Evaluating and measuring how new technologies and ubiquitous connectivity affect university students' psychosocial wellbeing

J. Taylor, M. Salvagno, R. Morris, M. Hutchings & M. Bobeva

Where universities focus on the benefits of technology-enhanced learning (TEL), they tend to underestimate the impact on learners' experiences and wellbeing. The goal of the research reported in this article was to investigate how new technologies and ubiquitous connectivity affect students' day-to-day life, learning habits and consequent psychosocial wellbeing. A mixed methods approach was taken to allow qualitative data (stage 1) to inform the development of a quantitative measure (stage 2). Stage 1 involved 88 students and eight staff participating in semi-structured interviews and focus groups. Constructivist grounded theory found that students used ubiquitous connectivity to enhance wellbeing by satisfying four basic psychological desires and needs: ease, freedom, engagement and security. However, students' wellbeing seems negatively affected by their struggles in coping with the ubiquitous availability of resources, in managing: information, communication and expectations regarding support. From stage 1, the factors from the model of students' psychosocial wellbeing helped develop a quantitative measure and the development of this Learning Technique Well-being Scale (LTWS) is described in stage 2. The LTWS was completed by 102 students on various courses and levels at one University. Preliminary analysis shows that the scale differentiates between five different learning techniques (tutor contact, lectures, published books, student-student discussion and course handouts) in terms of negative and positive emotional perceptions. Further research will involve thorough testing of the LTWS across different courses, ages and gender.

Keywords: *e-learning, emotions, wellbeing, stress, flexibility, student preferences.*

Introduction

THE USE OF E-LEARNING is increasing in both educational and work settings and the rise in students taking at least one online course has risen by 318.9 per cent from 2002 to 2013 (Allen & Seaman, 2013). Cancannon, Flynn and Campbell (2005) suggest a rise in the use of e-learning comes from the increase in full time students learning away from University at times to suit them (whereas traditionally, distance learning students made up the main users of e-learning techniques). Additionally, advances in software technology and connectivity now allow access to educational materials and tutors to be quicker and easier than even before. However, it is unclear what impact ubiquitous connectivity and using technology for different learning activities is having on students. The aim of our research is to investigate university students' positive and negative experiences with new technologies and ubiquitous connectivity and how these experiences affect their wellbeing.

Ubiquitous connectivity has been defined by El-Hussein and Cronje (2010) as 'time- and space-independent online access to resources, people and services'. In terms of student learning, this relates to three things: the mobility of technology, the mobility of learning, and the mobility of learners. Mobile technologies can include mobile phones, laptops and tablets. Mobile learning enables students to participate in learning activities on and off campus. For example, students can search for resources, download

or read online articles and books, access stored course materials (lecture notes, slides and video-recorded lectures) and course-related administrative information, network with peers and communicate with tutors, library and technical staff. The mobility of learners relates to the internet connection allowing learning activities to take place independent of location; most commonly this allows learning to take place at various places around campus and at home, but it also allows activities to take place in transit and while away from home or university.

Although ubiquitous technologies often enhance flexibility and make learning more efficient and sometimes more enjoyable, they can also negatively impact on wellbeing in many ways. At a physical level, health issues have been related to Wi-Fi radiation (Hardell, 2018), eye strain and postural issues (Sadagopan et al., 2017), and sleep issues (Tetsuo Harada, 2002). Mental health issues have been linked to over-reliance on technology or connectivity, so that normal day-to-day activities are affected and in extreme cases this can include internet or mobile addiction (Roberts, Yaya & Manolis, 2014). At a socio-psychological level, wellbeing can be affected at emotional and behavioural levels. For example, using ubiquitous technology can lead to reduced face-to-face interaction and isolation which has then been linked to depression, anxiety, a reduction in the quality and quantity of interpersonal relationships and social stress (Van Deursen et al., 2015).

Theories of wellbeing and online technologies

As stage 1 adopted the constructivist grounded theory approach (Charmaz, 2015), a thorough review of the literature was not necessary; instead key theories and research papers were read and below we identify some key approaches to wellbeing and to adoption of online technologies.

Deci and Ryan (2008) suggested that research on wellbeing fits either within the hedonistic tradition or the eudemonic tradition. The hedonic approach suggests wellbeing refers to happiness in regards to experiencing positive affect with the absence of negative feelings. Whereas, the eudemonic approach suggests wellbeing involves life being lived to the full and in a deeply satisfying way. Therefore, within the hedonic tradition it could be suggested that the positive and negative emotions experienced when learning could contribute to the wellbeing of a student.

Adoption and enjoyment of online technologies has been related to a number of theories in psychology. For example, Ledbetter, Hardman-Taylor and Mazer (2016) draw on the uses and gratifications theory to explain the frequency of use of different media, and Ifinedo (2016) also uses this theory to explain student adoption of social networking sites. The theory of flow has been drawn upon by Sherry (2004) to explain differential enjoyment of media. Sherry proposes that a flow experience can occur when media message content balances with an individual's ability to interpret that message. Further, Sherry theorises that media experience, along with individual differences in cognitive abilities, can facilitate or prevent flow state in media users.

In summary, stage 1 will explore student's experiences with new technologies and ubiquitous connectivity in a qualitative way (section 2.0). Following this, stage 2 will use a quantitative method to understand the impact of using different technologies for different activities on student's preferences and emotions (section 3.0).

Stage 1

Method

The methodology chosen was constructivist grounded theory (Charmaz, 2015); this qualitative approach was felt most appropriate for the topic as it would allow the development of a theory that describes and explains connections between students' experiences and their wellbeing. There were no hypotheses or preconceived ideas and therefore the

methodology allowed the collection of rich qualitative data from participant's narratives.

There were multiple sources of data collected from four data collection phases: (i) students completed open ended questions in an online survey; (ii) student and staff interviews; (iii) live data collection from students; and (iv) focus groups with students. Eighty eight students took part from various faculty studying a variety of degrees, with 72 on-campus and 16 online students. Eight staff also participated and were employed in a variety of roles such as learning technologists, IT support, librarians, academics and administrators.

Results

Given the complexity of this grounded theory study and the quality and quantity of data collected, full details of the method and results are described elsewhere (Salvagno et al., 2015; Salvagno et al., in preparation). An overview of the findings that informed and prompted stage 2 are concisely presented in this article.

Positive experiences which enhanced a sense of wellbeing included many aspects, such as students taking an active role in what they learn, with teacher as facilitator and students learning through collaboration. A common sub-theme was increased flexibility in learning and comments relating to how this encouraged and widened access to materials and enabled self-pacing and reflection. A number of comments related to ways that connectivity brought interaction to a normally isolated learner and improved communication between and among students and teachers and that a peer group can be wider. From these sub-themes, three key themes were produced.

1. *Sense of ease and freedom (ease, freedom, control)*
   'Technology changes lives, it has given me ample opportunity to 'google' any queries I may have. A mobile phone has given me freedom, and helps with social lives and heaps of other things. A laptop to help with uni work. And much more. I learn a lot, have more freedom, more control, easy access to all information.' (Student 2 – qualitative survey)

2. *Improved workflow (confidence, self-efficacy, productivity)*
   'It makes you feel good because you don't immediately forget what you just thought of… because if you think about something when you are out, by the time you are at home… if you didn't write it down…you won't remember it again… so it is good and it helps you to work and you feel more confident… about what you are doing… because you got a lot more of ideas, they are coming more (inaudible)… you can record down…' (Student 2 – focus group 1)

3. *Connectedness*
   'Interacting with new students helped to build friendships and helped to complete assignments.' (Student 13 – qualitative survey)

4. *Security and reassurance*
   'If you are somewhere, if you don't know an information you can always message someone asking 'hey where is it?' or 'what do I have to do? Is there any work that we had?' It is like a safety-net, you can find your information.' (Student 5 – focus group 2)

   'You get a lot of comments back of like reassuring that everyone is having the same problem as you.' (Student 9 – interview)

Negative experiences, which led to a diminished sense of wellbeing include the following: stress arising from equipment differences (software/hardware), unreliable connections, lack of technical support and information overload; frustration due to delayed feedback and lecturer reluctance to communicate online. Other impacts related to: the lack of textual skills; additional learning needs; unexpected disclo-

sure, and learning in a foreign language. From these sub-themes, three key themes were produced.

1. *Stress due to excessive reliance on technology*
   'I am quite reliant on technology and when it doesn't work I don't have a clue where to go from there I just call off and cry…' (Student 2 – focus group 2)

   'I don't have a plan B, my plan is to go online on myBU and doing my lecture, but when it is shut down I don't know what to do…' (Student 3 – focus group 3)

2. *Stress and distraction due to information overload*
   'I think it is also difficult to focus on one thing as well, because say that (…) you go to do one task… I often find myself going into my emails and I have an email from like a placement or something else… so then you start to search the company and you go on the tangent staring to doing something completely different… and you end up finding different things at once, you are not really focused on one thing…' (Student 1 – focus group 2)

3. *Diminished motivation in attending lectures*
   'laziness… you can miss lectures and just look at the power points online and even if you don't get as much information (…) you would have if you turned up… so it can make you like… 'oh I missed this one it is online already'… or it can make you like… 'what I need to do…' …you can message your friends about it and if they have gone they pretty much do it for you, so you can be quite lazy…' (Student 3 – focus group 1)

Development of a model

Figure 1 presents a theoretical model that summarises the structure of the grounded theory developed at the end of the data analysis process. As can be seen in Figure 1, ubiquitous connectivity enhanced wellbeing by satisfying four basic psychological desires and needs: ease, freedom, engagement and security. However, wellbeing was negatively affected by struggles in coping with the ubiquitous availability of resources, in managing: information, communication and expectations regarding support. This model was later applied to predict how increasing or decreasing elements would affect wellbeing; this is discussed in more detail elsewhere (Salvagno et al., 2015; Salvagno et al., in preparation).

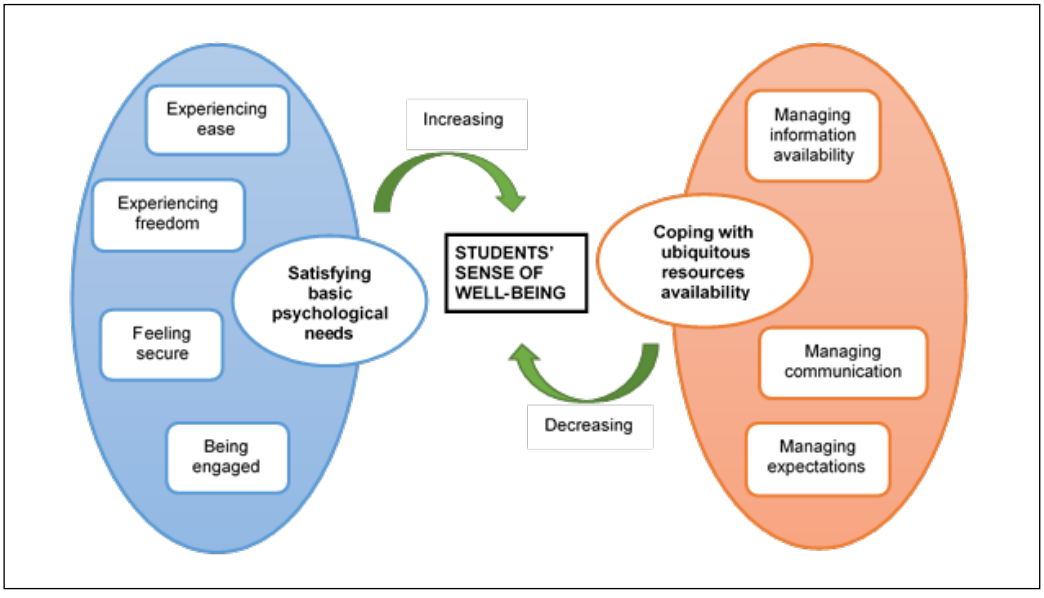

Figure 1: A model of ubiquitous connectivity and psycho-social wellbeing

Stage 2

Development of the LTWS

The findings from stage 1 prompted a further review of the literature and together these were used to develop a Learning Technique Well-being Scale (LTWS). The literature review was conducted to identify research relating to the role of emotion in academic settings (section 3.1.1) and also to identify positive or negative emotions experienced when using different technologies in teaching and learning (section 3.1.2).

Research exploring student emotions in academic settings

Emotions can affect the encoding and retrieval from memory, known as mood-congruent memory (Gaddy & Ingram, 2014; Ruci, Tomes & Zelenski, 2009), and therefore the emotions associated with the method of teaching could affect how the subject matter is remembered. For example, Levine and Burgess (1997) found being in a more positive mood aids all recall, no matter what the content is. Additionally, positive emotions have been found to improve learning that requires creative, holistic and intuitive problem solving (Bless et al., 1996). While Lapointe et al. (2013) found anxiety can negatively affect memory recall. Additionally, Pekrun et al. (2002) found positive activating emotions such as enjoyment were positively correlated with motivation, but positive deactivating emotions such as relief and relaxation decreased motivation or had no effect. Negative deactivating emotions such as boredom and hopelessness were negatively correlated to motivation along with negative activating emotions such as anxiety and anger. However, Bandura and Cervone (1983) found students increase their motivation when experiencing negative emotions as they strive to overcome the negative event. Pekrun et al. (2002) found negative emotions predict low achievement and positive emotions high achievement. This result may be mediated by motivation as they also found motivation was positively correlated with academic achievement. In summary, these findings illustrate how emotions are important in an academic setting and suggests that a student's well-being is important to their academic success and so it is important to consider techniques that evoke positive affect in learners.

Emotions are considered as a psychological state that involves subjective experiences, physiological responses and behavioural responses (Hockenbury & Hockenbury, 2007). Pekrun et al. (2002) explored a number of emotions experienced by students within academic settings. Anxiety was the most common emotion experienced (but mainly in relation to student assessments) and the number of negative emotions described overall were no more frequent than positive emotions. Positive emotions were categorised from an analysis of qualitative data into enjoyment, hope, pride and relief. Whereas, negative emotions were categorised into anger, anxiety, shame, hopelessness and boredom. From this data Pekrun et al. (2002) created and validated the Academic Emotions Questionnaire (AEQ). The AEQ could be used to measure wellbeing in an academic setting, however the questions used in this research related to attending classes, learning and taking tests rather than taking part in particular learning techniques; also e-learning techniques were not considered at all. It may be that e-learning techniques invoke different emotions. O'Regan (2003) investigated emotions experienced during e-learning and identified frustration, anxiety, shame, enthusiasm and pride as the key emotions.

A number of studies suggest that students perceive some learning techniques to be more efficient than others (e.g. Appleton, 2004; Cardall et al., 2008) and it might be assumed (based on stage 1 findings) that perceived efficiency would lead to positive emotions (such as achievement) and the absence of negative emotions (such as frustration). Pekrun et al. (2002) found that students not only felt bored and daydreamed when their abilities were perceived to be higher than the demands of the task,

but that they also felt stressed when the task demands were higher than their ability to keep up with the demands. This suggests that if the task demands do not match up with the students' abilities in either direction it can cause negative emotions to be felt. Furthermore, Yamac (2014) found enjoyment negatively correlated with boredom and anxiety. Therefore, if a student is not bored or anxious during a learning activity they may enjoy learning more.

In summary, emotions are significantly related to motivation and self-regulation therefore it is important to study wellbeing and emotions in an academic setting as they will ultimately affect the effectiveness of learning strategies and academic success. Additionally, it appears that a balance between individual differences in student abilities and media challenges can explain the enjoyment of online media. As Yamac (2014) stated, whilst there is a growing interest in academic emotions it is still an under-researched area.

Positive and negative emotions experienced when using different teaching and learning techniques

Traditional learning techniques used in universities have been classified by Cancannon et al., (2005) and Forrester-Jones (2003) into five categories: (i) tutor contact; (ii) lectures; (iii) published articles and books; (iv) student-student discussion; and (v) course materials. Research investigating these five techniques, in both traditional and electronic environments, will now be briefly highlighted.

i. Research found both face-to-face contact and email contact with tutors were linked with efficiency (Meyer, 2008). While having to wait for an appointment with a tutor was perceived as frustrating and it was difficult for students to talk to tutors face-to-face if they were not known (Tang, Pei & Luk, 2014). Similarly having to wait for an email response was also found to cause frustration and anxiety (Ng, 2001; O'Regan; Owen, 2002), however there was no perceived difficulty emailing an unknown tutor.
ii. Cardall, Krupat and Ulrich (2008) compared the use of traditional lectures to video lectures. Reasons given to why students preferred live lectures included them being a more fun way to learn, being able to ask questions and experiencing less technical difficulties. Whereas, reasons students preferred video lectures included not missing information, being able to learn at their own pace and the process being more efficient.
iii. The development of e-textbooks has encouraged researchers to investigate their advantage and disadvantages over printed text books. The main problems reported with e-textbooks related to technological issues and there was mixed reviews on whether information was easier to find or harder when using e-books compared to textbooks (Appleton, 2004; Falc, 2013; Connaway, Dickey & Radford, 2011). However an advantage of e-books was that students were less anxious, as they did not need to visit a library (O'Regan, 2003).
iv. Researchers have compared face-to-face discussions to online discussions (Higgs, 2012). Face-to-face discussions have been found to cause more anxiety than online discussions (O'Regan, 2003). Additionally, Bruss and Hill (2010) found less information is disclosed in face-to-face discussion which can lead to less depth in conversation. Similarly, Meyer (2008) found more in-depth conversations occurred during face-to-face communications, due to the abundance of non-verbal cues available. Students have also reported feeling more comfortable face to face, knowing what they were saying was not permanently stored (Bliuc et al., 2010).
v. Course materials that aid learning can be uploaded online rather than given out as handouts (Liaw, 2008). Sheard, Carbone and Dick, (2003) found a disadvantage of handouts were they were easy to lose, however O'Regan (2003) found students considered the control of where

they keep their materials an advantage because they had problems locating resources online. While Bouhnik and Marcus (2006) found students preferred aspects of having materials online, O'Regan (2003) found technical problems were seen as a disadvantage and Vernon (2006) found students prefer reading from handouts, compared to electronic devices.

This secondary review of the literature suggests there are advantages and disadvantage for each traditional learning technique and their e-learning equivalent. No specific hypotheses were proposed, as the key aim of stage 2 was to develop the LTWS. A further stage 3 will involve thorough testing of the LTWS across different courses, ages and gender. The preliminary analysis reported here will compare differences in perceptions and emotions experienced when using e-learning and traditional learning techniques.

Method

Design

The questionnaire was designed in such a way that individual and combined sub-scales could be investigated. This produced three dimensions and allowed a number of sub-scales to be produced and analysed. In addition to a total LTWS score, two dimensions each with two levels allowed eight sub-scales to be calculated. The first dimension 'technique' contained equal numbers of statements on e-learning techniques (e-LTWS) and traditional learning technique (t-LTWS). Eight statements were created for each of five learning techniques: (i) tutor contact; (ii) lectures; (iii) books; (iv) student-student discussion; (v) handouts. The second dimension 'emotions' contained equal numbers of statements on positive emotions (pos-LTWS) and negative emotions (neg-LTWS). Combinations of these dimensions allowed for four further sub-scales to be calculated (epos-LTWS, tpos-LTWS, eneg-LTWS and tneg-LTWS).

Materials

Individual items for the LTWS were developed based on a review of stage 1 findings and a secondary literature review. The LTWS comprised 40 statements that indicated preference for different e-learning techniques (20 statements) and their equivalent traditional learning techniques (20 statements).

Learning techniques

Five traditional learning techniques were identified by Cancannon et al. (2005) and Forrester-Jones (2003) and eight statements were created for each of these learning techniques.

i. Tutor contact: Four statements related to face to face tutor contact and four were related to emailing tutors. These were based on the work of: Pierce (2009); Yamac (2014); O'Regan (2003); Owen (2002); Meyer (2008); Tang et al. (2014) and Ng (2001). An example of one of these statements is: 'I prefer emailing my tutor compared to face to face communication as I get frustrated waiting for an available time to talk in person with them.'
ii. Lectures: Live lectures were compared to recorded lectures, which has also been compared in previous research: Cardall et al. (2008); O'Regan (2003); Sana, et al. (2013); Pekrum et al. (2002); (Yamac, 2014); Kondo and Ying-Ling (2004); Yoon and Sneddon (2011). An example of one of these statements is: 'I prefer live lectures compared to video lectures because they are more enjoyable as socialising can take place.'
iii. Published articles and books: Using printed books were compared to e-books as previously covered in the literature: Falc (2013); O'Regan (2003); Appleton, 2004; Connaway et al. (2011). An example of one of these statements is: 'I prefer paper books compared to e-books because e-books can have technical problems which can be frustrating.'
iv. Student discussion: Face to face discussions have been compared with online discussions by the following researchers:

Pierce (2009) and O'Regan (2003); Bruss and Hill, 2010; Dill and Anderson (1995); Meyer (2008); Bliuc et al., (2010); Yamac (2014). An example of one of these statements is: 'I prefer online discussions compared to face to face discussions because in face to face discussions I feel I am less able to express my true feelings which is frustrating.'

v. Course materials: Paper handouts were compared to online handouts: O'Regan (2003); Bouhnik and Marcus (2006); Kondo and Ying-Ling (2004); Liaw, 2008; Sheard, Carbone and Dick (2003); Vernon (2006). An example of one of these statements is: 'I prefer online handouts compared to paper handouts as I find it a more efficient way to store the information.'

Positive and negative aspects of wellbeing

Deci and Ryan's (2008) hedonic definition of wellbeing was used. Therefore preference towards learning techniques was focused on whether they induced positive or negative emotions. Positive emotions were measured using terms such as enjoyment and efficiency as both had been found to induce positive emotions (O'Regan, 2003; Pekrun et al., 2002). Negative emotions were measured using terms such as frustration and anxiety, as they were both commonly experienced during learning (O'Regan, 2003).

i. Ten statements measured positive emotions towards e-learning techniques, for example: 'I prefer emailing my tutor compared to talking with them face to face as it is a more enjoyable means of communication.'
ii. Ten statements measured positive emotions towards traditional learning techniques, for example: 'I prefer paper books compared to e-books as they are more efficient for finding information'.
iii. Ten statements measured negative emotions towards e-learning techniques, for example: 'I prefer face to face discussions compared to online discussions because it can be frustrating waiting for other people to respond in an online discussion.'
iv. Ten statements measured negative emotions towards traditional learning techniques, for example: 'I prefer video lectures compared to live lectures because I get anxious knowing I could miss some information in a live lecture.'

Some examples are provided below to help illustrate how these three dimensions combined to form each item.

Tutor, negative emotion, electronic: 'I prefer emailing my tutor compared to face to face communication as I get frustrated waiting for an available time to talk in person with them.'

Published materials, negative emotion, traditional: 'I prefer paper books compared to e-books because e-books can have technical problems which can be frustrating.'

Student discussion, positive emotion, traditional: 'I prefer face to face discussions compared to online discussions because it is a more enjoyable way to communicate.'

Items were presented in the survey randomly and measured on a five-point Likert scale (where 1=strongly disagree, 2=mostly disagree, 3=neither agree or disagree, 4=mostly agree, 5=strongly agree). Demographic questions (including gender, age, course of study and year of study) were requested at the start of the survey.

A pilot study was conducted by administering the survey to 30 university students (18 females and 12 males). To check internal reliability, an item analysis was carried out. The items had a global Cronbach's alpha of 0.879. External reliability was checked by test retest Pearson's correlation coefficient which showed that items were strongly correlated ($r = .743$, $p < 0.05$). Therefore no items were changed. The scale was then sent to five experts. The experts reviewed the items for ease of understanding, item content and comprehensiveness of item coverage. All items were understood in terms of whether they were measuring positive or negative wellbeing. No changes were made and the LTWS was ready to be distributed.

Participants

102 university student participants (51 female and 51 male) were approached through opportunity sampling and recruited without reward. Participants were aged between 18–25 years (*mean* = 20.88, *SD* = 1.55).

Procedure

The study was approved by the University Ethics Board. Two formats of the questionnaire were offered to control for the possibility that people may not participate because of the means by which the survey was delivered, especially as the questionnaire was measuring questions based on online and offline techniques. Participants were given a briefing sheet and asked whether they would like to complete the paper version or the online version. They were then asked to complete an informed consent form if they were completing the paper version and for the online version this was part of the survey and was required before questions could be answered. On completion, the participants were debriefed about the study and thanked for their involvement and given an opportunity to ask questions. The survey took no longer than 20 minutes to answer.

Results

As can be seen from Table 1, there appeared to be some differences in perceptions towards online and traditional learning techniques. The maximum for the sub-scales e-LTWS and t-LTWS is 100. Higher scores were reported for traditional techniques (M=66.98, SD=15.39) compared to e-learning techniques (M=59.49, SD=14.86). As the data is within-subjects and the Kolmogorov-Smirnov test showed the distribution was non-significant for the e-learning techniques condition (D(102) =.84, p=.071) and the traditional learning technique condition (D(102) =.80, p=.106) a parametric paired t-test was used. The t-test revealed a significant difference between the two conditions (t(101) = 2.67, p=.009). The effect size (mean difference= 7.49, CI: 13.06 to 1.92) was small to moderate (Cohen's d=0.5).

Table 1: Summary table indicating mean scores for total LTWS and e-learning and traditional learning sub-scales (to 1dp)

	e-LTWS	t-LTWS
Total	59.5	67.0

A comparison of the negative and positive items can be seen in Table 2. The maximum for the sub-scales neg-LTWS and pos-LTWS is 100. As would be expected the negative items were perceived in a more negative way (M=61.2) compared to the positive items (M=65.3). The maximum for the sub-scales epos, tpos, eneg and tneg is 50. It can be seen that, as would be expected, items containing negative wording for traditional techniques (tneg) were perceived in a more negative way (M=29.0) compared to those items containing positive wording for traditional techniques (tpos) (M=34.7). However, there is a surprising finding for the e-learning sub-scales, as the negative items were perceived in a more positive way (M=32.3) compared to positive items (M=30.6).

A comparison of the different learning techniques can be seen in Table 3, which shows that traditional methods were preferred in four out of five of the techniques. The maximum score for the sub-scales is 20. It can be seen that for e-learning, the most preferred technique was for course materials, while published online books and online student discussion were the least preferred. For traditional learning techniques, lectures were preferred, with tutor contact and paper course materials least preferred. The largest differences between online and offline techniques were for lectures, student discussion and published materials.

Discussion

There was a difference in total scores for e-learning techniques compared to traditional learning techniques. This could suggest that as traditional learning techniques had higher total than e-learning techniques that it may have greater advantages and/or fewer disadvantages which

could cause greater positive emotions and/or less negative emotions than e-learning techniques. There were also differences between techniques, which is supported by research that found there were different advantages and disadvantages of e-learning techniques and traditional learning techniques (Bouhnik & Marcus, 2006; Cardall et al., 2008; Owen, 2002) and that there are different positive and negative emotions experienced for both e-learning and traditional learning techniques (O'Regan, 2003 and Pekrun et al., 2002).

The finding that traditional lectures were preferred to e-lectures supports the literature, for example Yoon and Sneddon (2011) found students preferred live lectures compared to recorded lectures and only considered recorded lectures as a compliment to live lectures rather than a replacement. Therefore as it is not the preferred method by students it suggests that e-learning could be best used as an addition to traditional learning rather than a replacement as Pamfilie et al. (2014) propose. There is a significant body of research suggesting this combination of online and traditional learning techniques, in the form of 'blended learning', can improve the enjoyment of an academic course and student success compared to a course with just e-learning techniques or traditional learning techniques (Adileh, 2012; Higgs, 2010; Yoon & Sneddon, 2011). Blended learning can combine the best parts of virtual learning and campus based learning (Cancannon, et al., 2005). Therefore, specific online learning techniques and traditional learning techniques could run alongside each other in a university course to give students the best opportunity to succeed.

Research has shown that taking part in preferred learning techniques can affect academic satisfaction and achievement (Gurpinar et al., 2011). However, Monochehr (2006) found that having a preference for learning techniques used in traditional teaching approaches had no effect on a student's learning and achievement, but that learning technique preference did have a significant effect on e-learning. Further research is needed to identify if certain e-learning techniques are preferred to their traditional equivalents it could improve a student's learning, or if they are not preferred whether this would hinder learning. This study found a general preference for traditional techniques, however a combination of both online and traditional techniques has been found to improve student success and satisfaction with a course programme

Table 2: Summary table indicating mean scores for positive and negative emotion LTWS sub-scales (to 1dp)

	neg-LTWS	pos-LTWS	epos-LTWS	tpos-LTWS	eneg-LTWS	tneg-LTWS
Total	61.2	65.3	30.6	34.7	32.3	29.0

Table 3: Summary table indicating scores for each learning technique, comparing electronic or traditional formats (to 1dp)

	Tutor contact	Lectures	Published materials	Course materials	Student discussion
electronic	12.0	12.1	11.1	13.1	11.1
traditional	12.8	14.4	13.2	12.8	13.8
Sub-totals	24.8	26.5	24.3	25.9	24.9

compared to just using traditional learning techniques (Adileh, 2012).

It is important for educators to take into account student wellbeing when adopting learning techniques and designing curricula, however other pedagogic (aside from well-being) need to be taken into account. Also, although a learning technique that induces a positive mood in a student is more likely to lead to better memory and motivation to learn Pekrun et al. (2002), rather than learning techniques that induce negative moods (Gaddy & Ingram, 2014; Ruci et al., 2009; Lapointe et al., 2013). However this goes against Bandura and Cervone (1983) who found experiencing negative emotions whilst learning can motivate students to work harder in the settings that cause these feelings. However it would be unethical to choose learning techniques that induce negative emotions to increase motivations in students. Motivation is important as it has been positively correlated to academic success and may mediate the findings that experiencing negative emotions relate to low academic achievement and positive emotions to high academic success (Pekrun et al., 2002). Therefore this suggests lecturers could choose techniques that induce certain positive emotions to increase motivation in students which has a direct impact on academic success and from the results it would suggest traditional learning techniques are the best techniques to do this. However it is not known to what level the emotions are felt for each technique and what level they have to be felt at before they affect learning. This is something that would need to be studied in the future.

Conclusion

Stage 1 of this research showed that students used ubiquitous connectivity to enhance wellbeing by satisfying four basic psychological desires and needs: ease, freedom, engagement and security. However, wellbeing was negatively affected by their struggles in coping with the ubiquitous availability of resources, in managing: information, communication and expectations regarding support. The development of a quantitative measure was described, and this needs to be tested further. For example, as technology is developing quickly the scale would need to be revised to include current software and hardware. For example, this research was started three years ago and the development of social media and technology has advanced considerably since then. Also, age or online experience could impact student's preference for e-learning (Kirk et al., 2015), therefore the wellbeing of students of different ages and online experience will be compared for e-learning and traditional learning techniques in stage 3 of this research programme. Additionally, other individual differences could be investigated. Kurtz et al. (2009) researched the wellbeing of students enrolled on open and distance learning courses and showed a correlation between high self-esteem and positive attitudes towards e-learning. but no correlation between loneliness and attitudes towards e-learning. These and other personality factors could be explored, such as introversion-extroversion, neuroticism and openness to experience.

The authors

J. Taylor, M. Salvagno, R. Morris, M. Hutchings & M. Bobeva, Bournemouth University.

Correspondence

Associate Professor Jacqui Taylor, Bournemouth University, Dept of Psychology, Talbot Campus, Poole, BH12 5BB, UK. Email: jtaylor@bournemouth.ac.uk

References

Adileh, M. (2012). Teaching music as a university elective course through e-learning. *Australian Journal of Music Education, 2012* (1), 71–79.

Allen, I.E. & Seaman, J. (2013). *Changing course: Ten years of tracking online education in the United States.* Babson Survey Research Group. Pearson Publishers and Sloan Foundation. Retrieved 18 February 2018 from http://onlinelearningsurvey.com/reports/changingcourse.pdf

Anderson, T. & Garrison, D.R. (1998). Learning in a networked world: New roles and responsibilities. In C. Gibson (Ed.), *Distance learners in higher education* (pp.97–112). Madison: Atwood Publishing.

Appleton, L. (2004). The use of electronic books in midwifery education: The student perspective. *Health Information and Libraries Journal, 21*(4), 245–252. doi:10.1111/j.1471-1842.2004.00509.x

Bandura, A. & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology, 45*(5), 1017–1028. doi:10.1037/0022-3514.45.5.1017

Bless, H., Clore, G.L., Schwarz, N. et al. (1996). Mood and the use of scripts: Does a happy mood really lead to mindlessness? *Journal of Personality and Social Psychology, 71*(4), 665–679.

Bliuc, A., Ellis, R., Goodyear, P. & Piggott, L. (2010). Learning through face-to-face and online discussions: Association between students' conceptions, approaches and academic performance in political science. *British Journal of Education Technology, 41*(3), 512–524.

Bouhnik, D. & Marcus, T. (2006). Interaction in distance-learning courses. *Journal of The American Society for Information Science and Technology, 57*(3), 299–305. doi:10.1002/asi.20277

Bruss, O.E. & Hill, J.M. (2010). Tell me more: Online versus face to face communication and self-disclosure. *Psi Chi Journal of Undergraduate Research, 15*(1), 3–7.

Cancannon, F., Flynn, A. & Campbell, M. (2005). What campus-based students think about the quality and benefits of e-learning. *British Journal of Educational Technology, 36*(3), 501–512.

Cardall, S., Krupat, E. & Ulrich, M. (2008). Live lecture versus video-recorded lecture: Are students voting with their feet? *Technology and Medical Education, 83*(12), 1174–1178.

Cheng, K. (2006). A research study on students' level of acceptance in applying e-learning for business course: A case study on a Technical College in Taiwan. *Journal of American Academy of Business, 8*(2), 265–272.

Connaway, L.S., Dickey, T.J. & Radford, M.L. (2011). If it is too inconvenient I'm not going after it: Convenience as a critical factor in information-seeking behaviors. *Library and Information Science Research, 33*(3), 179–190.

Deci, E.L. & Ryan, R.M. (2008). Hedonia, eudaimonia, and wellbeing: An introduction. *Journal of Happiness Studies, 9*(1), 1–11.

Dill, J.C. & Anderson, C.A. (1995). Effects of frustration justification on hostile aggression. *Aggressive Behavior, 21*(5), 359–369.

Falc, E.O. (2013). An assessment of college students' attitudes towards using an online e-textbook. *Interdisciplinary Journal of E-learning and Learning Objects, 9,* 1–12.

Forrester-Jones, R. (2003). Students' perceptions of teaching: The research is alive and well. *Assessment and Evaluation in Higher Education, 28*(1), 59–69.

Gaddy, M.A. & Ingram, R.E. (2014). A meta-analytic review of mood-congruent implicit memory in depressed mood. *Clinical Psychology Review, 35*(5), 402–416. doi:10.1016/j.cpr.2014.06.001

Gurpinar, E., Alimoglu, M.F., Mamakli, S. & Aktekin, M. (2010). Can learning style predict student satisfaction with different instruction methods and academic achievement in medical education? *Advances in Physiology Education, 34*(4), 192–196.

Hankin, B.L., Mermelstein, R. & Roesch, L. (2007). Sex differences in adolescent depression: stress exposure and reactivity. *Child Development, 78*(1), 279–295.

Hardell, L. (2018). Effects of mobile phones on children's and adolescents' health: A commentary. *Child Development, 89,* 137–140.

Heatherton, T.F. & Polivy, J. (1991). Development and validation of a scale for measuring state self-esteem. *Journal of Personality and Social Psychology, 60*(6), 895–910.

Higgs, A. (2012). E-Learning, ethics and 'non-traditional' students: Space to think aloud. *Ethics and Social Welfare, 6*(4), 386–402. doi:10.1080/17496535.2012.654496

Ho, S.M.Y. & Lee, T.M.C. (2001). Computer usage and its relationship with adolescent lifestyle in Hong Kong. *Journal of Adolescent Health, 29*(4), 258–266.

Hockenbury, D.H. & Hockenbury, S.E. (2007). *Discovering psychology.* New York: Worth Publishers.

Ifinedo, P. (2016). Applying uses and gratifications theory and social influence processes to understand students' pervasive adoption of social networking sites. *International Journal of Information Management, 36*(2), 192–206.

Jones, T. & Clarke, V.A. (1994). A computer attitude scale for secondary students. *Computers and Education, 22*(4), 315–318.

Kirk, C.P., Chiagouris, L., Lala, V. & Thomas, J.E. (2015). How do digital natives and digital immigrants respond differently to interactivity online? *Journal of Advertising Research, 55*(1), 81–94.

Kondo, D.S. & Ying-Ling, Y. (2004). Strategies for coping with language anxiety: The case of students of English in Japan. *English Language Teaching Journal, 58*(3), 258–265.

Kurtz, G., Amichai-Hamburger, Y. & Kantor, J. (2009). Psychosocial wellbeing of Israeli students and attitudes toward open and distance learning. *International Review of Research in Open and Distance Learning, 10*(2), 1–11.

Lapointe, M.B., Blanchette, I., Duclos, M. et al. (2013). Attentional bias, distractibility and short-term memory in anxiety. *Anxiety, Stress and Coping, 26*(3), 293–313.

Ledbetter, A.M., Hardman-Taylor, S. & Mazer, J.P. (2016). Enjoyment fosters media use frequency and determines its relational outcomes: Toward a synthesis of uses and gratifications theory and media multiplexity theory. *Computers in Human Behavior, 54,* 149–157.

Levine, L. & Burgess, S.L. (1997). Beyond general arousal: Effects of specific emotions on memory. *Social Cognition, 15*(6), 157–181.

Liaw, S. (2008). Investigating students perceived satisfaction, behavioural intention, and effectiveness of e-learning: A case study of the blackboard system. *Computers and Education, 51*(2), 864–873.

Meyer, K.A. (2008). Student perceptions of face-to-face and online discussion. *Journal of Asynchronous Learning Network, 11*(4), 53–69.

Modrek, S., Hamad, R. & Cullen, M.R. (2015). Psychological wellbeing during the great recession: Changes in mental health care utilization in an occupational cohort. *American Journal of Public Health, 105*(2), 304–310. doi:10.2105/AJPH.2014.302219

Monochehr, N.N. (2006). The influence of learning styles on learners in e-learning environments: An empirical study. *Computers in Higher Education Economics Review, 18*(1), 10–14.

Ng, K. (2001). Using e-mail to foster collaboration in distance education. *Open Learning, 16*(2), 191–200.

O'Regan, K. (2003). Emotion and e-learning. *Journal of Asynchronous Learning Networks, 7*(3), 78–92.

Owen, M. (2002). 'Sometimes you feel you're in the niche time': The personal tutor system, a case study. *Active Learning in Higher Education, 3*(1), 7–23. doi: 10.1177/1469787402003001002

Pamfilie, R., Bumbac, R. & OrÎndaro, A. (2014). Is e-learning a genuine setting changer for the education field? *E-learning and Software for Education, 2,* 371–377. doi:10.12753/2066-026X-14-112

Papaioannou, P. & Charalambous, K. (2011). Principals' attitudes towards ICT and their perceptions about the factors that facilitate or inhibit ICT integration in Primary schools of Cyprus. *Journal of Information Technology Education, 10*(1), 349–368.

Paris, P.G. (2004). E-learning: A study on secondary students' attitudes towards online web assisted learning. *International Education Journal, 5*(1), 98–112.

Pekrun, R. (1992). The impact of emotions on learning and achievement: Towards a theory of cognitive/motivational mediators. *Applied Psychology: An International Review, 41*(4), 359–376.

Pekrun, R., Goetz, T., Titz, W. & Perry, R.P. (2002). Academic emotion in students' self-regulated learning and achievement: A program of Qualitative and Quantitative research. *Educational psychologist, 37*(2), 91–105.

Pierce, T. (2009). Social anxiety and technology: Face to face communication versus technological communication among teens. *Computers in Human Behaviour, 25*(6), 1367–1372.

Rhema, A. & Miliszenka, I. (2014). Analysis of student attitudes towards e-learning: The case of engineering students in Libya. *Issues in Informing Science and Informational Technology, 11,* 169–190.

Roberts, J.A., Yaya, L.H. & Manolis, C. (2014). The invisible addiction: Cell-phone activities and addiction among male and female college students. *Journal of Behavioural Addiction, 3,* 254–265.

Ruci, L., Tomes, J.L. & Zelenski, J.M. (2009). Mood-congruent false memories in the DRM paradigm. *Cognition and Emotion, 23*(6), 1153–1165.

Russell, D., Peplau, L.A. & Cutrona, C.E. (1980). The revised UCLA loneliness scale: Concurrent and discriminate validity evidence. *Journal of Personality and Social Psychology, 39,* 472–480.

Sadagopan A.P., Manivel, R., Marimuthu, A., Nagaraj, H. & Ratnam, K. (2017). Prevalence of smart phone users at risk for developing cell phone vision syndrome among college students. *Journal of Psychology and Psychotherapy, 7,* 299.

Salvagno, M., Taylor, J., Bobeva, M. & Hutchings, M. (2015). *The highs and lows of ubiquitous connectivity: Investigating university student's experiences and connections with wellbeing.* Poster presented at the Edulearn Conference, Barcelona, 6 July 2015.

Salvagno, M., Taylor, J., Bobeva, M. & Hutchings, M. (in preparation). *Constructivist grounded theory in practice: Coding with diagrams and situational analysis maps.*

Sana, F., Weston, T. & Cepeda, N.J. (2013). Laptop multitasking hinders classroom learning for both users and nearby peers. *Computers and Education, 62,* 24–31.

Selwyn, N. (1997). Students' attitudes toward computers: Validation of a computer attitude scale for 16-19 education. *Computers and Education, 28*(1), 35–41.

Sheard, J., Carbone, A. & Dick, M. (2003, January). *Determination of factors which impact on IT students' propensity to cheat. Proceedings of the 5th Australasian Conference: Vol. 20. Computing Education* (pp.119–126). Canberra: Australian Computer Society, Inc.

Shepherd, C. (2002). *Making the case for content.* Retrieved 18 February 2018 from www.fastrak-consulting.co.uk/tactix/Features/lcms.htm

Sherry, J.L. (2004). Flow and media enjoyment. *Communication Theory, 14,* 328–347.

Singh, S., Singh, A. & Singh, K. (2012). Motivation levels among traditional and open learning undergraduate students in India. *International Review of Research in Open and Distance Learning, 13*(3), 19–40.

Tang, G., Pei, J. & Luk, W. (2014). Email mining: Tasks, common techniques, and tools. *Knowledge and Information Systems, 41*(1), 1–13. doi:10.1007/s10115-013-0658-2

Tetsuo Harada, D.S., Mami Morikuni, B.E., Sato Yoshii, B.E. et al. (2002). Usage of mobile phone in the evening or at night makes Japanese students evening-typed and night sleep uncomfortable. *Sleep and Hypnosis, 4,* 149–153.

Tsai, C., Lin, S.S.J. & Tsai, M. (2001). Developing an internet attitude scale for high school students. *Computers and Education, 37*(1), 41–51.

Van Deursen, A.J.A.M., Bolle, C.L., Hegner S.M. & Kommers, P.A.M. (2015). Modelling habitual and addictive smart phone behaviour: The role of smart phone usage types, emotional intelligence, social stress, self-regulation, age and gender. *Computers in Human Behaviour, 45,* 411–420.

Vernon, R.F. (2006). Teaching notes: Paper or pixels? An inquiry into how students adapt to online textbooks. *Journal of Social Work Education, 42*(2), 417–427.

Yamac, A. (2014). Classroom emotions scale for elementary school students. *Mevlana International Journal of Education, 4*(1), 50–163.