A STUDENT PERSPECTIVE ON MINIMUM REQUIREMENTS FOR MOBILE NOTE-TAKING

Mari van Wyk
Tshwane University of Technology
South Africa

Abstract

In recent years there has been a sharp increase in the number of students who own mobile devices. In this case study, a group of students explore the note-taking possibilities of mobile devices in various educational settings. Data was collected through a questionnaire, group interviews, and observation. For students, the ease of use of both devices and applications were important. Although they preferred to use one application, they did not give preference to a specific device. More importantly, students need to share information between devices as well as with fellow classmates. Finally, recommendations are made on the minimum requirements needed for effortless note-taking.

Introduction

Numerous researchers have shown that the use of mobile devices has increased dramatically over the years (Schepman, Rodway, Beattie, & Lambert, 2012; Sooryamoorthy, 2014; Wallace, Clark, & White, 2012). The astounding popularity of mobile devices is illustrated by the fact that in the first four years since the launch of iPads, more devices had been sold than any other product in Apple's history (Dilger, 2014). Furthermore, the results of a worldwide survey showed that mobile subscriptions reached the 5 billion mark in 2017, which is a penetration rate of more than 66% of the world population (GSM, 2018).

In South Africa, a general household survey completed in 2016 showed that 96% of households had a mobile phone, while only 21% had a computer (Statistics South Africa 2016, 2017). Not only do South African citizens have access to mobile phones, but 37% of them indicated in 2015 that they owned a smartphone as well (Poushter, 2016). From the above it is clear that mobile devices, albeit laptops, smartphones or tablets, are popular and readily available for day-to-day use. One can now ask how these devices can be used in education, especially in a learning activity as relevant as note-taking.

Literature Review

Taking into consideration the popularity of mobile devices worldwide, the importance of note taking in educational environments, as well as the realities of students, the focus of the literature review will be on note-taking and the use of mobile devices in education

Note-Taking

Note-taking refers to the typing or writing of information in a systematic way; it can also include the recording of images or voices, or both, during a lecture or a discussion (Schneider, 2014). The importance of note-taking for students

was emphasized by several authors' research (Anderson & Armbruster, 1986; Cohen, Kim, Tan, & Windelmes, 2013).

Students often complain about the balancing act they need to perform in class by simultaneously trying to read from slides, actively listening to the lecturer, critically thinking about new constructs, and writing legible notes. If this process is so demanding, the obvious question is why lecturers do not simply provide students with full sets of notes or record all lectures. Russell, Caris, Harris and Hendricson (1983) found that if notes are provided, it is better to give students partial outlines only, as opposed to full sets of notes, as that enables them to add their own experience and thereby expand on the existing information.

Piolat, Olive, and Kellogg (2004) and Bui, Myerson, and Hale (2013), state that the process of note-taking is cognitively demanding. In this context, *cognitive demanding* refers to actions students take to simultaneously pay attention, organise the information, and record it in an understandable manner before it is forgotten (Bui & Myerson, 2014). For many years, university students, and first year students in particular, have been faced with the dilemma of how to recall the flow of information in traditional lecture periods (Piolat et al., 2004).

Bui et al. (2013) compared handwritten note-taking with taking notes on the computer and concluded that computers can be used with some success for note-taking. In spite of the findings of Bui et al. (2013), Mueller and Oppenheimer (2014) reiterate that the pen is mightier than the keyboard. They claim that note-taking on mobile devices, such as laptops, result in shallow processing because students transcribe what the lecturer say, word for word, while the cognitive demanding actions, as described above, do not take place.

Furthermore, Ward and Tatsukawa (2003) advocate that electronic note-taking still needs to engage the student's mind, and be cognitively challenging, while technology plays a supporting role (Ward & Tatsukawa, 2003), rather than being a distracter in class (Mueller & Oppenheimer, 2016). However, the reality in the classrooms are that students keep on using their mobile devices for personal activities and to some extent for note-taking (Vincent, 2016).

Mobile Devices in Education

Although mobile technology had not originally been designed for educational purposes (Traxler, 2010), its omnipresence challenges lecturers and researchers to develop applications so that it can be utilised in education. Students seem to use their mobile devices often and regularly, even more than their physical university libraries (Laurillard, 2012).

When students use mobile devices, the classroom's boundaries disappear, and, this learning environment without boundaries moves with the students wherever they go (Martin & Ertzberger, 2013). Johnson et al. (2013) note that tablets are emerging as powerful tools to be used inside as well as outside the classroom. The mobility, ease of input, and new screen format enables lecturers to present learning material in new ways (Clark & Svanaes, 2014).

In South Africa, the use of mobile devices in education is also increasing. Universities such as the University of KwaZulu-Natal (University of KwaZulu-Natal, 2013), the University of Johannesburg (Fripp, 2013), and some private universities (Alfreds, 2013) have also embarked on tablet projects. Furthermore, the Department of Basic Education of the Gauteng Province and three schools in the Eastern Cape province has embarked on tablet projects (Oxford, 2015; Wild, 2015). As a result of the above, many first-year students at South African universities will already have been exposed to the use of tablets when they enrol at universities.

When taking both the popularity of mobile devices and the value of note-taking into consideration, the question arises how students experience the use of mobile technologies in the various learning environments (Mackenzie & Knipe, 2006). To explore this, the following two sub questions were asked:

1. How do students use mobile devices to take notes in a typical health science course?
2. In the students' opinion, what minimum requirements should mobile devices have to ensure effective note-taking?

Research Method

This research study was exploratory and qualitative in nature, and the design is in line with that of a case study. BVSc students at a faculty of veterinary science at a university in South Africa participated in this study. The research was conducted in two phases. During the first phase, data was collected by means of a questionnaire, and during the second phase it was collected by means of group interviews and a class observation.

As part of phase 1, 179 (n= 365) pre-clinical training students who attended classes on a particular day completed an electronic questionnaire about their mobile device ownership, mobile device usage and internet access. This questionnaire was administered by the researcher and after the purpose was explained and consent was obtained, Clickers were used to collect their responses. These responses were counted and summarised using a Microsoft Excel spreadsheet.

In the last question of the questionnaire, student volunteers were invited to participate in the second phase of the study. Eight of the 179 pre-clinical training students volunteered to participate. This group of eight students consist of 2nd (n=1), 3rd (n=5) and 4th (n=2) year students. Half of the students were black (n=4); three were white and one an Indian student. Six female and two male students participated.

This article reports on how students used their mobile devices when they took notes. As part of the study, specific assignments were designed so that the participants could integrate mobile technology into their learning practices, particularly when taking notes in the typical educational environments of veterinary students. After exploring a particular aspect of mobile note-taking, participants had to report back on their experiences during a group interview.

The group interviews were held once a week for six subsequent weeks. Participants were asked to report on the specific device and applications they used for taking notes and whether or not they felt it worked for them. After written consent was granted, the group interviews were recorded and transcribed, the text was then analysed according to the method described by Henning, van Rensburg, and Smit (2004) to determine trends and recurring patterns.

Lastly, an observation was made when one of the researchers visited a practical anatomy class and observed how students used mobile devices. After permission was obtained from the lecturer and students, the researcher took photos of how the students took notes with and without their mobile devices.

Results

The results of the questionnaire administered during the first phase painted the picture of which devices the students had access to and how they already used them for social and academic purposes. Therefore, those results will be presented first. Subsequently, the feedback from Phase 2, namely the group interviews and observations, will be presented in the form of three themes: students' current note-taking practices, the mobile devices and applications used, and the perceived value of taking and sharing notes.

Mobile Device Ownership and Use

To confirm the use of mobile devices at this university, the participants were asked to indicate what mobile devices they were using at the time. In the electronic questionnaire, 96.6% of the students indicated that they were using a mobile device (laptop, tablet or smartphone) for either social or academic purposes. This usage is shown in Table 1.

Table 1

Mobile Device Uses For Social and Academic Purposes

Mobile Devices Used for Social Purposes		Mobile Devices Used for Academic Purposes	
Social media	158	Not using it for academic purposes	16
Email	148	Searching information	142
SMS	146	Accessing ClickUP (Blackboard LMS of the university)	116
Instant messaging	132	Taking notes	55
Videos and music	132	Taking photographs	109
News & weather	101	Recording lecturers	39
Browsing	129	Doing assignments & tests	61
Games	90	Discussion groups	70
Calendar	110	Other	16
Other	27		

The data from the questionnaire confirmed that the majority (96.6%) of the pre-clinical students owned a web-enabled mobile device. Of the students who participated in this study, 31% indicated that they used their mobile devices for taking notes during classes, 61% of them used their mobile devices for taking photographs during class, and 22% of the students had recorded a lecture in the past. This finding encouraged further exploration of the use of mobile devices more specifically on the use of mobile devices for note-taking purposes.

Current Note-Taking Practices

During the first group interview, participants were asked to indicate their current note-taking practices. Participants' explanations confirmed that students were already making use of their devices without the interference of lecturers or the university (Laurillard, 2012; Naismith, Lonsdale, Vavoula, & Sharples, 2004). It seemed to be irrelevant whether or not lecturers gave students copies of their presentation slides, or even lecture notes, before the class, as students took notes regardless of handouts. When taking notes, students either type or write on top of the electronic format of the notes, or they print the notes in hard copy and write on them in the traditional way. If the notes are not available beforehand, they either type the notes on their mobile devices, or they write on paper. After class, or when the slideshows become available, they organize and put all the notes of a subject together.

During the practical anatomy session, the researcher observed while students dissected and isolated specific anatomical structures. Some students printed out all the notes beforehand and came to the practical armed with an array of colored flags, pens and highlighters. They then did the dissection and took notes on their paper-based handouts as they went along. A few other students chose to use their smartphones or tablets and downloaded the notes on their devices beforehand. They opted to take photographs of their own dissections as they discovered the various anatomical structures and used an app with digital pens in a variety of colors to draw and highlight the various features on their picture (Figure 1).

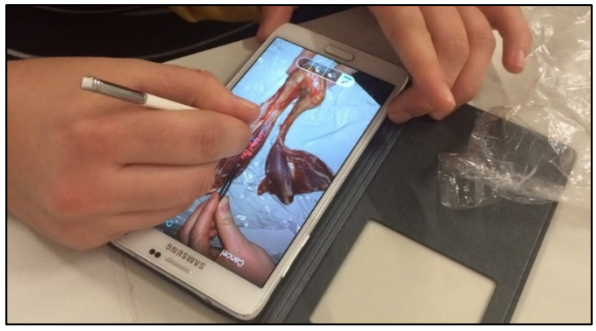

Figure 1. Taking notes with a smartphone.

Other students found it frustrating to divide their attention between their notes and the photographs of their dissection and opted to use their tablets as well. It seemed as if these students alternated effortlessly between the various devices, using each one in a slightly different way and for a different purpose, depending on their needs at the time.

Devices and Applications Used

To allow the participants to further explore the use of mobile devices for note-taking, the participants had to use applications of their choice to type notes and take pictures and videos and were then requested to organise and integrate the notes and images with the lecture notes they received from the lecturer.

The devices that participants experimented with were tablets (Samsung tablet, Samsung Galaxy 2 and an iPad), smartphones (Sony Xperia Z2, Lumia and Zest) and laptops. The mobile devices that have dedicated stylus recognition worked well, and participants could write and highlight text, make drawings, and write on pictures while using that application. The participants who used devices without a dedicated stylus downloaded a stylus application that did not work well, and they had to revert back to typing instead of writing.

Various Office applications such as King Office, Polaris Office, Office Suite 7, Documents Office and Microsoft Office, were also used. Some applications worked better than others, depending on what the participants tried to do and on which mobile device they used the applications. Typical actions were to highlight, format text and add objects like pictures. Although students attempted drawing on existing slideshows, they could not use the drawing function on a laptop. Participants also complained that not all Office packages were user friendly and that they had struggled to create new documents, especially on the smartphones.

The participants also experimented with dedicated note-taking applications such as Evernote, OneNote and S-Note, with mixed results. Although all these applications worked, documents could sometimes not be opened and edited, and in other cases documents could not be shared. The majority of participants explored Adobe, since the slides used in class were in PDF format. They mentioned that Adobe worked on all the devices and that documents could be moved between devices. However, they were unable to select a specific page to print.

In order to put together all the information collected during note-taking, and to make their note-taking effective, devices had to be able to sync with one another. This is confirmed by Mueller and Oppenheimer (2016), who concluded that the note-taking devices and applications used will differ from situation to situation, and that note-taking needed to be more effective rather than merely easier.

Note-Taking and Sharing of Notes

A significant theme that emerged from the feedback was the value of note-taking as experienced by the participants in the study. The veterinary students seem to have two specific opinions about note-taking. Firstly, note-taking was perceived as important because it was seen as an integral part of their own learning process. As one participant stated: “For me personally, sitting and putting the time into … making comprehensive notes for myself is almost two-thirds of the learning experience…” [P2].

But it was, secondly, interesting to note how these participants also regarded it as important to record and save information for future students (those currently in lower classes), especially in the form of visual notes like pictures with captions of specific diseases, and videos with voice recordings and explanations of real case procedures. The importance of sharing notes with one another, and of using notes that students from previous years supplied, also became clear as indicated by the following student remarks: "In Pathology it really helped going through what other students have made of each of the organ systems" [P1].

Discussion

It was clear from the onset of this study that the students who completed the questionnaire either owned or had access to mobile devices. It was further highlighted during the group interviews that students already used these devices as they saw fit in their different educational environments. Based on the students' feedback, the following should be taken into consideration when taking notes.

Ease of Use

When referring to what devices and applications they tried out as part of this study, participants regularly mentioned how difficult or easy some applications were to use or how some applications were not user friendly. This is an indication that ease of use is important when trying out applications on mobile devices and should and be taken into consideration when note-taking applications are developed. As a student mentioned, "But I am still trying to figure out how to use it. I didn't enjoy it. I like the pen and paper" [P3].

This is in agreement with what Davis (1989) also found: that ease of use is one of the possible indicators of users' attitude, intent to use or actual use of technology.

One Application Available on Multiple Devices

The participants also regularly referred to having everything they received, recorded or wrote down in one application. They experimented with various devices in the weeks of the study. According to them, there is not one specific device that will fit all their needs. As mentioned by one student: "You can't really only have one device and expect to use it all the time unfortunately. It is not practical" [P6].

Therefore, not only do the students want all their notes saved in one location, but they also want the notes to be available on various devices. Also, the saved notes should preferably be able to integrate seamlessly with whichever learning management system is used by an institution of learning.

Sharing Notes

In addition to being able to take notes and having everything together as a study unit, the participants emphasised the importance of sharing their notes. To do so, they need to save the notes in a format that is small enough to be transferred between devices. Participants not only want to share their notes with their fellow students, but also keep them safe for future students to access

and learn from. To the participants it is important to have access to rare and special veterinary cases of the past, because it is possible that they will not see such a case during their studies.

One participant commented that they appreciated it when final-year students recorded the real-life cases that they were exposed to in the clinical setting and then made the information available to students in the pre-clinical years. The student said: "It is a lot easier to remember diseases like that if you actually have memories of the pictures, … what it looks like, … what you saw and different variations of the same type of disease" [P1].

Therefore, such an application should be able to allow students to share their information with others, for example, through social media like Twitter and Facebook, or email. In addition, if saved in the cloud, it would also be available on all the devices students use.

These participants used mobile devices in class for mobile note-taking. Researchers claim that if you verbatim take down notes without any brain processing, the value of note-taking is shallow (Mueller & Oppenheimer, 2014). However, what was interesting about these participants, is the fact that after they took notes (apparently shallow processing), which they organised after class,they integrated all the notes that they made for the day into one learnable unit. This integration of information, students claim, forms a significant part of their learning process and eventually influences their results.

Conclusion

It was evident from the literature that the majority of students own mobile devices and use them on a daily basis **(**Gikas & Grant, 2013; Kobus, Rietveld, & Ommeren, 2013; Traxler, 2010). This trend was also found to be true for the students in this current study. Therefore, this study aimed to explore the current practices and experiences of students when they take notes using their mobile devices. This article contributed by looking at the type of activities students would like to engage in when taking notes, taking into consideration the sophisticated technology that is available, as well as students' higher levels of computer literacy. Minimum requirements are provided, that could be of great importance to creators of online applications aimed at institutions of higher education.

In short, participants in this study stressed the importance of ease of use and having a space where all their notes are available in one application from where they can seamlessly share their notes between devices and their fellow students. To make this possible, this application needs to be scalable over a variety of devices, so that students can choose which mobile device will fit a particular environment best. With the pace of technology development increasing (Columbus, 2015; Roser & Ritchie, 2016), more sophisticated note-taking applications are expected to be developed in the near future. It would be interesting to observe how the new age of cloud storage impacts on the note-taking activities of the future.

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Author Details

Mari van Wyk
vanwykm@tut.ac.za