' (ST20).

4.2.18 How students trust information on the internet

Students were asked to explain how they use the internet for information with regards to trusting the information they find and how reliable they think the information is. Four students said that they would only use websites that are 'well known' and 'well respected' and one student commented: *'they are well known websites 'names' I will think I'm ok to use them otherwise I stay away from websites like that unless I'm trying to find out where people are going wrong' (ST18).*

Five students would only use the E-course for information and the recommendations given by the University. Some students felt that they needed more guidance from university so that they could differentiate between reliable and unreliable websites as well as apps. Some students said they would check peer reviews on journals and stick to academic journals.

A student who used the YouTube for information explained how he dealt with finding reliable videos: *'You just look at the views, the likes and the comments, so if a video has 25,000 videos and the like bar is full green then you know it's a reliable source it's not going to have information not correct on it and then you have lecture notes to match the information' (ST5).*

4.2.19 Extra comments

Students were given the opportunity at the end of the interviews to add anything they thought that they had not addressed through the interview or emphasise on anything they had

mentioned during the interview. Figures **10, 11 and 12** highlights some of the comments students left before leaving the interview process. The themes were split in to three categories, which were internet use, improvements needed or suggestions for improvements and communication.

Figure 10: comments regarding internet use

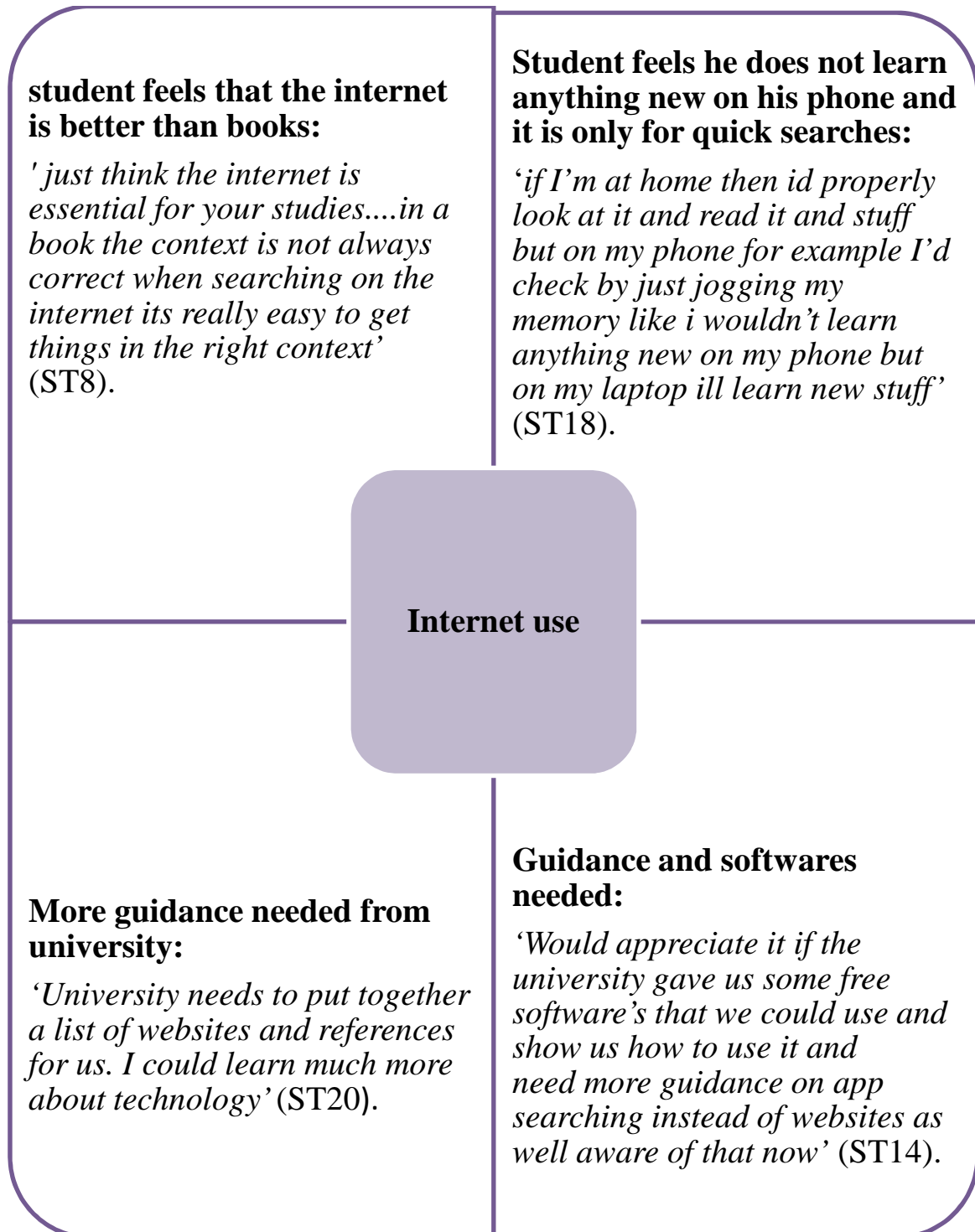


Figure 11: suggestions for further improvement

Student would like timetables on phone:

'Timetable needs to be available on my phone also, updated each week and accessible on mobile devices' (ST16).

Student would like CAFS system on phone:

'They've just bought out CAFS for on clinic so it's basically our scoring system on clinics and you can't get that on your phone at the moment..... Would like to check scores before i get home and not have to load up laptop' (ST12)

Need easier access to publications and training from tutors:

'an easier way to get access to publications on my phonetutors showing us how to get on to publication sites on different devices and train us to how to access information' (ST19).'

Student prefers apps over emails:

'An app for timetables which is regularly updated instead of updates through mails' (ST3).

Student prefers apps on mobile devices over library searches:

'Recommendations for apps would be good.....I'm not too good at like going library and finding a book if I could download it on my iPad id do twice as much' (ST13).

Student would like to record lectures and easier access to material:

'When you log on to a computer you have access to all the academic resources etc but from home and from my phone I don't have that because it must be linked to university somehow. It would be good to be able to record the lecture' (ST17).

Figure 12: Instant messaging; the way forward

Instant messaging over emails ; faster notifications:	<ul style="list-style-type: none">• <i>'I think instant messaging would definitely help ,with emails you don't get notifications straight away but with instant messaging you do and its quicker to send a reply and less formal' (ST2).</i>
Chatrooms and instant messaging are similar:	<ul style="list-style-type: none">• <i>'Chat room for students as well as having one for tutors but that's difficult to moderate too but because we have things like instant messaging like Watsapp its easier for us to sort out ourselves' (ST6).</i>
Need a new paltform:	<ul style="list-style-type: none">• <i>'Need a platform to ask question, so the tutor can log in where they can check the messageswith the Ecourse it's a website so you can't ask instant questions, instant is when you know the person has read the message and they reply to you straight away ' (ST5).</i>
avoiding taking or giving phone numbers:	<ul style="list-style-type: none">• <i>'I think instant messaging works well and it would be good if you could through the internet have emails of students and to use instant messaging too but not have their phone numbers' (ST10).</i>

One student was against the introduction of electronic/mobile learning as a core part of the course or an extra learning tool. She felt that 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 a 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 taking part and doing the interview was so that she could explain how there are students who may be at a disadvantage if technology did become a core part of dental education.

Section 3

4.3 Elite interview results

4.3.1 Demographic data

Of the sample (n=6) that agreed to be interviewed, all six tutors had access to the internet. At the start of the interview, tutors were asked to give more information about their background including age and if they had access to the internet. This question allowed tutors to get more comfortable at with the interview process. **Table 10** shows the demographic data of all the members of staff that were interviewed. All tutors were interviewed at the dental school in Birmingham.

Table 10: summary of background of tutors interviewed.

Respondents	Sex	Age
Tutor 1	Female	60
Tutor 2	Male	34
Tutor 3	Male	51
Tutor 4	Male	31
Tutor 5	Male	35
Tutor 6	Female	30

(T=Tutor)

4.3.2 Do you use the internet more for personal or dental course reasons?

The purpose of this question was to find out the different activities tutors engage in online and how much of their time is spent online related to dentistry. Three out of 6 tutors use the internet equally for both personal and dental related reasons, 2 tutors use the internet much more for their dental teaching and research and 1 tutor's activities online would depend on her location. For personal use, tutors seemed to use the internet for similar activities including social networking, catching up on news, shopping, emailing family and friends. For dentistry

related teaching activities and research, tutors would research for articles, communicate with other staff members, network nationally and internationally, look for teaching materials, literature reviewing, E-course, dental news and supporting students online. One tutor mentioned using different platforms, which have only recently been introduced or are piloted to enhance her teaching and student learning. She described the CAFS platform; which is presented to 3rd year students at the dental school with an iPad and the use of PEARL: *'I use CAFS which is internet based to grade students and I use PEARL which is a pilot thing we have set up looking at students uploading photographs of work they do on phantom heads and then they reflect on that'*. (T6)

4.3.3 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?

Once tutors identified their use of the internet and the purpose of each activity, tutors were asked to think about ways that may encourage them to use the internet more for personal or more for dental related reasons. The purpose of this question was to understand what influences tutors or motivates them to make changes to their use of the internet for different activities.

4.3.4 Using the internet more for dentistry

The use of apps was mentioned by one tutor and she explained that she was only just starting to get used to using apps on her new iPhone and had many personal related apps such as communication apps. She did not look for dental related apps as she prefers the desktop and laptop screens to her small iPhone screen when looking for information and further added:

'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)

4.3.5 Students should use their own devices

One tutor mentioned that it would encourage him to use his devices more for dental course if students are encouraged to use their devices also: *'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)

4.3.6 Use of iPads encourages tutor to use internet for dentistry

The use of iPads by 3rd and 4th year students seems to encourage one tutor to use the internet a lot more for dental course now and in the future. She likes the idea of keeping electronic records which are easier to keep hold of. She further explained the use of CAFS: *'Now that all the students have been given iPads I use CAFS when on clinic to grade the students through my iPad leave comments through their electronic note system on that'*. (T6)

4.3.7 Encouraging other staff members to use Social media

One tutor mentioned the use of social media and that he was encouraged to use it by fellow staff and friends in the same field. He explained that if he did start to use Social Networking Sites (SNS) for dentistry it would only be for referring, sharing articles and discussing articles. He noticed that on SNS some professionals are part of forums and group to exchange ideas and share the published results of their research. He commented: *'I have a close friend of mine, she's quite obsessed with Social media for her research and I often see that she refers to twitter, posts and Facebook posts from other scholars, scientists in the field. So I might be tempted to use it in the future'*. (T5)

4.3.8 Which device is your first and second choice to use when connecting to the internet and searching for information?

The next section concentrated on finding out which devices were most popular amongst students when using the internet and for what reasons. The purpose of this question was to find out how preferences may have changed from the past and which different factors may have an effect on the way tutors use technology for studies and personal time. For the majority of the tutors, the desktop and laptop were the first choices of devices for dental related research and work. Smartphones and iPads are used for more on the go information and quick searches rather than long research. The reason why desktop computers are the first choice is because tutors like the screen visibility, better internet connection and ideal as it is sat on their desks at all times at the dental school. Some tutors mentioned that the smartphone and iPad are associated with personal activities and desktop and laptop for dental work. Some of the explanations regarding the use of desktops as first choices and other devices were as follows:

4.3.9 iPad and desktop computer

‘The desktop is first choice as quite a lot of my pages work better on my desktop than the iPad and the iPad is preferred over the phone as the phone is a bit small and the screen is limited’.

(T6)

4.3.10 Smartphone and iPad

'I don't think you can actually do work on smartphones as you need the versatility of having a keyboard a screen etc.' (T4)

'I don't use an iPad I'm not in to interactive stuff at all so it's all really Microsoft based and windows based I use the laptop to deliver lectures. For searching the internet also I use tablet laptop and smartphone.' (T3)

'Smartphone is my first choice when on the move and I am getting comfy with the iPhone working on a little screen... apps help as more you start to use it the more you get used to it and use the device more'. (T1)

4.3.11 Advantages and disadvantages of devices

The Tutors had different opinions about the technology devices that they use but all agree that smartphones have everything to offer but the screen size is a problem. Similarly laptops seem to offer tutors the mobility but are too heavy to carry around. The iPad could be a solution for both these problems, with a bigger screen and being lighter to carry around but tutors seem to miss having a keyboard on a desk, when using the iPad. Laptop and desktop computers seem to be the first choice for tutors to do their work and heavy research but iPad and smartphones are the first choice for on the go information and quick internet searches. The use of apps on these devices seems to be helping tutors also, saving them time searching for information. The iPad is used to find the information and then this is emailed back to themselves for later access and in depth use on desktop computers and laptops. One tutor commented on the use of different devices and the advantages and disadvantages: *'So the laptop is like my desktop I have all my stats packages, all my files and everything on here.... my smartphone is with me*

all the time to bounce emails and messages and my tablet is to carry around when I'm away on conferences to access files.' (T2)

Other tutors commented: *'I'm not very comfortable with the iPad to do any work because typing is not easy on it I prefer to use the laptop or desktop because its more convenient when you want to write a report'.*

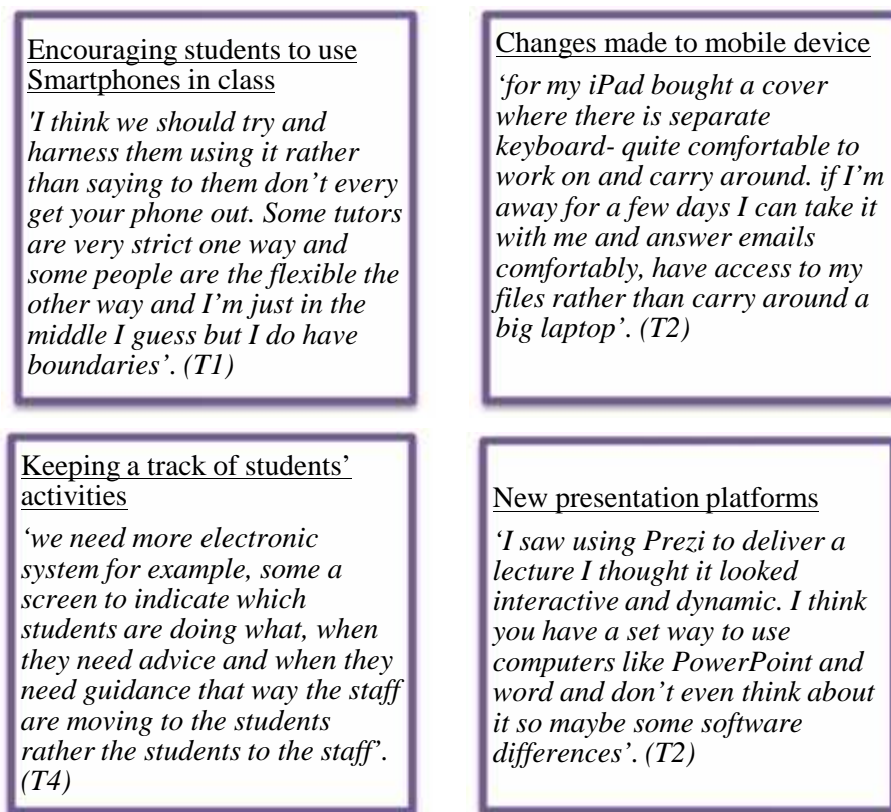
'The iPad is more for personal reasons really, I usually transfer papers etc to the laptop or desktop by saving it to my email and go through it using my desktop or laptop later'. (T2)

One tutor explained why devices do not work very well for teaching and learning: *'The real issue with the smartphone is the limitation of screen size and the problem with the limitation is that as soon as you have the screen size issue students can become disinterested'.* (T4)

4.3.12 Is there anything you would change or have changed about the way you currently use your devices to get the best out of them for your teaching/research?

After tutors identified their top devices, they were asked to think of any changes they may make, or have made to the way they use their devices to get the best out of them for their dental education. Two out of 6 tutors thought that nothing needed changing and 4 tutors discussed further. **Figure 13** shows some of the changes tutors would make or have made.

Figure 13: The changes that tutors have made to their devices to benefit their teaching/research



4.3.13 Which internet communication tools do you use most often on your devices?

One tutor used all communication tools including blogs, emails, instant messaging, chat-rooms, web-boards, Social networking sites and newsgroups. The tutor explained the use of all of these tools further: *'It's a way of gaining information as far as I'm concerned so I use them. So as long as it's helping with the work or whatever it's great'. (T4)*

For the rest of the tutors, emails and instant messaging was the top communication tools.

Long and detailed emails seem to be sent and read on laptop and desktop computers and short quick messages are read and sent on smartphones. Tutors further explained their use of instant messaging and emails in detail: *'I use the emails to email students and everyone at work and*

sendingwith instant messaging it's with other PhD students in the lab we have a WhatsApp group'. (T6)

4.3.14 Do you use different devices and different tools for staying in touch with different groups of people?

All tutors use emails or office telephones to communicate with other staff members and only emails with students. Instant messaging and SNS were the most popular communication tools for contacting friends and family.

4.3.15 What do you think can improve your communication with your students other than the email?

Tutors were asked to think of ways that could improve communication with students once they had all chose emails as the main way to communicate with students. All tutors explained that the problem with emailing students is that they are very slow in reading and responding to the emails. Two tutors felt that more face to face meetings would help them communicate with students better over electronic tools. Although one tutor felt that emails are slow, he did not like the idea of text messaging or using the smartphone to message students as this was his private phone and he did not feel comfortable. Similarly another tutor felt that there is no need for change and that emails are a good boundary between tutors and students: *'I would be happy for some members of staff to be contacting them on things like instant messaging or text messaging however I think the students feel that you know that teaching and work is separate and email kind of pauses that category'. (T4)*

There were a few different suggestions made by tutors regarding the improvement in communication with students. **Table 11** shows some of the suggestions made by tutors.

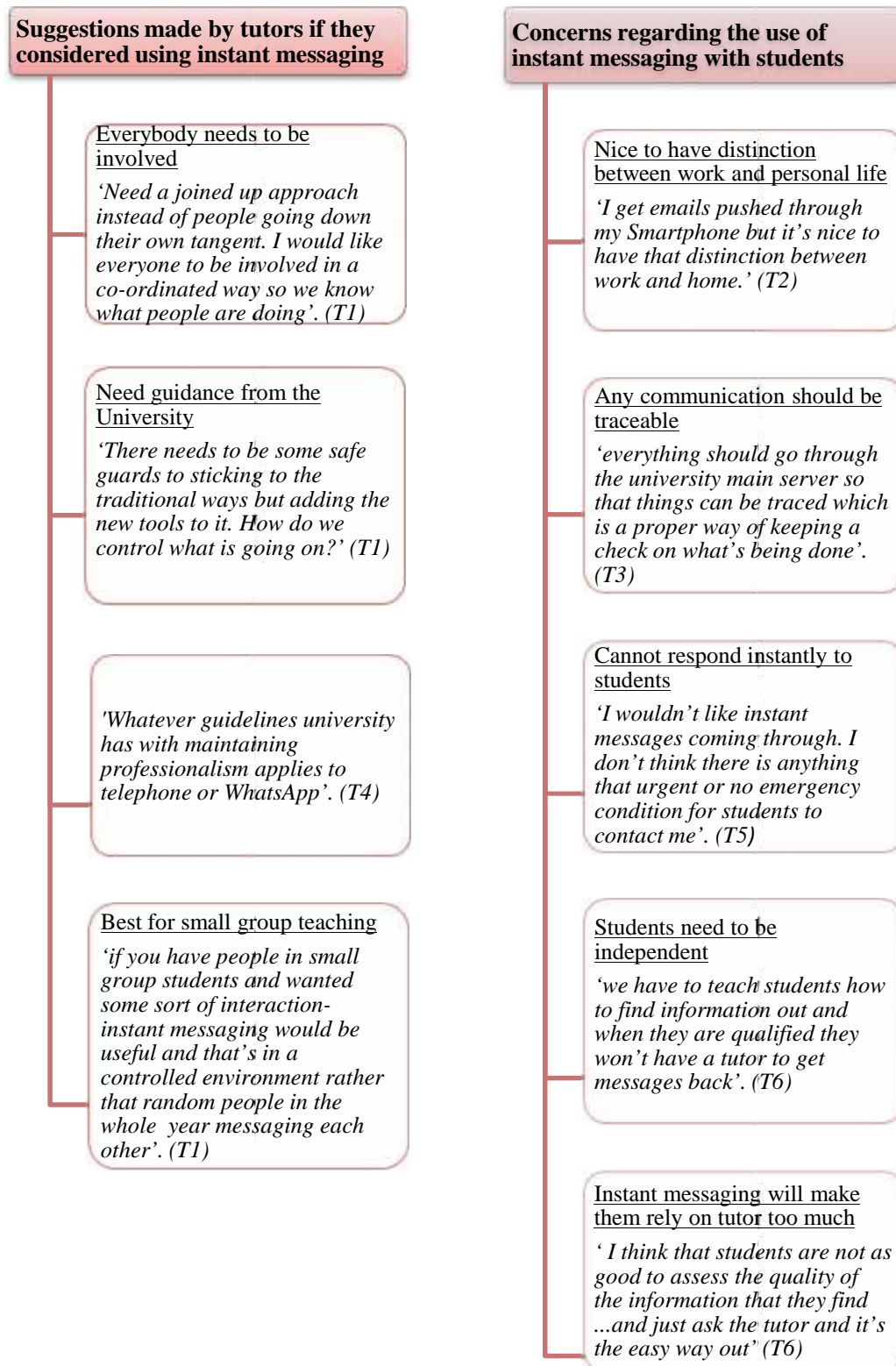
Table 11: Tutor suggestions regarding communication with students

Discussion forums	Social networking sites	Calls and text messages
<i>'it's very rare when you have to contact an individual student its usually the whole year like if a lectures been cancelled or some new information about a lecture and you tend to want to get in touch with a group of students so like E-course sort of forum might work quite well'. (T2)</i>	<i>'I'm not engaged with the students that much. People stop sending emails now and send instant messages /SNS. I am kind of reluctant and have my own concerns in regards to contacting students on SNS as I have my personal photos and students may not want to be seen the way they look outside of the dental school'. (T5)</i>	<i>'I wouldn't personally mind that if students were on my contact list and I wouldn't say no my students shouldn't know my telephone number. I wouldn't want to impose myself and put them in a situation where they wouldn't feel comfortable'. (T4)</i>

4.3.16 Would you consider using instant messaging to communicate with students?

Three tutors were happy to use instant messaging services to stay in touch with students but 3 tutors were not keen on this idea. Tutors who thought it would be a good idea and were keen on using instant messaging. However tutors had concerns and suggested ways that they would consider instant messaging, once these systems were in place (**Figure 14**).

Figure 14: Further suggestions and concerns regarding instant messaging



4.3.17 Do you have any comments regarding the use of Social networking sites by students and tutors?

Tutors were asked to give their opinion and comment on anything related to the use of SNS as dentists/tutors and the use by students. Tutors were generally not too keen on using SNS for dental education or communication with students and those that were, showed concerns about e-professionalism, professional and personal boundaries, bad examples already present. The following areas of concern and comments were discussed, illustrated in **figure 15**.

Figure 15: The use of Social networking sites by dental tutor

Communication with students	Unprofessional behaviour	Tutors use
<p><i>'Students could ask for me in perio if they posted a question on Facebook account and asked me a question then it could help but the other side of the coin is that I could give a quick incorrect answer. However, as it's out of the remit of the university where does the responsibility lie? So I do have my concerns'. (T2)</i></p>	<p><i>'We could have student or staff posting something on SNS which may be detrimental to their professional life'. (T2)</i></p>	<p><i>'I think I always think twice about what I put on and post and who might be able to see it and I very rarely refer to work on Facebook'. (T1)</i></p>
<p><i>'Whatever happens with using SNS it's got to be optional and if you're asking students to do something which they may not want to do, are turning something fun for them in to something that's not'. (T4)</i></p>	<p><i>'One students' posting about a patient was taken to the other site and the BDA picked it up. Ex students posting things about their days work and not named patients but say things like I've had a dreadful day but well actually if someone got hold of that you can be offended'. (T1)</i></p>	<p><i>'I don't have SNS account but it's important to think about it so if a student tries to contact me or befriend me, how do you deal with that'. (T2)</i></p>
<p><i>'Some students don't want to mix Whatsapp and email and may not want to add their tutors to Facebook because they may not want the tutors to see what they are getting up to. However if social networking sites can be utilised for educational tool that would be great'. (T3)</i></p>	<p><i>'I know students have posted things not appropriate either related to patients or staff and I think it's quite a dangerous thing'. (T3)</i></p>	<p><i>'I have seen my colleagues from around the world who on Facebook have pictures of strange root canal treatments or dental treatments and you know something like that which isn't exactly following a curriculum of learning but is of interest'. (T4)</i></p>
	<p><i>'I think students are naive with what they put on there. There is a blurred line because quite a lot of the staff is friends with some nurses who are friends with the students. Therefore I don't tend to put anything on SNS that I wouldn't mind everybody in the world knowing'. (T6)</i></p>	<p><i>'Personally I have zero concerns regarding it reasons being that SNS are something that some students engage but not all of them do'. (T4)</i></p>
	<p><i>'I advised students not to share any personal stories of patients online because I have had a very bad experience. I had a couple of heated debated with my dentist friends as they share stories and make crude comments about the patients'. (T5)</i></p>	<p><i>'I am quite careful with what I put on SNS and never put on anything regardless unless I don't mind it being broadcasted'. (T6)</i></p>
		<p><i>'I think only younger tutors use them and are more open with what they put on so they put more detail more about their lives than I would but I think it's how comfortable they are with it'. (T6)</i></p>

4.3.18 Why do students make these mistakes on Social Networking Sites?

Tutors who mentioned unprofessional behaviour demonstrated on SNS, were then asked why they think students may be making these mistakes. Some of the comments were: *'I think they do this all the time and even though they get told about confidentiality, they just don't see it. The boundary is blurred for them but for us tutors, as it's new, I feel we can see the boundary more'.* (T1)

'I think students need to be aware that your patients can see it so even something like I had a difficult day so if a patients you have seen that day is a friend of a friend and they see that they might not think its professional'. (T6)

'Students are so used to doing things on phone and SNS it's almost come as a second nature and just not in a habit of filtering things'. (T6)

4.3.19 GDC guidelines

Although the GDC guidelines have specific standards regarding the use of SNS by dentists and students, some tutors feel that it is still not well understood: *'I imagine or I don't know whether the university has issued guidance on this or best practice but there is not much on the relationship between tutors and students etc.'* (T2)

'If you ask them straight up about GDC standards, I think they just forget and get caught up. When they are on Facebook, they don't think about the standards and it's the same with confidentiality they are told specifically and obviously not to discuss anything about the patient'. (T6)

4.3.20 Professionalism on SNS

One tutor explained that his biggest concern is the distinction between professional and personal life. On SNS people put personal photos and personal comments and students could potentially know aspects of their tutors' life that they may not want share e.g. family pictures. The tutor further explained: *'Staff has potentially the ability to look at students' activities outside of work and photos. It just worries me about the appropriateness of that so examples would be like things students having things up like having a heavy night'*. (T2)

4.3.21 Use of SNS should be optional

'You have students who don't want to use SNS and don't have these accounts purely because they want everything out there So there's not a consensus, I mean if there was and everybody wanted to do it its great but whatever teaching happens has to be voluntary'. (T4)

4.3.22 What phone do you own?

The majority of students (n=4) own an iPhone which they use to do all smartphone related activities mentioned in the interview. One tutor mentioned that she would use the iPhone for work related things and her Nokia phone for personal i.e. home. This was mostly making phones calls as she felt that personal calls should be made on personal phones. Another tutor has a Nokia windows phone, which could be used as a smartphone. One tutor explained how he was against the use of smartphones and felt that the constant interruption through messages and pointless conversations, on instant messaging platforms was the reason he chose not to purchase a smartphone. He was strongly against the use of SNS on smartphones and explained how he resisted buying a smartphone: *'We are not as productive as we could be because of the impact of social media so I look at the negative side of SNS and have been*

resisting any smartphone so far. I was tempted last week to buying because of the peer pressure but I finally managed to stick to my ground.'

4.3.23 What kind of different apps do you use on your phone?

None of the tutors interviewed had access to dental related apps on their mobile devices. All tutors explained that they have personal related apps and mostly communication apps such as WhatsApp. One tutor explained that he did not feel that there would be any dental related apps specifically for his specialised area and explained: *'My assumption is that when you are working in a specialist area or working in secondary care or for your research there won't be one specific enough for me to use'.* (T2)

The tutor further added that he did not use the smartphone for *'heavy thought work'* and would only use the laptop which does not support apps. Other tutors felt that they did not really need apps as either they did not use smartphones for dental teaching and research, or they just preferred the conventional way of researching for information: *'The reason I don't have any dental related apps is because I know the resources and know where to find the information I am looking for in old fashion conventional way and I'm already overloaded to be honest with lots of resource'.* (T5)

The use of apps was linked to students and one tutor explained that she did not use apps as much as students and explained this due to the age gap: *'I think students will have apps I'm probably just a bit old and maybe they need it more and if I was a student now I would look for apps'.* (T6)

Only one tutor had access to a few dental related apps and these were 'C and N dental', which is an app looking at dental products and putting things together and the 'Dentist app', which is more of a dental dictionary. The tutor also had downloaded apps to help him with his teaching

like the 'Presenter' and 'Response' apps which he used as a respond system on his mobile devices. Although he had more access to dental apps compared to the other tutors interviewed, he felt that apps were not the way forward in dentistry and he preferred information to be more current and relevant. He further commented: *'The difficulty with having apps is that once it's created you have to start disseminating it. Web pages can be accessed from any device and technology.....As far as I'm concerned apps aren't the way forward. I prefer getting the information current as possible whereas on apps it's not the case'. (T4)*

4.3.24 Which mobile computing/communication activities do you engage in on your smartphone?

The majority of tutors chose E-books, videos, transferring files through DropBox and instant messaging as the most used computing/communication activities. E-books were popular for reading books whilst travelling on mobile devices and one tutor had downloaded audible versions also. Tutors download and watch dental related videos. When asked about sharing these videos with students, some tutors had concerns, as they did not trust the reliability of videos found online. Some of the comments were: *'It is concerning that students could be accessing information through videos that is not evidence based and I know myself if someone asks me something I just Google it first of all or even look at YouTube myself and I assume students will be the same'. (T2)*

'I do recommend some videos on the internet that are quite useful that I would recommend to students. The big problem with that is that students going away and looking for stuff themselves and there is a load of rubbish out there'. (T5)

One tutor was not worried about the reliability of videos on the internet and YouTube and explained that he did show videos to students. He did not show videos on smartphones as the screen was too small but did use iPad, desktop computer and his laptop for a better screen view. Similarly another tutor explained that she would find useful dental related videos and liked directing students to show them something being demonstrated through the videos on YouTube.

Transferring files through DropBox was a popular activity amongst tutors. Although most tutors have replaced emailing documents and using USB sticks with DropBox, one tutor explained that she would still use her USB and email files to herself.

4.3.25 Anything that helps you with teaching/research through these activities?

Tutors were asked to think further about these computing/communication activities and explained how some of these activities helped them for their teaching and research. Four out of 6 tutors explained how Cloud based platforms such as DropBox and iCloud were really useful to their teaching and research. Tutors explained how these platforms benefit them: *'I love it for sharing information to colleagues all over the world. I've actually encouraged people I understand that there are some privacy concerns around Dropbox but the information I share is not confidential'. (T5)*

The majority of tutors mentioned cloud based platforms which are well known and they used similar platforms. However one tutor explained how he used 'MyCloud' which is a cloud based platform but is different from Dropbox. My cloud is different from Dropbox as it is a western digital hard drive which connects to a wireless network. The tutor explained that once he connects this drive to his home network, it would essentially become a storage solution for all his devices. He further explained: *'We store everything at home on this network drive and*

its password protected. If I'm at work and I have something on my store hard drive I can get access to it and get what I need to'. (T4)

Although the majority of tutors explained how useful cloud computing apps, more specifically DropBox were to their teaching and research, they had some concerns regarding privacy. Tutors explained that the University may not like the use of DropBox as a storage device and one tutor explained that she would only use Dropbox for urgent things because she felt that the university was not '*keen*' on its use for teaching and research. The tutor felt that the reason why the university had implemented strict IT regulations, was due to reservations regarding the use of cloud based platforms and security/privacy. Even though the majority of tutors explained their concerns regarding the use of DropBox, one tutor stressed that people who choose to use such platforms should be prepared to have their files shared everywhere. The tutor explained: '*It is important to remember that whatever you put connected to the internet is going to be prone to hacking. I'm beginning to hate USB sticks as it is an extra hassle to take care of it*'. (T4)

4.3.26 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?

Tutors were asked to think of anything that they might want to use in the future to further enhance their teaching and research. The purpose of this question was to find out tutors knowledge of and attitude towards new or different ways of teaching students and research in dentistry. It was also proposed to find out how tutors are picking up on new or different tools and techniques. One tutor explained that she would only use something different if it added to her teaching and research and would not use a tool or device, only because other members of the staff are using it. She felt that by using the basics such as email, word and excel, she had

everything she needed and further added 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 as she explained that she was always the last one to know about new technology and tools such as WhatsApp which she only recently started to use. She did not feel that she needed anything extra and could do everything she wanted with the tools she has access to now. However, one tool that she planned to look in to is 'Nearpod'. Nearpod was highly recommended to her by a fellow member of staff and she explained: *'I can see it work in a small group situation where you don't have video facilities. The students get the link on their iPad and I think it has to be like an approximately thing and you have to invite a group of users to tutorials and its live and they see what you see same thing on there.'* (T6)

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

Tutors were asked to think about any barriers that may prevent them from using their devices. The majority of tutors complained about internet connection as a barrier in the dental school. Tutors had specific concerns and comments regarding barriers. One tutor explained that technology and tools should only be used if it helps students with their learning and tutors with their teaching research. She described this as a potential barrier to teaching and learning and stressed that devices and tools should only be used if they added something new. She further explained: *'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)

4.3.28 Teacher training

One tutor stressed the need for training to 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 PCAP but they didn't include details of different software's like Prezi'*. (T2)

4.3.29 Learn from fellow staff members

However, although one tutor felt training was needed, another tutor explained that 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)

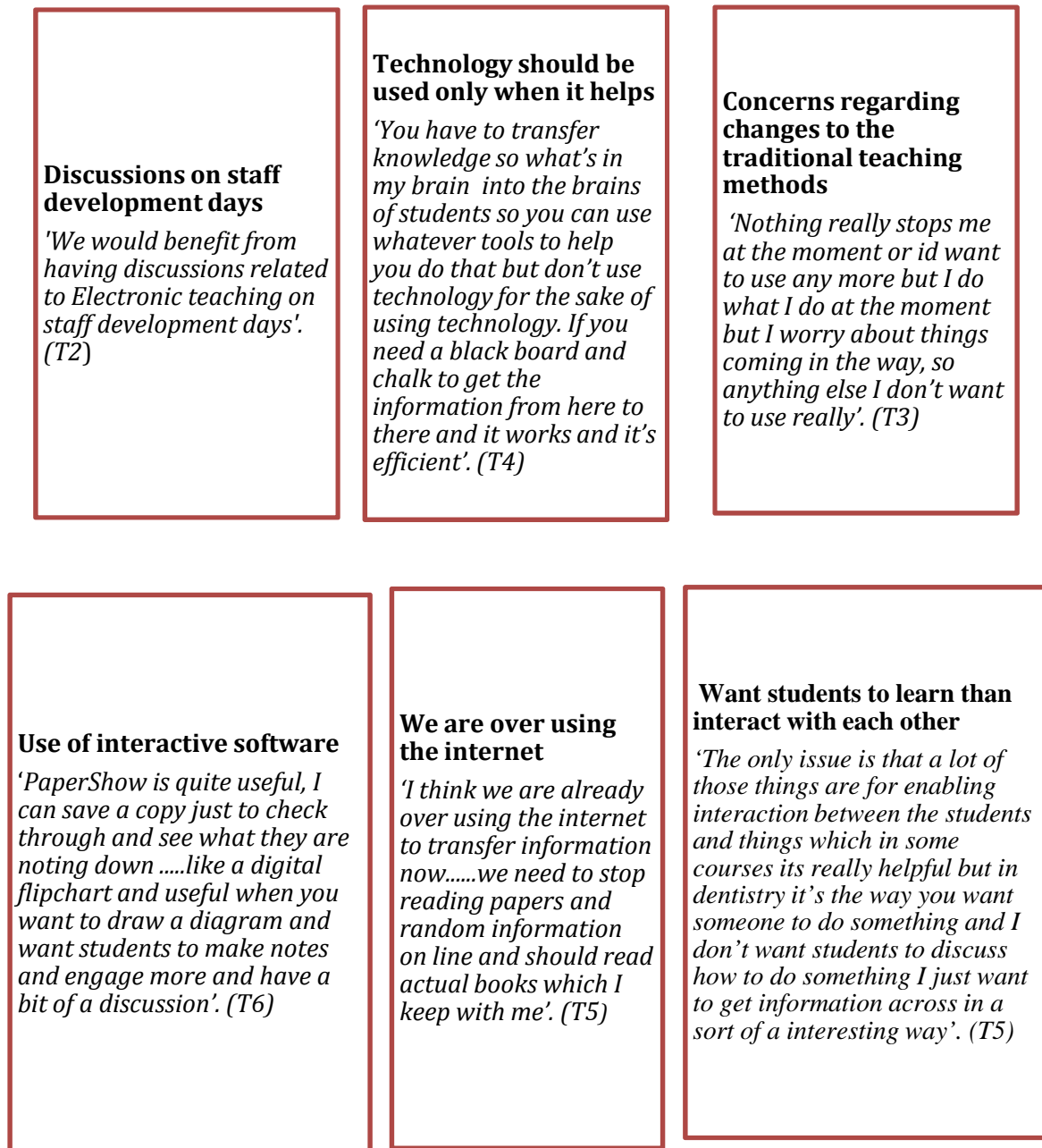
4.3.30 Electronic software's become barriers

The fast prevalence of electronic devices and tools was a barrier to one tutor, as he explained that such advances come in the way of his traditional way of doing things. For example, the university is thinking of implementing an encryption called 'GOOD' which is a package to encrypt phones to help prevent data loss. The tutor had concerns regarding this package and explained: *'I'm a bit concerned about the potential about some of these encryption things like GOOD which just goes on to email and I believe university is going to use it.....anything that puts a barrier to that is a problem and would stop my productivity and get in the way of my routine'*. (T3)

4.3.31 What would encourage you to use your device more often for teaching dental course and research?

Tutors were given the opportunity to explain how changes or new interventions may help them with their teaching and research in relation to electronic/mobile learning. **Figure 3** demonstrates suggestions that were made by tutors when addressing future changes or thoughts on current teaching methods.

Figure 16: Tutors views and comments regarding technology in dentistry



4.3.32 Do you know about any extra activities students are engaged in part of your class or outside your classroom for learning?

All of the tutors (n=6), when describing extra activities, explained that smartphones were used by students in the classroom. Although tutors had different attitudes and understanding, they all seemed to have noticed the increased use of mobile devices in the class.

4.3.33 Encouraging the use of smartphones in the class

One tutor explained that she would ask students to get their smartphones out and look up information as she assumed that they would get their smartphones out at some point anyway. The tutor further commented: *‘ If you go in to a meeting with staff and they will be on there iPhone messaging and then the same staff may be saying to the students you shouldn’t be using it in a lecture.....So staff members are behaving in ways that students shouldn’t be but it’s all a muddled picture really’. (T1)*

‘Once I had students discussing something in my lecture and I said asked, what are you actually talking about? They were actually having some good conversations about the lecture’. (T1)

4.3.34 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. However, he had 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 teachers, we need to be more aware of this’. (T3)*

4.3.35 Group work on WhatsApp via smartphones

Two tutors commented on the use of WhatsApp for group discussions and group work between students. The tutor praised the ability to send messages instantly with the advances of quick learning and knowledge boost. The tutor further explained the use of WhatsApp amongst his students: *‘With WhatsApp if one person has learnt something they can explain it to the other by WhatsApp so sometimes when a teacher explains something to a student’s no matter how hard they try it won’t go in but if a student’s explains to another student it clicks and it provides another learning portal’*. (T4)

Another tutor commented on the use of WhatsApp amongst her students: *‘A while ago, I became aware that students were using things like WhatsApp and have little groups and remind each other of lectures or one will take a photo of some notes or something and send it round to everybody’*. (T5)

4.3.36 Updates on lecture cancellations through WhatsApp

WhatsApp was used by one tutor, to update students about lecture cancellations, check when students will be in class and create groups and subgroups involving the whole year group: *‘So let’s say a lecture is cancelled everyone will know about it through a message so dissemination of that is like wild fire. If I’m in a group of students, I’d ask whose missing and if someone’s is I’d just ask a student to just text them..... As long as it is for learning and not distracting others’*. (T4)

4.3.37 Mobile devices; a distraction in my classroom

Although the majority of teachers approved the use of smartphones in the class, one tutor stressed that he had a problem with 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)

4.3.38 Do you have any comments regarding the use of DropBox/recording and loading on DropBox by students?

The majority of tutors had concerns regarding students recording their lectures and posting them on cloud based platform like DropBox. One tutor explained that she would use Dropbox for anything herself but would always be cautious because the University are apprehensive about the use of cloud based platforms for storage. The tutor stressed that as a university, there were great concerns regarding this further explained: *'The danger is that students could be using Dropbox and storing it on their phone and its breaching in a number of ways, it's the blurring of boundaries. So it still applies to the new tools and devices when they are taught about being professional and it should still be the same rules'.* (T1) The tutor commented further that tutors need to be more careful and sensitive regarding the use of new tools and not make students feel that they are totally against it. Just because tutors may not be using these tools, does not mean that students should also restrain from using them.

4.3.39 Outdated information

One tutor stressed that he would be concerned if students were posting his lecture recording on DropBox and commented: *'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)

4.3.40 Students with learning difficulties recording lectures

Most of the tutors who commented on the posting of recorded lectures on DropBox, all understood that some students have good reason to record. This was regarding students who may have learning difficulties and had permission to record. One tutor was not sure about the policy regarding the recording of lectures and explained: *'Officially the policy is the students are not allowed to record lectures even if they ask permission of the member of staff. The policy is this again I'm not hundred percent sure and you will need to look in to'.* (T4)

Another tutor who mentioned the recording of lectures by students with learning difficulties, explained that she was still not comfortable with this and discussed: *'I have had students with dyslexia who have asked me but I do have mixed feelings about that. I always say don't share it unless I can go through it first as you don't necessarily know what you say all the time and you want to make sure that you have the right information out there.'* (T6)

4.3.41 Do not say anything that you do not want to share with everyone

One tutor stressed that tutors should be alert and aware that students could be recording the lecture with or without their knowledge. Tutors should be conscious that anything that they are going to say in a public forum is not private and not something that they can 'hide'. The

tutor discussed that it is critical that staff members do know say something which '*they are afraid will come back and bite them*' and further added: '*Whatever you have said in a lecture you should stand by it so say the truth etc*'. (T4)

4.3.42 Concerns regarding security and privacy

Tutors had shown concern regarding the use of DropBox and security/privacy of files and data. One tutor explained that if students record lectures and posted them on DropBox; it may be the tutor who is blamed for the breach of policy and not the tutor, for allowing the student to record.

4.3.33 Extra comments overall

Figures 17, 18 and 19 show any extra comments made after the interviews ended and are split in to three categories: staff involvement, overall concerns and communication.

Figure 17: Tutors comments regarding staff involvement

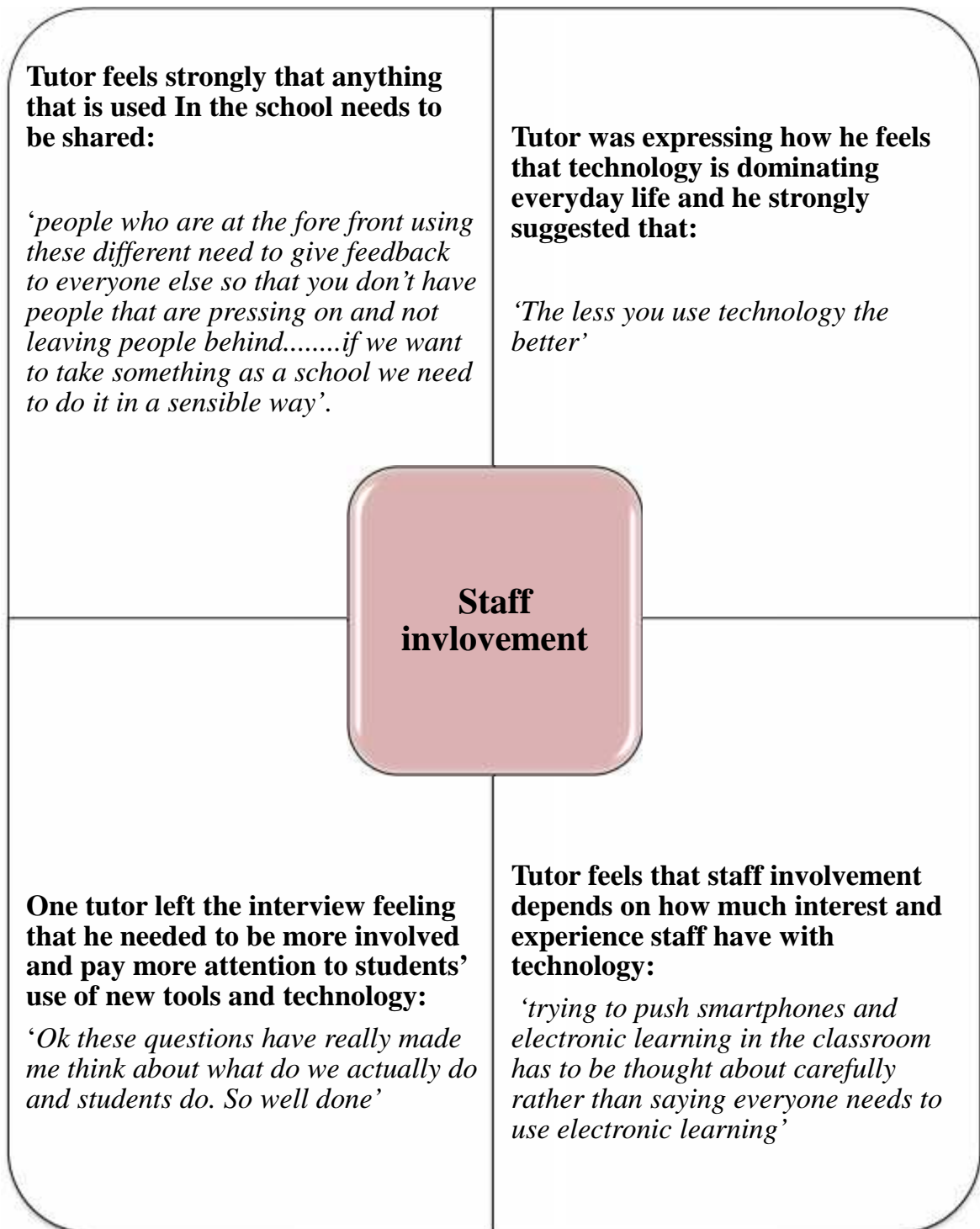


Figure 18: Tutors concerns overall

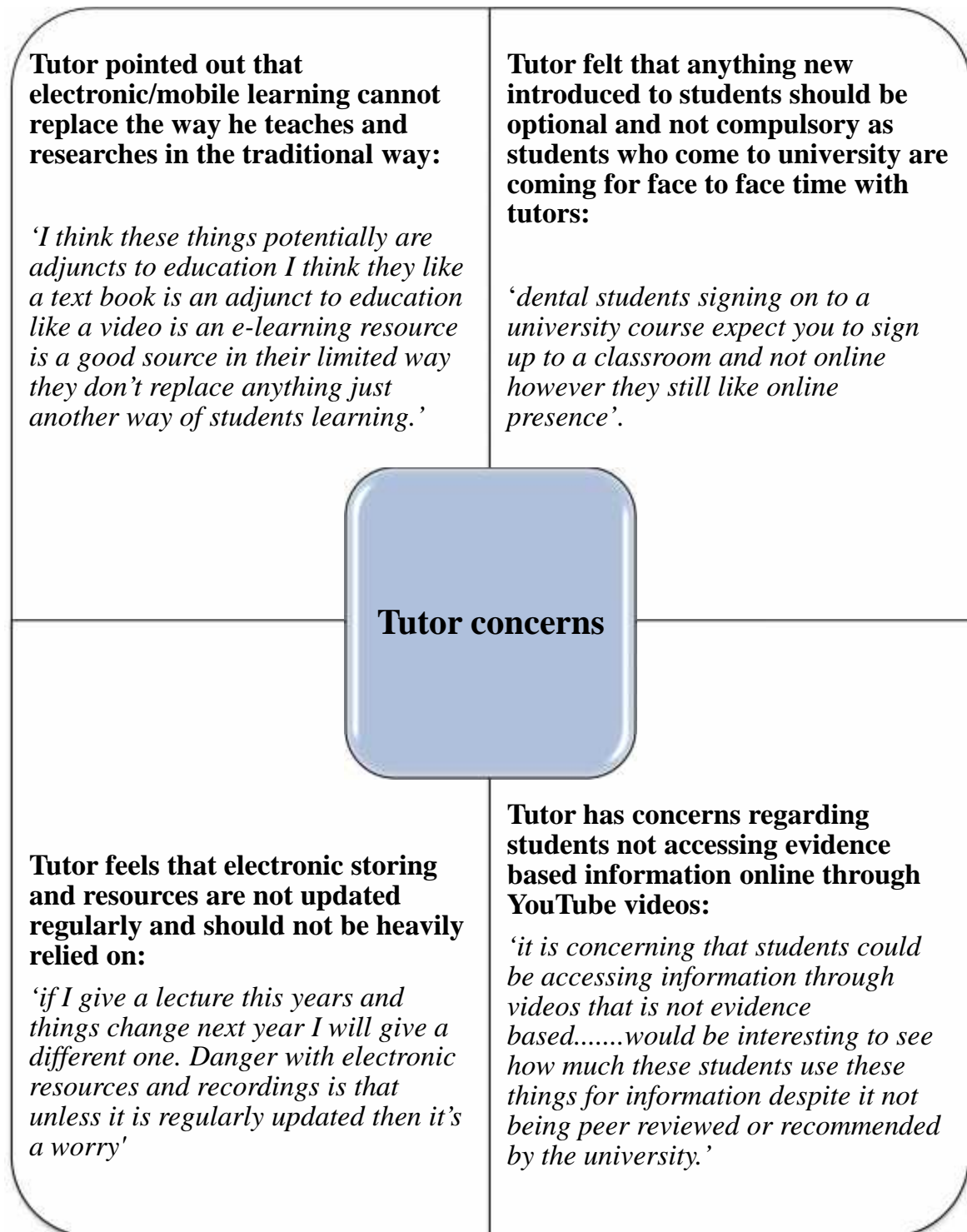
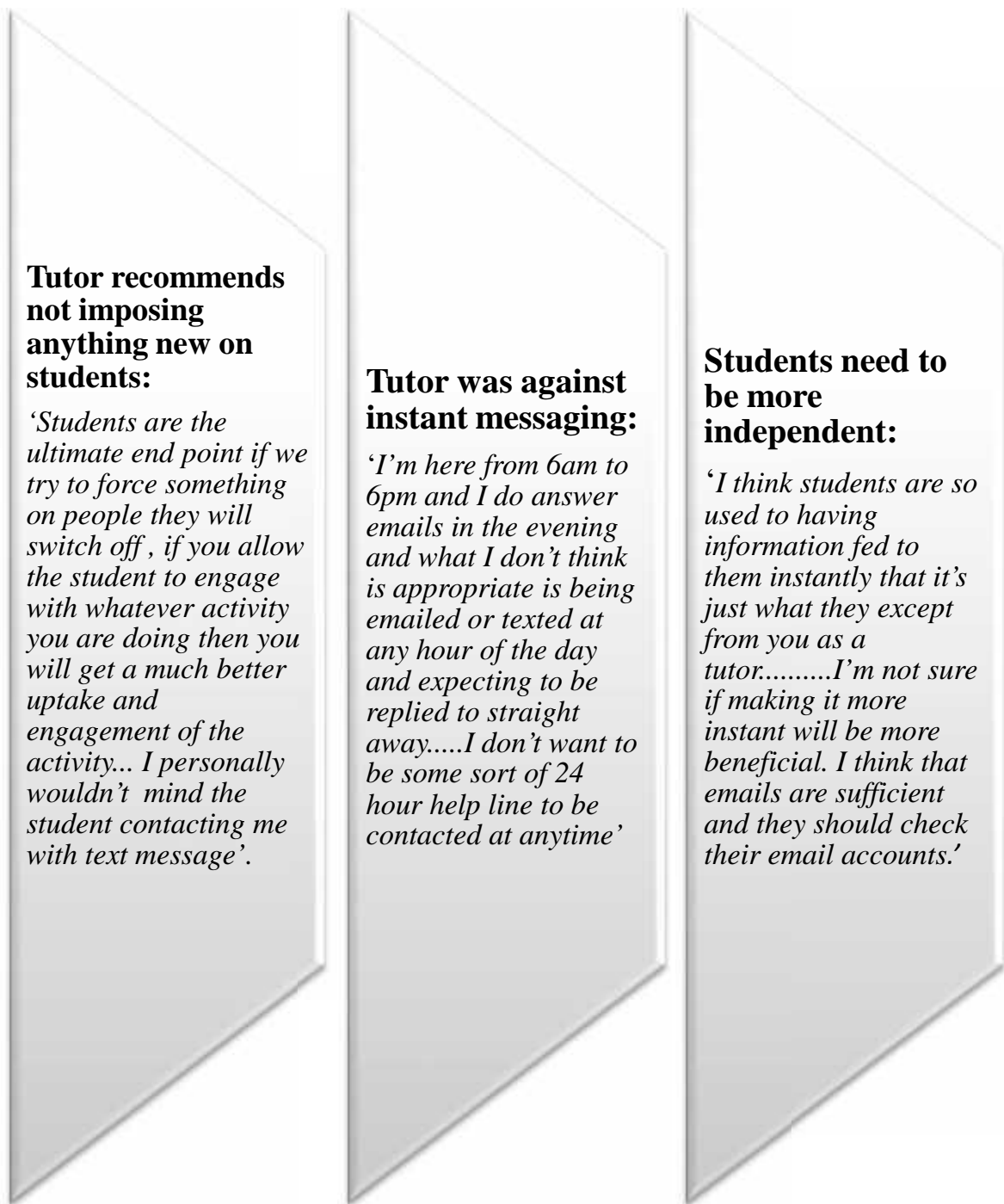


Figure 19: Tutors comments regarding communication



CHAPTER FIVE: DISCUSSION

Section 1

5.1 Student questionnaires

5.1.1 Discussion for Questionnaire

One of the main advantages of using a questionnaire for the first part of the research project was that a large amount of data was collected in a relatively short period of time. This provided the opportunity of quantifying results quickly and comparing the results with those from other studies and measuring change. The pilot study presented ideas which were then elaborated for the main questionnaire. The large number of questionnaires completed was one of the greatest benefits of using this method overall.

5.1.2 Introduction

The increasing use of technology has created a student demand for it to be introduced into their studies. In response educators are slowly enhancing the student education by equipping them with the latest tools and techniques. (Cruz-Cunha 2012). However choosing the best-suited method of learning that will serve their needs is a challenge. Dental education is progressing rapidly, with new information and scientific knowledge doubling every five years (Mattheos *et al.*, 2010). Ongoing research is required to understand the different ways students search, organise, study, share, examine, 'critique and create dental information' with their fellow students using the Internet (McAndrew and Johnston 2012). The present study provides an insight into the choice of current technology and tools, which may be used when searching for information by dental students. The knowledge gained in this study may be applicable to students who are studying in other disciplines.

5.1.3 Internet usage both for personal reasons and dental education

The present study is based on discovering how much students use their devices for personal or dental use. The findings show that in a typical weekday, students are connecting to the internet for both personal reasons and dental studies equally. However, this is closely followed by personal reasons alone. This suggests that students are keen on using the internet for many reasons and it is not only important for their studies but as important to them for their personal lives. This may be because the devices used are allowing students to connect to the internet anywhere at any time. Students are using the internet for just about anything that is convenient for them. It is this “always connected” status that may be leading to the blurring of boundaries between professional and personal activity. Students may be using their personal time at home etc. to communicate with tutors and peers about their dental studies and may define this as their personal time rather than dental studies. The results also show that students aged 18 to 21 are using the internet about an equal amount for both dental studies and personal reasons but students aged 22 to 25, are using the internet for more personal reasons which agrees with other researchers (Fogg *et al.*, 2011). Although a study in Australia found that students surf the internet more for pleasure than their studies (Kinash *et al.*, 2012). Similar findings by Kukulska-Hulme and Petit (2009) show that smartphones are used more for personal use followed closely by work related activities. It may be that the rapid change in the use of the internet is seen as an increase in work related activity when compared to personal time.

5.1.4 The most popular devices for connecting to the internet

The results revealed that students aged between 18 to 21 are using laptops more and smartphones are the top choice for those aged 21 to 25. This is interesting as it may be that laptops are a more convenient way to learn as they start off their dental studies but as they get used to the curriculum and more comfortable, they are finding mobile learning much more convenient, learn anywhere and anytime. Moving around the institution more often may mean that there is more value given to mobile devices. It was also found that the device being used is a decisive factor for when students choose the most preferred place to be when using their device for learning. The favoured place for students to connect to the internet using their devices is at home, with Laptop devices being the most popular. The preferred place for access for those students who use smart phones is anywhere with a connection. Three Students who left comments for smartphone use also liked to use their device whilst 'commuting'. Once again this is supported by similar results reported by Gosper *et al.*, (2013) in Australia. The findings suggest that students are more comfortable using their laptops in a confined place where there is maybe the opportunity to be sat down and relaxed, whereas smartphones have the important ability that they may be used anywhere without any restraints.

5.1.5 What prevents you from using your device?

For all the devices mentioned in this study, the absence of wireless connection is obviously the main aspect that would prevent them from using the internet on their devices. There was a difference however on the lower choices of not using the internet on their devices. For laptops, it was stated that loading of information taking too long (41% n=92) was the third choice. In contrast, smartphone users chose 'battery dies too quickly' as their third reason of

not using or being able to access the internet. For iPad/computer tablets, 'loading takes too long' was the selected choice. Although smartphones are a smaller device, "loading and taking too long" was not a problem faced by students compared to the larger devices. If students are using smartphone apps, the material needed can be preloaded on to the device prior to use and this can eliminate the barrier of loading taking too long. However, if the battery was to die too soon, this will obviously cause a problem. The comments that students left for each device show that they generally find it difficult to carry laptop devices and would prefer to leave them at home. One student commented:

"Only use it at home as the laptop is too bulky".

The size of the smartphone is much more convenient for students than laptops however the screen view is considerably reduced on the smaller device. The importance of both issues needs to be further investigated as information should be delivered in a manner that is suited to the student's needs. These results support the results of Wallace *et al.*, (2012) who found that amongst medical students, the iPad was seen as carrying around a small text book and much easier to take anywhere with them than a laptop which seemed too 'heavy and cumbersome'.

5.1.6 Communication

New ways of communicating by the present cohorts of students will drive the agenda as how educational resources will develop. Educators will be assessed on the manner that they contact and reach out to students. The study shows that email (84%), social networks (79%) and instant messaging (23%) were the top three most used internet communication tools by students on all three devices. This shows some changes compared to past research which found that blogging was a top choice of communication. Similar results were found when

Japanese student's usage of mobile phones for informal learning revealed that 66% students used emails to exchange information about lectures (Thornton and Houser 2004). The dramatic decrease in the use of blogs found in the cited study may be the result of the increase in easily available social networking apps which do not require the student to keep logging in every time they want to post something online. Similar results on the decreased usage of Blogs are found in a recent study (Gosper *et al.*, 2013). Blogging in the past has been labelled as only a personal diary by educators (Crook *et al.*, 2008).

On all the devices, the same top two communication tools, emails and social networks were seen as important. Instant messaging was used most by those students who use their smartphones for finding information and may be related to the continual introduction of new tools available on these devices. Apps such as 'WhatsApp' allow students to connect to fellow students, peers friends and tutors instantly but it does require internet connection. AppleTM allows people to use the instant messaging software 'iMessage' which can be used to send and receive messages on any compatible AppleTM device. It is completely free of charge but again does require internet or Wi-Fi connection. Other examples of the latest internet developments include social media services like 'Twitter' which can provide a platform for students, dentists, tutors and patients to discuss any topic instantly. This will open doors to communicating outside the university circle with millions of people and the new trend today is to 'follow' the interesting group on these sites and instantly start discussing one's thoughts on various subjects (Oakely *et al.*, 2012). Such quick leaps within the technology world helps make sense of why communication tools such as Blogs, Chat rooms and or non-related social networks, are no longer a number one choice. We are in the times where the most up to date information is attractive and exciting and tools/software that taken advantage of this will always be sought out by students. The internet has allowed news

to travel from one part of the world to the other and the audience is on a complete new level (Oakley *et al.*, 2012) and the same can be said about the globalisation of dental educational material.

5.1.7 Apps or Weblinks?

Students who chose smartphones and iPads, as their first or second choice of device for searching information, were asked to choose what they would find most useful on their devices out of mobile websites or apps. It was found that 48% students (n=87) on smartphones would prefer to use mobile websites for finding information on their smartphones. This was followed by 37% (n=67) students opting for a combination of both websites and apps. Similarly most students who used iPads opted for mobile websites. From 42 students who answered this question, 25 chose websites and seven students chose a combination of both apps and websites. Students are slightly more likely to use web links compared to apps which have only quite recently gained some publicity. It may take a little more time for students to start trusting apps and only when well evidence based apps are available (Wallace *et al.*, 2012). However the rate of change of technology will have an influence and it is difficult to predict how this may change in future years.

Students are very particular about their learning from either apps or web links, however in comparison to these results. Previous studies show that students were not fully aware of the advantages and different tools that they could use on their smartphones to assist their learning needs (Deepwell and Malik 2008). Such surveys as reported will enable universities and dental schools realise how advanced students learning is becoming. Students are accessing networks outside of the seminar or lecture room and want to keep up with the new technology. This is not always the case as other studies have found that in other countries and

cultures, tutors and professionals may have to make students aware of the different ways that mobile devices can be utilised to make them most effective for their learning (Santos and Ali 2012; Deepwell and Malik 2008). The internet and tools such as mobile apps allow students to access information immediately as they come across it on their handheld devices. One study supports this statement and found that medical students praise the capability of not wait around and gain access to information straight away, anytime and anywhere (Wallace *et al.*, 2013). Another study found that midwives, enrolled in a new born infant physical examination course, found mobile learning gave them the “just- in- time information” they required (75%) and 80% found mobile devices easy to use in clinical settings (Clay, 2011). Again, in comparison to the present study, Santos and Ali (2012) found that 87% students in UAE had access to the internet on their phones, but only a few actually used it. This could be related to many factors including culture which would need further investigation. It may be that in other areas of the world, there needs to be a broader range of technologies for students to use that will be flexible for their learning needs (Gosper *et al.*, 2013).

5.1.8 Top three apps on mobile devices

There are many mobile app ideas that are utilised by students to support their studies and for general information search. Students were given a list of ideas to choose from that they would find most useful on their device to access at any time as an app or web link. The three most popular were ‘Dictionary for dental education’ (70%), ‘Multiple choice questions’ (64%) and ‘Description and illustrations of tools in dental education’ (39%). Students using both smartphones and iPad/ computer tablets chose these ideas in the same order as their top three most favourite one. It has become apparent however that there is an increasing awareness of using apps and websites that are evidence based. The recent introduction of the NHS app library shows that as apps are becoming so popular amongst patients, there was a

need to upload approved and evidence based apps for safety and convenience. There is an absence of peer review material and students should be more discerning about information on the internet. Both students and tutors should be more aware about what they are accessing. One study found that some medical students are becoming more aware and cautious in using apps and websites which are reliable and would only use websites that they are not sure about just for general information rather than guidance on treatments (Wallace *et al.*, 2012). The least popular idea was 'Help with PowerPoint presentations and multimedia effects' (6%). This shows that students do not need assistance and tutoring in how to use their devices and learning material with the new forms of technology. They are already well advanced in adapting to the new technology that they use both at home and for educational studies. One student commented that he/she would like the E-course at the University of Birmingham to be presented as a downloadable app. This may indicate that the E-course website is not as accessible as students would like or may also mean that students would like to access the E-course at anytime and anywhere, via an app or web link on their mobile devices because they value the E-course highly in regards to their studies. Furthermore, 3 students commented at the end of the survey by stressing that a dedicated app for the E-course would be beneficial for them.

Only 16% students felt that they would find an app useful which would help them give advice to patients to overcome dental fears. Many students are looking for easy sources of information to assist them in passing their examinations. There may be a mismatch in expectations about the ease and speed of information but learning and assimilating information does require time. The use of more practical orientated apps will be useful to students who are well advanced in their studies. They wish to have apps that provide a translational approach to their work with patients. Future research is needed which focuses on

discovering which apps patients may find useful for their general health care information or guidance. These apps will need to have a student guide incorporated in them.

5.1.9 Top three mobile computing/ communication activities

The top three mobile computing/communication activities students regularly engage in on their devices are 'Send and receive email' (84%), 'Send and receive instant messages' (60%) and 'Download and view streaming movies/video clips' (40%). The fourth activity which closely followed these is 'Transfer photos and other data' (35%). Communicating via email and instant messages have become the top contact tools for students using all the devices recorded in this survey. The advantage of having a mobile device like a smartphone gives students the extra choices of using instant messages via social networks and software that support instant messaging through the internet. The popularity of these communication activities reflect upon the growing use of mobile devices for learning, searching for information and now communicating. Downloading videos and movies and transferring photos and other data is relatively easy on mobile devices. One student commented on smartphones:

'Really good, I take pictures of slides from lectures and flick through them when bored'.

This shows how the excellent resolution on smartphones today allows students to utilise their devices. However one study found that amongst medical students, smartphones are used much more for texting and emailing compared to only 10% reported to using them for transferring photos and images related to patients (Wallace *et al.*, 2012). Santos and Ali (2012) found that the most popular activity on smartphones was taking pictures and making videos to gather information. There may be a difference in transferring photos and other data related to patients compared to in taking pictures and making videos in general for studies. The recently

found popular podcasts amongst medical students (Wallace *et al.*, 2013), have now been replaced by instant messages and downloading of videos and movies by dental students. The study found that the least popular computing/communication activity recorded overall is ‘Download and listen to podcasts and audio books’. An Australian study found that the text messaging was more popular than emailing and podcasting and instant messaging were used by nearly half of the students in the survey equally (Gosper *et al.*, 2013). The next least popular activity is ‘Transfer files from one place to another via portable storage available via (pen drives)’. This could be explained by the new software available on the new smartphones which allow users to upload files on to their laptops, desktop computers, smartphones, iPad and all other devices and these files would then be available in that actual software files on all devices. One example of this is the ‘iCloud’ on Apple and ‘Dropbox’ (Wilson and Aagard 2012). Such software today, eliminates the need of using USB drives and pens to transfer files, pictures and other material from one device to another. This again highlights the fast growing technology changes and the effects on education overall.

One aspect that was not covered in the questionnaire was the governance and copyright issues associated with the free movement of images and videos. This is an important area and it will be explored further when evaluating the student and teachers views on mobile technology.

5.1.10 Disadvantages of Mobile/electronic learning

Although the majority of comments showed that students have a positive attitude toward mobile learning, there are many concerns about being ‘distracted’ when using mobile devices in the university campuses. One student commented on smartphones:

‘Can be useful as available 24 hours a day, but can be a distraction to my learning’.

Other concerns include relying too much on technology and ‘jet skiing’ information instead of ‘scuba-diving’, meaning skimming through information only because it is available at the tip of our fingers and not reading with full attention (Carr, 2011). The digital native generation is regarded as always switched on and therefore there are concerns that this may distract students from concentrating on real life issues and other important tasks. On the other hand, students have concerns that patients and tutors are not interacting enough and taking advantage of the new tools available (Wallace *et al.*, 2012). Educators may be more cautious when posting material online as they may be worried about the different interpretations of messages if it is not face to face (Griffiths, 2010). There are many issues associated with mobile learning but by understanding the changing relationship between technology and learning it will enable understanding on how to regulate educators and learners to take on these changes (Johnson *et al.*, 2013).

5.1.11 Limitations

Some of the limitations experienced through using questionnaires were that it was impossible to measure student’s emotions, behaviours and feelings towards the different tools and technology discussed. This could be possible through interviews. Although having completed questionnaires in a relatively short amount of time was an advantage, one limitation was also that it was impossible to know if students were truthful and if they had put much thought in to answering the questions. Students may not have understood some of the questions or the broader purpose of each section which may have affected the validity of the results. Students may have interpreted the questions in their own ways and there may have been a level of subjectivity which was not necessarily acknowledged in the present study.

The present results are mainly focussed on the general aspects of using devices, technology and tools for learning. Compared to other dental surveys, the questionnaire has not gathered detailed results focussing on student's computer skills and as not made a comparison between male and female students (Rajab *et al.*, 2005). Furthermore, the results from the present questionnaire were deemed as sufficient to make conclusions. Compared to this, Uribe and Marino (2006) used a final multivariate model to determine the variants in ICT use. This shows that there may have been a lack of attention paid to details and the questionnaire was mainly concentrating on general characteristics related to dentistry and mobile/electronic learning.

5.1.12 Future work

Students are readily adapting to the new tools such as apps and devices for their learning. Many healthcare organisations are incorporating the use of mobile tools in the workplace and facilitating these devices into patient care. An important group of people who still may need to adjust to technology is educators, institutions, practitioners and other bodies in authority over learning and practice. Only then will the gap be bridged and mobile learning be endorsed to transform into mobile education.

There seems to be a competition between search engines with no videos and search engines like YouTube which are based on Video information. It will be useful to further question students about what improves their education i.e. is it the use of videos, online information or simply the use of lecture notes? It would be interesting to make a comparison between different cultures and backgrounds and the utilisation of mobile learning tools in education.

We may find that some students are not as familiar with what is available and some may just find it much more convenient to keep using what they are familiar with for their studies.

Although there are ‘generalisations’ made about the baby boomers, Generation X and Y, it is more about taking it a step further and investigating the effects on attitudes of young people to new technology.

Section 2

5.2 Student interviews

5.2.1 Discussion for student interviews

The questionnaires did not allow students to elaborate on many of the questions and it was decided that further interviews were necessary to observe and record student's unique perspectives related to the different topics. Qualitative interviewing and research allows the researcher to ask open-ended questions which are then open for discussion. The most beneficial aspect of using this method was that students were understood much more in the way they were explaining their experiences and did not just provide 'yes' or 'no' answers, but gave conversational responses. This approach allowed students to give first-hand and first person accounts. There was a good cross section of students from all the year groups.

5.2.2 The internet: A distraction or a learning tool?

5.2.3 Video websites

In learning circle technology has transformed from simply 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 video websites contain a vast amount of medical and dental related content and it is an easy medium to access for knowledge (Sandars *et al.*, 2008). Clips showing surgical procedures and treatments such as anaesthetic techniques were the most popular. Knosel *et al.*, (2011) found, when searching specifically for education related videos that there were a high number of dental related educational videos compared to those videos found in a general search. A similar conclusion was reached by Tews *et al.*, (2011) who found that students turn

to videos for information about their clinical work. There is an overall improvement in the presentation scores following their viewing prior to the clinic. Similar results were found by McCann *et al.*, (2010) investigating e-teaching and learning preferences of dental and dental hygiene students. One student from the McCann *et al.*, (2010) study commented:

‘One of the main problems we have is not knowing exactly how to do a procedure. Sure we can read about it, but actually getting to see how it is done would greatly help us out’.

It is unclear whether students understand that videos uploaded on YouTube and similar platforms have undergone peer review. As the current study shows a high usage of YouTube for educational attainment, educators should review this area of their student’s education. Knosel *et al.*, (2011) findings show that dental videos uploaded may be developed by non-professionals and were only intended for entertainment value. Future research needs to focus on the motivation behind using dental related videos for extra guidance and whether students question the validity of these videos for their education.

5.2.4 Social media: a distraction

Educational researchers have reported in the literature the relative strengths, weaknesses and threats associated with the use of social media from a professional perspective (Bosch 2009; Schroeder *et al.*, 2010; Khatoon *et al.*, 2014). 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 SNS may offer community based collaborative learning (McLoughlin and Lee 2007), students do have concerns if their educational performance is affected at the same time. 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 (Khatoon *et al.*,

2014). The most popular feature of SNS is instant messaging. Instant messaging may prove to be a distraction. Bowman *et al.*, (2010) who used IMing as the IM tool established that students took significantly longer to concentrate and read a passage online when instantly messaging compared to those who did not or who messaged before reading. Although many reports show that students can multitask by studying and conversing online, Fox *et al.*, (2009) found that students had lower reading comprehensive scores when spending more time on IM. This could explain why the current study found that the student decided to deactivate her social media account, to prevent distraction away from her work. Further research needs to examine the educational benefits of SNS for students and how to overcome such barriers.

5.2.5 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 (Freeman 2005; Mazur 1998). On the other hand, a classroom environment with minimum interactivity will lead to uninspired students with reduced learning (Freeman 2005). Students are using laptops and or other mobile devices such as smartphones in the classroom to search for information that requires more explanation. The tutor is not the first point of contact now for questions as students have laptops with internet to turn to. Although there are many benefits of using laptops etc. in the classroom, the tutor may be unaware of any extra activities such as IM which the students are using whilst listening to the tutor (Ward *et al.*, 2003). One solution recommended by Scornavacca *et al.*, (2009) is that tutors could join in and become a part of this new way of learning using technology. The current use of mobile devices in the classroom demonstrated in this study can be described as informal or on demand learning (Scornavacca *et al.*, 2009).

5.2.6 Factors that will increase internet usage for dental studies

Students all agree that as work load from dental studies increases, they would most definitely use the internet for research and studies much more than for personal reasons. Students were given the opportunity to explore ideas that could help them use the internet for dentistry. For students at the school of dentistry, University of Birmingham, the E-course is the main platform that is used when studying. Students wish to have a mobile application (app) available to download for the E-course to improve access. Other reasons for requesting an app for the E-course were that the students felt they miss out on information in the classroom as some tutors may talk too fast or some lecturers may not provide handouts with full recaps. One student felt that if he had an easy app on his phone or web-link, he could have easily checked the material on the E-course uploaded for the particular lecture on his phone. This would help him assess when to make extra notes about the lecture. Mobile technologies such as apps offer students mobility allowing then unrestricted access to information (Chang *et al.*, 2003; Corlett *et al.*, 2005). Whether the E-course needs an app or web-link for mobile devices, it is certain that this platform is heavily relied on and is helping students through their course. Students felt that they would benefit from apps related to dentistry and one student specifically explained that with her new mobile device she could benefit from an evidence based anatomy app.

5.2.7 Audio lectures

Students suggested audio lectures should be uploaded on the E-course website as this would help them make better notes and fill in gaps where they have missed the lecturer's explanations. The results show that students find it difficult to make notes and listen carefully to the tutor at the same time. Similar results were found by McCann *et al.*, (2010) as students

expressed concerns regarding note taking and not having enough time to note down everything due to being slow writers. Other comments showed that students would like audio recordings of lectures on their MP3 players so that they can learn whilst driving, working out etc. Recording lectures is ubiquitous amongst students and many dental schools have taken the responsibility to make the lecture available to students in other ways also additional to the tutor speaking (Boynton *et al.*, 2007; Craig *et al.*, 2010; Schleyer *et al.*, 2012). Students are requesting to have audio lectures already present on the E-course website for them to access. Horvath *et al.*, (2013) investigated the use of lecture recordings in dental education using 66 North American schools. It was found that there were no common guidelines for best practice regarding lecture recordings in dentistry. The top three reasons why the universities decided to record lectures for students were to provide students with opportunity to review in preparation for exams (52%), student's demand (26%) and helping students who miss class for educational reasons (22%). One of the main concerns tutors may have regarding posting material such as videos and audio recordings online is that students may not attend the lecture. However, Billings-Gagliardi and Mazor (2007) found that students are prone to go to lectures regardless if there is some sort of electronic material posted online.

Further research needs to concentrate on implementing and testing similar projects in the UK where video/audio recordings are provided as it is important to research the relative advantages of using such facilities.

5.2.8 Interactive software

Students are more interested in interactive resources such as videos, but are expecting their mentors and university to help with differentiating between material which is appropriate to use and material which is not approved. One student suggested a platform which would allow

him/her to separate videos relating to different topics readily available. As part of dentistry students will need this type of just-in-time learning when in scenarios such as the clinical patient encounter (Jones, 2001). Having information at the point of need, such as videos, apps and web-links is a crucial feature which hand held devices offer students and practitioners. One example of using videos is demonstrated by Tews *et al.*, (2011) who evaluated medical students' case presentation performance and perception when looking at short videos using a handheld device. It was found that the majority of students preferred videos to review information rather than reading it. However the study also found that students had concerns about patient perception as it may appear that the student is playing around with their phone and not giving the clinical situation their full attention. Access to a platform or software which will provide videos that are easy to categorise and use at any time is a strong feature of this study and is in agreement with other reports (Tews *et al.*, 2011).

McCann *et al.*, (2010) found that students supported the need for recording lectures and some of the main reasons students gave were that they could not sit and concentrate all day in lecture rooms. Having access to the material in their spare time helped them in their studies. One student explained that attendance at lectures is mandatory but if for some unforeseen reason they could not attend a class, a recorded lecture would help enormously.

5.2.9 Most popular devices used for searching information

Similar to the previous questionnaire results, the interviews revealed that the laptop was the most popular device followed by smartphones. Through the in depth interviews, students were given the opportunity to explain the reasons why they used their preferred devices to search for information related to their dental education. The main reason why laptops are more popular than smartphones is that the former can provide the learner with a large screen which

allows several windows to be open. However, being ‘out and about’ means that the lightest and most pocket friendly device is opted for. This is why smartphones are a popular choice for instant information on the go. One student explained that she uses smartphone for information searches when she stood around the building and does not having anything timetabled. 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. The smartphone allows dental students to be logged in and alert all the time. Even between lectures students are checking emails, reading, finding information for the next lecture and using smartphones to read journals. One student explained how he has transformed his computer tablet to a mini laptop by downloading the ‘Microsoft King app’ which allows him to view, edit and download files from word, excel and power point. This gave the student all of the advantages from having a small compact device which is easy to carry around and also has the advantages of a laptop. This shows that by simple alterations and additions, students are adapting the new technologies to their work and universities must be ready to evaluate these new tools. Students praised iPads/ computer tablets as being handy for quick searches especially with the added value of apps. Students have managed to short cut websites that they access frequently and have readily available web-links for instant information. A laptop does not have this flexibility.

5.2.10 E-books vs. Textbooks.

Students are increasingly showing interest in using E-books compared to textbooks and appreciate Electronic journals on their mobile devices. Using E-books is associated mainly with iPad/computer tablets as it offers mobility but smartphones do not offer the same facility due to a limited screen view. One student explained that carrying heavy textbooks is just not an option so the alternative is getting codes for books on mobile devices, E-books and

creating web-links. It is evident that as computers may be getting replaced by mobile devices; traditional textbooks and paper journals may be less favoured now as with the new mobile tools, learners can access information on their screens. Overall E-books tend to be cheaper than paper books and devices such as iPad, iTouch and iPhone from AppleTM are ideal platforms for web-links, apps and E-books (Mui and Kenzie, 2008)

However, Shepperd *et al.*, (2008) found that psychology students preferred to purchase textbooks over E-books even though the price was twice as much. Previous studies show that there is a variation in student's preference between E-books and textbooks. Peterson *et al.*, (2007) found that dental students preferred using digital interactive books more than text books. In comparison, one study found that students prefer traditional text books compared to E-books but would use electronic resources to enhance the traditional way of learning (McCann *et al.*, 2010). Another study found that although students had experience of using E-books, they did not bring them to their lectures (Shepperd *et al.*, 2008). Using E-books/journals may be an individual preference but it may be useful for authors and Journals to give the option to download the text electronically so that students can pick and choose their preferred way of reading. Brunet *et al.*, (2010) carried out an online survey to find out the expectations and acceptance of an electronic textbook program of incoming dental students. Students liked the feature of being able to search for particular topics from a variety of different dental books. However, when reading large amount of text, students prefer paper textbooks.

5.2.11 E-Books and students' learning experiences

When E-books can provide the learner additional functionality compared to traditional text books, only then will they be practical for education purposes (Snowhill, 2001). Students

were asked to give further recommendations and were given the chance to voice any concerns after the interview questions were over. One student found that it was easier to search through books online for context compared to flicking through a book as the contents page may not always mirror the book precisely. Another student requested better access to publications on the smartphone, suggested by tutors through electronic tools as this would help with viewing relevant information. Requests of recommendations for apps have been discussed earlier but one student finds it hard to look for books in the library and would appreciate links or emails directing the student to E-books and journals which can be easily downloaded on the iPad. The student went on to say that he would be doing twice as much dental studying if there was access to relevant E-books/journals. Sun *et al.*, (2012) examined Students' learning experiences when using E-books. To understand different learning experiences, a survey was used for both groups of students who used E-books and those who did not. Similar conclusions were made to this study. It was found that tutors need to encourage the use of E-books as this would enhance learning outcomes. In the present study, the student has specifically asked for tutor help regarding the use of e-books/journals. Sun *et al.*, (2012) found that students who use E-books in the classroom are more engaged which in turn enhances their learning outcomes and secondly, students seem to benefit from the added features of E-books. Overall, E-books are not only paperless versions of textbooks but are a way to involve the student through engaging themselves in to learning (Snowhill, 2001).

5.2.12 Different apps used by students on Mobile devices

Mobile technology gives dental/medical learners wireless, affordable and flexible access to information instantly and has quickly become the norm, especially for pre-clinical students (Ducut and Fontelo 2008). Students were asked about the most used apps on their mobile devices which were used for communication, personal reasons and/or dental studies. The

iPhone was the most popular phone brand as 11 out of 20 students had an iPhone. Social networking apps were mentioned the most when referring to personal apps. The most popular dental related apps were 3D anatomy apps. This shows that students are keen on using apps which show 3D images and this could be helping students for their practice and education. 3D apps can enhance visual depth information through real life imaging capabilities. Students instantly gain access to individual anatomic parts rather than flicking through endless textbooks. Having access to anatomy apps on smartphones can give students the ability to interact with information easily and conveniently at their fingertips, in clinic or home (Ventola, 2014). One student mentioned that he made good use of the app 'iStudiez pro'. It is a dedicated student centred app which provides a platform to combine their assignment due dates, grades, appointments, schedules and tasks all in one. As well as making use of apps related to dental practice, students are finding different tools to manage their busy schedules and task as dental students. We need to better understand students experience and coping strategies with managing assignments, dealing with patients and using new technologies such as social media whilst being professional.

5.2.13 Most popular mobile computing tools

The most popular computing tools were transferring files and watching videos. Not only is emailing being replaced by IM tools for communication, it is being replaced as a backup for storing and transferring important files with DropBox (DropBox, 2014). DropBox is a file hosting service which allows the user to edit and share documents, videos and photos anywhere and with anyone. Students can synchronise files and recover files that they may want after deletion and it can be used by multiple people who can edit the files without overwriting (Pash, 2008; Snell, 2009). All of the students who took part in this study commented on the usefulness of having access to their work on every device. Students are

using this tool for sharing work and information with each other. However, research shows that the authentication architecture may be insecure (Netwon, 2011) and there are claims that DropBox employees may be accessing users files (De Icaza, 2011). One student explained that they had a student who would record the lecture, load it on DropBox and share this with the rest of the students. There are concerns about the use of DropBox and uploading important or confidential files. Universities are not fully aware of these activities and understanding how students are using these tools within the class is essential. This may also have implications for copyright and sharing of information and merits further investigation as it was outside the aims of this research study. There are some suggestions mentioned by researchers to protect sensitive information and to measure that data is secure in cloud systems. For example, federated identity management, firewalls, mask or de-identify of the data and encryption and key managements may be required (Luther 2009; Mcirvine 2010; SafeNet, 2010). Students are increasingly becoming more comfortable storing their files in the 'cloud' than on their devices, emails or USB sticks. One student explained that the app for 'Google Drive' was very useful for her dental education as she would lose portable storage devices and such platforms referred to as 'Cloud-based' give her many options once she was connected to the internet. With the speedy performance provided by cloud computing, universities can concentrate on research and teaching instead of software systems and IT configuration and this simplifies things in higher education overall (McCrea, 2009; Tout *et al.*, 2009).

Sasikala and Prema (2010) explain that cloud computing may become essential in higher education because of its popularity amongst students and the ongoing competition between universities in development. Although there is evidence of the benefits of using cloud computing amongst students, there is a delay in adoption by universities compared to other sectors such as governmental and commercial (Ambrust *et al.*, 2010). Although all students

listed the benefits of using cloud computing such as DropBox, some studies show that there are limitations of using cloud computing in higher education. For example, lack of confidence in its use, security and protection of data, support for organising data, the need for internet connection and a cloud-based application may not be suitable for some devices (Mircea and Andreescu, 2011). One advantage is that the simple approach could prove to be a strategy to improve agility when purchasing technology related tools, in the current financial crisis for universities (Mircea and Andreescu, 2011). Universities and dental practices could take advantage of cloud computing as it is more affordable than many IT technologies as they are always under pressure to upgrade software and hardware all the time (Sultan 2010). There is an increasing emergence of cloud computing amongst dental students, however the reasons why dental schools and universities are not embracing cloud computing could be many but to mention a few these include, issues with data protection, reliability and portability (Sultan 2010). The different interpretations of the benefits and limitations by dental schools require future research.

5.2.14 Internet communication tools and devices

Emails, social networking and instant messaging (IM) were the most preferred internet communication tools used by students. Emails are popular amongst students for typing long and formal messages on their laptops, whereas social networking sites and IM apps provide students provide a faster way of sending a message on their smartphones and iPads. Similar results were found by Lewis and Fabos (2005) as students explained that emails were best for telling 'long stories' and using 'big words' and when students needed more time to think about what they wanted to say.

Students are not keen on taking out and carry around their laptops all the time to check their mails and messages on social networking sites and so have started to use more mobile and lighter devices. When students need to download large files, the laptop is the first choice whereas instant information and a quick glance at a message is one of the attractive features of mobile devices like smartphones that students appreciate. As students do not carry their laptops around with them all the time, one student mentioned that she would miss out on important information throughout the day related to her studies. Waiting to go home and checking and replying to emails is just not an option anymore for students and smartphones have filled in the space for a more up to date and instant platform for anytime and anywhere instant access.

5.2.15 WhatsApp

The most popular app mentioned by students throughout the study and which has been the main IM app for students to communicate is 'WhatsApp'. The app is praised by students to be instant, allowing them to check if the other person has received and read the message. It also allows users to check if their contacts are online or not. One student explained how he had managed to instantly message on both his iPad and smartphone at the same time and used an app called 'Tap Talk' which allowed him to sync the two devices through Bluetooth and type on one device and send from another. Such advances in using technology and tools related to the internet have the potential to impact on education as communication is a vital part of a person's career and personal life. It is a worry that there will be technology knowledge gap between students and tutors which may impact on the delivery of educational material. As commercial social networking sites develop more user friendly apps, students are quickly adopting these on their mobile devices rather than use their University emails. Research in the past has stressed that knowing how much a student is involved in creating a learning

environment (Strydom *et al.*, 2010) Involving the students as ‘primary stakeholders’ (Malti 2013) will help tutors understand how the students prefer to learn. The results show that students are actually taking control of their learning by introducing their personal preferred ways of communicating to their education. This also proves the theory that higher education has shifted from being content based to a more student – centred way of learning and teaching. The use of Facebook and WhatsApp in a classroom environment was investigated by Malti (2013) after students chose these two apps as their first choice of internet communication tool. WhatsApp was used as part of a group chat where the staff and students were constantly connected. Important information and notices were broadcasted on WhatsApp group chat and a strong bond was created between students and tutors. As students were from the first year, they did not feel shy when asking questions on WhatsApp as they would have face to face. This study and results from the work of Malti (2013) show that students want to have some fun whilst they learn and when lecturers join students in using such technology it will create a deeper interest in learning. The results show that students are actually taking control of their learning by introducing their personal preferred ways of communicating to their education. This also proves the theory that higher education has shifted from being content based to a more student – centred way of learning and teaching.

5.2.16 Negative Comments

There were some negative opinions using IM apps for learning. It may be too personal for tutors to have constant connection with students. Tutors may not want give their mobile numbers to students. One student mentioned that it could be a distraction to her learning when chatting all the time and being connected all the time. Another student felt that pulling out a phone in class and whilst in clinic could look very unprofessional. Nicholson (2002) also

found that some students did not feel that IM would work as a learning tool but the concerns were different. One student commented:

“It’s actually the wrong technology to help facilitate learning, due to its inherent one-to-one nature.”

Another student felt that it was better valued as a social tool and a ‘very fun waste of time’. In comparison to the current study, students have both personal concerns and negative feelings towards IM as a learning tool. Instant messaging apps are used more for learning and communicating with fellow students. They are concerned about the opinions of their Tutors towards this change.

5.2.17 Communication between students

When on IM apps or sites, there is an option to create groups which allows work discussion and the sharing of dental studies related work. One student explained that out of her group, if there is a question, someone will always be online and free to answer questions or chat in general about their work. Similar results were found by Lewis and Fabos (2005) as students favoured this sort of communication above the rest because they found it exciting to know when someone was online or not. If they were not online, they would be back at some point as they would put their status up as ‘away’. Tutors are often not aware of the new technologies and find themselves teaching but not understanding how the new generation of students are learning (Fry *et al.*, 2009).

Nicholson (2002) found that students who used IM software to communicate with each other compared to students who did not, were communicating with each other more each week on the IM software. Students felt a ‘sense of community’ when chatting on IM software’s and they felt it was the easier way to chat to other students. Interestingly, Nicholson (2002) found

that students were using the IM software for group work the least as they could do this on the Virtual learning environment which provided asynchronous group discussions. Today, the new IM software's are available as applications on smartphones and can be used to communicate anywhere with an internet connection.

5.2.18 Communication between students and tutors

Exchanging emails is the only way students are communicating with their tutors when not meeting them face to face. The study reveals that 13 out of 20 students feel that there is a need for change in this way of communicating. Some of the reasons why they feel emailing is not adequate anymore is that it is too slow in getting a response from the tutors, they cannot find out if the tutor has received and read their messages, it is not instant and it is not possible through emails to check if the tutor is online at the time that they send their messages. It seems as though the problems outlined are the same advantages of using IM tools. Most students, who did show concerns and felt that IM was the next best thing, did seem a little hesitant in asking for this change as they did not want to invade the tutor's privacy. Some students explained that although IM is a lot better than emailing, it may be too personal and 'weird' to have tutors on their contacts list. However, students still feel that universities could invest in putting together an app or platform which can be used just as an IM app or website which can be logged in to and logged out of for the comfort of both students and tutors. Previous studies show that younger students use IM much more deeply than older peers and are more excited to try new tools and features that IM apps or software's offer (De Bakker *et al.*, 2007).

5.2.19 Mobile learning; a digital divide

Students were asked to think about any barriers that may be preventing them from using the internet to search for information and/or any other concerns they had regarding the use of electronic/mobile tools. Some of the concerns included battery life on devices, poor Wi-Fi connection and limited screen view on smartphones. One significant finding from this interview question was that a student felt that using her smartphones at the dental school may look unprofessional. The student explained that the reluctance of using smartphones on clinic and in the dental school came from her thinking that patients and tutors may think that she is messing about on her phone rather than learning. She referred to this as a 'stigma' attached to the use of smartphones in the educational environment. There is little research in this area and it would be interesting to ask patients about their perceptions and views on the use of mobile/electronic tools on clinic. One suggestion could be that if tutors and patients could understand the benefits of using mobile devices in the dental schools and hospitals, they may be less reluctant to accepting this change. These benefits could be those helping students' education and practice. It may be useful to analyse the use of smartphones or mobile technologies by dental patients.

One interesting finding that surfaced from this question was when one student elucidated that she felt 'disadvantaged' and thought that she was 'old-fashioned' regarding the use of technology at the dental school. She was against the introduction of technology tools in the classroom and the clinic as she was not confident with using them as well as her peers. She had the conception that 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 explained that she took part in this interview mainly to voice these concerns and she showed high level of anxiety with the introduction of iPad at the dental school. There may be a digital divide

amongst students that needs immediate attention. Researchers often focus on the divide between the digital native students and the traditional tutors but these results create an emergence for immediate research in this area. There is much effort being put in to keeping up to date with technology by universities but this is all based on the conjecture that students come to the university as digital natives and use the internet and related tools for their personal and educational lives (Selwyn 2008). Students of this generation are often considered to have grown up with the internet and technology and are expected to be comfortable with using these tools and platforms (Prensky, 2001). Students are often labelled as over reliant on technology and the internet (Jones, 2002; Weiler, 2005; McMillan and Morrison, 2006). These assumptions may be ignoring and overriding students who are not the 'ideal' candidates of the digital generation and are not ready for mobile/electronic learning to be blended with their traditional ways of learning and practice. Brotcorne (2005) concluded that the reasons to choose or not to choose the internet and technology for educational purposes, is not because of some students feeling or being disadvantaged but because of their own preferences and choice. It was further concluded that the difference in student's use of the internet etc. may not be down to a 'digital divide' but more towards a 'digital choice'. Selwyn (2008) suggested that the minority of students who need support and attention when using the internet and tools should not be overlooked when universities plan to move forward on technology. It was also found in this study that there was a lack of confidence in using the Internet. These results are similar to the present findings as it shows that although Selwyn's study was in 2008, and almost 6 years later, students are remain individuals who require different support and are not all part of the 'technology generation'. Bullen *et al.*, (2011) found no evidence in their study which supports the general view that there is differences between the net-generation and non-net generation with regards to the use of technology,

learning preferences and behavioural characteristics. Similar results were found by Reeves and Oh (2007), Jones and Cross (2009) and Selwyn (2009). It was further concluded by Bullen *et al.*, (2011) that the use of technology is driven by the needs of the program, familiarity, cost and immediacy. If students are familiar with the tool, in particularly communication tools, students will use the tool more frequently for education. This shows that the student who felt disadvantaged in the present study is not using tools for personal use and this is affecting her familiarity with the technology used at the dental school. Students need to find immediacy from the tools that they are using such as instant messaging. If they are not getting immediate information and satisfaction from using technology tools, they may not be as content with using these tools for their dental education. Again, the student in the present study seems to have a lack of interest in technology overall and by not using these tools at home for day to day life, she may be distancing herself compared to other students. For example, one student seemed to be extremely familiar and advanced 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 and researchers should not be tempted to base decisions on digital generation stereotypes and should try to understand other factors that may play a role in to why some dental students may be feeling left out or left behind. Not all students can click in to using technology tools provided by universities straight away and may need extra attention and training even for basic use of tools.

5.2.20 GDC standards and social networking

The General Dental Council standards handbook for dental students and practitioners includes guidelines for SNS. The guidelines have clear set boundaries and promote cautiousness when professionals/dental students entertain themselves through communication on SNS.

Throughout the guidelines, patient's interest is the main focus as with any health care profession. Information posted, discussed or mentioned should not allow patients to identify themselves or others. The guidelines have taken into account the main Social networking sites like Twitter, Facebook, LinkedIn, Flickr, YouTube, GDDUK, Instagram and Pinterest. For dentistry, SNS guidelines have only recently been introduced, in September 2013. Student's knowledge of using social networking sites whilst complying with to the GDC standards was tested. Only 6 out of 20 students could give correct explanations about the Do's and Don'ts of social networking as a dental student and practitioner. These students had a good understanding of the importance of being professional online and explained how your own family members and friends could report you if you breach any guidelines on SN sites. Students mentioned keeping patients interest in mind at all times frequently and one student stressed that devices should also be locked so that no one can have access to confidential files. There are many ethical concerns regarding the use of social networking sites by dental and medical students in particular as they may have access to patient information which needs to be safeguarded. The GDC standards stress that the most important aspect of becoming a dental practitioner is by incorporating high principles, however it is also recognised that there is a blurred boundary between being responsible as a professional and enjoying SNS for personal use. Some of these boundaries that are often reported include receiving gifts in the doctor patient relationship, sexual and financial relationships (Lyckholm, 1998; Norris *et al.*, 2003; Brendel *et al.*, 2007).

One study found that medical students are not careful about keeping their profiles on SNS sites such as Facebook private and are open to the public. To add to this, students profiles showed information which is not usually disclosed in a doctor-patient relationship and their personal information was available to everyone. Even though both medical and dental students are given handbooks and seminars stressing these standards, there is still a lack of professionalism on SNS (Thompson *et al.*, 2008). It may help if educators started to have discussions and start to mentor students about E-professionalism when using SNS. (Wear and Kuczewski 2004; Ratanawongsa *et al.*, 2006). The most important ethical issue is regarding patient-doctor or patient-dentist relationship and putting patient's interest first. McDaniel *et al.*, (2007) discussed physical disclosure on SNS between patients and practitioners and found that the discussions were more focused on the practitioner's needs and not the patients. Such cases further emphasis the urgent need of E-professionalism at all times. Guseh *et al.*, (2009) highlight guidelines to help students and practitioners who receive friend requests from patients on SNS. For example, accepting friend requests from patients is recommended to be avoided and if patients are offended then the practitioner should explain in a friendly manner. It is further concluded that the risks associated with befriending patients on SNS outweighs any potential benefits. Future research needs to examine these conclusions further and assess the potential benefits of SNS use in dental practice by patients and practitioners.

5.2.21 Evidence based information on the internet

Healthcare students require more training to be successful and efficient in their search for evidence based information. Students have shown mistakes and poor search strategies in the past when researching independently (Mitchell *et al.*, 1992; Proud *et al.*, 1993; Wildemuth and Moore 1995). Students were asked to describe what the term evidence based information/apps meant to them and how they trusted information on the internet. Out of 20

students, 10 could explain the term evidence based and only 5 gave correct answers and showed good understanding. When asked about how they trust the information online, 4 students commented that they would only use information from ‘well known and well respected’ sources, such as the British Dental Journal and 5 students only use university websites such as the E-course. The results show that students may not have adequate skills and knowledge to search for, evaluate and synthesis 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 (Harmon, 2007; Bonk, 2009; Richardson, 2009). Students were asked about the apps that they are accessing and similar results were found as they were unsure about the techniques and search skills needed to find evidence based apps. Information seekers are facing new challenges with the fast growing user generated content available online today. SNS, apps, blogs, podcasts etc are great ways to share information but pose a threat for students searching for evidence based information as it could be unfiltered and incorrect (Kingsley *et al.*, 2011). Some students mentioned in the present study that they searched for information on websites recommended by the university or university websites. In contrast to this, Walters (2009) found that the majority of students searched for information on Google instead of using databases recommended by the tutors. There seems to be a lack of information literacy amongst the present group of dental students and they do not have the skills or knowledge to filter and find evidence based information on line, especially when this is a critical part of training to become dental practitioners. Similar results were found by Kingsley and Kingsley (2009) where the majority of dental students in a biomedical science course, who despite having specific detailed directions by the instructors, were unable to find evidence based references on PubMed. It was found that dental students, entering first year

lacked the skills and training to find, retrieve and evaluate evidence based information (Kinglesey and Kingsley 2009; Kinglesey *et al.*, 2011). Students rely exclusively on well-known websites such as Google and YouTube etc. instead of using evidence based research tools. One student explained that he used YouTube for information and he would check the reliability by the numbers that would indicate the amount of views, comments and likes related to the specific videos. He felt that if the video has a certain high number of views and likes, this would be sufficient evidence for him to use the video for his studies and he could always check his lecture notes to match the key information. These results show that dental students may not have 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 pick and choose databases which are ‘well known’ and are ‘liked’ by their peers instead of researching adequately for evidence based information. Similar conclusion were made in other studies which explain that websites such as Google seem to largely facilitate the majority of higher education searches (Mackey and Jackson, 2005; Barragan *et al.*, 2005; Hollister, 2007; Mokhtar and Majid, 2008; McLure and Clink, 2009; Walsh, 2009; Beautyman and Shenton, 2009). Previous studies suggest that dental students need specialist training and detailed instructions on how to perform online information searches, find evidence based and academically adequate information/apps and assess the reliability and quality of databases. It may be useful to place such help earlier on in the first years of dental education so that students are given equal opportunity to succeed in their studies and training (Kingley *et al.*, 2011). Although such help is available to dental students now, the results in the present study show that this is not working and it maybe that there needs to be a constant reminder and help to ensure that students familiarise themselves with Evidence based information. The aim of this part of the study was to evaluate information

literacy amongst dental students and understand the preferred ways of searching for information/ apps. It may be useful to do a similar evaluation of student's information literacy.

Section 3

5.3 Elite interviews

5.3.1 Introduction

There is a focus both on the use of technology as a learning tool for students (Wallace *et al.*, 2012) together with the impact of technology and related tools in dental education (Mattheos *et al.*, 2008; Handal *et al.*, 2011; Hillenburg *et al.*, 2006; Arnett *et al.*, 2013). However, there is little research on the use of technology by educators and healthcare professionals for teaching/research (Cuban 2001). There seems to be a resistance towards the use of Electronic teaching in general by tutors (Keengwe *et al.*, 2009). Therefore, it is important to understand the tutors' perspective on the use of technology in dentistry.

5.3.2 Use of the internet

The interviews with tutors did focus on their use of the internet. The results indicate that tutors are using the internet much more for dentistry than for personal reasons. This is interesting as when students were asked the same question, they used it the other way around i.e. for personal reasons. There may be many reasons for such a difference. Students are using social media and instant messaging as personal activities and therefore, they are using technology incorporating these activities. Tutors on the other hand, were using the internet for literature reviewing, communicating with other staff members and reading dental related information. The tutors make a distinction between time spent on the internet solely for personal reasons and time spent for dentistry. Students however use the internet mainly for communication and fun activities with less time spent focussing on their dental education. This could be because students are often referred to as 'digital natives' (Kennedy *et al.*, 2010)

and use the internet and associated technology for more comfortable and stimulating activities compared to tutors who may associate the use of technology for more formal work (Salmon, 2000). Tutors were then asked to describe factors that may change the way they would use the internet in the future. One tutor explained that the nature of his work would affect his decision of using the internet for different activities. He would find himself using the internet much more for dental research over the years as his literature reviewing increased. Compared to this, students suggested that work load from the dental school would influence their decision to use the internet for their studies. In the past, researchers have claimed that the generation gap between students and tutors could be affecting the way they use the internet and technology (Kvavik and Caruso 2005; Selwyn 2008; Gray and Kravee 2008), however the present results show that students and tutors may be influenced to uptake different tools and use the internet for similar reasons.

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

The majority of tutors used the internet and accepted the use of Smartphones in their lectures. 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 in the class and another agreed that Smartphone use in the class should not be completely rejected in the first instance. In the past, smartphones have been described as personal digital assistant devices which allow health care students to carry resources around with them all the time. 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 (Leon *et al.*, 2007; McLeod and Mayz 2008; Clark *et al.*, 2009; Martin 2007; Koeniger-Donohue 2008). Dental tutors have repeatedly described the health 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 (Rowles and Russo 2009; Clough *et al.*, 2008; Jarvel *et al.*, 2007).

Two tutors explained that they noticed students using instant messaging apps on their smartphones such as WhatsApp to create groups and work together as a class. Similar results were found when students were asked about extra activities in the classroom and it is interesting to find that tutors are aware of these activities and have noticed this. WhatsApp would be used as a platform by students to inform other students about lectures, share notes and share photos related to dentistry. An example, of good practice for using hand held devices in the classroom are lecture responsive systems. This would involve students using smartphones as clickers to answer questions and take part in quizzes, with tutors responding with correct answers instantly (Jones *et al.*, 2009; Mayer *et al.*, 2009; DeBourgh 2008).

One tutor suggested that if students were encouraged to use their smartphones in the class, the university would not need to give extra training as students would be harnessing the tools that they already use in their personal lives. This would eliminate the need for training on IT. Similar suggestions were made by Julia and Tami (2011) for nursing students and added that a clear protocol is necessary. 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 patients.

Smartphone use in the class has been described in the present study as a way to explain different topics to students through students explaining it to each other. One tutor elaborated on this and described 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 to that they did not understand from the tutor face to face. This method has been used and approved in the past through describing ‘budding nurses’ who should not only rely on their memory alone, but to ‘consistently verify reflective information’. This can only be possible with the use of instant messaging through hand held devices (Institution of Medicine 2001).

One tutor found that if students were missing in his class or running late, or even if his lecture was to be cancelled on the day, he would ask students directly to text message/WhatsApp fellow students, to update them or find out how long it may take them to reach the lecture hall. He added that this was one way that he would utilise smartphones but only if it did not become a distraction to his teaching. Scornavacca *et al.*, (2009) found that using mobile devices in the class, increased class interactivity, interest level and was overall and enjoyable addition to teaching and learning. Similar results were found with regards to tutors attitudes towards mobile devices in the class. Tutors explained that 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.

5.3.4 Use of mobile devices by tutors

The most popular devices amongst tutors were desktop computers and laptops. Smartphones and iPads were used for more personal activities such as shopping, social media, communication etc. These results differ from those found when interviewing students as the

top two devices for students were smartphones and laptops. Tutors seemed to be very comfortable with using desktop computers provided at the dental school, solely for teaching and research. Smartphones are used by tutors mainly to ‘bounce emails’, gain instant access to information and take part in activities that do not require editing of long documents. Bouncing emails refers to quickly checking an email and send swift responses. Similar results were found by Wallace *et al.*, (2012) who found that tutors listed a number of advantages related to the use of smartphones for teaching and research. These included instant access to information on the internet, flexible communication and access to different electronic resources.

It is evident that 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 seem to have difficulty viewing information and files on smartphones and iPads because of the small screens. One tutor explained that he would be reluctant to show anything to students on a Smartphone because he felt that the small screen size would make students lose interest. Wallace *et al.*, (2012), 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 properly. One tutor argues that it is impossible to actually ‘work’ on mobile devices as you need the versatility of having a keyboard. Interestingly, another tutor explained how he purchased a keyboard to attach to his iPad which helped him to comfortably have more access to all his files. This was much more convenient for him than carrying around a laptop. Similar results are discussed in previous research papers and discussed that mobile devices have advanced and users can now access information and files ‘at the point of need’ (Tempelhof 2009; Jorkowitz *et al.*, 2006; Kho *et al.*, 2006; Carroll and Christakis 2004).

One tutor explained that he/she was encouraged and motivated to use iPads after she saw students using their handheld devices and felt that she was more enthusiastic, once she knew that students were benefitting. The use of apps was found to be very helpful for one tutor as she explained that once she started to use apps, she would use her smartphone more and this had eventually become her first choice of device 'when on the move'.

5.3.5 Staff members need to approach students

Interestingly, one tutor suggested that the university should implement a platform or software which will track students' activities so that tutors can instantly check where students are, what they are doing, and who needs help where and when. This shows that some tutors could be open to many possibilities when harnessing technology for dental education. Many researchers have had us believe that there exists a never ending 'digital divide' (Prensky 2001) between staff members and students. Such thoughts have prevented researchers to analyse the actual use of technology by tutors and often generalised that staff members may not be accommodating the 'tech savvy' generation and consequently fail to participate in integrating technology in to education (Tapscott 1999; Prensky 2001; Levin and Arafeh 2002; Oblinger and Oblinger 2005). However, the current findings show that tutors are much more open to implementing technology in the school and seem to have more technology based ideas than the tutors interviewed. It is clear that the story may be a more complicated than assuming that every difference is because of generation gaps. Moreover, one tutor discussed how he/she would take out their mobile phones to use in the lecture hall.

5.3.6 Improvements in communicating with students

There was a similarity in the use of communication tools between tutors and students. Both groups used emails and instant messaging as the top two communication tools overall. Social

media use was a lot more common in students and tutors seemed to be more reluctant or careful when using these sites. Tutors were given the opportunity to suggest ideas which could improve their communication with students. All of the tutor's interviews confirmed that they only contacted students through email. One tutor felt that she did not want any improvements and would prefer to meet the students face to face than messaging them. However, some scholars in the past have found that students tend to be more open through computer mediated communication compared to face to face meetings (Tidwell and Walther 2002).

Discussion forums was one suggestion made by a tutor who felt that he would rarely need to get in contact with one individual and would like a forum to message the year group together. Social networking sites was a implication addressed by one tutor, however he later explained that he was reluctant as he did not want the students to see his personal pictures and vice versa. Compared to this, O'Sullivan *et al.*, (2004) found that there may be positive effects on student's education and learning outcomes if students are viewing their tutors' personal social media pages. The researcher explained that students seem to feel more open and motivated if they have a connection with their tutor's personal life online through simple viewings of social media pages. Similar results were found by Mazer *et al.*, (2009) who explain that students tend to be more caring and attribute trustworthiness towards tutors who are willing to disclose personal information such as photographs, wall posts and biographical information. However, Joseph *et al.*, (2007) and Keh Foon (2011) found that tutors' self-disclosure on Facebook could have negative effects on their teacher credibility. Although some tutors were reluctant in providing ideas for better communication with students, one tutor explained that he would have no objections and would not feel uncomfortable if students called him and sent him text messages/WhatsApp on his private phone. However, he clarified that he would not

like to impose himself on students and would only provide this service if students were comfortable. Correspondingly, Eusebio *et al.*, (2009) explains that using text messaging in the class can positively affect students learning experience and students interaction with the instructor. Text messages in the classroom have been researched as classroom feedback systems and as the tutor in the present study is willing to communicate with students outside the class, it would be interesting to analyse how using these techniques in the class could affect students-tutor relationship and learning outcomes. Many researchers in the past have found that such tools could improve the quality of discussion in the lecture room, improve teacher awareness of students who have difficulties and increase student engagement (Mazur, 1998; Freeman and Blayney, 2005; Penuel *et al.*, 2005).

5.3.7 Instant messaging between tutors and students

Once tutors had been given the chance to give ideas regarding improvement in communicating with students, they were asked to comment on the idea of IM between themselves and students. This question was important as the majority of students in their interviews and survey stressed that they wanted to stay in touch with tutors through instant messaging for their dental education. Half of the tutors (n=3) were not keen on this idea and 3 tutors were ready to give further suggestions. One tutor explained that emails and WhatsApp messages were the same to him and he had no concerns regarding students messaging him through instant messaging. Another tutor suggested that instant messaging should be used with small group teaching classes and would be useful in a controlled environment rather than random people sending messages to each other. This is similar to the suggestions made by Hillenburg *et al.*, (2006) who explain that advanced technology works well for small group teaching, to facilitate increased contact between students and tutors. Previous studies show that students who communicate with tutors via instant messaging have a personal connection

with them and tutors could get to know students individually in response, and give tailored advice and tutoring (Hrantinski *et al.*, 2014).

Although some tutors were not as resistant towards IM, there were many concerns regarding the use of IM with students. Tutors used WhatsApp and instant messaging platforms with their family and friends but one tutor mentioned that he would like to have a distinction between his personal and professional life. Doering *et al.*, (2008) found that tutors felt extremely uncomfortable with not having an academic but a social conversation with students on instant messaging platforms. Other tutors explained that instant messaging may not be traceable by the university and this is a concern as if there are any issues they need to be addressed by the university. One tutor argued that he would not like instant messages coming through to him, which may not be important anyway. He explained that anything related to dentistry cannot be so important or an emergency that it cannot wait for the next meeting or morning. Similar results were reported by Church and de Oliveira (2013) who found that users may not appreciate lots of irrelevant messages coming through which may make it feel like a non-academic way of communicating.

Students should be encouraged to work independently and instant messaging may lead to constant messaging to tutors to ask for answers to questions. This was one concern, raised by a tutor who explained that if students are provided with instant messaging platforms, they will not try to assess information online and will feel that it is alright to message the tutor anywhere at any time. Yeboah *et al.*, (2014) found that students who used WhatsApp in the class or for communication, later showed negative effects on their education. These negative effects included the activity taking up too much of study time which led to an unbalancing of academic preparations. Lack of overall concentration may be a detrimental consequence of online activities. However, Amry (2014) found that students who use WhatsApp seem to

have improved problem solving skills and can sometimes overcome learning difficulties through its use. The use of information technology raises divided opinions and there may be negative effects on students and tutors use of instant messaging as well as positive academic enhancements. Future research needs to concentrate on the use of instant messaging in different settings to determine which aspects bring about the best educational improvements for students.

5.3.8 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 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 need to be involved and this suggestion was made by 2 out of 6 tutors. Hillenburg *et al.*, (2006) investigated the opinions of administrators and information technology specialists regarding E-learning and the future of dental education. The results showed that the professionals felt that collaboration was very important to help with the innovations of electronic learning in dentistry. These findings are similar to the suggestions made by tutors in the present study as both suggest that meaningful technology advances would only be achieved once there is a high degree of collaborative effort. Similar conclusions were made by Wiecha and Barrie (2002) who investigated collaborative learning amongst general practitioners (GPs), in an online continuing medical education course. It was found that the GPs benefitted from meeting up twice a week and discussing treatment decisions. The GPs made considerable changes based on this experiment when treating

diabetic patients afterwards. Furthermore, Arnett *et al.*, (2013) explains that SNS such as Facebook can be used to actually share best practices and teaching strategies. It is also described as a resource for professional developments. This shows that SNS may have some important uses in education. Future research needs to focus on ways to achieve this and the benefits of sharing ideas, resources and collaborative brain storming of the use of technology in dentistry through using technology.

5.3.9 Maintaining professionalism; issues with self-disclosure

The most noticeable difference between the two sets of interviews, tutors and students concerned maintaining professionalism when using new technology. This was evident by the answers they were given on instant messaging and the use of social media in dentistry. The majority of tutors were apprehensive towards adopting these modes of communication because they were not sure of the exact guidelines. There was a sense of '*blurred boundaries*'. This refers to tutors who are not sure about the guidelines which separate the use of social media for fun vs. dentistry. It is evident that tutors feel that they need extra guidance from the university on such matters and are not sure of the way to control such scenarios. One tutor explained that from his understanding, the university does have strict guidelines on communication but there are no specific rules on communicating with students through instant messaging and therefore he suggested that the same rules apply to this mode of communication and it was not anything different for him. The possibility of students and tutors viewing private profiles of each other with private life details was a concern for one tutor. He stressed that it was very unprofessional for him to be viewing student's pictures which would give details of students '*drunken nights*' or '*heavy night out*'. Carter *et al.*, (2008) explain that it is very important for tutors to not engage in any conduct which could potentially discredit their profession as a teacher. Kirschner and Karpinski (2010) give

examples of the negative effects of using social networking sites, such as students posting inappropriate pictures on Facebook which could potentially affect their chances of getting jobs. In previous findings, it has become evident that students seem to post honest and very private information on social networking sites as they do not want to come across as dishonest to their friends (Christofides *et al.*, 2009; Young and Quan-Haase, 2009). These findings validate the concerns that the tutors have in the current study as they feel it is their duty to stay away from viewing these profiles as tutors. Similarly, Mazor *et al.*, (2009) found that one teacher posted information on Facebook which was private, including wall postings disclosing information about her activities and social gatherings. Although there is much research on the negative effects of self-disclosure leading to unprofessionalism, McBride and Wahl (2005) explain that self-disclosure could ultimately lead to tutors creating an ‘immediate classroom environment’. It is also evident that cognitive learning may be enhanced and positively affected by immediate behaviours such as tutors using humour and personal examples, to get to know students (Gorham, 1988; Christensen and Menzel, 1998; Frymier and Houser, 2000). Future research needs to focus on the stress experienced by tutors to remain professional when communicating or using social networking sites.

5.3.10 Students need to be independent researchers

When tutors were asked about the use of instant messaging and communicating with students, one tutor explained that this could lead to students relying too much on the tutor and not thinking independently. The tutors stressed that it was the educators’ duty to teach students to find information independently to prepare them for life after qualification when they would not have the resources to contact tutors instantly. The tutor explained that students need to be aware of how to find evidence-based information without the assistance of their tutors. Kingsley *et al.*, (2011) found that nearly half of the students in his survey (n=70/160) could

not find an evidence based citation. Students are not using appropriate research skills and with the use of instant messaging, they may start to over use this communication medium with their tutors.

5.3.11 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 stressed that it was really important to not force technology upon tutors and students as this would make them turn away. 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. Ruiz *et al.*, (2006) cite 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 forced. Correspondingly, Divaris *et al.*, (2008) found that learning that takes place outside the classroom, including interactions and information retrieval, needs to make the learner feel in control. This shows that the tutors concerns may be experienced by others also and further research needs to identify the impact of compulsory vs. voluntary E-learning.

5.3.12 Social media

5.3.13 Communication with students

Some of the positive comments regarding communication with students on SNS included, helping students by answering dental related questions, utilising SNS tools for education and posting dental related interesting information and pictures. The majority of tutors had at least some concerns regarding this activity. The most reoccurring remarks were that it could be portrayed as unprofessional and that tutors did not want to cross boundaries and break rules.

One tutor explained that he did not feel that students would like tutors to view their personal information and photos on SNS and would not want tutors to see their personal activities. It is evident that through the use of SNS tutors seem to be confused about where privacy ends and professional life begins. This is the most important barrier to the use of SNS for communication with students. Carter *et al.*, (2008) explain that tutors exhibit professionalism and are very aware of the risks of using SNS for communication. Although tutors may be aware of the potential risks, more and more tutors are taking these risks. Other researchers have looked at the advice students gave to tutors who use Facebook. Interestingly, the students' advice for tutors was that they should always consider professionalism on SNS, should not post personal information which students could make fun of or post comments related to politics. However, students did advise tutors to be themselves on SNS as this would allow the students to '*get a better feel of their personalities*' (Mazer *et al.*, 2007). The majority of the tutors in the present understood that students may not be comfortable with tutors viewing their personal information. Similar results were found by Mazer *et al.*, (2007) where students were concerned that tutors might change their perceptions of the students, after viewing their SNS profiles. For example, one student commented: '*Don't lecture students about things you may come across on their profile*'. Future research needs to focus on ways to decrease such risks related to professionalism. Students and tutors may need to come together to share experiences and make collaborative decisions for best use of SNS.

5.3.14 Unprofessional behaviour on SNS

The majority of comments made by tutors regarding SNS use by tutors and students were related to unprofessional behaviour. Three out of 6 tutors could recall incidents which involved unprofessional behaviour by staff or students on SNS. One tutor stressed that SNS could prove to be detrimental to students and tutors professional life through inappropriate

postings. One of the examples which were discussed by a tutor involved a student's posting, noticed and picked up by the British Dental Association. The posting was regarding a patient and such examples were a concern to the tutors. Similar results were found by Chretien *et al.*, (2010) where all students agreed that posting pictures of patients was unprofessional. They were more concerned about their '*personal relationships with clients being affected*' rather than understanding that such acts could pose a threat to their profession overall.

One tutor explained that he knew other dentists/professionals who had posted things online which would include crude comments regarding patients. This was a huge concern for him as he had often had heated debates against such unprofessional behaviours. Such incidents seemed to affect tutors decisions about engaging with SNS. Previous studies have found similar unprofessional conduct in the use of Social media by patients, students and health care professionals (Farnan *et al.*, 2009; Lagu *et al.*, 2008; Thompson *et al.*, 2008; Chretien *et al.*, 2009; Greysen *et al.*, 2010).

George, (2011) evaluated a 3 part continuing education mini-course titled '*Friending Facebook?*' and investigated utilization of SNS by health care professionals. There was resistance against the use of SNS on the grounds that using such tools can violate standards related to patient privacy. Further research should focus on utilising the strengths and eliminating the risks wherever possible.

The most concerning area highlighted was unprofessional relationships between students/tutors and patients. One tutor described how he would advise students as much as possible to not share personal stories of patients online or befriend patients. There is much emphasis on similar dangers of using SNS regarding the protection of patients (Gabbard 1995; Lyckholm, 1998; Norris, 2003; Brendel, 2007). One study found that only 37.5 per cent

medical students and residents put privacy settings on their SNS pages and these profiles are viewable by the public (Thompson, 2008). One tutor explained that students tend to be naive when posting information on SNS and may be confused as some of the staff members are friends on SNS with the nurses at the dental hospital, who are friends with the students. This creates a linking chain of people who can view each other's profiles if privacy settings are not in place. She made it clear that this is the reason why she would not put anything on SNS which she was not comfortable with sharing with the world. Griffiths (2010) suggest that dental professionals/students need to be careful to how much information they are posting online which could potentially be misinterpreted and not portray what they actually intended to post. Research shows that using the internet and posting anything on SNS especially, is referred to as leaving 'digital footprints' which can be traced back to anywhere at any time. This information is never 'really erased' and may be stored forever (Oakley *et al.*, 2012).

5.3.15 Use of Social media by tutors

The more experienced and older tutors show more resistance and concerns regarding SNS, whereas the younger tutors were open to using SNS and utilising its benefits for dental education. Similarly, George (2011) found that the more experienced physicians were inclined to shunning such platforms altogether, or would maintain separate profiles for personal and professional use and maintain boundaries. On the other hand, younger healthcare professionals were very comfortable with maintaining one profile that would mix both personal and professional contacts and content. This could again be explained by the generation gap or could be explained by the experience of elder professionals compared to younger professionals. Similar explanations were given by one tutor who thought that the younger tutors use SNS more than the elder tutors. She further explained that younger tutors were more comfortable with the new technology. Furthermore, one of the more experienced

tutors explained that he/she rarely referred to her work on Facebook. Although most research and findings in the current results show that practitioners/professionals show a discrepancy against befriending patients on SNS and stay away from creating such contacts. There are still concerns as there have been cases reported which show unprofessional behaviour and inappropriate relationships maintained between patients and doctors (Khatoon *et al.*, 2014).

Although most tutors had reservations regarding the use of SNS, some tutors did see the potential of using SNS for educational purposes. One tutor explained that he had colleagues from other countries who would post pictures on their Facebook of '*strange root canal treatments*' and he would find this very interesting. He wondered how much such tools can be utilised for education. Similarly, another tutor was absolutely fine with using SNS to communicate or give guidance to students on SNS. Overall it seems as though tutors are more concerned about contacting patients on SNS but may be more liable to use it to communicate with students. As none of the students have directly communicated with tutors on SNS for educational purposes, not many suggestions or comments were made regarding the positive outcomes of using SNS to communicate with students. However, literature shows there are a few reports that demonstrate positive outcomes of using SNS. George (2011) found that Facebook is best for communicating with billions of health professionals from around the world and LinkedIn is useful for professional networking and building connections. Kind *et al.*, (2010) report that Twitter is a free micro-blogging platform which would send alerts on the way practitioners and patients are thinking, reading, and writing. Furthermore, Cole, (2011) found a professor of educational technology, who would use two screens during his lecture; one for normal slides to show students and the other to tweet relevant links and feed student comments. Arnett *et al.*, (2013) described some of the most commonly used SNS and their use in education. Facebook was used by tutors to have more in-depth discussions with

students and give the student the control over their learning. Tutors would contact fellow staff members on SNS also. Other benefits include students getting the chance to communicate with each other beyond the walls of the lecture hall (Hung and Yuen, 2010). One tutor described that his close friends, a dentist and tutor was '*quite obsessed*' with using SNS for her research and would often refer to her tweets and posts of Facebook. She would recommend tweets and posts on Facebook made by other scholars and scientists also. This was some of the extra information that she would advise students to view outside the lecture room. The tutor further added that such examples were making him consider using SNS as learning /teaching tools for his classes. Similarly, Bhargava *et al.*, (2013) assessed whether SNS such as twitter can be used for oral surveillance or not. They found that twitter and other SNS could be used to detect disease trends, estimate the impact of dental problems on people's day to day activities and understand the interests and concerns they may have regarding their oral health. Further research needs to focus on the risks and benefits associated with using SNS when coming in contact with patients and the use of SNS by patients overall.

5.3.16 GDC guidelines regarding the use of SNS

The results from face to face interviews with students showed that although the GDC guidelines are clearly explaining the standards of using SNS, students are still making professional mistakes. It was expected before the interview that the tutors would not have this problem. However, one tutor explained that he did not know of any guidelines that the university may have issued regarding the use of SNS and the relationships between tutors and students. Tutors may be in need of training or guidance with relation to using SNS when communicating with students. Interestingly there are guidelines at the University of Birmingham yet one of the staff is showing ignorance on guidelines. This reveals the complexity of the issue and problems with communication. One tutor asked: '*Students could*

ask me questions on SNS, as it's out of the remit of the university where does the responsibility lie?' such results indicate that universities need to make faculty fully aware of SNS developments and implement faculty training when using technology and related tools on the internet. Overall, there are strict guidelines in place concerning doctor- patient interaction and the guidelines or instructions of using SNS as educational tools in a clinical setting should be revisited to ensure that the boundaries are clear.

5.3.17 Why do students make these mistakes?

Throughout the interview answers related to social media and its use amongst students, tutors mentioned unprofessional examples and the risks of using SNS. Some tutors that mentioned these examples were asked why they thought students were making these mistakes despite the GDC guidelines and also seminars delivered, related to acting professionally by the dental school. Tutors felt that students are so used to using SNS and other tools in their personal time, that they cannot maintain the boundary of professional life and personal life. One tutor explained that it 'almost comes as a second nature' to use these tools to communicate etc. outside of university and there seems to be '*blurred boundaries*'. Other risks of using SNS reported include upload information about their studies which could appear as marketing and therefore inappropriate (Griffiths and Liyange 2008). Correspondingly, Schroeder *et al.*, (2010) describe the threats of using SNS including the difficulty of ensuring that students' anonymity is protected. Students who post/tweet inappropriate content will also affect the universities credibility. Interestingly, the tutors in the present study gave examples of inappropriate use of SNS but Schroeder *et al.*, (2010), after investigating 20 UK based social software initiatives, did not find any reported cases of such incidents taking place on SNS. Guseh *et al.*, (2009) provide guidelines for physicians using SNS and these guidelines could be also used by students. One of the guidelines stresses that practitioners should avoid

accepting invitations or friend requests with patients on SNS. Further research needs to focus on helping students and tutors maintain a boundary between their private and professional/educational lives, especially where patients are involved.

5.3.18 Phones and apps

One tutor demonstrated the split between professional and personal life by explaining how she used smartphones for dental related work/contacts and a Nokia for personal contacts. On the other hand, one tutor was against using smartphones at all and felt that it would interrupt him through pointless conversations on instant messaging apps. He explained that this was one of the risks of using SNS by both tutors and students and that it would distract him from his dental related workload. Nevertheless, some studies have found that there is no evidence of disruption in academic practices, through the use of some tools such as virtual learning environments (VLE) may cause similar concerns. Blin and Munro (2008) found that VLE did not disrupt teaching practices and did not affect teaching and learning activities in the classroom. There may be more interruption experienced through instant messaging on smartphones compared to platforms which can be logged in to and out of at any time.

In the previous interviews with students, the use of dental related apps was not the most popular mobile activity but was still evident and students wanted to see more dental related apps, provided by the university on their phones. However, tutors expressed a lack of interest or need to download dental related apps on their mobile devices. The teachers are often working in a specialist area and there may not be any specific apps related to this area or research. Another tutor explained that he did not use dental related apps because he knew the resources from which to gain the information he would need and this was the 'old fashioned conventional way', through which he was already over loaded with information. One tutor

tried to explain why she felt that students would be accessing more dental related apps than tutors and this was because she felt that apps are for students of the new age, who are already using apps all the time and tutors may be old fashioned and may not need it as much also. These findings show that tutors are still assuming that the generation gap may be the excuse or the reason why they are not using technology related tools but in fact based on the results, tutors are probably using the same tools and electronic services but seem to be more reluctant in using it for their teaching and research. Only one tutor out of the 6 tutors interviewed, had access to dental related apps. However he felt that apps were not the way forward but web-links on mobile devices would work better. This was related to information on apps not being updated constantly and the tutor preferred to access information as current as possible. This suggests that even though tutors may not have access to dental related apps as much as students, there is still awareness of apps not being updated amongst tutors and such issues need to be addressed, for the sake of students accessing information that is not relevant.

5.3.19 The use of YouTube and videos in dental education

One of the most popular mobile computing activities engaged on smartphones was downloading dental related videos and E-books. However, some tutors were reluctant to share these videos with students. Tutors were concerned that students may be accessing information through videos online, which may not be trustworthy and evidence based. One tutor explained that he himself had the habit of just '*Googling*' information and was worried that students may do the same when looking for videos on YouTube related to dentistry. Another tutor explained that he does recommend video links to students that he thinks may be useful, but he stressed that the problem arises when students go away and look for videos on YouTube independently without any guidance. Researchers have found that YouTube is being used

increasingly for dental and medical related videos, especially for by professionals who share the videos with patients and public (Keelan *et al.*, 2007; Vance *et al.*, 2009; Green and Hope 2010). With the use of the internet, information can be uploaded by anyone from anywhere who may or may not have evidence to back the information uploaded (Ache and Wallace 2008; Fernandez-Luque *et al.*, 2009; Lo *et al.*, 2010; Pandey *et al.*, 2010; Khatoon *et al.*, 2013). This obviously worries the teachers especially with the increasing use of YouTube videos by students for their dental education and practice. In the past, researchers have reported some of the limitations and challenges in using YouTube. For example, it may be a difficult and time consuming task, to search for videos on YouTube which are relevant and appropriate to use for a specific topic (Burke and Snyder, 2008). It is advised to tutors to check the credibility of videos on YouTube, just as they would with any other source that they wish to share with students. This is because there are many non-evidence based and inaccurate videos posted on YouTube, which is an unrestricted platform (Trier 2007; Burke and Snyder 2008; Snyder and Burke 2008).

On the other hand, using YouTube videos helps tutors explain concepts and procedures to students in a more effective way, especially for practical courses in dentistry. Similar results were found by Knosel *et al.*, (2011) as they described how dentists could benefit from videos on implant techniques and sinus lifts. It was also found that one of the most important advantages of using this medium is that it can be viewed by students 24 hours a day. Burke *et al.*, (2009) found some positive perceptions about the use of YouTube as an instructional tool for tutors. Tutors explained that such mediums can be used to show students real life examples after verbally explaining the topic. Students may feel refreshed and more interested in learning when accessing information through new technologies. YouTube videos were also found useful to promote critical thinking and discussion in a classroom environment.

Nevertheless, the biggest concern that tutors have throughout literature and found in the current results is that students can go home and access non-evidence based and unreliable information. This was an authenticated view as in the previous results, when interviewing students, who admitted that they have not got the skills to search for information which is evidence based. Knosel *et al.*, (2011) found that through creating YouTube channels, academic institutions and journals are utilising YouTube for educational reasons. Similarly, Skiba (2007) found that there are a growing number of credible health organisations, such as the World Health Organisation who are uploading videos on YouTube for educational purposes. It is further advised by Knosel *et al.*, (2011) that as YouTube and other similar mediums are increasingly being accessed for dental related queries and educators should use such platforms to ensure that evidence based information is being updated all the time. This will be achieved by tutors accessing videos and uploading their own evidence based videos with a scientific supported background.

5.3.20 Cloud computing in dental education

Students and tutors highly valued Cloud computing platforms for their learning and teaching and the application that was often mentioned was DropBox. Transferring files, storing files, sharing information with colleagues from around the world and having files to access anywhere are some of the benefits described by tutors when using cloud computing platforms. One tutor described a cloud computing platform which was personalised for him. ‘MyCloud’ was used as a storage device for everything and the tutor and his family could gain access to their files from anywhere with an internet connection. Thorsteinsson *et al.*, (2010) explain that cloud computing is used as a collaborative method to instruct and share information. Furthermore, Pocatilu *et al.*, (2009) portrayed cloud computing as an educational service which provides direct and instant access to users through centralised data storage and data

access monitoring facilities through virtualisation. All tutors described similar uses of Cloud computing platforms and seemed to have replaced the USB sticks with DropBox etc. One tutor explained that she would still however use USB sticks and email herself files as it was the '*traditional way to do things*'. Cloud computing has become the ultimate solution for many universities in an economical context due to factors like cost increase, competition in development and institutional success (Sasikala and Prema, 2010). Cloud computing is seen as a versatile environment that benefits both staff and students (Mircea and Andreescu 2010).

Although the majority of comments, regarding the use of cloud computing in education were positive, all tutors had reservations related to privacy and security of their files. Tutors seemed to lack confidence in the use of such platforms to store confidential files or files which could identify patients. One tutor stressed that users should be ready to have their files accessed when posting anything online as '*anything related to the internet is prone to hacking*'. Some tutors stressed that the university is not keen on the use of DropBox and cloud computing platforms to store files. Similar limitations of the use of cloud computing platforms were reported by Cattedu and Hogben, (2009) with emphasis on the security and data protection risks. Tout *et al.*, (2009) agreed that anything which is classed as '*moving knowledge*' between clouds and networks is always going to be prone to hacking and a target by attackers. Furthermore, 75% of IT specialists and Chief information officers consider security being the most important issue when using such platforms (Jitterbit, 2009). In relation to this, one tutor commented that the danger with students storing their confidential information on cloud based platforms is that now they have mobile devices which are breaching boundaries in many ways. Smartphones are very personal and students have access to this data all the time, even at home. Mircea and Andreescu, (2010) give some advice on such issues and stress universities to pay more attention to sensitive data. The main options to

overcome such issues discussed include maintaining sensitive data within the university, de-identifying data, encryptions and key management, firewalls etc.

The majority of students and tutors throughout this work used cloud based platforms because they are free. Evans, (2009) found that 65% of the respondents in his survey, used cloud computing because it was cheap and this was their driving force behind adopting this platform. Students have reported to be using DropBox for sharing their files and group work previously and interestingly, tutors are aware of this. Similar to this, Fox (2009) described that one of the most important educational benefits of using such platforms is that a large number of users (students) can be contacted in a short amount of time. Overall, cloud computing seems to be replacing the traditional ways of storing data, with the additional benefits of collaborative work, but such advances are not providing the security that is essential in dental education. Therefore, it is the responsibility of students, tutors and practitioners to ensure that their data is protected and confidential files relating to patients etc. are masked or kept off such platforms, which may be prone to hacking.

5.3.21 New platforms and software's adopted by tutors

Harnessing technology to transform and improve education has been widely accepted by scholars, policy makers and practitioners (Dynarski *et al.*, 2007; Campuzano *et al.*, 2009).

Tutors were asked to describe technology together with the various tools, software, hardware and new platforms which they may be using or thinking of using in the future for their teaching/research. The three main platforms described by tutors in detail were '*Prezi*', '*ePearl*', '*Nearpod*' and '*PaperShow*'.

Prezi was described as an online application which allows tutors to present their lectures dynamically. Prezi (<http://prezi.com>) can be used as an alternative to power point

presentations and can take presentations beyond bullet points and slides by using zooming digital presentation editor. One tutor explained that he saw the use of Prezi in another tutors lecture which motivated him to find out more. He added that tutors seem to have a set way to utilise different tools for a lecture and may not think about using a new software or platform. The tutor further compared PowerPoint presentations to Prezi by explaining that Prezi was the new tool and PowerPoint was the traditional way of presenting to students. Lightle (2011) explained that Prezi is a free tool and available online without the need for extra software. Additionally, Prezi can be use without the internet also as an offline version can be downloaded easily on the users device. Such advances in technology are inspiring tutors to make changes to their lectures in dental education. It is also evident that tutors are more prone to changing their ways of lecture delivery, if they see another tutor using the same technology. Campbell and Williams-Rossi (2012) describe that prezi works well for science related courses because many students find Lab related lectures ‘boring’ and with the use of software like Prezi, students can brainstorm, edit and work on collaborative projects. Clearly, Prezi seems to provide the educator and the learner a new platform to present ideas dynamically and with a lot more interaction. Further research needs to concentrate on the use of Prezi in dental education, in particular clinical tutorials.

One tutor explained that she was considering the use of ‘Nearpod’ in her lectures for a more collaborative learning environment. Nearpod was highly recommended to her by a fellow staff member. Nearpod can be used to create interactive presentations, share them with students on their mobile devices, give students the control of interacting with the tutor by giving responses to questions etc. and finally, monitor and give feedback to students on an personalised and cumulative basis (www.nearpod.com) . Before mentioning Nearpod, she commented that she did not need to change or add anything to the way her lectures are

delivered or for research. However, she explained that Nearpod was an exception as it was recommended to her by a fellow senior staff member. As some of the students at the dental school are given iPads, the tutor was thinking about using these iPads for Nearpod. She appreciated the fact that students could view the same material and screen as she did on their iPads or mobile devices. The ability to show students pictures, videos and clearly illustrated tables etc pushed the tutor to consider this platform. Karolkik *et al.*, (2013) found that tutors were attracted to educational software and electronic learning tools which provided the user with a specific set of features. These include simplicity, clarity, interactivity, multimedia character, graphical processing and the tools to show students videos and clear pictures. In addition it was found that tutors would opt for software and learning tools which were free to use and download. Both Prezi and Nearpod are free to use online platforms, with dedicated freely available apps.

One tutor explained how she used the interactive software called 'Papershow'. Papershow is an instant wireless digital writing solution, which enables the user to display handwritten notes and diagrams, on the computer screen instantly (www.papershow.com). The tutor explained that this tool software allows her to check students note taking skills, draw diagrams to illustrate concepts to students as a group and enable discussion over the content on the screen. Karolkik *et al.*, (2013) found that tutors expected educational software to provide them the control to keep an eye on students work and it should be graphically interesting software. It is evident that tutors are hungry for new tools which are interactive, interesting and not boring or the traditional way of doing something. However, tutors are not prepared to waste their time learning to utilise a new tool, if it does not add anything to their teaching. One tutor commented that she would not use or think of changing her ways for something new just for the sake of it. She would only consider the software/tool if it added

something different to her way of teaching. There is a difference of opinion when it comes to using technology which is recommended by fellow tutors, as some tutors are influenced and motivated seeing other tutors using such tools but other tutors are more set in their ways and would not use a tool just because a fellow member is recommending or using it.

At the University of Birmingham, tutors can attend training sessions to help them with teaching and research skills. One tutor explained that at the course, she picked up on a new educational teaching tool which she has been using ever since. ePEARL is an electronic portfolio software, used to encourage students to self-regulate their studies and includes both meta-cognitive and motivational components (ePEARL, 2014). The tutor found the software extremely useful because she could give students feedback on their profiles about pictures taken in class and discussed online. Meyer *et al.*, (2010) explains similar advantages of using ePEARL and further explains that it is very useful for students as they can get feedback from tutors, personalise their portfolios, set goals, reflect on and share work and provides them with an editor to edit text work and the facilities for audio recordings. Students benefited from this software as it increased their development of ICT, improved their foundation competencies and improved their motivational and cognitive benefits. Future research needs to find out what motivates tutors to use electronic tools and software and how this helps their teaching/research and students learning outcomes. Overall students showed more enthusiasm and excitement in using new technology, tools and software as compared to tutors who would only utilise them if they added something new to helping them teach and research.

5.3.22 Outdated and unreliable information

Most tutors had concerns regarding the use of internet based information by students. This prevented them from asking students to research a certain topic on their own, without any

references provided from the tutor. One tutor explained that although mobile devices offer students access to information anywhere, students could be potentially accessing information which is not evidence based, peer reviewed or reliable and is readily accepted by students. The only tangible benefit is that it is instant. Furthermore the tutor commented on the use apps compared to using websites which are updated regularly. Tutors had similar concerns regarding the use of stored lecture recordings which are played a year or so later for revision. One tutor stressed that such recording could be out of date or not current information. He explained that even lectures could need a change the next year that the same course is taught again and further explained: *'If I give a lecture this year and things change the next year, it will be a different lecture that I deliver that year'. Danger with electronic recordings is that unless regularly updated they are a worry'*. (T5)

Tutors are not confident in the manner that students are researching online for information. With the prevalence of instant information, tutors are unsure of the searching skills that students are using. Tutors express concerns that the process of finding, retrieving and evaluating information online, which is evidence based and reliable, is difficult for students. Information on the internet, whether freely available or restricted on databases, needs to be inspected for timelessness, credibility, reliability and applicability to dental education. The researcher needs excellent evaluation skills to understand how to differentiate evidence based information from that which is misleading and unreliable (Kingsely *et al.*, 2011). In support of such fears that tutors have regarding students searching skills, one study found that the majority of students would search for information on Google instead of using the databases or websites recommended by their tutors (Walters, 2009). Similarly, Kingsley and Kingsley (2009) found in a biomedical course that although tutors asked students to use PubMed, the majority of students (54%) failed to search for evidence based references and used unreliable

sources. This supports the results as students are not using evidence based information for their studies (Barragan *et al.*, 2005; Hollister, 2007; Mokhtar and Majid 2008; Beautyman and Shenton, 2009; Mclure and Clink 2009) and with the new mobile technologies, tutors are concerned that students may get distracted in using the instant information and not check for valid information. During the interviews with students, it was found that they are not able to define the term evidence based and would like more guidance in searching for reliable, peer reviewed information online and through apps. In the future, universities may need to teach students how to become internet researchers and not rely on anything that they find on the internet, without scrutinizing it first. There may be need for a step to step guide of how to differentiate between information which is evidence based and of high quality and information which is unreliable and not peer- reviewed.

5.3.23 Tutors need training

Throughout the interviews, some tutors stressed that they needed help and support when using new electronic tools or new devices. One tutor explained that he was '*stuck in his ways*' and was teaching the new generation of students, just as he got taught and felt that there was a need for change. Similarly, Niess (2005) discussed that the way teachers learned their subjects as students, is not the way that the 21st century students will access education. One tutor cited training from the University of Birmingham course 'Postgraduate Certificate in Academic Practice' (PCAP), but explained that he did not get any training related to using different software such as Prezi. Sang *et al.*, (2010) explained that it has been a great challenge to teach tutors to combine technology into their teaching practices, especially since the introduction of educational technologies. One tutor stresses that he would benefit from discussion meetings on staff development days. He explained that as staff members already

meet and discuss teaching practices, educational technology should also be a core topic up for discussion. Kay (2006) summarise similar strategies to train tutors for the use of technology in the classroom and suggest that universities should offer mini workshops, deliver training courses and model ways to use technology and integrate it in all courses. To add to this, Blin and Munro (2008) found that the lack of transformation of teaching practices from traditional to using learning technology, is linked to training and development programme offered by universities. Alternatively, one tutor explained that he is extremely tech-savvy and can deal with any issues related to technology etc. However, he is concerned about tutors who only know the basics and stresses that technology should not be forced on to tutors, but tutors and students should be eased in to using it. Ertmer (2005) agrees and discusses that the use of technology for teaching should be a decision made by the tutors themselves, regardless of the prevalence of educational technology. Furthermore, Oliver (1993) found that there was no difference in the use of technology by tutors who received training, from the tutors who did not receive training from the beginning. Sang *et al.*, (2010) stress that there are many factors which need to be considered when analysing the use of technology by tutors for their teaching and research. These include cultural differences, gender issues, teacher efficacy about computers, computer attitudes, self-efficacy and teacher thinking process. Such factors need to be taken in to consideration when implementing training courses for dental educators/practitioners. Sang *et al.*, (2010) further recommend that for successful implementation of technology, tutors thinking process needs to be considered and challenged.

5.3.24 Traditional teaching methods challenged

The majority of tutors expressed different concerns regarding their use of technology and electronic software. One tutor felt that his traditional ways of teaching may be challenged and may even be replaced in the future. Such thoughts are becoming barriers in the successful

adoption of electronic software packages and tools in dental education. One tutor was against the introduction of new software which would potentially stop him from doing this his way or the traditional way. For example, he explained that the University is thinking of implementing an encryption package called 'GOOD' which prevents data loss by encrypting phones for emails. The tutor felt that anything that puts a barrier on his productivity or normal routines would not be welcome. Furthermore, he explained that he is satisfied with the way he teaches and manages his role, however if there is something introduced which is coming in the way of his normal routine, he would be reluctant to adapt to these changes easily. This highlights the difficulties in managing change in an organisation and there will be early adopters but also there will be others who are not confident in adapting to change. In support of this, Scanlon and Issroff (2005) explain that some higher education tutors may feel alienated with the introduction of learning technologies, which may be in contradiction to the traditional methods of teaching. Even more, such hesitance may be related to the tutors thinking process towards electronic learning and teaching. This attitude towards the introduction of new software and the use of new platforms should be managed by the University establishment. A strategy should be adopted to maintain the confidence of all members of the teaching faculty (Sang *et al.*, 2010).

There was a difference of opinion in the use of smartphones and mobile devices in the class. There were some very strong views where it was considered to be a distraction for students. In his opinion, students are using smartphones as a way to stay connected to the outside world. He considered this to be distracting and de-motivating students due to not having their full concentration on their studies. Interestingly, another tutor described a time when she saw students using smartphones and assumed that they were '*messing about*' and not using the Smartphone for their learning. However, after further investigation the tutor found that

student were actually looking up information and discussing something related to the class. The tutor further pointed out that during staff meetings, sometimes tutors are using mobile devices and not concentrating, which could be hypocritical as tutors are then asking students to put their devices away in class. Overall tutors do make assessments of the different technology tools and devices, and the results from their initial piloting are often the decisive factors for them to continue using it in the classroom. Kirkup and Kirkwood (2005) found that tutors were not ready to accept a new electronic marking/commenting system because it was time-consuming. Although there were obvious benefits such as improved quality feedback from students, tutors did not feel that the extra advantages were enough for them to adapt to it. Blin and Munro (2008) found that using technology in universities does not disrupt the traditional teaching methods and is not at the stage of transforming the traditional way of learning and teaching.

5.3.25 Students should learn and not interact

Interestingly, one tutor expressed that she did not want to use technology and tools which would enable students to interact with each other more or communicate further in class. She explained that dental education is about the delivery of information from tutor to the students and not to enable interaction between students. She further added that such tools may become a distraction to her teaching. Another tutor explained that the main focus is to transfer knowledge and that he would use any method which would do this best and further commented:

'You have to transfer knowledge from tutor's brains to student's brain, so you can use whatever tools to help you do that but don't use technology for the sake of using technology.' (T4)

Further research may need to focus on the pedagogical aspects which may be challenged in dental education and those which may need to be altered. There seems to be some uncertainty about the degree to which tutors are supposed to utilise technology in their teaching. There are also very strong views expressed on certain teaching practices that are based on opinion rather than evidence based teaching practices.

5.3.26 Lecture recordings on cloud based platforms

Students are recording lectures, and then posting them on DropBox to share with fellow students. Tutors were asked to comment on this and it was found that the majority of tutors have concerns regarding students recording their lectures, and then posting them on cloud based platforms such as DropBox. Recording lectures is becoming common and students can now use mobile devices in the class to record immediately what is happening in the classroom (Boynton *et al.*, 2007). Furthermore, many dental schools are now providing facilities for lecture capturing in a variety of formats (Brittain *et al.*, 2006; Craig *et al.*, 2010; Schleyer *et al.*, 2012). However, tutors are concerned now that students could be posting the recording on other platforms such as You Tube which are open to access by everyone, and not just their own use for studies.

Although tutors were concerned regarding these activities, they were unaware of students posting their lectures on cloud based platforms. One tutor explained that when he is giving a lecture, it is personal to him at the time, and through cloud based platforms, it could be heard many years later, by when the information may well be out of date. He further explained that it is extremely worrying if students are posting material on such platforms, which could potentially contain patient information and records. Although most of the tutors have concerns, all tutors appreciated that some students, with learning difficulties had valid reasons

to record. Students in the past have found lecture recordings to be extremely helpful and an enjoyable learning experience (McCombs and Liu, 2007; Bolliger *et al.*, 2010). However, one tutor stressed that although students with learning difficulties are allowed to record the lecture; she still has reservations about it and would always ask to listen to it first, before letting the student walk away with the recording. The results show that tutors are very apprehensive about having their lectures recorded and shared, especially on cloud computing devices. This is because tutors do not want the wrong information out there for people to check many years later. It was also evident that one tutor was not sure about the policies regarding students recording lectures and would dismiss the idea anyway. On the other hand, one tutor advised that tutors should not be saying anything in the lecture to students which they do not want to share. He tries to explain that today with the prevalence of electronic platforms, everything that is said is prone to being recorded, shared, copied and scrutinized. Similarly, some studies have explained that intellectual property is a barrier to the adoption of such lecture recordings and there needs to be a balance between accommodating students' needs and protecting intellectual property (Brittain *et al.*, 2006; Zhu and Bergom 2010; Horvath *et al.*, 2013).

Tutors understood that students may need to use lecture recordings to prepare for exams and tests and this is reported in many studies (Reynolds *et al.*, 2008; Lonn and Teasley 2009; Nast *et al.*, 2009; Guertin, 2010). However, tutors are more concerned about their lecture recordings being misinterpreted. It may be possible for universities to work around this problem if they can see that students are benefiting from lecture recordings (Brittain *et al.*, 2006). One possible solution is reported by Brotherton, (2004) who found that tutors were not concerned about students recording their lectures, once they could edit out the information that they did not want to be recorded. This is similar to the present study, as one tutor

explained that she would always check what part of her lecture is recorded before students were allowed to take the lecture away.

Overall, universities need to work around the copyright and privacy issues, but look further in to the benefits of lecture recording and the use of cloud computing platforms.

5.4 Electronic/Mobile technologies and the theories of learning

The growing use of electronic/mobile technologies and platforms cannot ignore their place in the learning/training process. Thus, the findings in this research need to be framed and considered against sound learning theories. It is important to consider the new practices revealed in this research, against the existing theories.

The findings reveal that students are keen on using instant messaging platforms to communicate and learn. Tutors are using platforms such as E-pearl, Prezi and Nearpod to assess, reinforce, get feedback, and aid students. Such mobile learning environments fit well in the behaviourist paradigm, which propounds feedback and reinforcement. Through the reinforcement of an association between a particular stimulus and a response, learning is facilitated. Mobile devices such as smartphones and iPads enable on the spot reinforcement and feedback.

In the constructivist approach, learning is taking place through activities which lead to the concepts. Students' learning is enhanced through social interaction, and learning is moving from experience to knowledge (Cooperstien and Koccevar-Weidinger, 2004). Tutors encourage students to be active constructors of knowledge. In an electronic/mobile learning context, with the use of virtual reality and games, an immersive learning experience is created. The current results show that students are facilitating group work on group chats using WhatsApp and uploading learning resources on DropBox. Such personal learning environments are shifting the responsibility of the teacher to the learner, which allows learners to create their own mobile learning environments. When students are creating their own learning environments, they may feel more enthusiastic to learn, and engage with others anywhere at any time (Shih, 2007).

Mobile devices accompany users in their everyday practices and become a suitable source of information or means of communication that supports learning. The situated learning approach posits that learning can be improved by ensuring that it takes place in an authentic environment (Naismith *et al.*, 2004). With a mobile device, students and tutors can use them in different settings and draw on those contexts to improve learning activities. Furthermore, mobile devices allow content transferability into 'context aware' environments.

The results show how mobile devices and platforms are significantly changing communication and learning activities. Mobile devices have the potential to change the way students interact with each other, behave, and their attitudes to learning (Homan and Wood, 2003). SNS are placing students at the centre of networks of information and proficiency, which possibly lead to new practices of education; through communicating instantly.

Researchers have promoted their use as part of a 'connectivist learning theory' (Downes, 2006). Another theory which is linked with using mobile devices in this manner is conversation theory (Pask, 1976) which is learning through conversations between different systems of knowledge. Mobile devices and SNS provide users a platform for mobile-computer collaborative learning (MCSCCL). The use of WhatsApp for group work is not an attempt to replace the human-human interaction, but provides a means of coordination outside the classroom.

Teaching and learning with mobile technologies and platforms has made a break through by their use and implementation in universities. However, Naismith *et al.*, (2004) explain that in order for such interventions to be successful, educators must consider the context, the ability to link the activities in the outside world, students individual learning experiences through using mobile technologies, and the degree to which informality would work in a learning environment.

Overall, the results reveal that mobile learning environments provide interactive mechanisms among learners, instructors and the learning material. It is a blended approach which has enabled students and tutors in the current study to successfully learn and teach, with the use of new mobile technologies. An effective and engaging learning environment can be created through this blended approach, drawing on a number of different theories and practices.

CHAPTER SIX:

CONCLUSION, LIMITATIONS,

RECOMMENDATIONS AND

SUGGESTIONS FOR FURTHER

RESEARCH

6.1 Conclusions

One of the main principles of this study was to examine the use of mobile devices and electronic platforms/software's in dental education. Overall, Laptops are used by students mostly in a comfortable sit down place where they can 'do' their work. However, smartphones and mobile devices are increasingly becoming more dominant in helping students learn information instantly anywhere at any time. It may be too soon to assume that students are using the smartphones solely for their learning but it is evident that smartphones are much more convenient for students to learn and give advice to patients on the go than any other device on the market today, with the support of tools like apps. Such convenience may turn into addiction and it may become impossible to tear away from mobile learning even in the classroom. Especially, now that there is evidence that students are using mobile devices in the classroom, with the approval of their respected tutors.

The study shows that although in the past dental educators have been great facilitators and planners in spreading the knowledge of dentistry, they may now need training to keep up with the new technology. With the fast paced new generation, tutors may need to regain their authority and demand training and further development to keep up with the latest technology.

There is an all-embracing use, by both tutors and students of mobile learning tools such as instant messaging, cloud based platforms, E-books, mobile apps etc. The findings indicate an elevated level of contentment with Instant messaging (IM) use in education compared to previous studies. Learners are keen on making such tools are more permanent part of their learning but not without the approval of their respected tutors. Institutions should be aware of such changes and look to adapt their learning practices to the IM technology.

Students are keen on harnessing new technology and tools, whereas tutors will only accept such changes if they see pedagogical improvements. The linking in of IM to other social media tools merits further work. The group work function of the IM apps and cloud based platforms allows students to promote them throughout the year. Students want to communicate with tutors instantly and want to know that tutors have acknowledged their messages. The present commercial apps for smart phones make such links easy and inexpensive. Accessibility is the major advantage and the message for institutions is be aware and adapt to such changes.

The results show that students may not have adequate skills and knowledge to search for, evaluate and synthesis evidence based information on the internet, despite this being one of the most fundamental issues in higher education. Both tutors and students agree that universities need to acknowledge this and implement training workshops etc. to ensure that students are not only accessing evidence based information on paper, but can differentiate between evidence based and non-evidence based apps, YouTube videos, e-books etc.

Tutors are keen on using new tools for teaching and research; however they would like to see a collaborative effort to ensure that both students and tutors are equally involved in any new implementations. The majority of students agree on harnessing new technology and related electronic/mobile tools, tutors on the other hand show a difference in opinion. Some tutors are not happy with changing or adding anything new to the traditional way of teaching dentistry whereas other tutors are suggesting exciting and innovative ideas. Some staff members are afraid of being left behind in the fast paced development of educational technology, and would like other tutors to share their experiences and recommendations on a regular basis.

A substantial part of the research concentrated on the use of SNS by dental students, practitioners and tutors. Social media sites online and SNS mobile friendly apps will keep evolving and competing to give the user a better experience every time. Everyone, including dental students/ tutors and practitioners should be able to enjoy Social networking sites (SNS). The generation and age gap between students and dentists/tutors mentioned in the past seems to be a minor concern now as lately, both students and professional seem to be equally getting a grasp of SNS. The main uses of SNS by dental students and professionals are to share interests, build and maintain relationships and stay more connected to the world. However, it is the responsibility of students/ professionals to now take on board the recently introduced GDC guidelines, and manage their actions on SNS whilst keeping up the 'e-professional aura'. Although tutors have shown reservations when using SNS as professionals, students seem to be much more care-free and open about what they post on SNS. In order to avoid actions being taken against professionals and students or risks against their careers, guidelines need to be taken very seriously.

6.2 Limitations

Although this research was carefully prepared, there is still some awareness of its limitations and shortcomings. First of all, the research was conducted over 3 years, which did not allow the researcher to investigate all of the students in the dental school. It also did not allow any comparisons between different dental schools in the UK or internationally. It would be better if it was done over a longer time period.

The number of students and tutors involved in this research is small. Only 6 faculty members and 20 students were interviewed. If there was more time, more tutors and students would have been interviewed to gain a greater insight in to the use of electronic/mobile learning technologies. A larger sample may have enabled more in-depth comparisons between the different attitudes towards and uses of platforms and devices. This could have been improved by conducting focus groups at the beginning, to understand the depth of the different attitudes, and this could have indicated the number of the sample size to aim for.

Another shortcoming of the participants included in the study is that tutors who were selected for the interviews, were selected based on another faculty member's judgement. Purposeful sampling does not allow the research to represent the entire population, or the dental school. Since a small sample has been used, any small variations in the sample could have caused deviance in the results. The selection conditions used by the faculty members could have been arbitrary and was subjective. If there was more time, a probabilistic sampling technique would have been used to ensure that the sample represents the population well. Overall, this research cannot be generalised to dental education in other environments both nationally and internationally.

When the questionnaires were completed, students were in a classroom environment, with their tutors present at the time. This may have affected their responses in the questionnaire. They may be hesitant or biased when providing answers related to their education.

The purpose of the study and some of the questions had to be explained to the students and tutors in the interviews and during questionnaire distribution. This has 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.

6.3 Recommendations

It is the responsibility of universities and authorities to ensure that both students and tutors receive the training they need to keep up with the ever evolving educational technology.

Tutors and students have many concerns, which need to be acknowledged and addressed.

Some of the queries which have become apparent through the research and other areas which need further attention include:

- What are the policies regarding students recording lectures and posting them on cloud based platforms?
- Where do the boundaries lie when communicating with students on SNS and instant messaging tools?
- Why are students and practitioners not adhering to GDC guidelines when using SNS?
- Why are some tutors adopting electronic tools, software's and platforms, whereas other tutors do not want to acknowledge them?
- How can we avoid the disruption caused by technology, of academic teaching practices and students learning in dentistry?
- Why are students finding it difficult to find evidence based and peer reviewed material?

6.4 Suggestions for further research

- The use of SNS in dental education, as a blended way of learning needs further research but current evidence shows that much attempt has been made, most recently, by authorities and organisations to help students and practitioners overcome the challenges on SNS through step by step guidelines. However, there are still examples of unprofessional behaviour on SNS and this needs some attention.
- There is little evidence or research on the use of SNS by patients and their activities in relation to their health and communication with practitioners. There is a need for urgent research on this as in recent months; there have been many cases of unprofessional and inappropriate behaviour on SNS related to patients.
- Further in depth interviews will determine if mobile learning has the potential to be shifted to mobile education but this will only be possible once universities put together a system where mobile learning tools such as apps are regularly updated and evidence based material is provided for students to access.
- There is a difference of opinion in the use of mobile instant messaging between students and tutors. If tools like WhatsApp become a common way of communication, it will become the responsibility of universities to ensure that such tools are integrated in the best way in to pedagogical and dental educational goals. This may be achieved through further work identifying the pros and cons and user properties.

- Further work is required to examine the use of cloud based computing platforms such as DropBox by students and tutors. Students uploading videos and recordings of their lectures need further exploration. Security and privacy issues need to be addressed and may need re-defining.
- 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.
- There are a number of beliefs amongst tutors which need to be acknowledged and managed such as the fear of traditional teaching methods being replaced with electronic/mobile technology, constant connection with students through instant messaging, tutor's lectures being shared without their knowledge and the use of mobile devices in the classroom becoming a distraction in their teaching.

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APPENDICES

APPENDIX I: QUESTIONNAIRE

1.

I am currently investigating E-learning and its use within the dental school and dentistry overall as part of my Ph.D. My supervisors Prof Damien Walmsley and Dr. Kirsty Hill have helped me formulate this questionnaire. The aims of the questionnaire are to gain a better insight into how new technology is being used to help students with their studies. Devices such as smart phones, iPads, laptops etc are being looked into and your answers may help create a system which will guide students for many years to come. The award winning Ecourse at the school of dentistry is an example of the efforts of faculty and students working together to enhance a better learning experience at the university of Birmingham. Your responses to the questionnaire are very valuable. Thank you for taking your time to fill this in.

Please limit your answers to three or two per question when prompted.

Questionnaire on the internet and Dentistry

1. Are you?

☐ Male

☐ Female

2. How old are you?

☐ 18-19

☐ 19-20

☐ 21-25

☐ 25+

3. Which year of study are you in?

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

4. Do you have access to the Internet?

☐ Yes

☐ No

If you answered yes to using the Internet please answer the following questions:

5. In a typical weekday, do you use the Internet most often for Dental course, for personal reasons, or about an equal amount on both?

- ☐ Much more often for dental course
- ☐ Somewhat more often for dental course
- ☐ About an equal amount for dental course and personal reasons
- ☐ Somewhat more often for personal reasons
- ☐ Much more often for personal reasons

6. Do you use an E-Book reader?

if yes, please go to question 8 on page 4. if no, please carry on.

- ☐ Yes
- ☐ No

3.

7. Which of the following devices is your FIRST choice to use to connect to the Internet for searching information?

- ☐ Smart phone
- ☐ Desktop computer
- ☐ Laptop computer
- ☐ I Pad/computer tablet
- ☐ Other (please specify)

FOR THE ABOVE QUESTION, PLEASE GO TO THE RELEVANT QUESTIONS AND PAGES ACCORDING TO THE ANSWER YOU GAVE.

Smart phone.. go to page 6 question 14.

Desktop computer... go to page 18 question 40.

Laptop computer... go to page 18 question 40.

IPad/ computer tablet... go to page 12 question 27.

.

4.

8. Which E-Book reader do you have?

- ☐ Amazon Kindle: Kindle, Kindle Touch, Kindle Fire
- ☐ Barnes & Noble Nook: Nook 1st Edition, Nook Simple Touch, Nook Color, Nook Tablet
- ☐ Kobo
- ☐ Sony Reader

Other (please specify)

9. How often do you use your E-Book reader?

- ☐ twice or more times a day
- ☐ once Every day
- ☐ Two to three times a week
- ☐ Once a Week
- ☐ Never
- ☐ Other (please specify)

10. Where do you most prefer to be when you use the E-Book reader, please choose THREE top choices?

- ☐ University/faculty
- ☐ Friend's home
- ☐ Home
- ☐ Library
- ☐ Bookstore
- ☐ Work
- ☐ Outside of university (coffee shop, pub etc)
- ☐ Anywhere with connection
- ☐ none
- ☐ Other (please specify)

11. Do any of the following stop you from using the E-Book reader, please limit your answer to THREE choices?

- ☐ Cost of use
- ☐ Internet connection
- ☐ No wireless available
- ☐ Battery dies too quickly
- ☐ No network coverage
- ☐ Limited screen view
- ☐ Loading takes too long
- ☐ Navigation problems (scrolling takes too long)
- ☐ Confidence in the accuracy of information
- ☐ Confidence in the ability to use
- ☐ None
- ☐ Other (please specify)

12. The availability of the E-Book reader has had a positive impact on your dental academic experience in general?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ Dont know/ not sure
- ☐ none
- ☐ Other (please specify)

13. Are you reading more dental related books etc because of the E-Book reader or less?

- ☐ More
- ☐ Less
- ☐ Equal amount
- ☐ None

ONCE COMPLETED THIS SECTION, PLEASE GO BACK TO QUESTION 7 ON PAGE 3.

5. section 2: SMART PHONES

14. Which phone do you have?

- ☐ Apple
- ☐ Blackberry
- ☐ Android
- ☐ Windows
- ☐ None
- ☐ Other (please specify)

15. How often do you use your mobile phone to access the Internet?

- ☐ twice or more times a day
- ☐ once Every day
- ☐ Two to three times a week
- ☐ Once a Week
- ☐ Never
- ☐ Other (please specify)

16. Where do you most prefer to be when you use the Internet on your phone, please choose THREE top choices?

- ☐ Home
- ☐ Library
- ☐ Bookstore
- ☐ University/faculty
- ☐ Friend's home
- ☐ Outside of university (coffee shop, pub etc)
- ☐ Work
- ☐ Anywhere with connection
- ☐ none
- ☐ Other (please specify)

17. Which of the following do you prefer to use for finding information?

☐ Mobile phone apps

☐ Mobile websites

☐ both

☐ none

Other (please specify)

18. Do any of the following stop you from using the Internet on your mobile phone, please limit your answer to THREE choices?

☐ Cost of use

☐ Internet connection

☐ No wireless available

☐ Battery dies too quickly

☐ No network coverage

☐ Limited screen view

☐ Loading takes too long

☐ Navigation problems (scrolling takes too long)

☐ Confidence in the accuracy of information

☐ Confidence in the ability to use

☐ None

☐ Other (please specify)

19. Which of the following top THREE sites do you use most to access dental subjects on your smart phone?

- ☐ Wikipedia
- ☐ Google
- ☐ Google scholar
- ☐ Ecourse
- ☐ PubMed
- ☐ science direct
- ☐ Organisations
- ☐ Commercial sites
- ☐ Personal sites
- ☐ Search engines
- ☐ University sites
- ☐ None
- ☐ Other (please specify)

20. which of the following top TWO Internet communication tools do you use most on your mobile phone?

- ☐ Bloggs
- ☐ Email
- ☐ Instant messaging
- ☐ Web boards
- ☐ Chat rooms
- ☐ Social networks
- ☐ Newsgroups
- ☐ None
- ☐ Other (please specify)

21. Which of the following top THREE apps are most useful to you on your smart phone?

- ☐ Utility apps (calculate, convert, translate, etc.)
- ☐ Entertainment apps (movie trailers, celebrity gossip, radio station guides, etc.)
- ☐ Game apps (puzzles, charades, etc.)
- ☐ News apps (local news, national headlines, technology announcements, etc.)
- ☐ Productivity apps (calendar, to do list, price checker, etc.)
- ☐ Search tool apps (directions, phone numbers, recipes, etc.)
- ☐ Social networking apps (location check-ins, friend status updates, etc.)
- ☐ Sports apps (sports schedules, scores, headlines, etc.)
- ☐ Travel apps (airplane tickets, tourist guides, public transportation info, etc.)
- ☐ Weather apps (local forecasts, natural disaster updates, etc.)
- ☐ None
- ☐ Other (please specify)

22. Which of the following top THREE mobile computing/communication activities do you regularly engage in on your smart phone?

- ☐ Download and listen to podcasts/audio books
- ☐ Download and read e-books/ print based content
- ☐ Download and view streaming movies/video clips
- ☐ Send and receive email
- ☐ Send and receive instant messages (IMs)
- ☐ Transfer files from one place to another via portable storage available on phone or iPad (pen drives)
- ☐ Play interactive games via internet
- ☐ Transfer photo or other data
- ☐ None
- ☐ Other (please specify)

23. Which of the following THREE would you find useful on your phone to access at anytime either as an app or weblink?

- ☐ Multiple choice questions
- ☐ Dictionary for dental education
- ☐ Stress management for students/staff (yoga etc)
- ☐ Description and illustrations of tools in dental practice
- ☐ Advice for you to give to patients to over come dental fear
- ☐ Help with power point presentations and multimedia effects
- ☐ Help with oral presentations and tests
- ☐ Personal portofolio
- ☐ Instant messaging and social networking with fellow students/staff
- ☐ Fun activites and games (e.g crack the dental puzzle of the week)
- ☐ staff contact details and staff autobiographies
- ☐ none
- ☐ Other (please specify)

24. The availability of Internet on Smart phone has had a positive impact on your dental academic experience in general?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ Dont know/ not sure
- ☐ none
- ☐ Other (please specify)

25. Are there any other comments that you would like to make about the use of the intertent on your smart phone in dentistry?

5

26. Which of the following devices would be your SECOND choice to use to connect to the Internet for searching information? (if you have already made your two choices for devices then please tick the appropriate answer from the list below, and end the survey)

- ☐ iPad/computer tablet
- ☐ Desktop computer
- ☐ Laptop computer
- ☐ none, already chose two devices
- ☐ Other (please specify)

FOR THE ABOVE QUESTION, PLEASE GO TO THE RELEVANT QUESTIONS AND PAGES ACCORDING TO THE ANSWER YOU GAVE.

Desktop computer... go to page 18 question 40.

Laptop computer... go to page 18 question 40.

IPad/ computer tablet... go to page 12 question 27.

6. section 3: Ipad/computer tablets

27. which Ipad/computer tablet do you have?

☐ Ipad 1

☐ Ipad 2

☐ Ipad 3

☐ all

☐ none

Other (please specify)

28. How often do you use your Ipad/computer tablet to access the Internet?

☐ twice or more times a day

☐ once Every day

☐ Two to three times a week

☐ Once a Week

☐ Never

☐ Other (please specify)

29. Where do you most prefer to be when you use the Internet on your Ipad/computer tablet?

☐ Library

☐ Anywhere with connection

☐ University/faculty

☐ Home

☐ Bookstore

☐ Friend's home

☐ Outside of university (coffee shop, pub etc)

☐ Work

☐ none

☐ Other (please specify)

30. Which of the following do you prefer to use for finding information?

- ☐ Ipad /computer tablet apps
- ☐ internet link on Ipad/ computer tablet
- ☐ both
- ☐ none

Other (please specify)

31. Do any of the following stop you from using the Internet on your Ipad/computer tablet, please limit your answer to top THREE?

- ☐ Cost of use (cost of apps)
- ☐ Internet connection
- ☐ No wireless available
- ☐ Battery dies too quickly
- ☐ Limited screen view
- ☐ Loading takes too long
- ☐ Navigation problems (scrolling takes too long)
- ☐ Confidence in the accuracy of information
- ☐ Confidence in the ability to use
- ☐ None
- ☐ Other (please specify)

32. Which of the following top THREE sites do you use most to access dental subjects on your Ipad/ computer tablet?

- ☐ Google scholar
- ☐ Medline
- ☐ Google
- ☐ Wikipedia
- ☐ PubMed
- ☐ science direct
- ☐ Organisations
- ☐ Commercial sites
- ☐ Personal sites
- ☐ Search engines
- ☐ University sites
- ☐ None
- ☐ Other (please specify)

33. which of the following top TWO Internet communication tools do you use most on your Ipad/ computer tablet?

- ☐ Blogs
- ☐ Email
- ☐ Instant messaging
- ☐ Web boards
- ☐ Chat rooms
- ☐ Social networks
- ☐ Newsgroups
- ☐ None
- ☐ Other (please specify)

34. Which top THREE of the following apps are most useful to you on your Ipad/computer tablet?

- ☐ Utility apps (calculate, convert, translate, etc.)
- ☐ Entertainment apps (movie trailers, celebrity gossip, radio station guides, etc.)
- ☐ Game apps (puzzles, charades, etc.)
- ☐ News apps (local news, national headlines, technology announcements, etc.)
- ☐ Productivity apps (calendar, to do list, price checker, etc.)
- ☐ Search tool apps (directions, phone numbers, recipes, etc.)
- ☐ Social networking apps (location check-ins, friend status updates, etc.)
- ☐ Sports apps (sports schedules, scores, headlines, etc.)
- ☐ Travel apps (airplane tickets, tourist guides, public transportation info, etc.)
- ☐ Weather apps (local forecasts, natural disaster updates, etc.)
- ☐ None
- ☐ Other (please specify)

35. Which of the following top THREE mobile computing/communication activities do you regularly engage in on your Ipad/computer tablet?

- ☐ Download and listen to podcasts/audio books
- ☐ Download and read e-books/ print based content
- ☐ Download and view streaming movies/video clips
- ☐ Send and receive email
- ☐ Send and receive instant messages (IMs)
- ☐ Transfer files from one place to another via portable storage available on phone or iPad (pen drives)
- ☐ Play interactive games via internet
- ☐ Transfer photo or other data
- ☐ None
- ☐ Other (please specify)

36. Which of the following top THREE would you find useful on your Ipad/computer tablet to access at anytime either as an app or weblink?

- ☐ Multiple choice questions
- ☐ Dictionary for dental education
- ☐ Stress management for students/staff (yoga etc)
- ☐ Description and illustrations of tools in dental practice
- ☐ Advice for you to give to patients to over come dental fear
- ☐ Help with power point presentations and multimedia effects
- ☐ Help with oral presentations and tests
- ☐ Personal portofolio
- ☐ Instant messaging and social networking with fellow students/staff
- ☐ Fun activites and games (e.g crack the dental puzzle of the week)
- ☐ staff contact details and staff autobiographies
- ☐ none
- ☐ Other (please specify)

37. The availability of Internet on your Ipad/computer tablet has had a positive impact on your dental academic experience in general?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ Dont know/ not sure
- ☐ none
- ☐ Other (please specify)

38. Are there any other comments that you would like to make about the use of the internet on your Ipad/computer tablet?

5

39. Which of the following devices would be your SECOND choice to use to connect to the Internet for searching information? (if you have already made your two choices for devices then please tick the appropriate answer from the list below, and end the survey)

- ☐ Laptop computer
- ☐ Smart phone
- ☐ Desktop computer
- ☐ None already chose two
- ☐ Other (please specify)

FOR THE ABOVE QUESTION, PLEASE GO TO THE RELEVANT QUESTIONS AND PAGES ACCORDING TO THE ANSWER YOU GAVE.

Smart phone.. go to page 6 question 14.

Desktop computer... go to page 18 question 40.

Laptop computer... go to page 18 question 40.

7. section 4: DESKTOP COMPUTERS/LAPTOPS

if you answered desktop and laptop computers please fill out section 4.

40. Do you have a laptop or desktop computer?

☐ Laptop

☐ Desktop

☐ both

41. How often do you use your laptop/ desktop computer to access the Internet?

☐ twice or more times a day

☐ once Every day

☐ Two to three times a week

☐ Once a Week

☐ Never

☐ Other (please specify)

42. Where do you most prefer to be when you use the Internet on your laptop/desktop, please limit your answer to only THREE choices?

☐ Outside of university (coffee shop, pub etc)

☐ Work with desktop computer

☐ University/faculty desktop computer

☐ Home with desktop computer

☐ work with laptop computer

☐ Bookstore

☐ Library

☐ home with laptop

☐ Anywhere with connection

☐ Friend's home

☐ University/faculty with laptop

☐ none

☐ Other (please specify)

43. Do any of the following stop you from using the Internet on your laptop/desktop, please limit your choice to THREE ?

- ☐ no wireless available
- ☐ viruses
- ☐ Internet connection
- ☐ computer crashes
- ☐ Loading takes too long
- ☐ Navigation problems (scrolling takes too long)
- ☐ Confidence in the accuracy of information
- ☐ Confidence in the ability to use
- ☐ None
- ☐ Other (please specify)

44. Which of the following top THREE sites do you use most to access dental subjects?

- ☐ Google scholar
- ☐ wikipedia
- ☐ Google
- ☐ Medline
- ☐ PubMed
- ☐ science direct
- ☐ Organisations
- ☐ Commercial sites
- ☐ Personal sites
- ☐ Search engines
- ☐ University sites
- ☐ None
- ☐ Other (please specify)

45. which of the following top TWO Internet communication tools do you use most on your desktop/laptop computer?

- ☐ Blogs
- ☐ Email
- ☐ Instant messaging
- ☐ Web boards
- ☐ Chat rooms
- ☐ Social networks
- ☐ Newsgroups
- ☐ None
- ☐ Other (please specify)

46. The availability of Internet on your laptop/desktop has had a positive impact on your dental academic experience in general?

- ☐ Strongly agree
- ☐ Agree
- ☐ Neutral
- ☐ Disagree
- ☐ Strongly Disagree
- ☐ Dont know/ not sure
- ☐ none
- ☐ Other (please specify)

47. Are there any other comments that you would like to make about the use of the internet on desktop computers/ laptops in dentistry?

5

48. Which of the following devices would be your SECOND choice to use to connect to the Internet for searching information? (if you have already made your two choices for devices then please tick the appropriate answer from the list below, and end the survey)

- ☐ Smart phone
- ☐ Ipad/computer tablet
- ☐ None already chose two
- ☐ Other (please specify)

FOR THE ABOVE QUESTION, PLEASE GO TO THE RELEVANT QUESTIONS AND PAGES ACCORDING TO THE ANSWER YOU GAVE.

Smart phone.. go to page 6 question 14.

IPad/ computer tablet... go to page 12 question 27.



APPENDIX II: TOPIC GUIDE (Student interviews)

ELECTRONIC LEARNING AND DENTISTRY INTERVIEW TOPIC GUIDE

AIMS AND OBJECTIVES:

The overall objective of this interview is to understand E-learning and its use within the dental school and dentistry overall. The aims are to gain a better insight into how new technology is being used to help students with their studies. Devices such as smart phones, iPads, laptops etc are being looked into. The award winning Ecourse at the school of dentistry is an example of the efforts of faculty and students working together to enhance a better learning experience at the university of Birmingham. The follow up interviews will help better understand some of the responses gathered through the questionnaire.

Introduction

Aim: introduce the research and set the context for the proceeding discussion.

- Introduce self and supervisors helping
- Introduce study: what it's for, what it is about
- Talk through key points:
 - Purpose and length of the interview
 - Voluntary nature of participation and right to withdraw
 - Reasons for recording interview
 - Reasons for recording interview
 - Confidentiality, and how findings will be reported
 - Any questions they have?

1. Background of student

Aim: to introduce respondent and highlight background issues that may influence their use of the internet.

- Age
- Year of study
- Access to the internet?

2. Reasons for using the internet

Aim: to find out if student is using the internet for dental course or for personal reasons most?

Do you use the internet more for personal or dental course reasons?


Why do you think you use the internet most for personal/dental reasons?

Personal reasons

- Social networking
- Shopping
- Games etc

Dental course

- Researching
- Studying (Ecourse)
- Watching practical videos
- Listening to lectures



PROBE
FULLY for
all
questions

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

-Why is that?

3. Top two choices of devices

Aim: to find out which device student is using as first and second choice to connect to the internet and search for information.

Which of the following is your first and second choice of device to use when connecting to the internet and searching for information? Laptops, smartphones, ipads, desktop computers?

Reasons for first choice

Reasons for second choice

- Convenient why?
- For what reasons do you use the devices?
- Which device is best for different types of activities
 - Advantages and disadvantages of each device

Is there anything you would change about the way you currently use your devices to get the best out of them for your studies?

Why? How?

4. Internet communication tools

Aim: which internet communication tools do you use most often on your devices?

LIST: blogs, emails, instant messaging, webboards, chatrooms, social networks, newsgroups.

- Which device do you use all these different types of tools?
- Any reasons for the choice of device for each activity?

Who do you communicate with the most?

Do you use different devices and different tools for staying in touch with different groups of people?

- Tutors
- Students
- Friends
- family

5. phones and apps

Aim: usage of phones and app tools for different reasons.

What phone do you own?

What kind of different apps do you use on your phone?

-study related?

- Personal reasons?
- Communication?

If they use apps for studies

- Evidence based?
- Where do they download them from?
- Pay for them?
- Any apps you will find useful for studies?

6. Mobile computing/communication activities

Aim: which mobile computing/communication activities do you engage in on your Smartphone?

LIST: podcasts, e-books, videos, email, instant messaging, transfer files from one place to another via portable storage (pen drives), play interactive games via internet, transfer photos etc.

- **Why are they useful?**
- **Anything else you would use more often in the future?**
- **Anything that helps you with your studies through these activities?**

7. Frequency of use

Aim: how often do you use your device to access the internet?

- **Any reason why?**
- **Where Do you use the internet to search for information mostly**

8. Barriers

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

LIST: cost of use, internet connection, no wireless, battery life, no network coverage, limited screen view, loading takes too long, navigation problems, confidence in ability to use etc

- **Why do you think this is?**
- **Any ways that this could be prevented?**

How do you trust the information you find on the internet?

Is the information evidence based and what does evidence based mean to you?

9. Suggestions

Aim: get students thoughts on how to improve dental studies via devices and tools

What would encourage you to use your device more often for dental course and research?

- **Reflect on any barriers discussed earlier**
- **Teachers help?**
- **Training?**

NEXT STEPS

- Thank you for participating. Check if student has any remaining questions about the research.
- Reassure about confidentiality and anonymity.
- Ask if they would like to be informed of the outcomes of the research (email address if that is their preferred way of being informed).

APPENDIX III: TRANSCRIPT TEMPLATE (student interviews)

- Introduce yourself, your project, what it's for, length of interview, you have a right to withdraw at anytime and its voluntary, im recording because it helps me concentrate better on you and not distract you by writing notes, the answers you give will be used as part of my research and you can have the results too if you want.

1. Background of student: age, year, access to the internet?
2. Do you use the internet more for personal or dental course reasons?
3. Which of the following is your first and second choice of device to use when connecting to the internet and searching for information?
4. Which internet communication tools do you use most often on your devices out of this list?
5. What do you think can improve your communication with your tutors other than the email?
6. What phone do you own?
What kind of different apps do you use on your phone?
7. Which mobile computing/communication activities do you engage in on your Smartphone?

LIST: podcasts, e-books, videos, email, instant messaging, transfer files from one place to another via portable storage (usb), play interactive games via internet, transfer photos etc.

8. How often do you use your device to access the internet?

Any reason why?

9. Where do you use the internet to search for information mostly?

List: Home, Anywhere with a connection, University faculty, work, outside of university (coffee shop, pub etc), library, friend's home, bookstore, other?

10. Barriers- Is there anything that may prevent you from using your device for studies?

LIST: cost of use, internet connection, no wireless, battery life, no network coverage, limited screen view, loading takes too long, navigation problems, confidence in ability to use etc

11. What would encourage you to use your device more often for dental course and research?

- Reflect on any barriers discussed earlier
- Teachers help?
- Training?

12. is there anything else you would like to add to this interview about your dental studies and technology/devices?

APPENDIX IV: TOPIC GUIDE (Tutor interviews)

ELECTRONIC LEARNING AND DENTISTRY INTERVIEW TOPIC GUIDE- ELITE INTERVIEWS

AIMS AND OBJECTIVES:

The overall objective of this interview is to understand E-learning/mobile learning and its use within the dental school and dentistry overall. The aims are to gain a better insight into how new technology is being used to help students and tutors. Devices such as smart phones, iPads, laptops etc are being looked into. The interviews will help better understand some of the responses gathered from students through prior interviews and by addressing similar questions to the tutors, there will be a better understanding of the status of electronic/mobile learning at the dental school.

Introduction

Aim: introduce the research and set the context for the proceeding discussion.

- Introduce self and supervisors helping
- Introduce study: what it's for, what it is about
- Talk through key points:
 - Purpose and length of the interview
 - Voluntary nature of participation and right to withdraw
 - Reasons for recording interview
- Reasons for recording interview
- Confidentiality, and how findings will be reported
- Any questions they have?

10. Background of Tutor

Aim: to introduce respondent and highlight background issues that may influence their use of the internet.

- Age
- Subjects taught
- Access to the internet?

11. Reasons for using the internet

Aim: to find out if tutor is using the internet for teaching purposes/Research or for personal reasons most?

Do you use the internet more for personal reasons or Dental teaching/research?


Why do you think you use the internet most for personal/dental reasons?

Personal reasons

- Social networking
- Shopping
- Games etc

Dental course

- Researching
- Teaching
- Ecourse uploading



PROBE
FULLY for
all
questions

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

- Why is that?

12. Top two choices of devices

Aim: to find out which device tutor is using as first and second choice to connect to the internet and search for information.

Which of the following is your first and second choice of device to use when connecting to the internet and searching for information? Laptops, smartphones, ipads, desktop computers?

Reasons for first choice

Reasons for second choice

- Convenient why?
- For what reasons do you use the devices?
- Which device is best for different types of activities
- Advantages and disadvantages of each device

Is there anything you would change about the way you currently use your devices to get the best out of them for teaching?

Why? How?

13. Internet communication tools

Aim: which internet communication tools do you use most often on your devices?

LIST: blogs, emails, instant messaging, webboards, chatrooms, social networks, newsgroups.

- Which device do you use all these different types of tools?
- Any reasons for the choice of device for each activity?

Who do you communicate with the most?

Do you use different devices and different tools for staying in touch with different groups of people?

- Tutors
- *Students*
- Friends
- family

-What do you think can improve your communication with your students other than the email?

-Would you consider using instant messaging to communicate with students?

-Do you have any comments regarding the use of Social networking sites by students and tutors?

14. phones and apps

Aim: usage of phones and app tools for different reasons.

What phone do you own?

What kind of different apps do you use on your phone?

- Teaching/research related?
- Personal reasons?
- Communication?

If they use apps for dental course teaching/research

- Evidence based?
- Where do they download them from?

15. Mobile computing/communication activities

Aim: which mobile computing/communication activities do you engage in on your Smartphone?

LIST: podcasts, e-books, videos, email, instant messaging, transfer files from one place to another via portable storage (pen drives), play interactive games via internet, transfer photos etc.

- **Why are they useful?**
- **Anything else you would use more often in the future?**
- **Anything that helps you with your teaching/research through these activities?**

16. Frequency of use

Aim: how often do you use your device to access the internet?

- **Any reason why?**
- **Where Do you use the internet to search for information mostly**

17. Barriers

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

LIST: cost of use, internet connection, no wireless, battery life, no network coverage, limited screen view, loading takes too long, navigation problems, confidence in ability to use etc

- **Why do you think this is?**
- **Any ways that this could be prevented?**

18. Suggestions

Aim: get tutor thoughts on how to improve dental studies via devices and tools

What would encourage you to use your device more often for dental course teaching and research?

- **Reflect on any barriers discussed earlier**
- **further help?**
- **Training?**

19. Extra activities

Aim: Get tutors to think about any extra activities that they or thier students are involved in which are related to mobile/electronic learning and technology in general.

Do you know about any extra activities students are engaged in part of your class or outside your classroom for learning?

Do you have any comments regarding the use of DropBox/recording and loading on DropBox and students?

NEXT STEPS

- Thank you for participating. Check if tutor has any remaining questions about the research.
- Reassure about confidentiality and anonymity.
- Ask if they would like to be informed of the outcomes of the research (email address if that is their preferred way of being informed).

APPENDIX V: TRANSCRIPT TEMPLATE (Tutor interviews)

Interview

1. Introduce yourself, your project, what it's for, length of interview, you have a right to withdraw at anytime and its voluntary, I'm recording because it helps me concentrate better on you and not distract you by writing notes, the answers you give will be used as part of my research and you can have the results too if you want.
2. Background of Tutor: age, subject taught/research, access to the internet?

3. **Do you use the internet more for personal or dental course reasons?**
Why do you think you use the internet most for personal/dental reasons?
 - Personal reasons: Social networking, Shopping, Games etc.
 - Dental course: Researching, teaching

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

- Why is that?

4. **Which of the following is your first and second choice of device to use when connecting to the internet and searching for information?**
Laptops, smartphones, ipads, desktop computers
 - Reasons for first choice
 - Reasons for second choice
 - Convenient why?
 - For what reasons do you use the devices?
 - Which device is best for different types of activities
 - Advantages and disadvantages of each device
 - **Is there anything you would change about the way you currently use your devices to get the best out of them for your studies?**
 - **Why? How?**
 -
5. **Which internet communication tools do you use most often on your devices out of this list?**

LIST: blogs, emails, instant messaging, webboards, chatrooms, social networks, newsgroups.

- Which device do you use all these different types of tools?
- Any reasons for the choice of device for each activity?

Who do you communicate with the most?

Do you use different devices and different tools for staying in touch with different groups of people?

- **Other tutors**
- **Students**
- **Friends**
- **family**

What do you think can improve your communication with your students other than the email?

6. **Would you consider using instant messaging to communicate with students?**

7. Do you have any comments regarding the use of Social networking sites by students and tutors?

8. What phone do you own?

What kind of different apps do you use on your phone?

-dental course related?- Personal reasons?- Communication?

- Are they Evidence based?
- Where do they download them from?

9. Which mobile computing/communication activities do you engage in on your Smartphone?

LIST: podcasts, e-books, videos, email, instant messaging, transfer files from one place to another via portable storage (usb), play interactive games via internet, transfer photos etc.

- Why are they useful?
- Anything else you would use more often in the future?
- Anything that helps you with teaching/research through these activities?

10. How often do you use your device to access the internet?

Any reason why?

Where do you use the internet to search for information mostly?

List: Home, Anywhere with a connection, University faculty, work, outside of university (coffee shop, pub etc), library, friend's home, bookstore, other?

Why?

11. Barriers- Is there anything that may prevent you from using your device for studies?

LIST: cost of use, internet connection, no wireless, battery life, no network coverage, limited screen view, loading takes too long, navigation problems, confidence in ability to use etc

-Why do you think this is? - Any ways that this could be prevented

12. What would encourage you to use your device more often for teaching dental course and research?

- Reflect on any barriers discussed earlier
- Further help?
- Training?

13. Do you know about any extra activities students are engaged in part of your class or outside your classroom for learning?

14. Do you have any comments regarding the use of DropBox/recording and loading on DropBox and students?

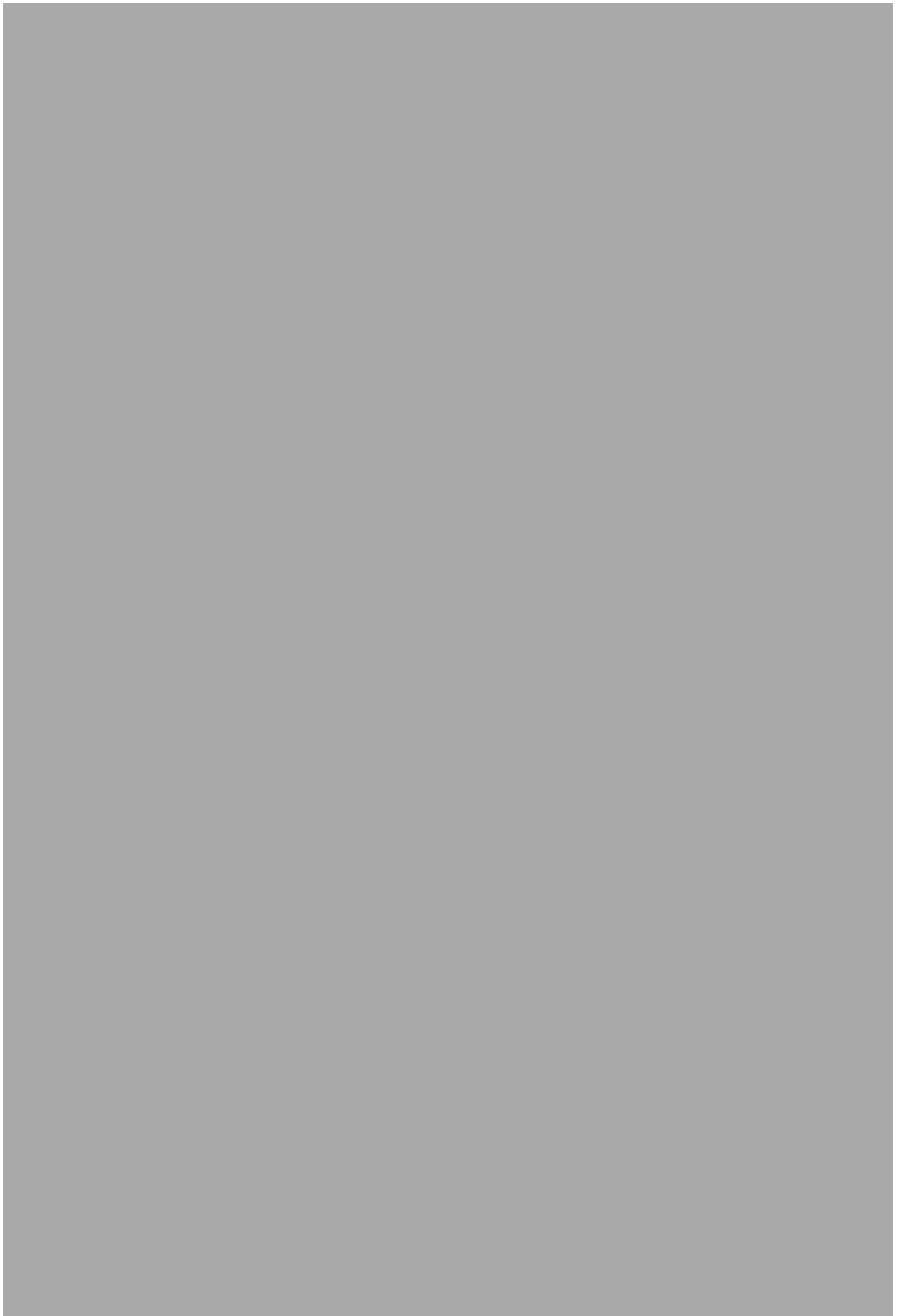
End of interview:

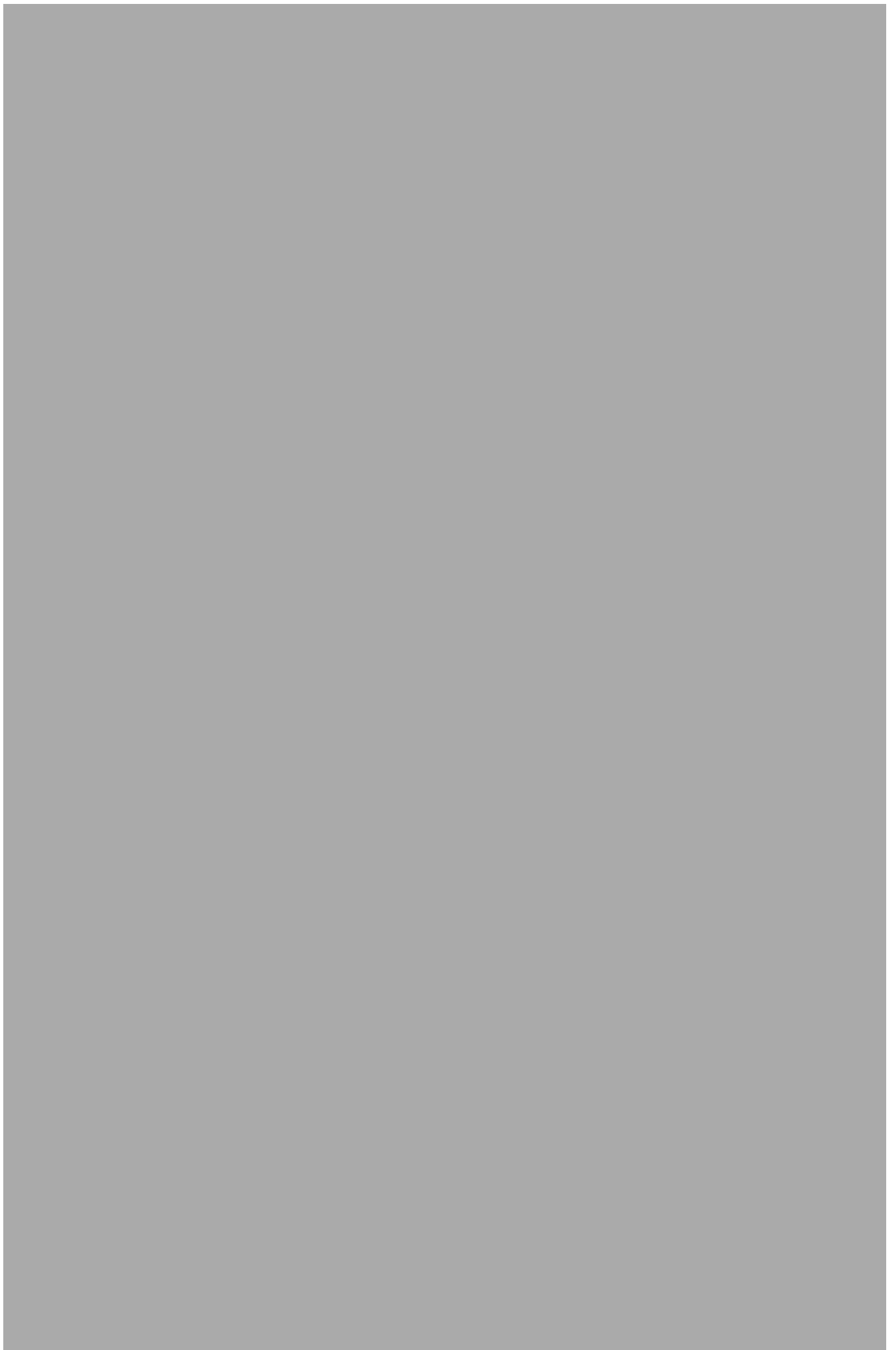
- Thank you for participating. Check if tutor has any remaining questions about the research.
- Reassure about confidentiality and anonymity.
- Ask if they would like to be informed of the outcomes of the research (email address if that is their preferred way of being informed).

APPENDIX VI: ETHICAL APPROVAL FORM

[Redacted content]







The first part of the paper discusses the importance of the research and the objectives of the study. It then proceeds to a literature review, highlighting the key findings of previous studies in this field. The methodology section describes the research design, data collection methods, and statistical analysis techniques used. The results section presents the findings of the study, and the discussion section interprets these findings in the context of the research objectives. Finally, the conclusion summarizes the main points and suggests areas for future research.

The study aims to explore the relationship between the independent variable and the dependent variable. The independent variable is defined as the factor that is manipulated or controlled by the researcher, while the dependent variable is the outcome or response that is measured. The research hypothesis predicts a positive correlation between the two variables.

The data was collected through a series of experiments and surveys. The experiments involved manipulating the independent variable and observing the resulting changes in the dependent variable. The surveys were used to gather self-reported data from a large sample of participants. The data was then analyzed using statistical software to determine the significance of the findings.

The results of the study indicate that there is a significant positive relationship between the independent variable and the dependent variable. This finding is consistent with the research hypothesis and provides support for the theoretical framework. The discussion section explores the implications of these findings and suggests potential applications in practice.

In conclusion, the study has successfully identified a positive relationship between the independent variable and the dependent variable. The findings have important implications for the field and suggest areas for further research. The study also highlights the importance of rigorous methodology and statistical analysis in conducting research in this area.

The first part of the paper discusses the importance of understanding the cultural context of the research. It highlights the need for researchers to be sensitive to the values and beliefs of the communities they are studying. This is particularly important in the field of education, where cultural differences can significantly impact learning outcomes. The paper then moves on to discuss the challenges of conducting research in culturally diverse settings. It notes that researchers often face difficulties in establishing rapport with participants and in interpreting their responses. To address these challenges, the paper suggests several strategies, including the use of local informants and the development of culturally appropriate research instruments. The final part of the paper discusses the importance of ethical considerations in cross-cultural research. It emphasizes the need for researchers to obtain informed consent from participants and to ensure that their research does not cause harm to the communities they are studying.





APPENDIX VII: DATA ANALYSIS SCREENSHOTS

Student interview data analysis (Screenshots 1-3)

Screenshot 1

Microsoft Excel - analysis of interviews STUDENTS						
	A	B	C	D	E	F
1	Respondants	Demographic Data	Access to the internet	Use of internet for personal or studies	Factors that may affect use of internet (studies and personal)	What would more for Dent
2	S1	age 22 in year 5	yes	More for Personal: Email, Facebook, Social network Dental: YouTube for Clips on Surgeries and Ecourse	More interactive software needed: watch vidoes, download them and stream them and lables to differentiate between things interactively. Podcasts: 'They should record lectures so i can play it in the car sort of thing'. pg2 ln5	if there was i at university
3	S2	age 22 year 3	yes	More for personal: Email and watching Tv as i dont haveTV. Dental: i dont really need it at the moment as it is mainly practical and not much research. I use the Ecourse alot and Dental update and emailing Tutors.	depends on work load, more work load means using more internet for me and if more of the studying was based online.	if more study electronic le internet at th better device load will incr clusters are r to be made.
4	S3	Age 18 year 1	yes	More for personal: social networking, surfing Dental: Ecourse	app and twitter link- 'maybe linking ecourse to more sort of like methods that students would use maybe having ecourse linked to twitter or something like or having ecourse like an app or something ' pg2 ln1.	more work le needs to giv on for resear
5	S4	age 18 year 1	yes	equally for both. For personal_ social media (twitter, facebook, youtube, flicker) , videos for studies- ecourse, journals, alot of reading demands at the moment so interent is the first choice.	as the course goes on, i have heard from other students that i will be using alot more internet for reading etc and ecourse demands.	more work le

Screenshot 2

	E	F	G	H
1	<p>Factors that may affect use of Internet (studies and personal)</p> <p>More interactive software needed: watch vidoes, download them and stream them and iables to differentiate between things interactively.</p> <p>Podcasts: 'They should record lectures so i can play it in the car sort of thing', pg2 ln5</p>	<p>What would encourage you to use the Internet more for Dental course and Research?</p> <p>if there was more Apps available and if the Wifi at university was better.</p>	<p>First and second choice of device and reasons</p> <p>First choice: Laptop- easy to type, comfortable and can carry around most of the time.</p> <p>used for essays as it has a bigger screen</p> <p>Second choice: Smartphone- can use instantly- 'Its just clinic when i don't undersntand or hanging around the building waiting to go home i could just check obvisoly when no patients are around', pg2 ln17</p> <p>used for little facts and instant information</p>	<p>Advantages and Disadvantages of both c</p> <p>laptops: Difficult to set up</p> <p>Smartphone: does not look professional</p>
2	<p>depends on work load, more work load means using more internet for me and If more of the studying was based online.</p>	<p>If more studying was based online so more electronic learning.</p> <p>Internet at the university needs improving and better devices should be provided. More work load will increase internet use and the computer clusters are not free alot so Improvements need to be made.</p>	<p>first choice: Laptop- first choice because phone slows down and wifi at home so its better and also bigger screen.</p> <p>Compared to Desktop: 'Erm i cant sit in bed with my desktp so in the winter its cold in the student house so erm its easier to move around' pg 3 ln1.</p> <p>Compared to Smartphone: Laptop is for long work and sit at home with and smartphone is out and about/checking things quickly on clinic.</p>	<p>Laptop: bigger screen can type better, b heavy cannot take everywhere with me.</p> <p>Smartphone: can stick in pocket and use anywhere but sometimes no wifi so cos' money to connect to the internet.</p>
3	<p>app and twitter link- 'maybe linking ecourse to more sort of like methods that students would use maybe having ecourse linked to twitter or something like or having ecourse like an app or something' pg2 ln1.</p>	<p>more work load in future years and Ecourse needs to give more reputable links to follow up on for research</p>	<p>1. Laptop- can use at home bigger screen easier to navigate, Faster Ecourse than phone, used more for dental studies</p> <p>2. Smartphone- easier to use when out and about, used more for social networking</p>	<p>Laptop disadvantages- bigger and less portable</p> <p>Smartphone- smaller hard-navigate</p>
4	<p>as the course goes on, i have heard from other students that i will be using alot more internet for reading etc and ecourse demands.</p>	<p>more work load and as course progresses</p>	<p>1. nexus seven tablet-' i mean its mobile when im moving between lectures i can do things like check emails update files ot the internet, read stuff off, for a work device its unparallel i can even read journals off it'pg2.</p>	<p>disadvantages- not as quick for typing as computer</p>

Screenshot 3

U	V	W	X
<p>1 Knowledge of GDC standards and Social networking</p> <p>9 principles dentists follow like patients interest and there is something about using the internet but i havent read it yet.</p>	<p>How do you trust the information on the internet?</p> <p>if they are well known websites 'names' i will think im ok to use them otherwise i stay away from websites like that unless im trying to find out where people are going wrong.</p> <p>Enough guidance from uni? YES</p>	<p>Extra Comments</p> <p>information on the net: if im at home then id properly look at it and read it and stuff but on my phone for example id check by just jogging my memory like i wouldn't learn anything new on my phone but on my laptop ill learn new stuff. Pg7</p>	
<p>2</p> <p>yes. We have to consider patient confidentiality and act professionally online. We have to reference every information we get from the internet and not just put anything on the internet.</p>	<p>stick to well known websites such as BDJ and stay away from websites like wikipedia.</p>	<p>improvements: 'Erm they've just bought out cabs for on clinic so its basically our scoring system on clinics and you cant get that on your phone at the moment and its frustrating cuz you have to look on your laptop or ipad or something. Would like to check scores before i get home and have to load up laptop'. instant messaging with tutors: 'i think it would defineltly help just because with emails you don't get notifications straight away but with instant messaging you do and its quicker to send a reply and less kind of formal i think which is kind of nice'.</p>	
<p>3</p> <p>been given a book to read and had a few assignments. Dos and donts list for the internet given,</p>	<p>stick to the Ecourse recommendations and reinforce in the internet.</p>	<p>instant messaging- 'with students i was going to say maybe having some sort of chatroom for students as well as having one for tutors but that's difficult to moderate too but cuz we got things like instant messaging like Watsapp its easier for us to sort out ourselves '. last page.</p>	
<p>4</p> <p>guildlines i have read which tell you that our whole life is professional basically. Alot of information on how ot behave on social networking sitesand the GDC website is really informative and easy to use, gives alot of guidance as to how to use the internet professionally. there are other dedicated websites also for guidance the 'royal college of general practitioners has a traffic system or highway code'.</p>	<p>makesure its cited, peer reviewed and referenced.</p>		

Tutor interview data analysis (Screenshots 1-3)

Screenshot 1

Factors that may affect use of internet (studies and personal)	First and second choice of device and reasons	Advantages and Disadvantages of both devices
<p>dental more apps and its really new for me; not particularly too modern but just starting to get grips of those and can see this growing and iv had an iPhone for a while now and iv started to download personal apps such as WhatsApp.</p> <p>Dental related: Not looked for them as I prefer using the desktop or laptop or iPad as the apps are only on phone and there is limited screen view issues.</p>	<p>depend on location; if at work then desktop if at home- laptop.</p> <p>ipad and iPhone are for when on the move. smartphone is my first choice when on the move cuz at one point I was taking both iPhone and iPad. but as I am getting comfy with the iPhone working on a little screen im getting used ot using it and actually don't need both I can use just that. - APPS help as more you start to use it the more you get used to it and use the device more.</p>	<p>Smartphone screen is a problem for the eyes as getting older and iPad is good for that but too heavy to carry around.</p> <p>Speed of desktop has been a problem in the past but ok now as its been</p>
<p>could speak sort of retrospectively but iv over the last few years of my PhD iv found that iv used it alot more for work so when i first started the post i used it more for social reasons and only really for email for work but then as iv progressed through research i use it alot more for work so literatures reviewing, pubmed, medlines. its the nature of the work really rather than work load from a personal perspective iv used it consistently over the last few years.</p>	<p>depends really for what nature- from a work perspective a desktop or a laptop and from a social perspective, definitely my mobile phone and smart phone you know like news and social for emails so it differs between the nature of what im using it for.</p>	<p>Laptop too heavy- bought a tablet a Microsoft surface as my laptop is a big 17 inch beast which is uncomfortable to carry around so I wanted a tablet that gives me abit more productivity and a bit more portable and easy to carry around cuz its very limited what you can do on a smartphone.</p> <p>have a big laptop so its not particularly portable and had a 13 inch laptop bought the tablet.</p> <p>laptop has everything I need but too heavy to carry around</p> <p>Smartphone has everything but screen too small the iPad is in the middle.</p> <p>So the laptop is like my desktop I have all my stats packages, all my files here and do the main heavy work and my Smartphone is with me all the emails and messages and my tablet is to carry around when im away on for the weekend and I want access to my files or if I want to work on a pc etc.</p>
	<p>So the first choice for searching for information is my desktop.</p> <p>So second is Smartphone or laptop.</p> <p>My first choice is desktop because its better internet connection over the Smartphone for instance, speed connection easy to use, size of screen that sort of thing. in my own office too.</p> <p>I don't use an iPad i'm not in to interactive stuff at all so its all really Microsoft based and windows based I use the laptop to deliver lectures for searching the internet also I use tablet laptop thing at home as well to pick up emails as</p>	<p>Smartphone is 8g but you can long on to wifi but its slow the size of screen is an issue, small phone so I tend to go something with a bigger screen and ideally a wifi connection also.</p>

Screenshot 2

Microsoft Excel - Copy of analysis of interviews -elite (2)		M	
	L		
1	Improvements in communication with students	Would you consider using instant messaging to communicate with students?	Do y
	face to face- emails are really useful; today i cancelled a lecture i was meant to give today and one student still asked the reception where this lecture was also emailed the whole year group and had particular messages at the top of the email to highlight that its an urgent message. And for specific things- email a student and ask them to come and see me.	I would if i could be sure that we have got every body and that everything was up to date cuz the big problem in the uni is that in hte beginning of the year it was a night mare as not everyone gets emails etc like if you have a small group of people it would work. It would benefit me as i would get an immediate response. boundary between professional and personal; i am reletavily informal with students in one way there still needs to be a boundary between personal life and professional life and instant messaging may blur it. some sort of guidance needed and not make it so informal. uni guidance is that you shouldn't be giving the students your numbers for example so i think its about taking things farward and being modern but there needs ot be some safe guards too and sticking to the traditional ways but adding the new tools to it. some students will be way ahead from what im doing but im perfectly happy with taking on new stuff and some of it is like having records of what you are doing aswell and if everyone is instantly messaging in the school how do we control what is going on? really keen on a joined up approach instead of people going down there own tangent and they may be going against what we are doing as aschool. So im not against it but i think some people are too enthusiastic and may be taking down a line so i would like everyone to be involved in a co-ordianted way so we know what people are doing. for example, school reception can send text messages now but we don't do it all the time as it is costly but it can help getting students really quickly but its about the school office doing it and not everyone messaging random groups of students all over the place. don't have a problem with it like if you have a small group teaching session for example someone in biomaterials does problem based assessment with small group teaching using Ecourse discussion boards so if you have people in small group students and wanted some sort of interaction- instant messaging would be useful and thats in a controlled environment rather than random people in the whole year messaging each other.	stay a stu with unpr and i drea ultra Tutor Why I thni boun phon
2	sometimes in my exepricne anyway when iv emailed students they not always replying and even some staff to some extent you don't always get a reply. sometimes we asking for details of patients like notes students have made so we have the facility to text students aswell which has worked well through the school office. students have mobile phone of some form now and a text message popping up is hard to ignore or miss. If there could be a discussion forum almost like the ecourse and its very rare when you have to contact an individual student its usually the whole year like if a lectures been cancelled or venue has been changed or some new information about a lecture and you tend to want to get in touch with more a group of students so like ecourse sort of forum might work quite well.	yes for the same reason as text messages but worry a little bit about the appropriateness of using it- ltend to use instant messagingwith friends and family. use Watsapp very good but with the students it worries me the fine line between social and professional i don't know how much the students would like it either but within reasons i get emails pushed through my Smartphone but its nice to have that distinction between work and home but i would consider it but i wouldn't be too keen so yh you never know. Id be open to it but my first impression is i wouldn't be keen.	I don its n netw want just i denti worri it's d befri gues So yo like i acco stuff
3	emails predominantly work the issue is that students don't often pick them up and their inboxes can get full which is a problem sometimes which is a bit of an issue. i don't know how else to do improve i wouldn't want students to text me its a personal phone not a uni phone a personal contract i have on there although i checkk emails on there its my personal phone.	I wouldn't be keen on that at all i think we have an email system that the university uses which is traceable and if you get text messages from students and theres any issues that would be a problem as you can't trace that as well and everything should go through the uni main server typ the things can be traced which is a proper way to sort of keeping a check on whats being done and random text messages for instance if student cancels and says im off sick today it shouldn't come this way it should be through email so uni knows everything. Even if there was a platform where it was through the uni and could log in and log out but more instant than email, i mean if i have to log in to it the beauty of emails is with the Smartphone i use things get pushed through on it instantly i get an email straight away and i respond to that and if i have to log in to something i have to physically think of logging in to something and look for something its still the traditional thing like emails. The beauty of emails is it comes through.	I don shari the u dang

Screenshot 3

Microsoft Excel - Copy of analysis of interviews -elite (2)	W
<p>Do you know about any extra activities students are engaged in part of your class or outside your classroom for learning?</p> <p>Smartphone use: they are using smartphones now in the class and I'd say to them look this up or who can find about this so I assume that they are just using the internet. I find it really difficult to translate what staff do to what students do. for example you go in to a meeting with staff and they will be on there iPhones messaging and then the same staff may be saying to the students you shouldn't be using it in a lecture. So what are students actually doing with a phone in their lecture, are they messaging to find information or are they connecting to for group chats about the lecture. Like for example once I had students discussing something in my lecture and I said what are you actually talking about and they were actually having some good conversations about the lecture. So staff are behaving in ways that students shouldn't be but it's all a muddled picture really.</p>	<p>Do you have any comments regarding the use of DropBox/recording and loading on DropBox and students?</p> <p>would use dropbox for anything but always have in my head that university are really funny about cloud based storage and they are worried about it at a high level and that for both students and staff and we are trying to tra data and protection.</p> <p>not just about dropbox it's just a tool in a whole range of tools and again there has been issues of students taki and we are teaching students about photography but we do talk to students and come up with strict rules with N these pictures and the danger is that students could be using dropbox and storing it on their phone and its breai and if it's easy for students to use things which it should be but it's the blurring of boundaries. So it still applie devices when they are taught about being professional and it should still be the same rules.</p> <p>it's about making students understand the potential difficulties with these tools than just making them feel that these things. So tutors need to be more careful and sensitive. Just cuz us tutors don't use it doesn't mean student only tools and I just remember this always and because they are there, people can use them for all sorts of thing students remember to use them properly or engaging their brains of what is actual benefits of it. but some of the</p>
<p>students tactics towards all this information and portable Smartphone and tablets its phenomenal how its increasing like when I was a student only a hand full of people had a mobile phone and now its main stream but e just the prevalence of these devices its amazing now that they are using it and secondly even though I don't know what students are doing extra it just highlights how important your research is because it needs to be investigated and teaching a subject like perio for example or public health or any other subject, 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 its a concern and as teachers we need to be more aware of this and I've had instances where I've read reports and elective projects where they have referenced things like Wikipedia for example well you think ok we all use it and it's a useful tool but you need to know about the limitations of using certain err different things for educational purposes and it's about raising awareness. I think cuz they younger and bought up with this technology will be more tech savvy and not as the older staff who did not grow up with this stuff.</p>	<p>I mean where the responsibility lie or copy right lies with posting lectures on dropbox and then tutor awareness</p>
<p>Yh there is I think at the college surgeons produced, an e-learning package, can't remember what it's called but the perio part of that which is my speciality, a lot of the work done on that was done by either us here or colleagues that I know very well so that's quite useful package that students have access to.</p>	<p>dropbox is a cloud based thing where you can drop information and pictures and stuff like that my understandi allowed to record us and post it on dropbox, I normally don't have students asking me one student has some ed meant that they are allowed to record lectures but that is some years back. I would be concerned if students wei recording on there as its personal at the time and if it recorded three four years down the line these things stay t three four years down the line things may have changed and I see a problem with that and if its material shared on a platform like that it can reach anywhere especially with patient information and records so you know I can problems with these things.</p>

Screenshot 4

Microsoft Excel - Copy of analysis of interviews - elite (2)	
Barriers	What would encourage you to use your device more for dental course and research?
<p>1</p> <p>why use them? - its the question what is the reason to be using these devices not about barriers; are people using these devices cuz it helps students learn or is it just about using a new gadget - that would be my question. quite open to using new things in teaching if its adding to something iv already done but don't want to embed videos and this that the other which is what people do, if i think it by face of face talking to students is helping them then i don't think theres any use of using anything extra but if it helps students remember and retain information then i don't mind using it.</p> <p>we have been through the phase of where we found out how many students are using mobile devices and what they own and its changed quite alot in the last few yearsss and then we have gone in to the stage of students using ipads in the third clinical year so you are more likely to ask them to do things as they have ipads to use. And other things like wireless access is a problem which has improved. So in a lecture theatre if i want to show students smething which is interent based it is a problem if the connection is so slow.</p> <p>training or just pick it up- 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 and obvisouly if you have good evicence that they are good teaching tools then its fine but i think im in the middle band and only wnat ot use it if it helps and if it adding something.</p>	
<p>2</p> <p>would be useful to have some sort of training so you can get stuck in traditional ways of presenting or running small group teachings or lectures and i mentioned with PowerPoint as an example and it would be quite useful i guess to have almost refresher courses or something to do with different ways of doing things cuz 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 and that may not be the way using prezil as an example. When i saw the prezil in a lecture i thought it was really really good.</p> <p>uni should maybe start giving some training when i started out as a lecturer, we had to go on the PCAP course which was very valuable and they did give details about how to get the most out of lectures of small groups that was a while ago but they didn't include details of different software like prezil which i would have found to be really useful if they could have told us about engaging students in another way and showed prezil to us.</p>	<p>on regular staff development days when all staff come together and we discuss different topics- would actual relation to the new build as well as the whole building is changing and the way we deliver teaching here could facilities in the new build and new rooms new aspects of technology im sure and that has then the potential to teaching and to raise awareness because electronic learning and student engagement is only going to become are using these things.</p> <p>i know when i was a student if someone was using electronic learning it was something new but now its more student engagement thats where Ecourse is particularly good with discussion forums cuz i know when you give students to digest information and when you go away or home you think about what about this and what about working hours of tutor issues but i think the particularly good features of the Ecourse is the student engagement their learning and its an area for improvement.</p>
<p>3</p> <p>i'm a bit concerned about the potential about some of these encryption things like GOOD which just goes on to email and i believe uni is going to use it as i haven't used it and i have good access to things, emails come through really good i can respond well also if i need to but anything that puts a barrier to that is a problem and would stop my productivity.</p> <p>GOOD is a university is rolling out a package to encrypt phones to help prevent data loss again i know limited about it and i haven't used it yet but i just hope it doesn't get in the way of my routine and stuff.</p>	<p>nothing really stops me at the moment or id want to use any more but i do what i do at the moment but i worry that like protocols coming in the way where you can only use certain devices it becomes too prescribed in terms of very window based so obviously windows, phones windows, so anything else i don't want to use really.</p>

APPENDIX VIII: PILOT STUDY RESULTS

Pilot Study

Aim and objectives

The aim of this study was to gain a better understanding of how new technology is being used to help students with their studies. For future research a questionnaire was used to determine which ICT devices are most commonly used by students and for what reasons. The main devices looked in to for the purpose of the study were smart phones, laptops/desktops computers, Personal digital assistant devices such as iPads and computer tablets. The results of this study would provide a better understanding of how developments in technology and devices may help the dental school and other schools for learning and teaching. A questionnaire was created using an online website called 'Survey Monkey' which was useful for organizing the questions in different sections and the overall formatting.

Response rate at each attempt 48% response rate

Section A: Survey questions from *Demographic Data* on age, gender and year of study were as follows:

The results show that 57% (n=8) students were female and 43% (n=6) were male. Seventy nine percent students between the age group of 21-25, Twenty nine percent students out of the 14 in total were between 19-20. Six students were from the third year of study at the dental school, 3 were from the 4th and 3 from the 5th and 2 students were from the 2nd year. These results can be found in **figures 1, 2 and 3**.

Figure 1: Responses to ‘Are you male or female?’ (n=14).

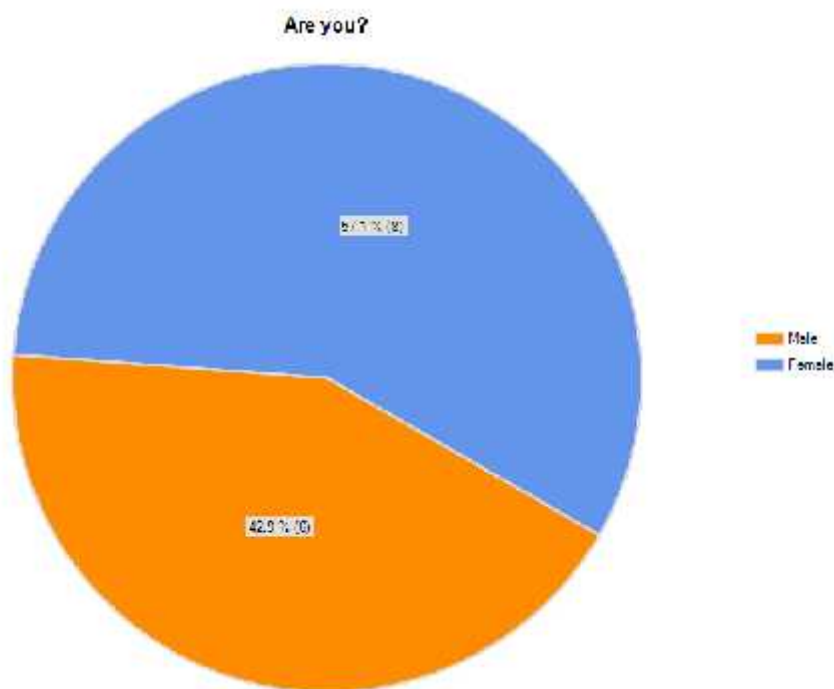


Figure 2: Responses to ‘how old are you?’ (n=14).

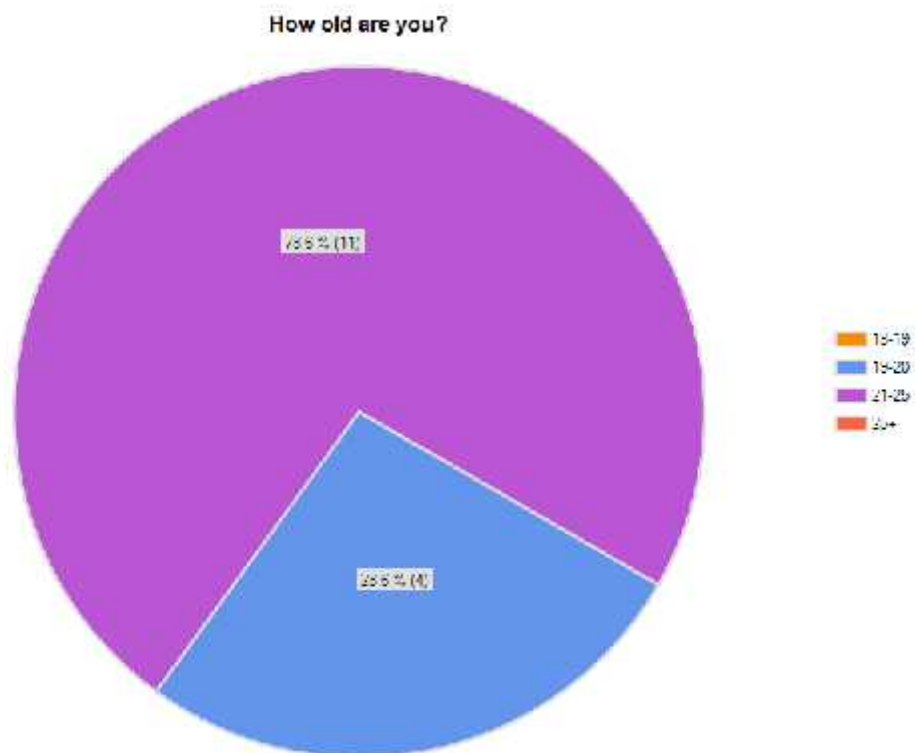
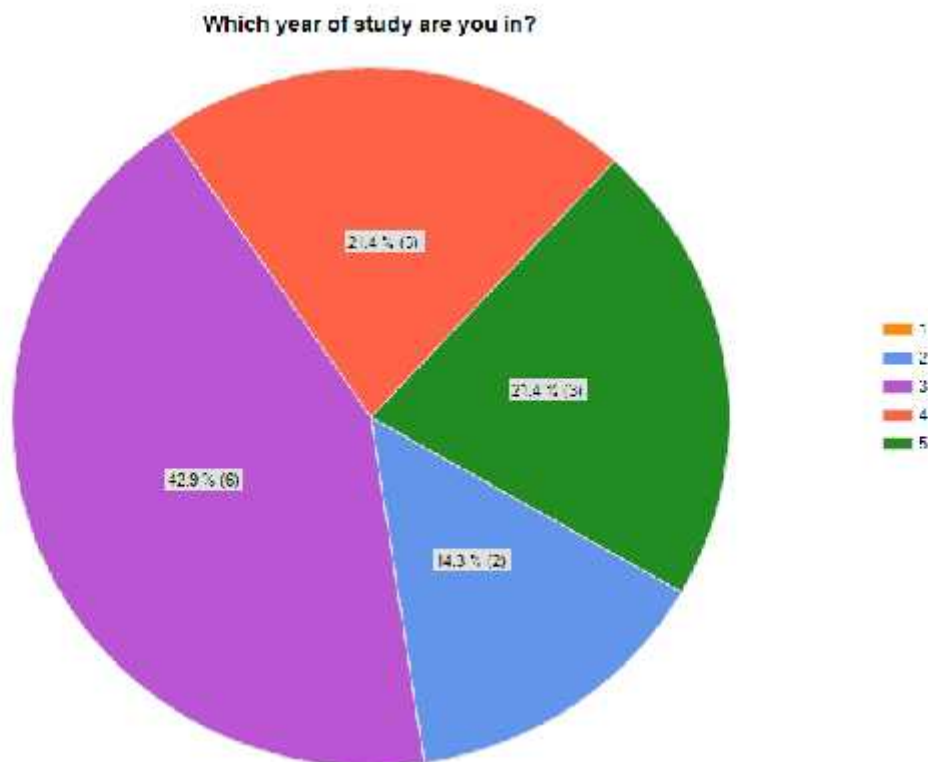


Figure 3: Responses to ‘which year of study are you in’ (n=14).

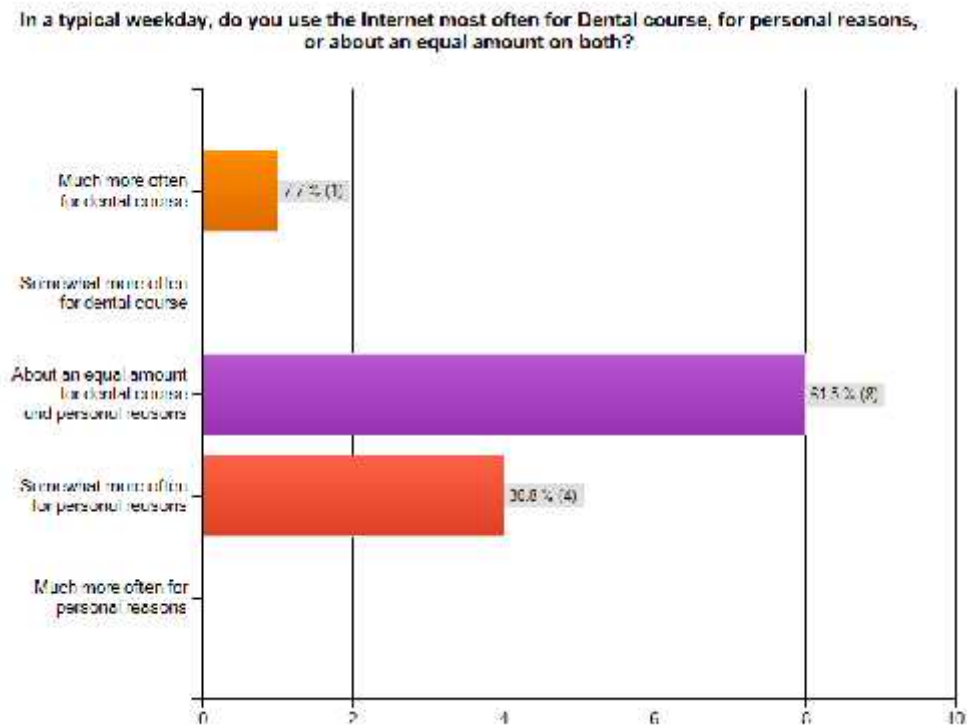


The next few questions analysed the *use of the internet* in general for dental studies and for private use. Out of the 14 students, 13 students had access to the internet. The next question asked students about the E-book reader and the results show that out of the 14 students none of the students use E-books readers.

The following figures and questions show which devices are most popular for students as their first choice to use for connecting to the internet and searching for information.

Q: “In a typical weekday, do you use the internet most often for Dental course, for personal reasons, or about an equal amount on both? (13 responses, 1 student skipped this question)”

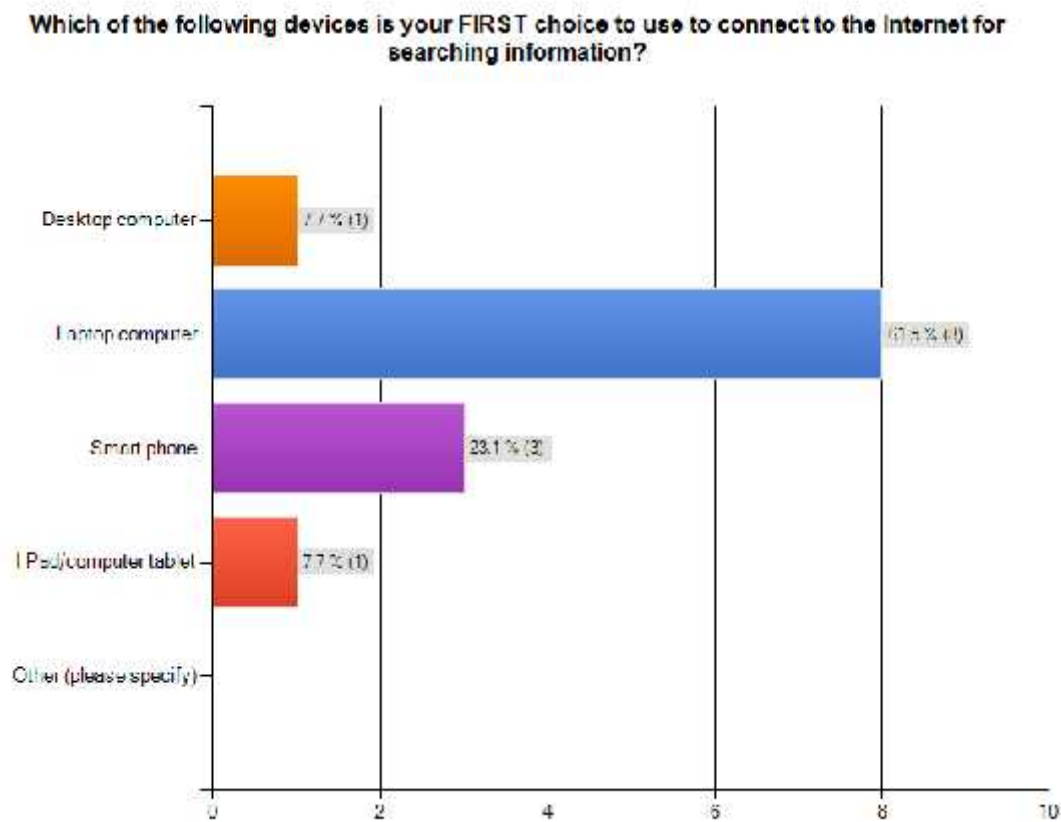
Figure 4: (responses n=13)



The results in **figure 4** show that most students used the internet for both the dental course and personal reasons equally as 62% (n=8) students chose this answer. Twenty three percent students used the internet a little bit more for personal reason (n=3) and 1 student used it much more often for dental course.

Q: “Which of the following devices is your FIRST choice to use to connect to the internet for searching information? (13 responses, 1 student skipped this question)”

Figure 5: (Responses n=13).

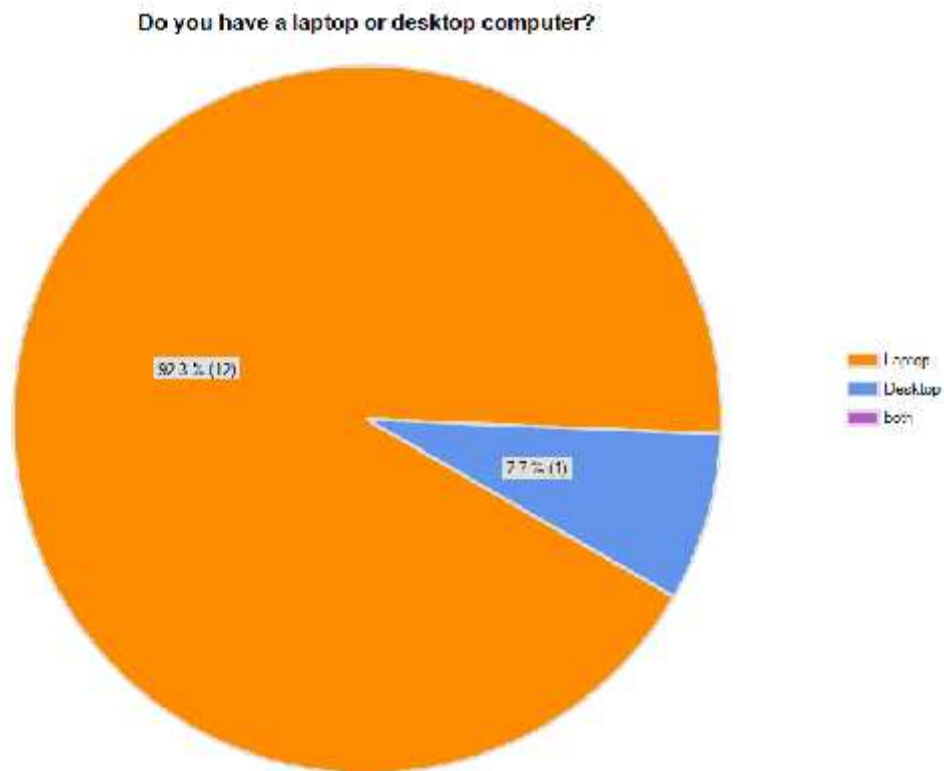


The results in **figure 5** show that most of the students use the laptop computer to connect to the internet and search information as 62% (n=8) students chose this device as their top choice. The second most popular device is smart phones as 23% (n=3) students chose this as their top choice of device. Both the desktop computer and I Pad / computer tablets were chosen by one student for each device.

Survey questions from the most popular choice of device which was *laptops* were as follows:

Q: “Do you have a laptop or desktop computer? (13 responded, 1 student skipped this question)”

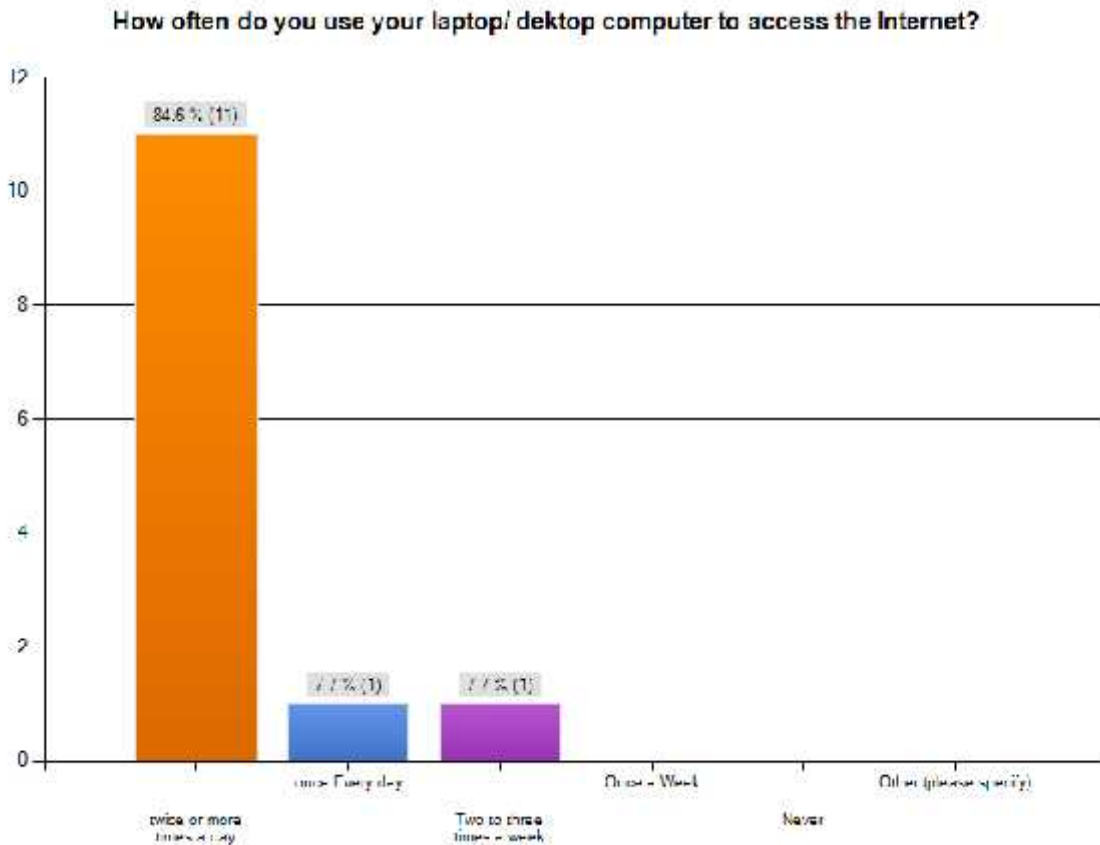
Figure 6: (responded n=13)



The results from **Figure 6** show that most students have a laptop computer (n=12) and only one student had a desktop computer. As the laptop was the most used device, the rest of the questions in this section will only focus on laptops.

Q: “how often do you use your laptop/desktop *computer to access the internet?* (13 responded, 1 student skipped this question)”

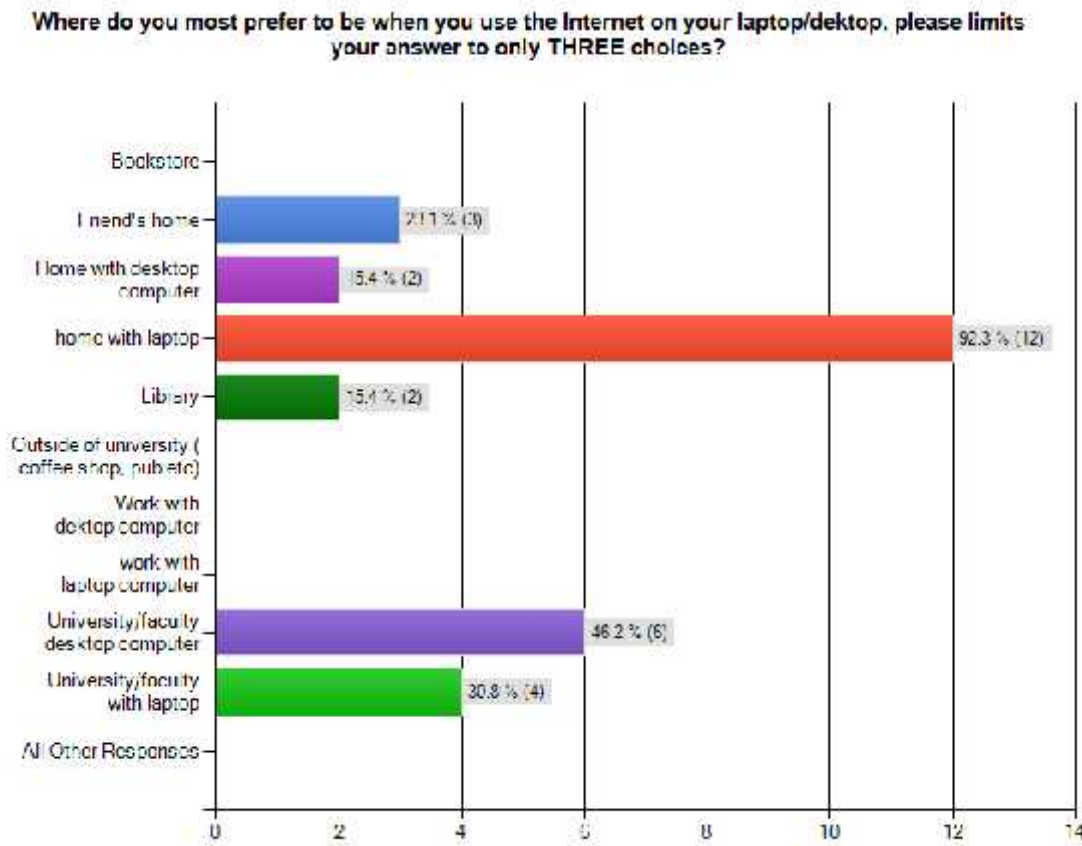
Figure 7: (responded n=13)



The results from **Figure 7** show that 85% (n=11) students use the laptop/desktop twice or more times a day to access the internet, 1 student uses their device to access the internet once every day and 1 student uses their device to access the internet two to three times a week.

Q: “where do you most prefer to be when you use the internet on your laptop/desktop, please limit your answer to only THREE choices? (13 responded and 1 student skipped this question)”

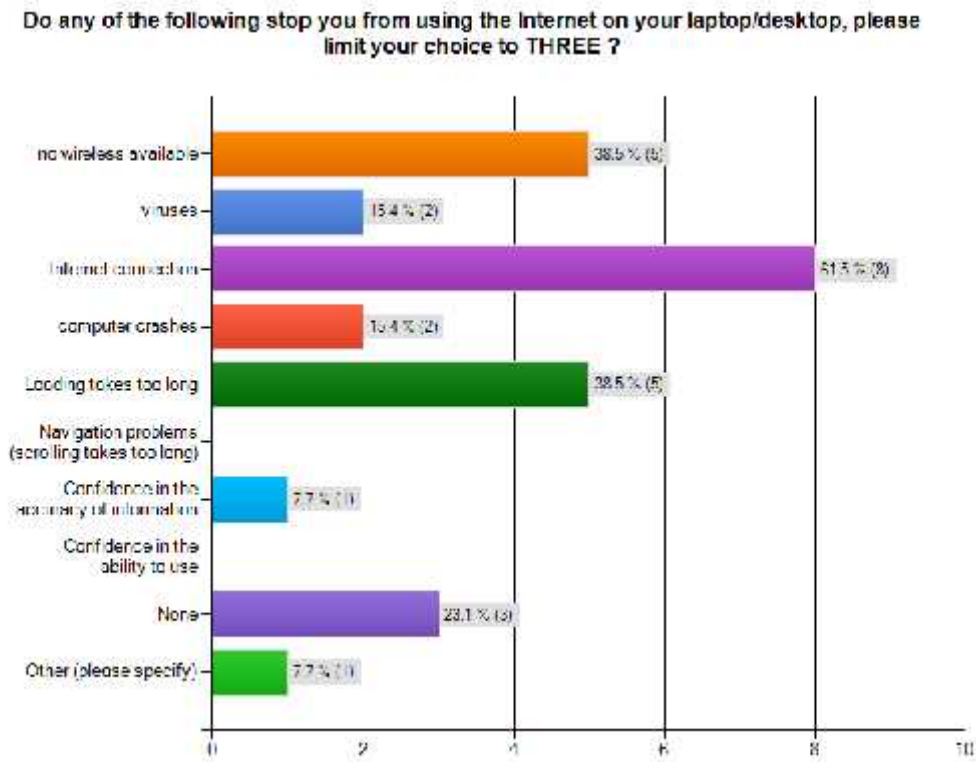
Figure8: (responded n= 13).



The results demonstrated in **Figure 8** shows that the most popular place students prefer to be when using the internet is at home with the laptop with a response percent of 92.3% (n=12). The next preferred place was at the university/faculty using the university desktop computer with a response rate of 46.2% (n=6). The third most preferred place was at the university/faculty with a laptop (30.8%) and the fourth most preferred place at friends' home (23.1%). The library as a place to use the internet received a response rate of 15.4% (n=2).

Q: “Do any of the following stop you from using the internet on your laptop/desktop computer, please limit your choice to THREE (13 responded, 1 student skipped this question)”

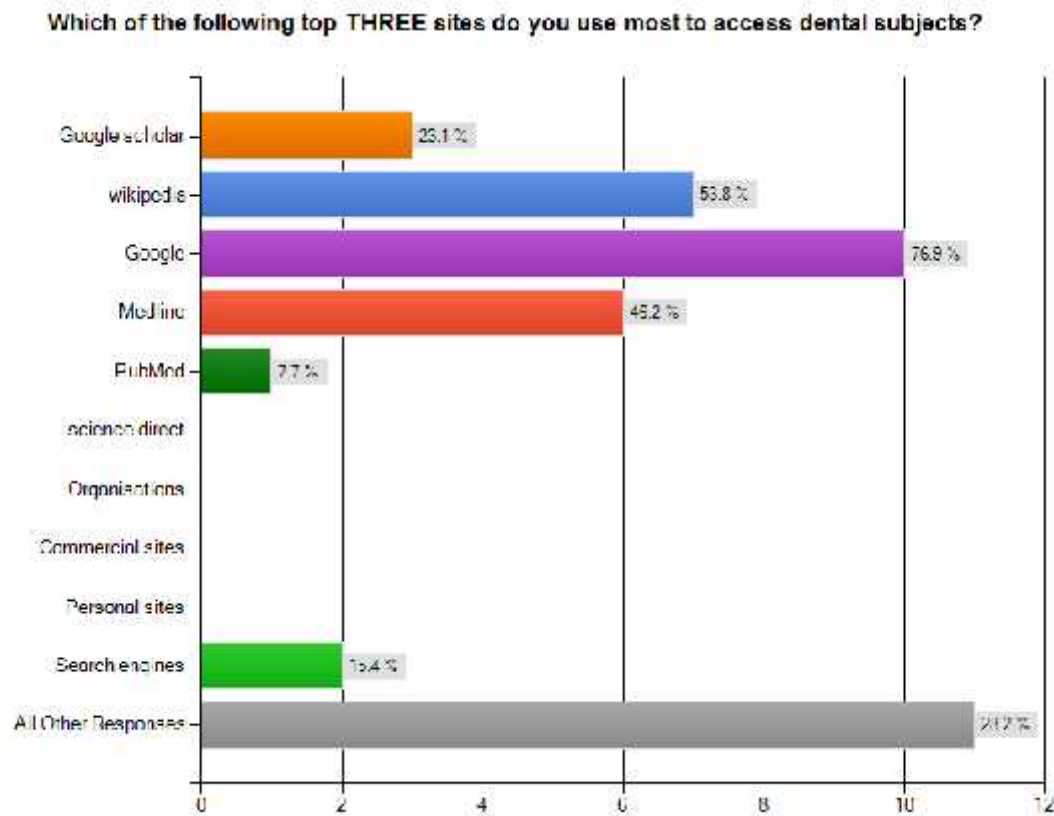
Figure 9: (responded n=13)



The results demonstrated in **figure 9** show that internet connection was a problem student faced the most when trying to use the internet. Sixty two percent students chose this as their main obstacle (n=8). The unavailability of wireless was the second most popular response as 39% (n=5) students chose this answer. At the same 39% students also find that loading takes too long at times and this is a problem when trying to connect to the internet. Twenty three percent students opted for none as their choice meaning that nothing stopped them from using the internet on their chosen device. Two students chose viruses and 2 students chose computer crashes. One student chose ‘other’ and left a comment: “*Quicker to look up/do smaller tasks on iPhone than turn laptop on!*”

Q: Which of the following top THREE sites do you use to access dental subjects? (13 responded and 1 student skipped the question)

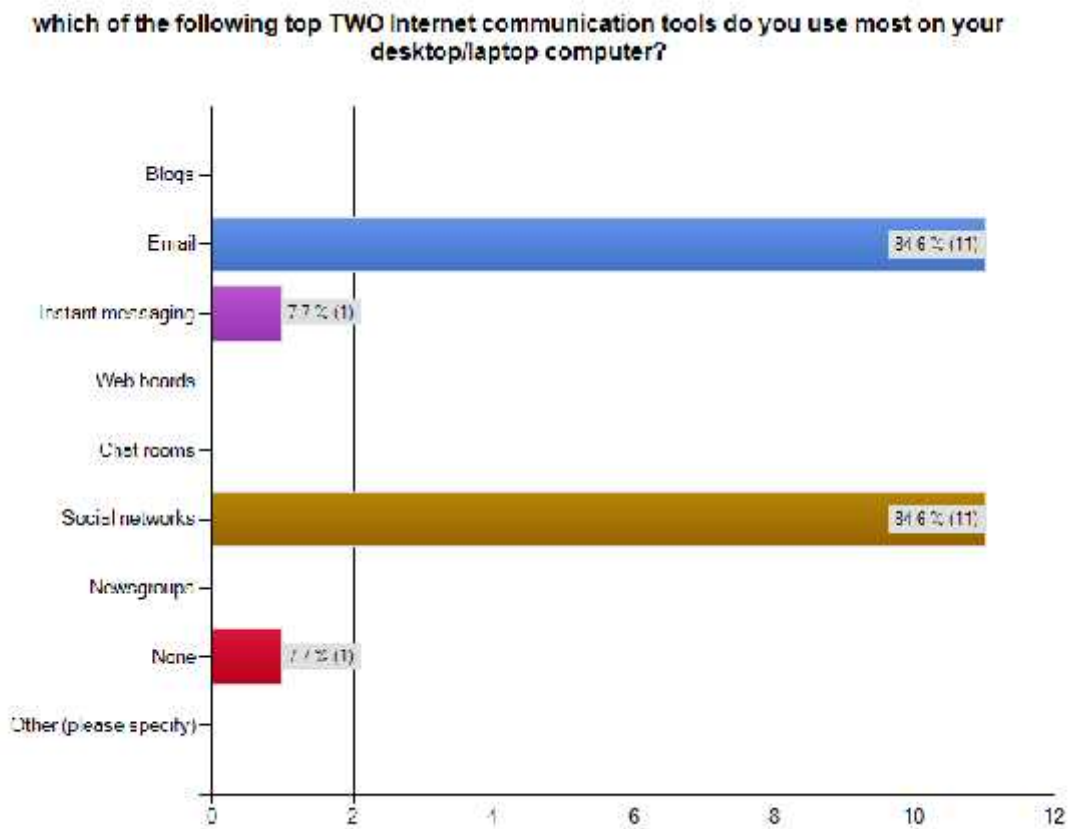
Figure 10: (responded n=13)



Out of the list of websites demonstrated in **Figure 10**, students chose their top 2 favourite sites and 77% (n=10) students chose Google as their top choice. Fifty four percent students chose Wikipedia (n=7) and 54% students also chose university sites. Medline was the next choice as 47% students chose this answer. Thirty one percent students (n=4) chose the option 'other' and left comments all referring to the 'University of Birmingham Ecourse'. Two students chose search engines and 1 student chose Pubmed.

Q: “Which of the following top TWO internet communication tools do you use most on your laptop/Desktop computer? (13 responded, 1 student skipped this question)”

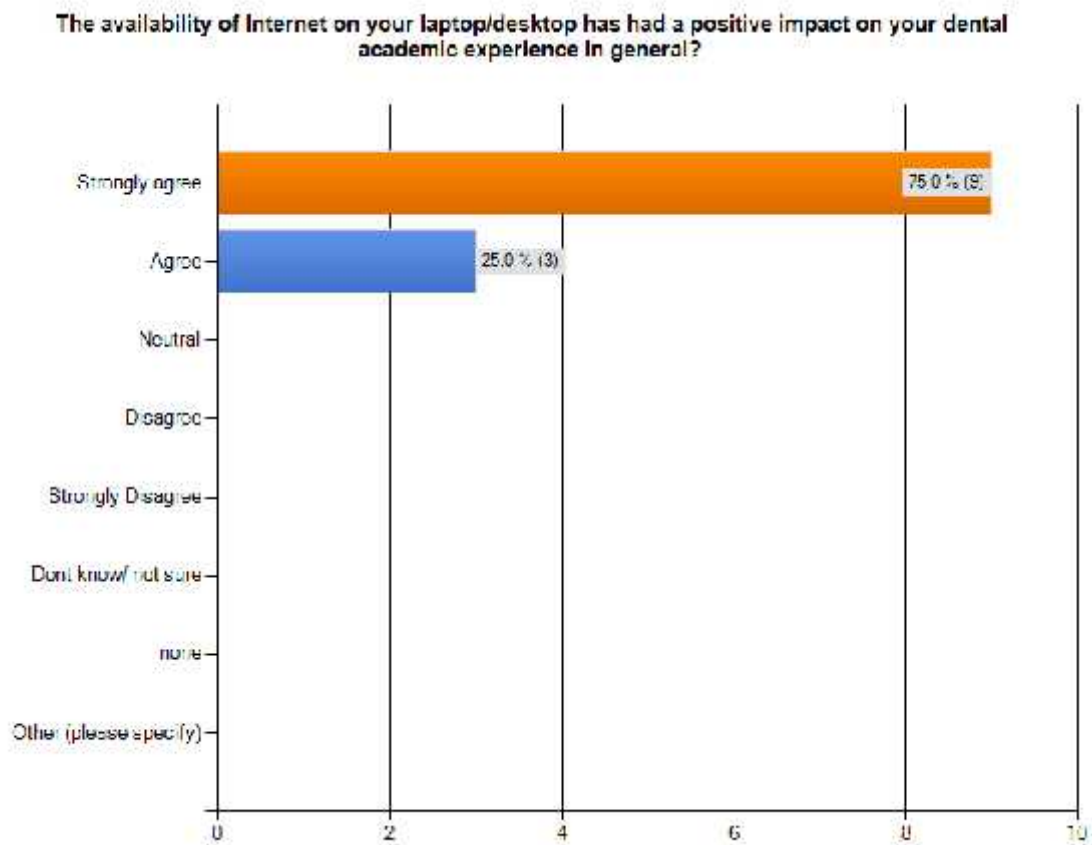
Figure 11: (Responded n=13)



Emails and social networks was the most used communication tool students used as both answers received a response rate of 84.6% (n=11). Instant messaging received a response rate of 7.7% (n=1). One student used none of these communication tools on their laptop/desktop computer. **Figure 11** demonstrates the choice of answers in more detail.

Q: “The availability of internet on your laptop/desktop computer has had a positive impact on your dental academic experience in general? (12 responded, 2 students skipped this question)”

Figure 12: (responded n=12)



The results show, demonstrated in **figure 12** show that that 75% (n=9) students strongly agreed that the internet on their chosen device has had a positive impact on their dental academic experience overall. Twenty five percent (n=3) students agreed to this statement and none of the students disagreed or was not sure.

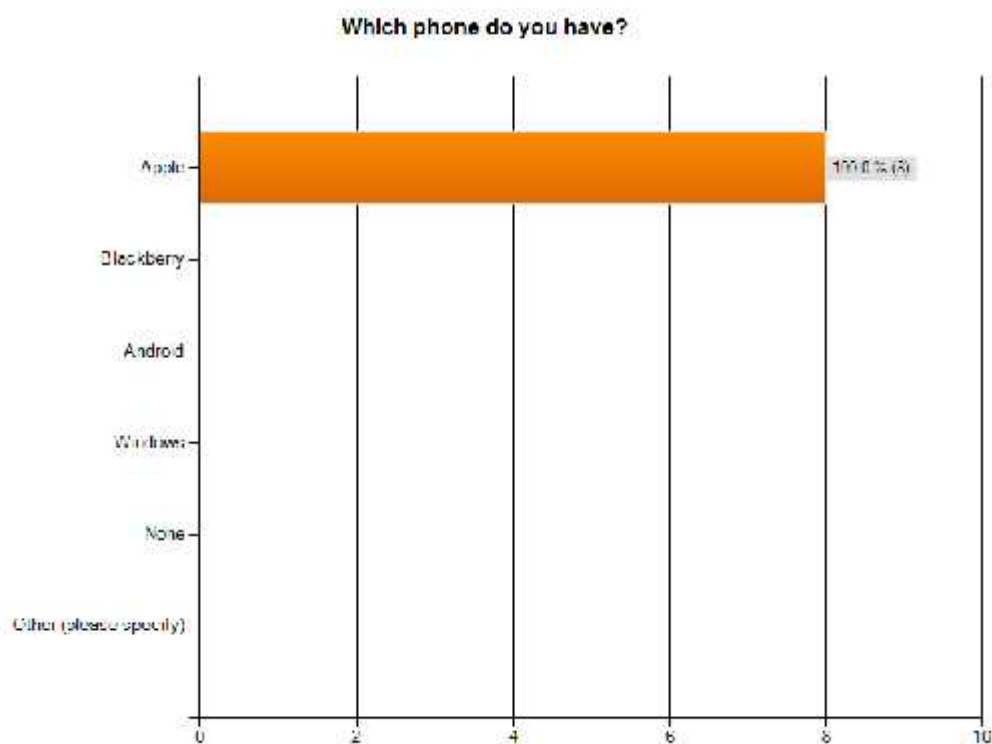
Q: “Are there any other comments you would like to make about the use of the internet on desktop computers/laptops in dentistry?”

Out of the 14 students, one student left a comment for this question regarding the use of the internet on their chosen device:

*“As Dentistry is a large subject area, it makes refining your searches much easier than leafing through books”.*The second most popular device used for internet and searching for information chosen by students is Smart phones. The following results are from the Smart phone section. **Figure 5** show that 3 students chose smart phones as their first choice of device. 5 students chose Smart phones as their second top choice of device for searching information on the internet.

Q: “Which phone do you have? (8 responded 6 students skipped this question)”

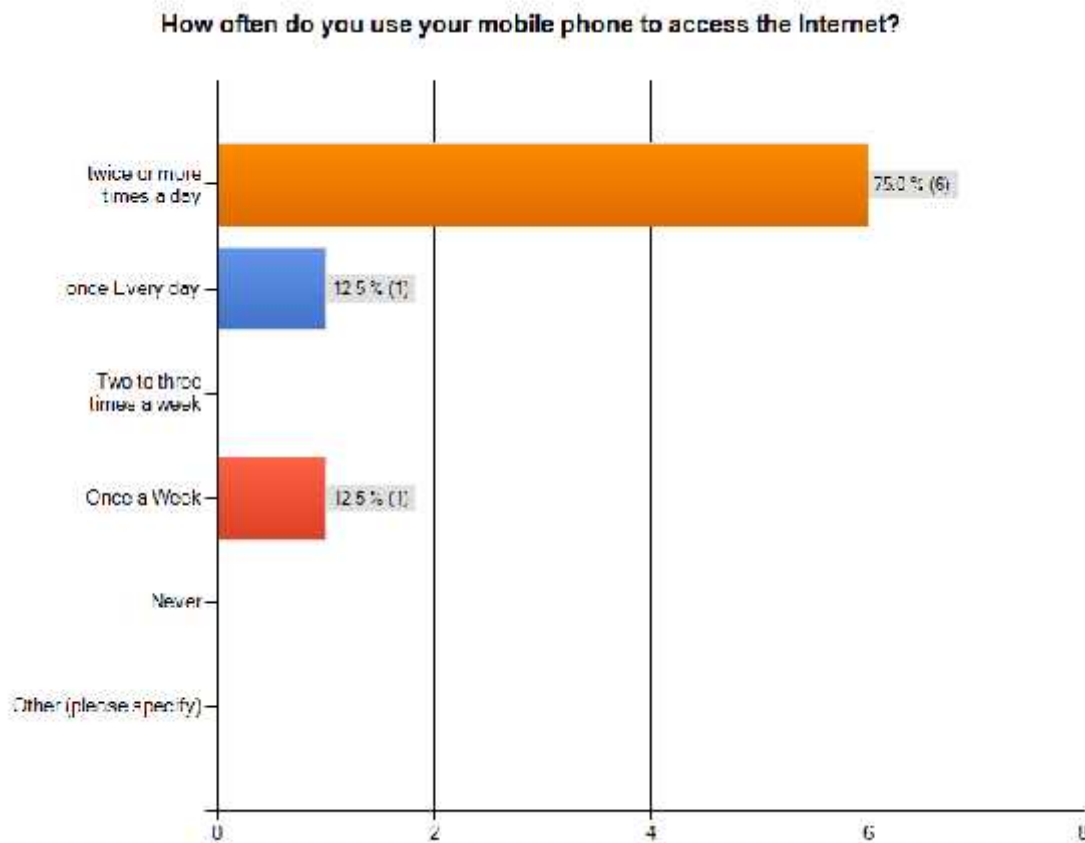
Figure 13: (responded n=8)



The results show that all of the students that use smart phones for their information search via the internet have an Apple smart phone (100%).

Q: “How often do you use your mobile phone to access the internet? (8 responded and 6 students skipped this question)”

Figure 14: (Responded n=8)



The results demonstrated in **Figure 14** show that 75% (n=6) students use their smart phone twice or more times a day to access the internet. One student used the smart phone once every day and 1 student used their smart phone to access the internet once a week.

Q: “Where do you most prefer to be when you use the internet on your phone, please choose Three top choices? (8 responded, 6 students skipped this question)?”

Figure 15: (responded n=8)

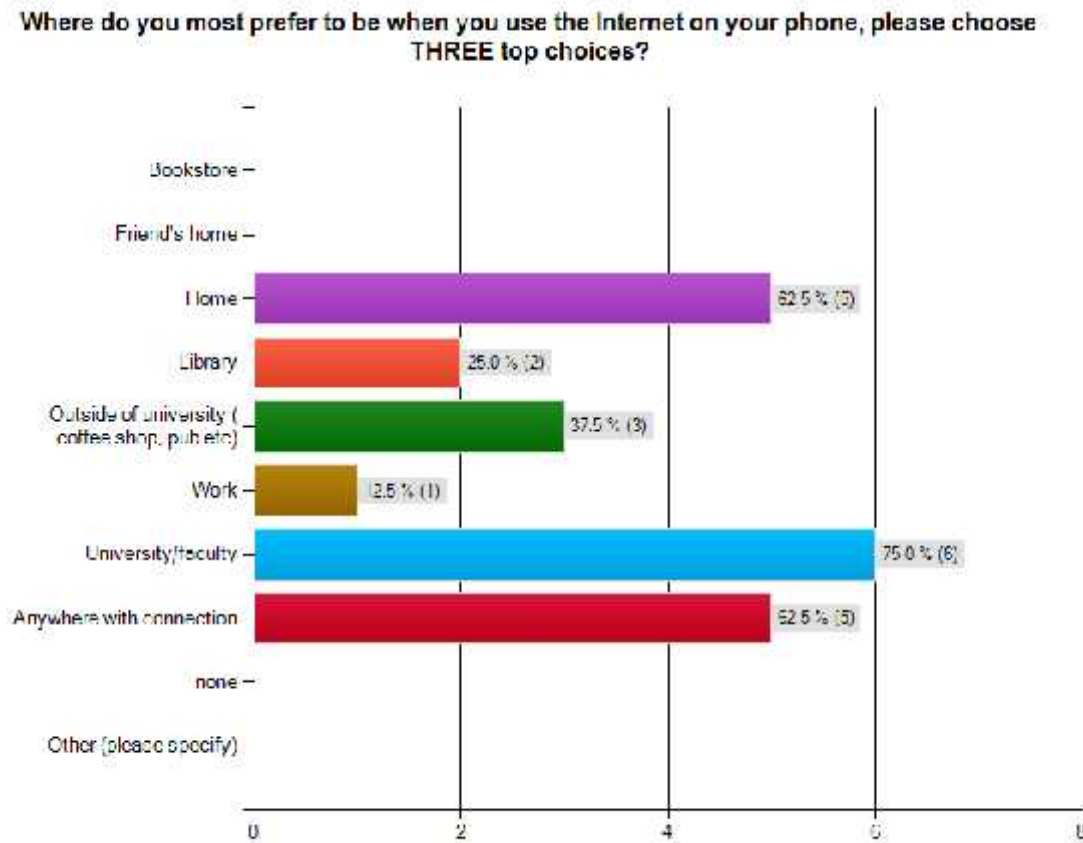
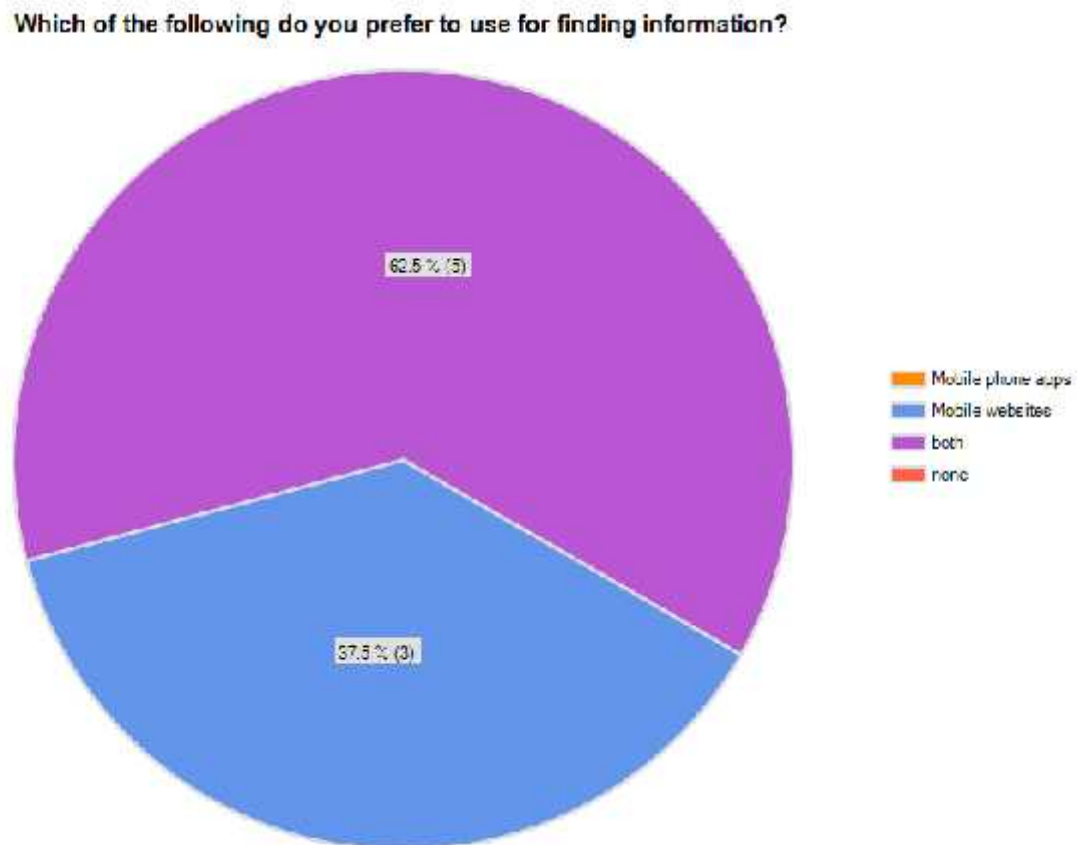


Figure 15 shows that the most popular place students choose to be when using the internet on their smart phone was university/faculty as 75% (n=6) students selected this, closely followed by being at home 63% (n=5) and anywhere with a connection to the internet 63% (n=5). The next most preferred place was outside of the university (coffee shop, pub etc) with a response rate of 38% (n=3). Two students opted for the library as a place to use the internet on their smart phone and 1 person chose their work place.

Q: “Which of the following do you prefer to use for *finding information*? (8 responded, 6 students skipped this question)”

Figure 16: (responded n=8)



Most of the students (n=5) preferred to use both mobile phone apps and mobile websites for finding information on their smart phones (63%). Three students preferred mobile websites to find information on their smart phone devices (38%).

Q: “Do any of the following stop you from using the internet on your mobile phone. Please limit your answer to *THREE* choices? (8 responded, 6 students skipped this question)”

Figure 17: (responded n= 8)

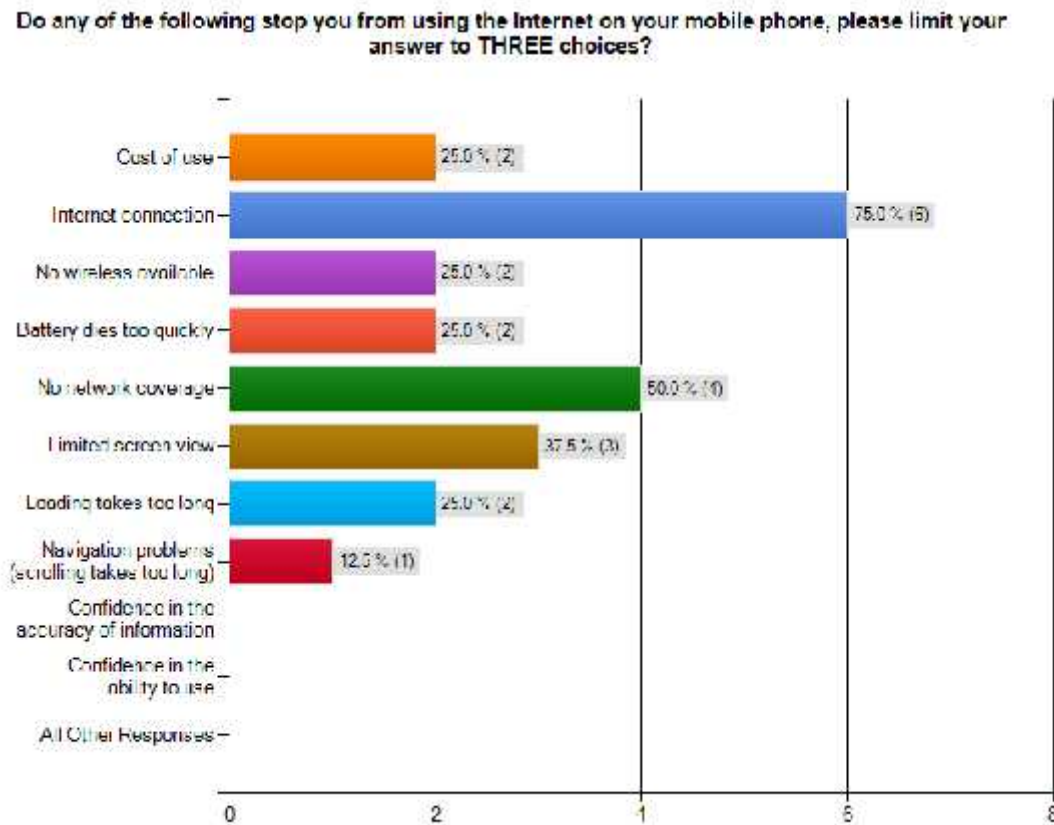
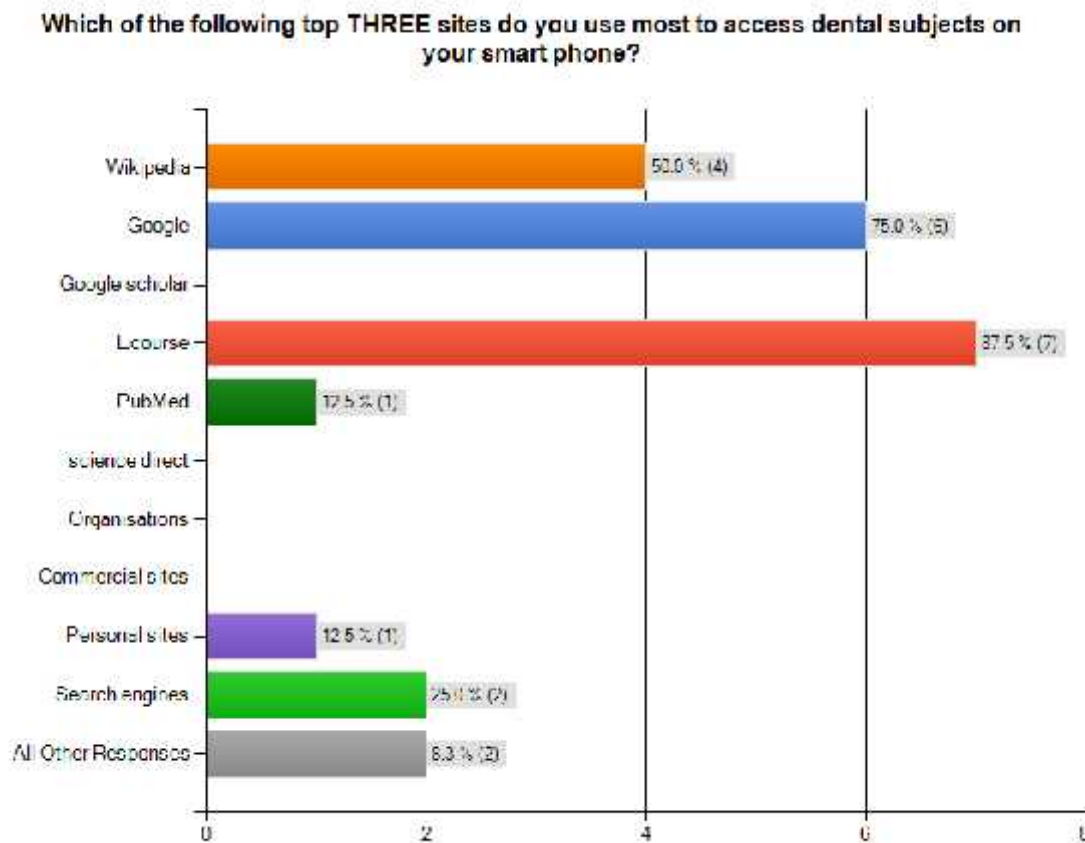


Figure 17 shows that the most chosen problem faced by students when using the internet on their smart phones was internet connection (75%). 50% students found that having no network coverage would stop them from using the internet on their smart phones. Limited screen view was the third most chosen problem with a response rate of 38% (n=3) and cost of use, no wireless available, battery dying too quickly and loading taking a long time were all problems which received a response rate of 25% (n=2) each. 1 student found that navigation problems limited their use of internet on their smartphones.

Q: “Which of the following top THREE sites do you use most to access dental subjects on your smart phone? (8 responded, 6 skipped this question)”

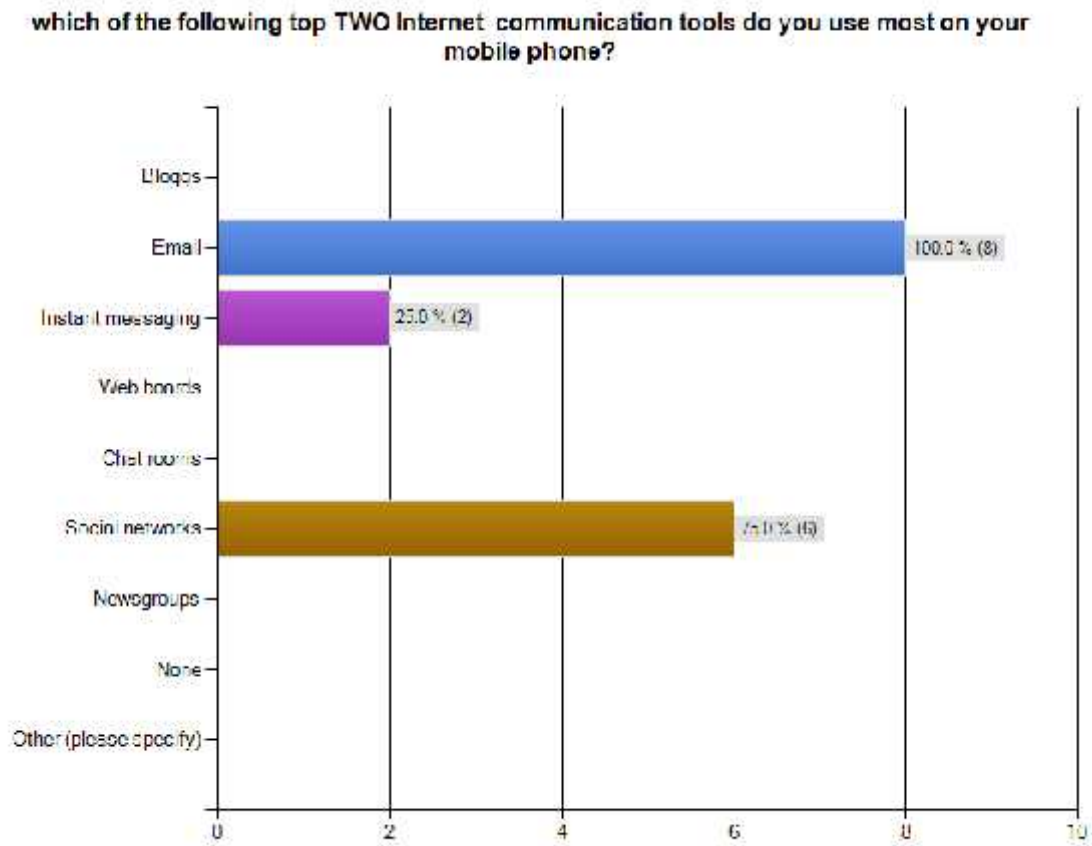
Figure 18: (responded n=8)



The most popular used site was the Ecourse with a response rate of 88% (n=7). Google was the second most used site with a response rate of 75% (n=6). Four students chose Wikipedia as their most accessed site for dental subjects on their smart phone (50%). Search engines and university sites received a response rate of 25% (n=2). PubMed and personal sites were chosen by one student each as the most access sites on smart phones by students (13%). The full list of sites can be found in **figure 18**.

Q: “Which of the following top TWO internet communication tools do you use most often on your mobile phone? (8 responded, 6 skipped this question)”

Figure 19: (responded n=8)



The most popular internet communication tool was Emails as 100% (n=8) students chose this option as one of their top two tools. Seventy five percent students chose social networks as one of their top two internet communication tools (n=6). Instant messaging was the only other communication tool selected by students as a used communication tool (25%).

Q: “Which of the following top THREE apps are most useful to you on your smart phone (8 responded, 6 skipped this question)”

Figure 20: (responded n=8)

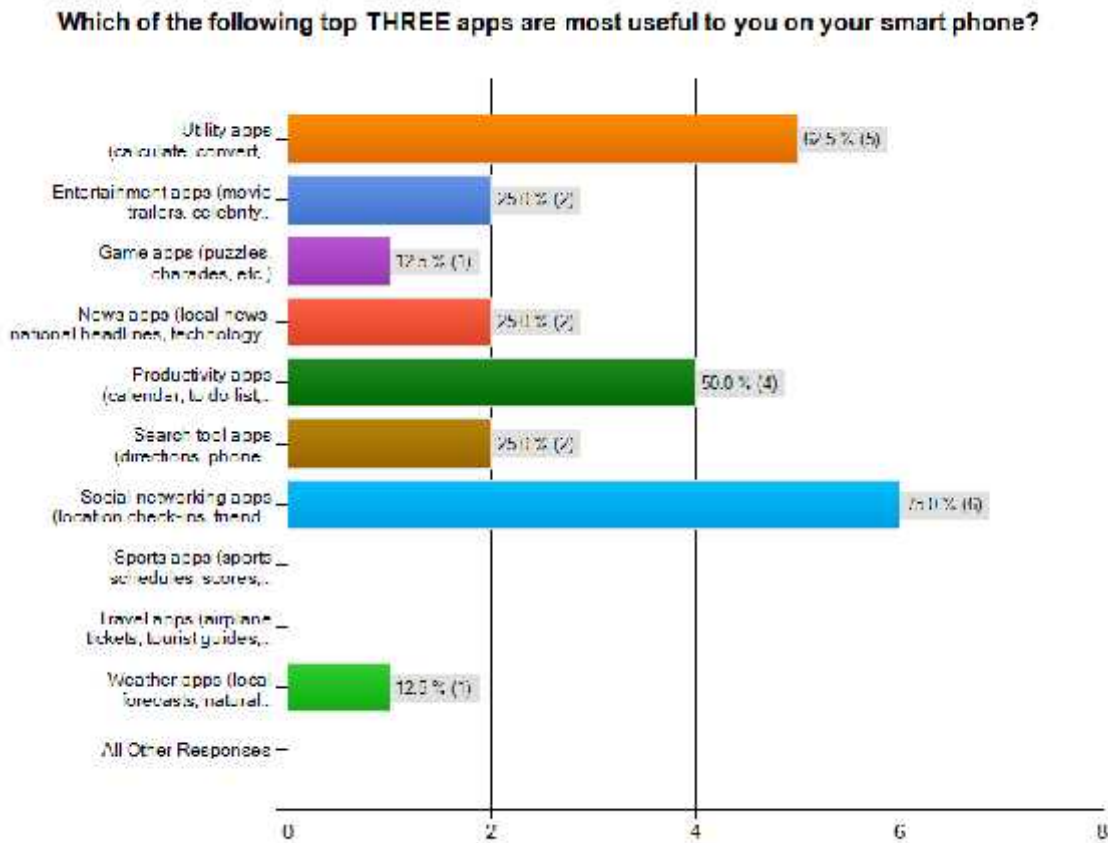
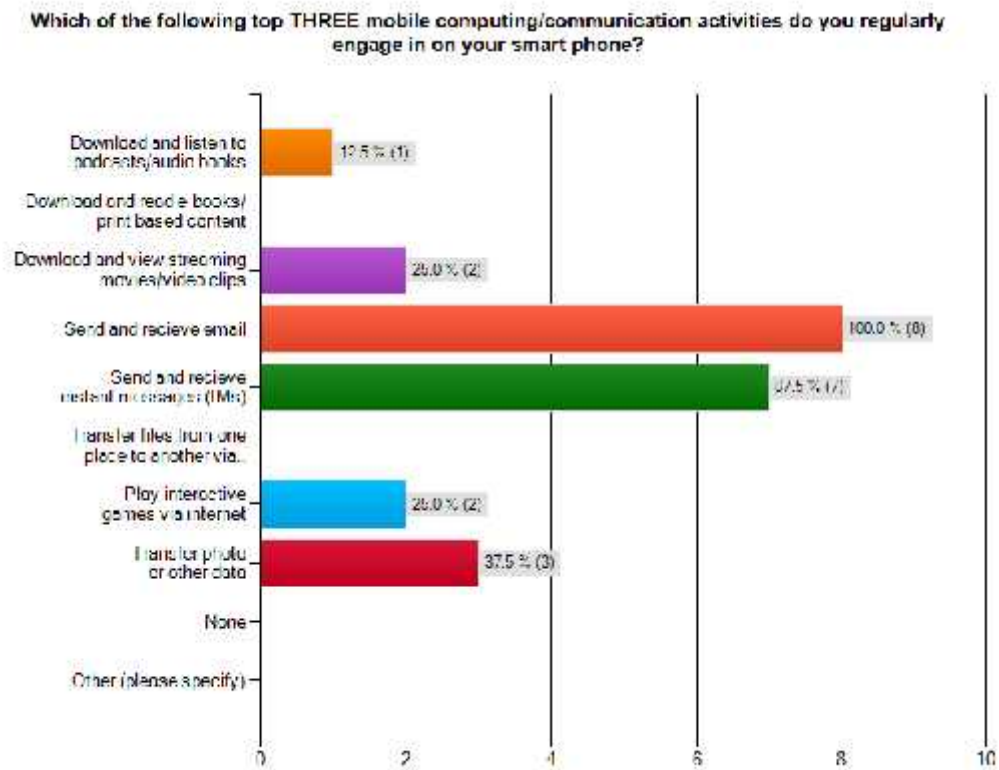
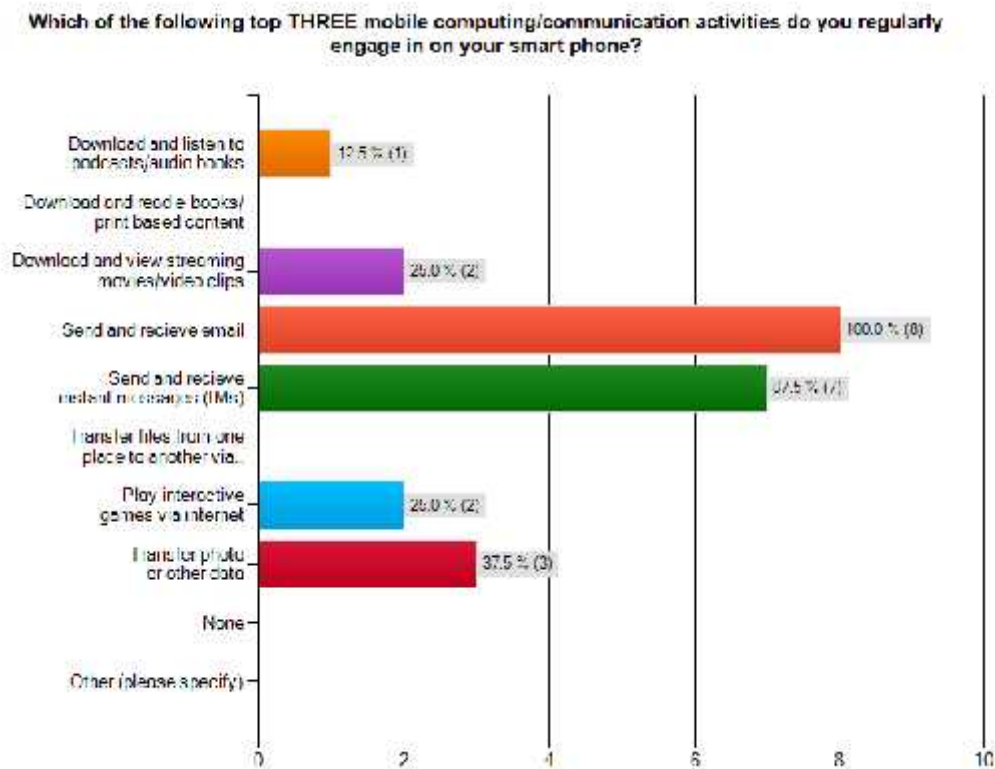


Figure 20 shows that Social networking apps were found to be the most useful to students on their smart phones as 75% (n=6) students chose this app as one of their top three apps. Utility apps (calculate, convert, translate etc.) was the second most popular app students found most useful on their smart phones (63%). Productivity apps (calendar, to do list, price checker, etc.) received a response rate of 50% (n=4). Entertainment apps, news apps, search tools apps all received 25% response rate (n=2). One student chose the weather apps as one of the top three most useful apps on his/her smart phone (13%).

Q: “Which of the following top THREE mobile computing/ communication activities do you regularly engage in on your smart phone? (8 responded, 6 students skipped this question)”

Figure 21: (responded n=8)

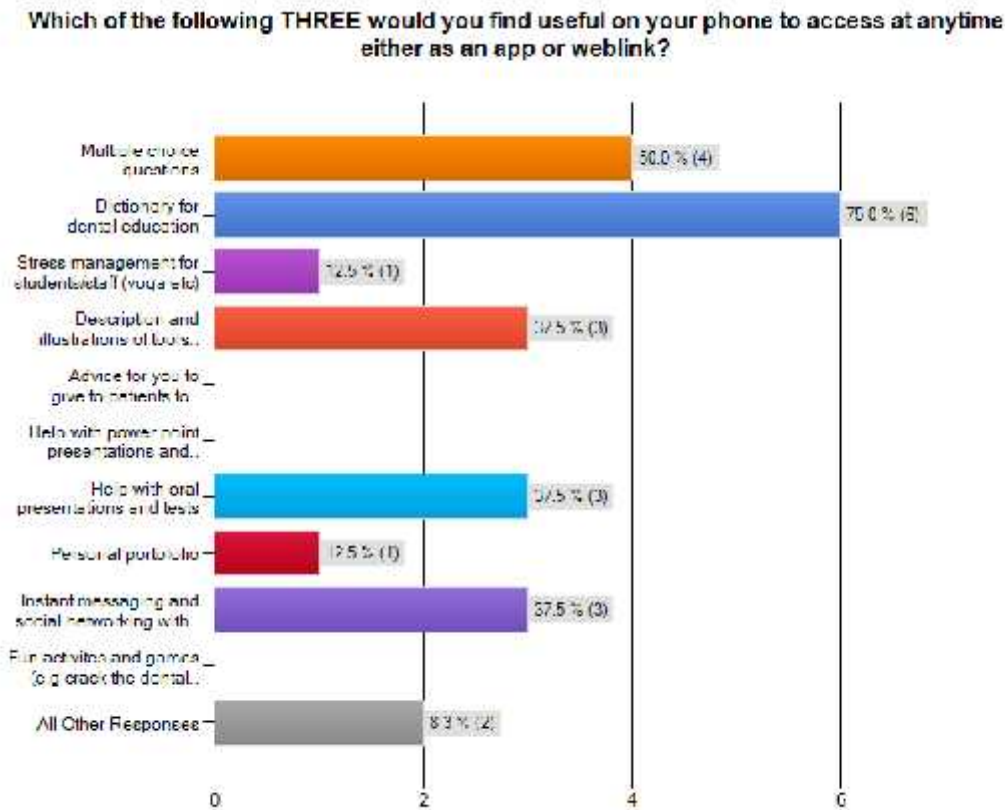




The most popular mobile computing/communication activity was sending and receiving emails on student's smart phones 100% (n=8). The next most popular activity was sending and receiving instant messages (IMs) as 88% (n=7) students chose this activity as one of the top three mobile computing and communication activities. Three students opted for transferring photos and other data (38%). Two students chose both downloading and viewing streaming movies/video clips and playing interactive games via the internet (25%). One student engaged in downloading and listening to podcasts/audio books as a regular activity to do on his/her smart phone as demonstrated in **figure 21**.

Q: “Which of the following THREE would you find useful on your phone to access at anytime *either* as an app or web link? (8 responded, 6 students skipped this question)”

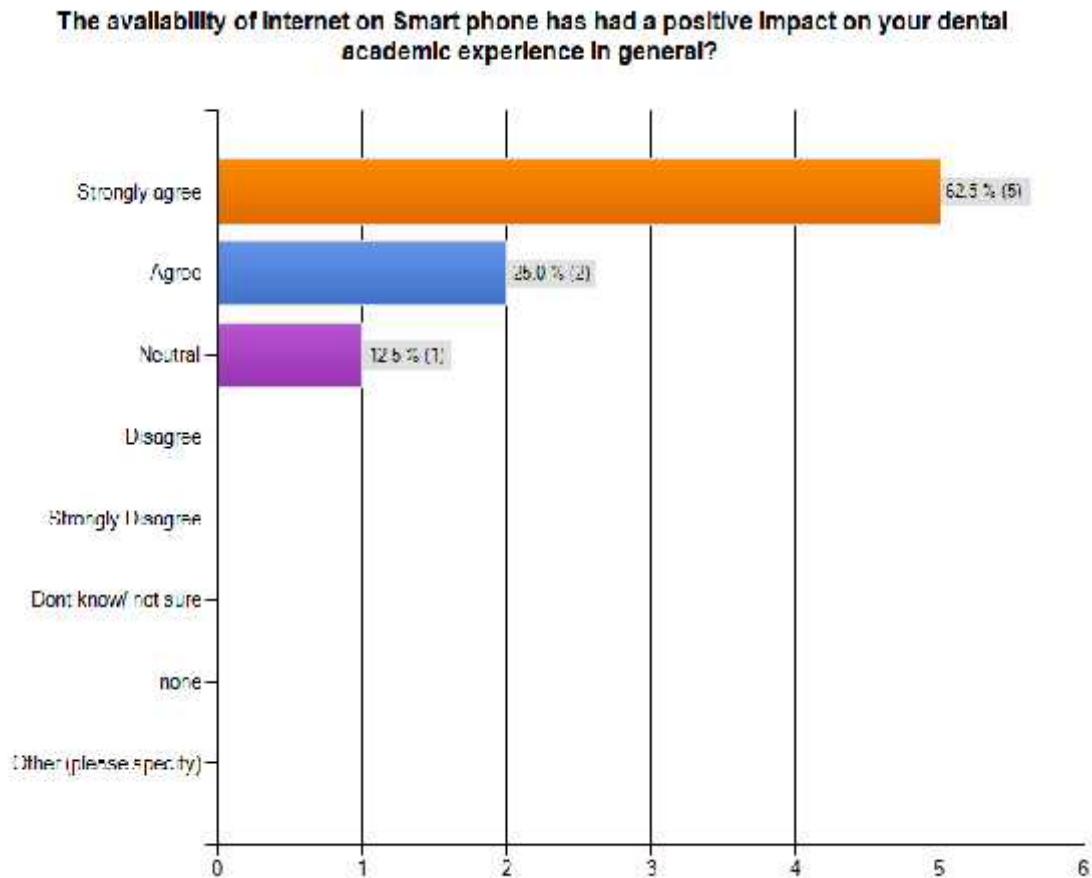
Figure 22: (responded n=8)



Students thought that having a dictionary for dental education as an app or web link would be the most useful on their smart phones as 6 out of 8 students selected this option (75%). The next most popular app or web link idea was multiple choice questions (50%). Description and illustrations of tools in dental practice, help with oral presentations and tests and instant messaging and social networking with fellow student/staff were each chosen by 3 students as being useful on their smartphones to have access to (38%). Two students thought that staff contact details and autobiographies would be useful (25%). Stress management for student/staff was an app idea which 1 student thought would be useful on their smart phone.

Q: “The availability of internet on smart phone has had a positive impact on your dental academic experience in general? (8 responded, 6 students skipped this question)”

Figure 23: (responded n=8)



The results show that 63% students strongly agree that having internet on their smart phone has had a positive impact on their dental academic experience (n=5). 25% students agreed to this statement (n=2) and 13% agreed neutrally (n=1).

Q: “Are there any other comments that you would like to make about the use of the internet on your smart phone in dentistry? (2 responded and 12 students skipped this question)”

Out of the 8 students that chose smart phones as one of their top two most used devices for the internet and finding information, 2 students left comments and 6 students skipped this question. The comments were as follows:

Respondant 1

“Ecourse could be better for iPhones and there could be an iPhone app.”

Respondant 2

“In question 17, dictionary and description of tools was also a good idea!”

Can we learn, teach and practise dentistry anywhere, anytime?

B. Khatoon,^{*1} K. B. Hill¹ and A. D. Walmsley¹

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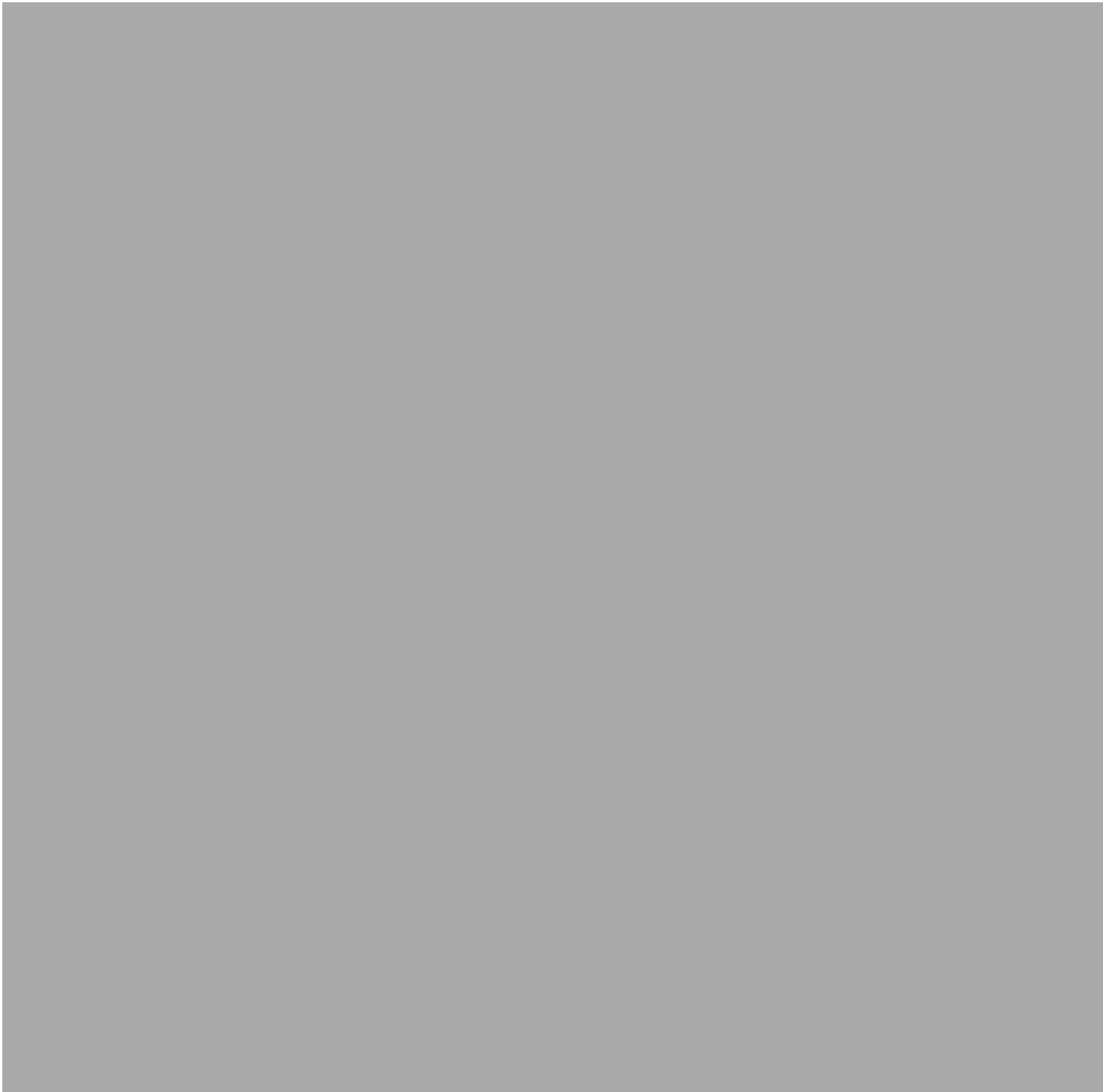
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Dental students' uptake of mobile technologies

B. Khatoon,^{*1} K. B. Hill,¹ A. D. Walmsley¹

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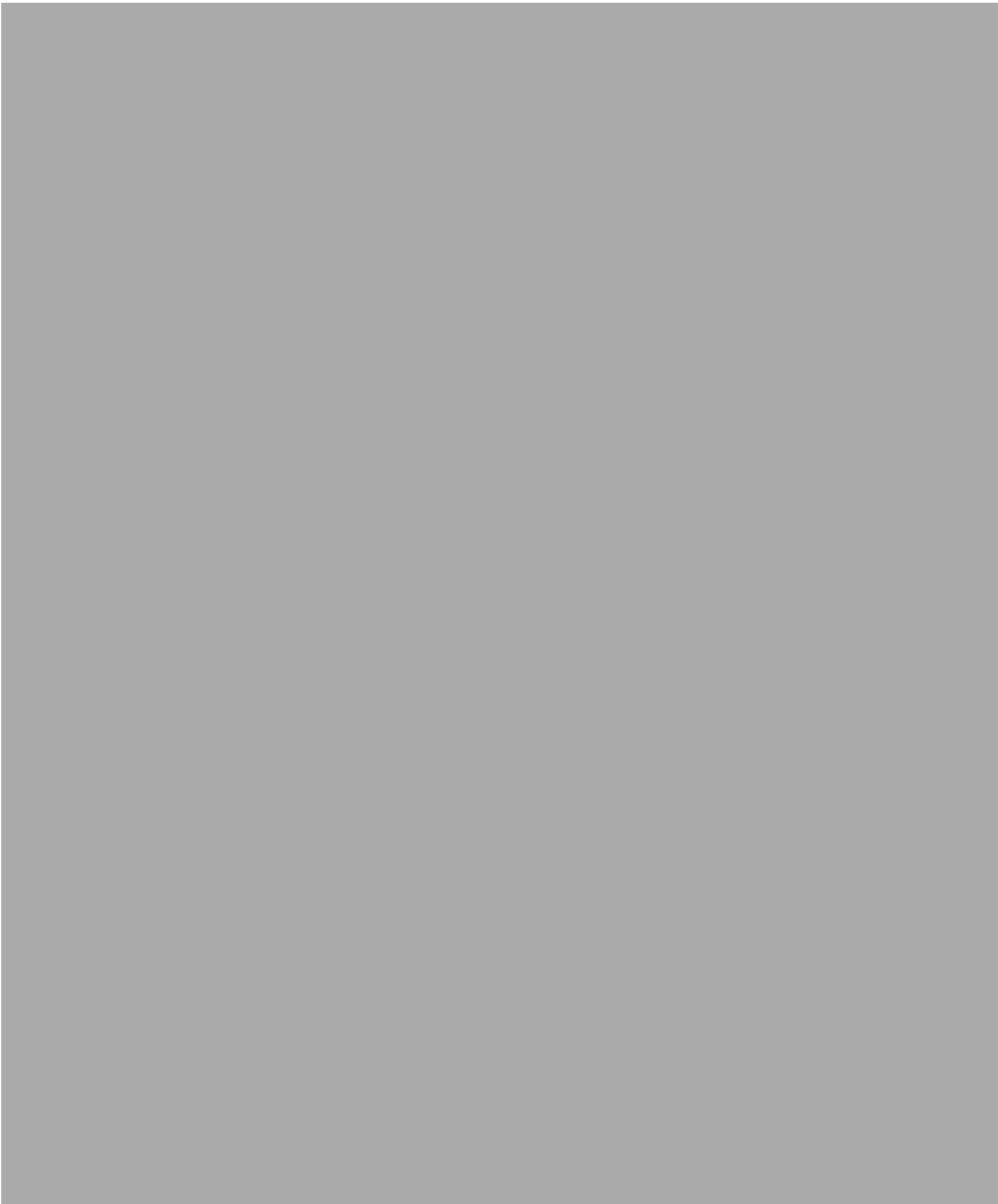
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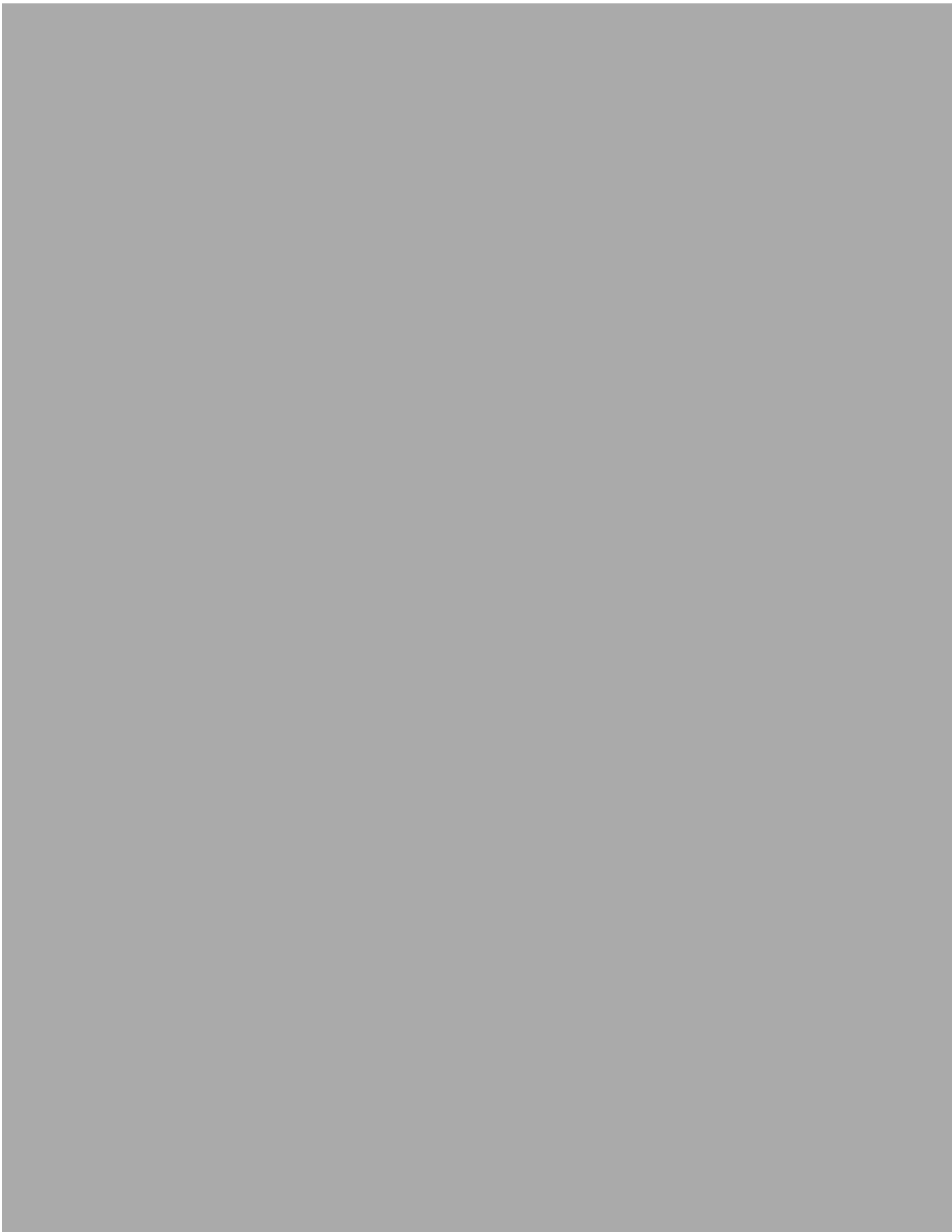
The Dos and Don'ts of Social Networking in Dentistry

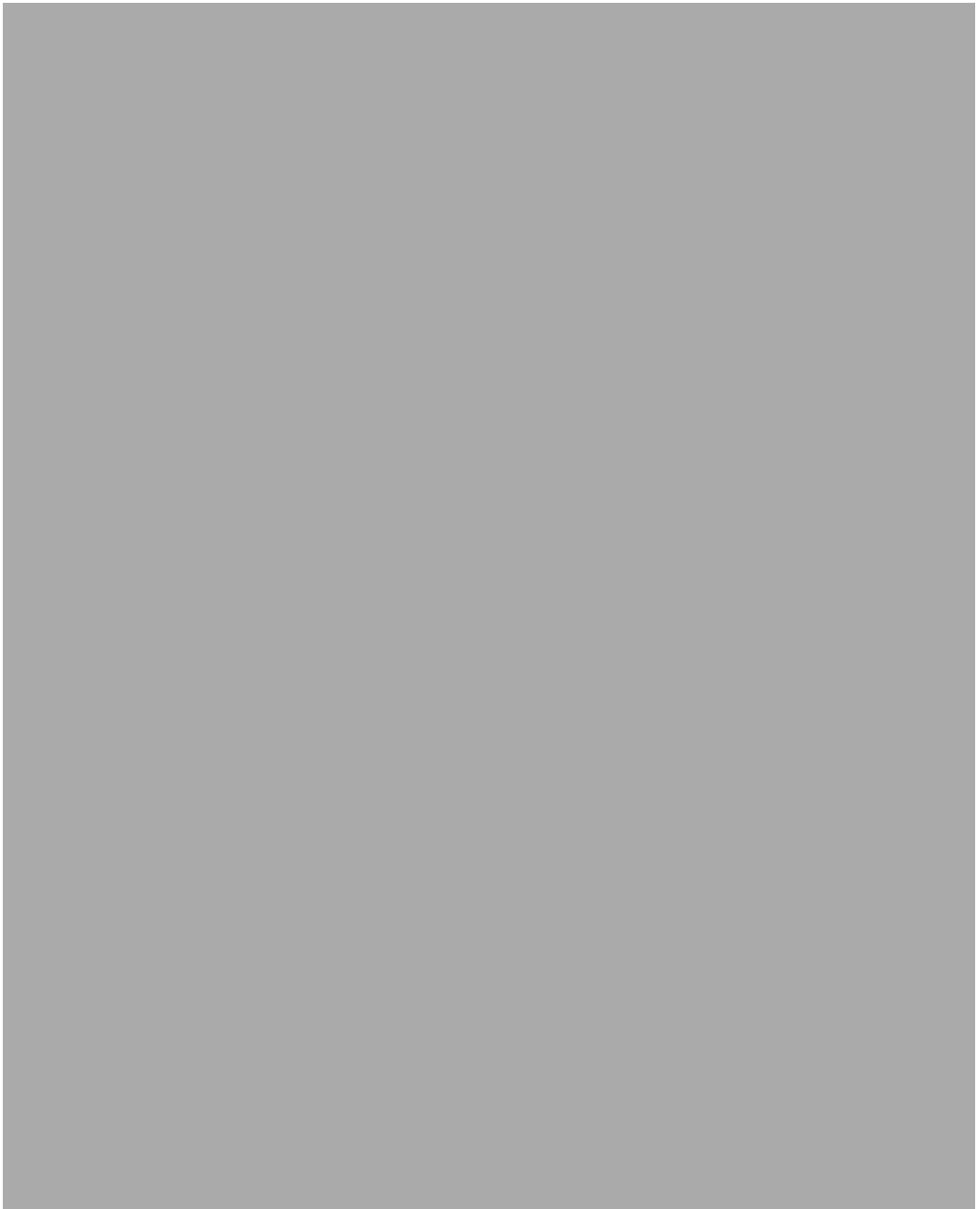
Abstract: Online social networking sites are a popular way to share interests, build and maintain relationships and stay more connected to the world. Tools that were not available a few years ago are now used on a daily basis. Social networking has been likened to a digital tattoo. Both Universities and Healthcare Institutions have concerns about the potential implications that students, educators and practitioners may face when using the media. The main concerns are related to patient protection by both qualified and student healthcare workers. This article outlines the guidelines put in place to avoid any mistakes made on SNS and how to maintain an e-professional aura whilst using SNS. Examples of good and bad social networking by students and practitioners are given. How the implementation of recently introduced guidelines impacts on the use of SNS in dentistry requires further research.

Clinical Relevance: Social networking has become part of everyday life and yet it can create problems for dental healthcare professionals as they attempt to accommodate both personal and professional 'aura' in the medium.

Dent Update 2014; 41: 690–696







ABSTRACT

Purpose: Instant messaging (IM) is when users such as dental students can communicate instantly via their mobile devices and it has become one of the most preferred choices of tools to communicate amongst health students. The aim of this study was to understand how dental students communicate via IM, the faculty perspectives on using IM to communicate with students and whether such tools are useful in their learning space. **Method:** After free-associating different themes on online communication, two draft topic guides for structured interviews were designed and focussed on mobile device related communication activities. A total of 20 students and 6 faculty members agreed to take part in the interview and were interviewed at the dental school, University of Birmingham. Students were selected from years 1-5 representing each year group. **Results:** The most preferred communication tools were emails, social networking and IM. Emails are used for more formal messages and IM and social networking sites are used for shorter messages. WhatsApp was the most used IM app because of its popular features such as being able to check if the recipients have read and received the messages and group work. Students thought that changes were necessary to improve their communication with faculty members. Faculty members have mixed feelings towards the use IM to communicate with students. **Conclusion:** The study findings demonstrated an elevated level of contentment with IM use in dental education compared to previous studies. It was a preferred alternative to email communication. Dental learners wish to make such communication tools a permanent part of their learning space but they would not wish this to occur unless they have the approval of the respected faculty members. Faculty members are willing to accept IM as a communication tool, only if it is monitored and maintained by the university and has a positive effect on learning.

Key words: Social media, Technology, Communication, Education, Dentistry, Instant Messaging

INTRODUCTION

A constant challenge is anticipating the next technology that students will adopt, to help with their education.¹ There has been research focussing on the use of the internet in dental education,²⁻⁵ but the advances in technology are challenging traditional email communication, as students adopt tools such as instant messaging. An instant messaging (IM) service is an app or tool which allows users to communicate with each other, when online at the same time. It is generally used via internet connections which are free of any charges. Users can create different contact lists such as a 'Buddy list' and it also allows them to sort their conversations into several different groups of their own choosing⁶. The most popular feature is the ability to check to see who is online and who is not. This has a distinct advantage over traditional email, as it instantly allows users to know if the other person has read and received the message.

Social media technologies like IM have improved communication immensely⁷ and this naturally impacts on teaching and learning to dental students. IM is now as much of a popular student communication tool as emails.^{8,9} Students may use IM up to 16.3 hours per week.¹⁰ Students are chatting to each other instantly and long conversations are put through with a few short cut words on instant messaging apps, this is also creating social identities. Social networking sites (SNS) such as Facebook can be used by students to develop new campus-based relationships.¹¹ Through IM platforms such as WhatsApp, users are communicating with contacts who they already know. Facebook can be used to post messages on other users 'walls', view pictures and virtually poke one another.¹² WhatsApp on the other hand, is a little more personal as users have to share mobile numbers to communicate, and it includes a variety of functions such as audio files, text messages, video files and attached images.¹³

The views on the academic use of IM are generally negative and may be the result of the limited amount of studies focussing on different types of IM tools.¹ Spending time on the internet and getting distracted, is often cited by researchers as a criticism to linking web based tools to student activity.¹⁴ Students will attempt to multi-task and examples include texting in the class or IM through assignments.^{15,16} In dentistry, such forms of communication are occurring informally but the impact has not been assessed in a formal manner.

Learners are changing and adapting quickly to new technologies and this has an impact directly on educational practices.¹¹ Faculty members could benefit from using these new tools, which may help bridge the gap between the faculty member and the learner, therefore benefitting everyone.¹¹ Some of the educational benefits of using IM platforms include organising group activities, discussing issues, obtaining quick information, such as links to helpful websites, sending files,¹⁷ faculty member and student in-person interaction concerning the course and students personal issues; elimination of the barriers between faculty members and students, and informal communication between students.¹⁸

AIM

The aim of this study was to understand how IM is used by dental students to communicate with each other and whether such tools are useful in their learning space. In addition, the study aimed to understand faculty members' attitude towards the use of IM to communicate with students.

METHODOLOGY

The project gained ethical approval from the University of Birmingham, ethical committee. After free-associating different themes on online communication, two draft topic guides for the interviews was designed. The aim of the interviews was to focus on mobile device related communication activities. This research follows guidelines of conducting qualitative research¹⁶. The topic guides included all the themes that were decided on when putting together questions. These included:

1. Use of internet for personal reasons and dental studies
2. First and second choice of device used to connect to the internet and search for information
3. Most used internet communication tool
4. Different ways of communicating with different groups of people
5. Improvements needed when communicating with faculty members
6. Phone brand
7. Different kind of apps used by students (study, personal, communication)
8. Mobile computing/communication tools engaged on smartphones
9. How often the devices access the internet

10. The most preferred place when connecting to the internet
11. Barriers when connecting to the internet to search for information
12. Students perspective on the term 'Evidence based apps'
13. General Dental Council (UK) ethical standards in relation to social networking
14. How students trust information on the internet
15. Any extra comments not covered elsewhere

For the purpose of this work, only questions related to communication are discussed. The interviews with students included questions on most used internet communication tools, different ways of communicating with different groups of people, improvements needed when communicating with faculty members and any concerns students may have regarding IM. The interviews with faculty members focussed on understanding their perspective on improvements needed when communicating with students and the use of instant messaging to communicate with them.

The questions and qualitative research process

For participation in the one-to-one interviews, students' and faculty members' consent was sought before and during the interview. They were assured that their answers are confidential and their names and information will not be used or displayed. A total of 20 students and 6 faculty members agreed to take part in the interview process and were recruited via email. Only students who took part in the previous survey were asked to be part of the interviewing process. Students were interviewed at the dental school, University of Birmingham. Students were selected from years 1-5 and the aim was to have students from each year group. This was achieved by making students aware of the study as a whole class and anyone who wanted to participate left their name and email address. Faculty members were asked to participate in the study through emails and face to face meetings.

The interviews were recorded with a digital voice recorder (Olympus VN-713PC) to avoid missing any points and also to prevent interviewee distraction. Once the question was asked, students and faculty members were given time to provide a detailed answer if they so wished. There were no time limits on the interview and it lasted up to half an hour. At the conclusion of the interview, students and faculty members were given a chance to discuss areas that had not been covered during the interview.

Data collection and processing

The information gathered during the interview was saved on a voice recorder. The voice memos were then organised on a laptop by taking out the interviews and sorting them into different folders. Students were given a specific ID which identified their sex, age and year of study. Faculty members' specific ID identified their age and sex. It was very important to ensure that the specific ID for both students and faculty members did not lead back to them and identify them. For this reason, the job detail for each faculty member was not disclosed. The interview recordings were then transcribed individually word for word into scripts. The transcripts were then used to highlight codes and categories, with the main themes being categorised again, using a qualitative data analysis computer software; NVivo.

RESULTS

Student interviews

Demographic data

Of the student sample (n=20) who volunteered to be interviewed, all twenty students had access to the internet. At the start of the interview, students were asked to give more information about their background including year of study, age and if they had access to the internet. This question allowed students to get more comfortable with the interview process.

Table 1 shows the demographic data of all the students that were interviewed in order of year. All students were interviewed at the dental school in Birmingham except one student who was interviewed at the main Campus, University of Birmingham. See **Table 1**.

(ST= student number).

Most used internet communication tool

All students chose emails, social networking and instant messaging as their first choices of communication. There was no difference in place of use, home or dental school. Eleven students chose emails as their first choice, 6 students chose social networking as their first choice and three students chose instant messaging. Students were asked to give explanations about their choices. For emails, many students felt that laptops were best for typing long and formal emails whilst writing short emails and quickly checking them were best done on smartphones and iPads. One student commented '*sometimes you can't be bothered to take out iPad to look at it so I use phone and if I have big files to download I use iPad and for a quick glance it's the phone*' (ST16).

One student felt that smartphones have helped her reach her emails much quicker than on her laptop, she explained: '*Well I don't carry my laptop around all the time and I feel with emails*

you have to check regularly and I feel before the smartphone I used to miss out on things such as first come first serve and by the time I'd get home I'd already missed out and it was too late so I feel the smartphone has definitely helped me' (ST20).

All students who mentioned instant messaging referred to the communication app called 'WhatsApp'. Instant messaging was preferred on smartphones by all students and one student explained that he instantly messaged on his computer tablet also. He explained how he managed to message the same way on both smartphone and computer tablet: *'I use the 'tap talk app' which is a communication app that lets you sync two devices via Bluetooth so you can essentially type on one and get the other one to send it for you' (ST6).*

Communication between students

To communicate with each other, some students used emails, as they did not have a close friendship but most of the students used instant messaging. WhatsApp was used a lot to undertake group work and share files for their dental studies. One student mentioned: *'We use instant messaging and do group and we like to do group presentations.'* (ST15). Another student again explained how WhatsApp is used for group work in the dental school: *'We have I think 6 groups per year so there is twelve of us in a group and we have our own WhatsApp group and someone will always reply' (ST13).* Facebook messaging was another popular way to communicate with fellow students for group work. All 20 students communicated with faculty members through emailing.

Improvements needed when communicating with faculty members

The dental students were asked to think of ways that may improve the way they communicate with faculty members, if they thought that improvements were needed. Students felt that they wanted to communicate with their faculty members through instant messaging, if this was

possible in the future. The main reason for this was because they felt this would be more instant and sometimes they cannot tell if the faculty member has received or read their emails, which through instant messaging such as WhatsApp, it is possible. Three students felt that emailing was adequate for communicating with faculty members and two students felt they needed more face to face meetings. One student felt that just as he communicated with fellow students through Facebook, maybe faculty members/faculty members could also be contacted the same way and suggested: *'It sounds bad but if they were on Facebook or a way to communicate with them through Facebook. I think it would be easier because you wouldn't have to search through the university emails or anything and it would be fast and instant and can be used on any device. Whereas I cannot send emails on my phone and only receive and WhatsApp would be better than Facebook as it is instant'* (ST12).

Instant messaging was mentioned by all of the students at some point and instantly messaging their faculty members was a very popular idea as students commented: *'if students and faculty members were happy WhatsApp would be good so that you know they have received the message'* (ST16). Another student suggested: *'Faculty members should get WhatsApp because it's instant. Obviously they might get annoyed but if messages are coming through and if you're on the same kind of level it should be ok. Emails are more formal and WhatsApp is more informal that's probably why they don't do that but if you have a question for a faculty member instant messaging is the best way'* (ST5).

Although the majority of students suggested instant messaging and Facebook messaging, 3 students felt it may be too personal and thought they may feel uncomfortable.

One student felt that the new smartphones and tablets allowed him to access emails instantly anyway and explained: *'Text messaging would be good but the idea of having a work phone and personal phone it could be hard work but I've seen people do this. Emails are convenient*

too especially with the new mobiles they are much more instant so the new mobile phone devices seem to deliver email messages more instant and work well' (ST1).

Faculty member interviews

Demographic data

Of the sample (n=6) who agreed to be interviewed, all six faculty members had access to the internet. At the start of the interview, they were asked to give more information about their background including age and if they had access to the internet. This question allowed them to get more comfortable with the interview process. The dental subjects taught by the faculty members are not disclosed, as this could identify them. **Table 2** shows the demographic data of all the members of staff that were interviewed. All faculty members were interviewed at the dental school in Birmingham.

(F= Faculty member number)

What do you think can improve your communication with your students other than emailing?

Faculty members were asked to think of ways that could improve communication with students other than emails. All faculty members explained that the problem with emailing students is that they are very slow in reading and responding to the emails. Two faculty members felt that more face to face meetings would help them communicate with students rather than electronic tools. Although one faculty member felt that emails are slow, he did not like the idea of text messaging or using the smartphone to message students, as this was his private phone and he did not feel comfortable using it this way. Similarly, another faculty member felt that there is no need for change and that emails set a good boundary between

faculty members and students: *'I would be happy for some members of staff to be contacting them on things like instant messaging or text messaging however I think the students feel that you know that teaching and work is separate and email helps maintain the boundary. (F4)*

Would you consider using IM to communicate with students?

Some faculty members were happy to use IM services to stay in touch with students whereas others were not keen on this idea. Even though instant messaging was something that some faculty members would consider, they expressed concerns and suggested ways that may encourage them to use IM. **Figure 1** illustrates the concerns and suggestions that they had towards using instant messaging to communicate with students.

DISCUSSION

Previous findings from the survey and the results from the present interviews show that the most popular instant messaging platform mentioned by students and faculty members was 'WhatsApp'. The app was praised by students to be instant, allowed them to check if the other person has received and read the message and allowed users to check if their contacts are online or not. Such advances in using technology and tools related to the internet have the potential to have an impact on education, as communication is a vital part of a person's career and personal life. When dental schools are not aware of the way students are using the new apps and internet tools, the gap between students and dental faculty members will become larger and may impact on the delivery of educational material. As commercial social networking sites develop more user friendly apps, students are quickly adopting these on their mobile devices instead of using their dental school emailing platform. Research in the past has stressed that knowing how much a student is involved in creating a learning environment¹⁹ and involving the students as 'primary stakeholders'²⁰ will help faculty understand how the students prefer to learn. The results show that students are actually taking control of their learning by introducing their personal preferred ways of communicating with peers and wanting the same communication with faculty members. It is important to acknowledge that the dental students, who took part in the study, may not represent the opinions and attitudes of the average student. Although the majority of comments made by students were positive towards using IM apps for dental studies and communication, there were some negative feelings towards this change. With regards to communicating with faculty members, students understood that it may be too personal for faculty members to have constant connection with students. Similarly, one faculty member mentioned that he would like to have a distinction between his personal and professional life. Doering *et al.*,²¹ found that faculty members felt extremely uncomfortable with not having an academic but a social conversation with students

on instant messaging platforms. One student mentioned that it could be a distraction to her learning when chatting all the time and being connected all the time. Another student felt that pulling out a phone in class and whilst in clinic could look very unprofessional. Nicholson²² found that some students did not feel that IM would work as a learning tool but the concerns were different. One student commented:

“It’s actually the wrong technology to help facilitate learning, due to its inherent one-to-one nature.”

Another student felt that it was better valued as a social tool and a *‘fun waste of time’*. In comparison to the current study students have both personal concerns and negative feelings towards IM as a learning and communication tool. The current results show that students are willing to use IM apps more for group work, and were communicating with each other but were concerned about the opinions of dental faculty members, towards communicating on similar platforms.

One faculty member explained that emails and WhatsApp messages were the same to him and he had no apprehensions towards students messaging him through instant messaging. Another faculty member suggested that instant IM should be used with small group teaching classes and would be useful in a controlled environment, rather than random people sending messages to each other. This is similar to the suggestions explained in a study that advanced technology works well for small group teaching, to facilitate increased contact between students and faculty members.²³ A previous study shows that students who communicate with faculty members via IM have a personal connection with them and faculty members could get to know students individually in response, and give tailored advice and tutoring.²⁴

Whilst using IM apps or sites, there is an option to create groups which facilitates work discussion and the option to share dental study related work. One student explained that out

of her group, if there is a question, someone would always be online and free to answer questions or chat in general about their work. Similar results were found by Lewis and Fabos²⁵ as students favoured this sort of communication above the rest because they found it exciting to know when someone was online or not. If they were not online, they would be back at some point as they would put their status up as 'away'. Such activities taking place, when students go home or even at university need to be acknowledged by academic staff, so that they can understand the impact of upcoming and new tools used for learning through communication.²⁶

Exchanging emails was the only way students were communicating with faculty members, when not meeting them face to face. However, faculty members explained that students were slow in replying to their emails and this was frustrating at times. Similarly, some of the reasons why students felt emailing was not adequate anymore, were that it was too slow in getting a response from the faculty members, they could not find out if the faculty members had received and read their messages, it was not instant and it was not possible through emails to check if the faculty member was online, at the time that they sent their messages. Although some faculty members were not as resistant towards IM, they had concerns regarding the use of IM with students. Others explained that instant messaging may not be traceable by the university, and this was a concern. Faculty members felt that it was important to ensure that any issues, related to students were addressed by the university. Another faculty member argued that he would not like instant messages coming through to him, which were not urgent. He explained that any messages or queries could be solved the following day and students did not need an instant platform to message faculty members. Similarly, Jones, Edwards and Reid²⁷ found that this method of communication may not be as favoured by faculty and may require more time commitment.²⁸ This could relate to the 'Creepy Treehouse effect'. Creepy Treehouse is a term used to describe technology/tools

which learners are already using in their private lives, used by institutions as innovative ways to communicate. The Creepy Treehouse effect explains the ‘repulse some users’ may feel when asked to participate in using intuitively controlled tools.²⁹ One faculty member stressed that if students were provided with IM platforms; they would not try to assess information and would feel that it was normal to message them anywhere at any time. Yeboah *et al.*,³⁰ found that for students who used WhatsApp in the class, there was an increased detrimental effects on their education. These negative effects included taking up too much of study time, not balancing academic preparations and online activities appropriately, and lack of concentration overall. However, Amry³¹ found that students who use WhatsApp seem to have better problem solving skills and can sometimes overcome learning difficulties through its use.

Dental students and professionals have a duty to follow guidelines and protect patient confidentiality. The use of IM tools and other social media mediums may have potential drawbacks related to the transmission of patient data. As IM tools are not yet secured by institutions, students could potentially breach patient confidentiality and privacy, when discussing patients.³²

The results show that there may be negative effects on students and faculty members when using IM as well as positive academic enhancements. Future research needs to concentrate on the use of IM in different settings.

CONCLUSION

The findings indicated an elevated level of contentment with IM use in education compared to previous studies. IM was used as a communication tool by students and also as a platform for group work. Dental students wish to make such tools a more permanent part of their learning, but only with the approval of the respected faculty members. Faculty members at the dental school were reluctant in taking up such tools, when communicating with students, and would only use them if there is a controlled and monitored platform in place. It is important to understand the effects of IM on learning. Dental schools should be aware of such changes/effects and look to adapt their learning practices to the IM technology.

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