

1 **Evaluating and measuring how new technologies and ubiquitous connectivity affect**
2 **university students' psychosocial well-being**

3

4

5 Abstract

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

25

26 Keywords: e-learning, emotions, well-being, stress, flexibility, student preferences

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29

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

41 Ubiquitous connectivity has been defined by El-Hussein and Cronje (2010) as 'time- and
42 space-independent online access to resources, people and services'. In terms of student
43 learning, this relates to three things: the mobility of technology, the mobility of learning, and
44 the mobility of learners. Mobile technologies can include mobile phones, laptops and tablets.
45 Mobile learning enables students to participate in learning activities on and off campus. For
46 example, students can search for resources, download or read online articles and books,
47 access stored course materials (lecture notes, slides and video-recorded lectures) and course-
48 related administrative information, network with peers and communicate with tutors, library
49 and technical staff. The mobility of learners relates to the internet connection allowing
50 learning activities to take place independent of location; most commonly this allows learning
51 to take place at various places around campus and at home, but it also allows activities to take
52 place in transit and while away from home or university.

53 Although ubiquitous technologies often enhance flexibility and make learning more efficient
54 and sometimes more enjoyable, they can also negatively impact on well-being in many ways.
55 At a physical level, health issues have been related to Wi-Fi radiation (Hardell, 2018), eye
56 strain and postural issues (Sadagopan, et al., 2017), and sleep issues (Tetsuo Harada, 2002).
57 Mental health issues have been linked to over-reliance on technology or connectivity, so that
58 normal day-to-day activities are affected and in extreme cases this can include internet or
59 mobile addiction (Roberts, Yaya and Manolis, 2014). At a socio-psychological level, well-

60 being can be affected at emotional and behavioural levels. For example, using ubiquitous
61 technology can lead to reduced face-to-face interaction and isolation which has then been
62 linked to depression, anxiety, a reduction in the quality and quantity of interpersonal
63 relationships and social stress (Van Deursen, Bolle, Hegner and Kommers, 2015).

64

65 1.1 Theories of well-being and online technologies

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

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

77 Adoption and enjoyment of online technologies has been related to a number of theories in
78 psychology. For example, Ledbetter, Hardman-Taylor and Mazer (2016) draw on the uses
79 and gratifications theory to explain the frequency of use of different media, and Ifinedo
80 (2016) also uses this theory to explain student adoption of social networking sites. The theory
81 of flow has been drawn upon by Sherry (2004) to explain differential enjoyment of media.
82 Sherry proposes that a flow experience can occur when media message content balances with
83 an individual's ability to interpret that message. Further, Sherry theorises that media
84 experience, along with individual differences in cognitive abilities, can facilitate or prevent
85 flow state in media users.

86

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

91

92 2.0 Stage 1

93

94 2.1 Method

95 The methodology chosen was constructivist grounded theory (Charmaz, 2015); this
96 qualitative approach was felt most appropriate for the topic as it would allow the
97 development of a theory that describes and explains connections between students'
98 experiences and their well-being. There were no hypotheses or preconceived ideas and
99 therefore the methodology allowed the collection of rich qualitative data from participant's
100 narratives.

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

107

108 2.2 Results

109 Given the complexity of this grounded theory study and the quality and quantity of data
110 collected, full details of the method and results are described elsewhere (Salvagno et al, 2015;
111 Salvagno et al, in preparation). An overview of the findings that informed and prompted stage
112 2 are concisely presented in this article.

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

121 **1. Sense of ease and freedom (ease, freedom, control)**

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

126 **2. Improved workflow (confidence, self-efficacy, productivity)**

127 *"It makes you feel good because you don't immediately forget what you just thought*
128 *of...because if you think about something when you are out, by the time you are at home...if*
129 *you didn't write it down...you won't remember it again...so it is good and it helps you to*
130 *work and you feel more confident... about what you are doing...because you got a lot more of*
131 *ideas, they are coming more (inaudible)...you can record down ..."* (Student 2 – focus group
132 1)

133 **3. Connectedness**

134 *"Interacting with new students helped to build friendships and helped to complete*
135 *assignments"* (Student 13 – qualitative survey)

136 **4. Security and reassurance**

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

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

142

143 Negative experiences, which led to a diminished sense of well-being include the following:
144 stress arising from equipment differences (software/hardware), unreliable connections, lack
145 of technical support and information overload; frustration due to delayed feedback and
146 lecturer reluctance to communicate online. Other impacts related to: the lack of textual skills;
147 additional learning needs; unexpected disclosure, and learning in a foreign language. From
148 these sub-themes, three key themes were produced.

149 **1. Stress due to excessive reliance on technology**

150 *“I am quite reliant on technology and when it doesn’t work I don’t have a clue where to go*
151 *from there I just call off and cry...”* (Student 2 – focus group 2)

152 *“I don’t have a plan B, my plan is to go online on myBU and doing my lecture, but when it is*
153 *shut down I don’t know what to do...”* (Student 3 – focus group 3)

154 **2. Stress and distraction due to information overload**

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

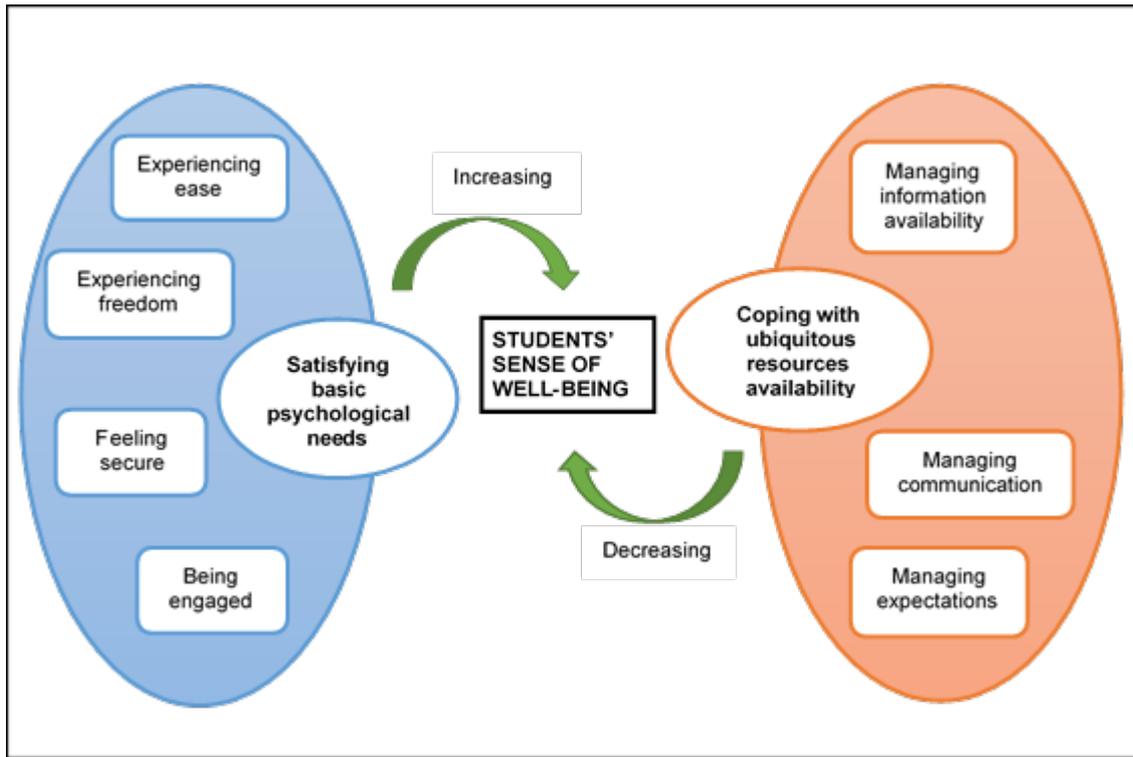
160 **3. Diminished motivation in attending lectures**

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

166

167 **2.3 Development of a model**

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



176

177 Figure 1: A model of ubiquitous connectivity and psycho-social well-being.

178

179 3.0 Stage 2

180

181 3.1 Development of the LTWS

182 The findings from stage 1 prompted a further review of the literature and together these were
 183 used to develop a Learning Technique Well-being Scale (LTWS). The literature review was
 184 conducted to identify research relating to the role of emotion in academic settings (section
 185 3.1.1) and also to identify positive or negative emotions experienced when using different
 186 technologies in teaching and learning (section 3.1.2).

187

188 3.1.1 Research exploring student emotions in academic settings

189 Emotions can affect the encoding and retrieval from memory, known as mood-congruent
 190 memory (Gaddy and Ingram, 2014; Ruci, Tomes and Zelenski, 2009), and therefore the
 191 emotions associated with the method of teaching could affect how the subject matter is
 192 remembered. For example, Levine and Burgess (1997) found being in a more positive mood

193 aids all recall, no matter what the content is. Additionally, positive emotions have been
194 found to improve learning that requires creative, holistic and intuitive problem solving (Bless
195 et al., 1996). While Lapointe et al. (2013) found anxiety can negatively affect memory recall.
196 Additionally, Pekrun et al. (2002) found positive activating emotions such as enjoyment were
197 positively correlated with motivation, but positive deactivating emotions such as relief and
198 relaxation decreased motivation or had no effect. Negative deactivating emotions such as
199 boredom and hopelessness were negatively correlated to motivation along with negative
200 activating emotions such as anxiety and anger. However, Bandura and Cervone (1983) found
201 students increase their motivation when experiencing negative emotions as they strive to
202 overcome the negative event. Pekrun et al. (2002) found negative emotions predict low
203 achievement and positive emotions high achievement. This result may be mediated by
204 motivation as they also found motivation was positively correlated with academic
205 achievement. In summary, these findings illustrate how emotions are important in an
206 academic setting and suggests that a student's well-being is important to their academic
207 success and so it is important to consider techniques that evoke positive affect in learners.

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

223 A number of studies suggest that students perceive some learning techniques to be more
224 efficient than others (e.g. Appleton, 2004; Cardall et al., 2008) and it might be assumed
225 (based on stage 1 findings) that perceived efficiency would lead to positive emotions (such as

226 achievement) and the absence of negative emotions (such as frustration). Pekrun et al.,
227 (2002) found that students not only felt bored and day-dreamed when their abilities were
228 perceived to be higher than the demands of the task, but that they also felt stressed when the
229 task demands were higher than their ability to keep up with the demands. This suggests that if
230 the task demands do not match up with the students' abilities in either direction it can cause
231 negative emotions to be felt. Furthermore, Yamac (2014) found enjoyment negatively
232 correlated with boredom and anxiety. Therefore, if a student is not bored or anxious during a
233 learning activity they may enjoy learning more.

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

240

241 3.1.2 Positive and negative emotions experienced when using different teaching and learning 242 techniques

243 Traditional learning techniques used in universities have been classified by Cancannon et al.,
244 (2005) and Forrester-Jones (2003) into five categories: (i) tutor contact; (ii) lectures; (iii)
245 published articles and books; (iv) student-student discussion, and (v) course materials.
246 Research investigating these five techniques, in both traditional and electronic environments,
247 will now be briefly highlighted.

248 (i) Research found both face-to-face contact and email contact with tutors were linked with
249 efficiency (Meyer, 2008). While having to wait for an appointment with a tutor was perceived
250 as frustrating and it was difficult for students to talk to tutors face-to-face if they were not
251 known (Tang, Pei and Luk, 2014). Similarly having to wait for an email response was also
252 found to cause frustration and anxiety (Ng, 2001; O'Regan; Owen, 2002), however there was
253 no perceived difficulty emailing an unknown tutor.

254 (ii) Cardall, Krupat and Ulrich (2008) compared the use of traditional lectures to video
255 lectures. Reasons given to why students preferred live lectures included them being a more
256 fun way to learn, being able to ask questions and experiencing less technical difficulties.

257 Whereas, reasons students preferred video lectures included not missing information, being
258 able to learn at their own pace and the process being more efficient.

259 (iii) The development of e-textbooks has encouraged researchers to investigate their
260 advantage and disadvantages over printed text books. The main problems reported with e-
261 textbooks related to technological issues and there was mixed reviews on whether
262 information was easier to find or harder when using e-books compared to textbooks
263 (Appleton, 2004; Falc, 2013; Connaway, Dickey and Radford, 2011). However an advantage
264 of e-books was that students were less anxious, as they did not need to visit a library
265 (O'Regan, 2003).

266 (iv) Researchers have compared face-to-face discussions to online discussions (Higgs, 2012).
267 Face-to-face discussions have been found to cause more anxiety than online discussions
268 (O'Regan, 2003). Additionally, Bruss and Hill (2010) found less information is disclosed in
269 face-to-face discussion which can lead to less depth in conversation. Similarly, Meyer (2008)
270 found more in-depth conversations occurred during face-to-face communications, due to the
271 abundance of non-verbal cues available. Students have also reported feeling more
272 comfortable face to face, knowing what they were saying was not permanently stored (Bliuc,
273 Ellis, Goodyear and Piggott, 2010).

274 (v) Course materials that aid learning can be uploaded online rather than given out as
275 handouts (Liaw, 2008). Sheard, Carbone and Dick, (2003) found a disadvantage of handouts
276 were they were easy to lose, however O'Regan (2003) found students considered the control
277 of where they keep their materials an advantage because they had problems locating
278 resources online. While Bouhnik and Marcus (2006) found students preferred aspects of
279 having materials online, O'Regan (2003) found technical problems were seen as a
280 disadvantage and Vernon (2006) found students prefer reading from handouts, compared to
281 electronic devices.

282

283 This secondary review of the literature suggests there are advantages and disadvantage for
284 each traditional learning technique and their e-learning equivalent. No specific hypotheses
285 were proposed, as the key aim of stage 2 was to develop the LTWS. A further stage 3 will
286 involve thorough testing of the LTWS across different courses, ages and gender. The

287 preliminary analysis reported here will compare differences in perceptions and emotions
288 experienced when using e-learning and traditional learning techniques.

289

290 3.2 Method

291

292 3.2.1 Design

293 The questionnaire was designed in such a way that individual and combined sub-scales could
294 be investigated. This produced three dimensions and allowed a number of sub-scales to be
295 produced and analysed. In addition to a total LTWS score, two dimensions each with two
296 levels allowed 8 sub-scales to be calculated. The first dimension ‘technique’ contained equal
297 numbers of statements on e-learning techniques (e-LTWS) and traditional learning technique
298 (t-LTWS). Eight statements were created for each of five learning techniques: (i) tutor
299 contact; (ii) lectures; (iii) books; (iv) student-student discussion; (v) handouts. The second
300 dimension ‘emotions’ contained equal numbers of statements on positive emotions (pos-
301 LTWS) and negative emotions (neg-LTWS). Combinations of these dimensions allowed for
302 four further sub-scales to be calculated (epos-LTWS, tpos-LTWS, eneg-LTWS and tneg-
303 LTWS).

304

305 3.2.2 Materials

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

310 3.2.2.1 Learning techniques

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

314 (i) Tutor contact

315 Four statements related to face to face tutor contact and four were related to emailing tutors.
316 These were based on the work of: Pierce (2009); Yamac (2014); O'Regan (2003); Owen
317 (2002); Meyer (2008); Tang, et al. (2014) and Ng (2001). An example of one of these
318 statements is: 'I prefer emailing my tutor compared to face to face communication as I get
319 frustrated waiting for an available time to talk in person with them'.

320 (ii) Lectures

321 Live lectures were compared to recorded lectures, which has also been compared in previous
322 research: Cardall et al (2008); O'Regan (2003); Sana, et al, (2013); Pekrum et al. (2002);
323 (Yamac, 2014); Kondo and Ying-Ling (2004); Yoon and Sneddon (2011). An example of
324 one of these statements is: 'I prefer live lectures compared to video lectures because they are
325 more enjoyable as socialising can take place'.

326 (iii) Published articles and books

327 Using printed books were compared to e-books as previously covered in the literature: Falc
328 (2013); O'Regan (2003); Appleton, 2004; Connaway et al. (2011). An example of one of
329 these statements is: 'I prefer paper books compared to e-books because e-books can have
330 technical problems which can be frustrating'.

331 (iv) Student discussion

332 Face to face discussions have been compared with online discussions by the following
333 researchers: Pierce (2009) and O'Regan (2003); Bruss and Hill, 2010; Dill and Anderson
334 (1995); Meyer (2008); Bliuc et al., (2010); Yamac (2014). An example of one of these
335 statements is: 'I prefer online discussions compared to face to face discussions because in
336 face to face discussions I feel I am less able to express my true feelings which is frustrating'.

337 (v) Course materials

338 Paper handouts were compared to online handouts: O'Regan (2003); Bouhnik and Marcus
339 (2006); Kondo and Ying-Ling (2004); Liaw, 2008; Sheard, Carbone and Dick (2003); Vernon
340 (2006). An example of one of these statements is: 'I prefer online handouts compared to
341 paper handouts as I find it a more efficient way to store the information'.

342

343 3.2.2.2 Positive and negative aspects of well-being

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

350 (i) Ten statements measured positive emotions towards e-learning techniques, for example: 'I
351 prefer emailing my tutor compared to talking with them face to face as it is a more enjoyable
352 means of communication'.

353 (ii) Ten statements measured positive emotions towards traditional learning techniques, for
354 example: 'I prefer paper books compared to e-books as they are more efficient for finding
355 information'.

356 (iii) Ten statements measured negative emotions towards e-learning techniques, for example:
357 'I prefer face to face discussions compared to online discussions because it can be frustrating
358 waiting for other people to respond in an online discussion'.

359 (iv) Ten statements measured negative emotions towards traditional learning techniques, for
360 example: 'I prefer video lectures compared to live lectures because I get anxious knowing I
361 could miss some information in a live lecture'.

362

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

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

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

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

371

372 Items were presented in the survey randomly and measured on a 5-point Likert scale (where
373 1=strongly disagree, 2=mostly disagree, 3=neither agree or disagree, 4=mostly agree,

374 5=strongly agree). Demographic questions (including gender, age, course of study and year
375 of study) were requested at the start of the survey.

376 A pilot study was conducted by administering the survey to 30 university students (18
377 females and 12 males). To check internal reliability, an item analysis was carried out. The
378 items had a global Cronbach's alpha of 0.879. External reliability was checked by test retest
379 Pearson's correlation coefficient which showed that items were strongly correlated ($r = .743$,
380 $p < 0.05$). Therefore no items were changed. The scale was then sent to 5 experts. The experts
381 reviewed the items for ease of understanding, item content and comprehensiveness of item
382 coverage. All items were understood in terms of whether they were measuring positive or
383 negative well-being. No changes were made and the LTWS was ready to be distributed.

384

385 3.2.3 Participants

386 102 university student participants (51 female and 51 male) were approached through
387 opportunity sampling and recruited without reward. Participants were aged between 18-25
388 years (mean = 20.88, SD = 1.55).

389

390 3.2.4 Procedure

391 The study was approved by the University Ethics Board. Two formats of the questionnaire
392 were offered to control for the possibility that people may not participate because of the
393 means by which the survey was delivered, especially as the questionnaire was measuring
394 questions based on online and offline techniques. Participants were given a briefing sheet and
395 asked whether they would like to complete the paper version or the online version. They were
396 then asked to complete an informed consent form if they were completing the paper version
397 and for the online version this was part of the survey and was required before questions could
398 be answered. On completion, the participants were debriefed about the study and thanked for
399 their involvement and given an opportunity to ask questions. The survey took no longer than
400 20 minutes to answer.

401

402 3.3 Results

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

412

	e- LTWS	t- LTWS
Total	59.5	67.0

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

415

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

425

	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

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

428

429 A comparison of the different learning techniques can be seen in Table 3, which shows that
430 traditional methods were preferred in 4 out of 5 of the techniques. The maximum score for
431 the sub-scales is 20. It can be seen that for e-learning, the most preferred technique was for
432 course materials, while published online books and online student discussion were the least
433 preferred. For traditional learning techniques, lectures were preferred, with tutor contact and
434 paper course materials least preferred. The largest differences between online and offline
435 techniques were for lectures, student discussion and published materials.

436

	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

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

439

440 3.4 Discussion

441 There was a difference in total scores for e-learning techniques compared to traditional
442 learning techniques. This could suggest that as traditional learning techniques had higher total
443 than e-learning techniques that it may have greater advantages and/or fewer disadvantages
444 which could cause greater positive emotions and/or less negative emotions than e-learning
445 techniques. There were also differences between techniques, which is supported by research
446 that found there were different advantages and disadvantages of e-learning techniques and
447 traditional learning techniques (Bouhnik and Marcus, 2006; Cardall et al., 2008; Owen, 2002)
448 and that there are different positive and negative emotions experienced for both e-learning
449 and traditional learning techniques (O'Regan, 2003 and Pekrun et al., 2002).

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

463 Research has shown that taking part in preferred learning techniques can affect academic
464 satisfaction and achievement (Gurpinar et al., 2011). However, Monochehr (2006) found that
465 having a preference for learning techniques used in traditional teaching approaches had no
466 effect on a student's learning and achievement, but that learning technique preference did
467 have a significant effect on e-learning. Further research is needed to identify if certain e-
468 learning techniques are preferred to their traditional equivalents it could improve a student's
469 learning, or if they are not preferred whether this would hinder learning. This study found a
470 general preference for traditional techniques, however a combination of both online and
471 traditional techniques has been found to improve student success and satisfaction with a
472 course programme compared to just using traditional learning techniques (Adileh, 2012).

473 It is important for educators to take into account student well-being when adopting learning
474 techniques and designing curricula, however other pedagogic (aside from well-being) need to
475 be taken into account. Also, although a learning technique that induces a positive mood in a
476 student is more likely to lead to better memory and motivation to learn Pekrun et al. (2002),
477 rather than learning techniques that induce negative moods (Gaddy and Ingram, 2014; Ruci et
478 al., 2009; Lapointe et al., 2013). However this goes against Bandura and Cervone (1983) who
479 found experiencing negative emotions whilst learning can motivate students to work harder in
480 the settings that cause these feelings. However it would be unethical to choose learning
481 techniques that induce negative emotions to increase motivations in students. Motivation is
482 important as it has been positively correlated to academic success and may mediate the

483 findings that experiencing negative emotions relate to low academic achievement and
484 positive emotions to high academic success (Pekrun et al., 2002). Therefore this suggests
485 lecturers could choose techniques that induce certain positive emotions to increase motivation
486 in students which has a direct impact on academic success and from the results it would
487 suggest traditional learning techniques are the best techniques to do this. However it is not
488 known to what level the emotions are felt for each technique and what level they have to be
489 felt at before they affect learning. This is something that would need to be studied in the
490 future.

491

492 4.0 Conclusion

493

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

512

513

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