Research in Learning Technology
Vol. 22, 2014

COACTION PUBLISHING

Internet self-efficacy does not predict student use of Internet-mediated educational technology

Tom Buchanan*, Sanjay Joban and Alan Porter

Department of Psychology, University of Westminster, UK

(Received 21 August 2012; final version received 7 June 2014)

Two studies tested the hypothesis that use of learning technologies among undergraduate psychology students was associated with higher Internet self-efficacy (ISE). In Study 1, the ISE scores of 86 students were found not to be associated with either attitudes towards, or measured use of, blogs and wikis as part of an IT skills course. ISE was associated with time spent online, and positive attitudes to wikis were associated with higher use. Study 2 measured 163 students' ISE scores at the beginning and end of the same course. ISE was again not correlated with attitudes towards, or actual measured use of, learning technologies used in the course. However, ISE was shown to increase during the course. Positive attitudes towards wikis and discussion boards were associated with higher use of each. Overall, ISE scores did not influence measured use of a Virtual Learning Environment (VLE, including blogs, wikis and a discussion board), or attitudes towards those technologies. This implies that while ISE is linked to aspects of online behaviour (time spent online) and can be modified by online activity or training, it does not predict student use of educational Internet technologies.

Keywords: Internet self-efficacy; student; blog; wiki; VLE

Within the Higher Education sector, there is growing capacity and enthusiasm for technology-enhanced learning: the use of technology to support and perhaps transform the learning experience through online activities. In addition to more traditional content-delivery tools (e.g. posting lecture notes on web pages or videos of lectures as used in many very large-scale online courses), there is considerable interest in more participatory and interactive technologies such as blogs, wikis and social media.

Such collaborative authoring, publication and communication technologies enable learners to play an active role in the construction of educational dialogues, objects and resources and are seeing widespread interest and adoption in universities and colleges around the world (see e.g. Collis and Moonen 2008; Hartshorne and Ajjan 2009). These tools, sometimes described as 'Web 2.0' technologies, can play important roles in purely online and distance learning courses. They are also widely used as part of blended or technology-enhanced learning programmes, where traditional models of instruction are supplemented by online components.

*Corresponding author. Email: T.Buchanan@westminster.ac.uk

Citation: Research in Learning Technology 2014, **22**: 19585 - http://dx.doi.org/10.3402/rlt.v22.19585
(page number not for citation purpose)

Assumptions underpinning technology-enhanced learning

It is now common to see traditional, in-person, contact-based courses supported by Virtual Learning Environments (VLEs) such as Blackboard or Moodle, and incorporating the use of participatory web-based technologies such as blogs, wikis, discussion boards, chat servers, podcasts (audio and video), social networking sites, online multiple choice tests, interactive demonstrations and even immersive simulated environments such as Second Life. The drive towards the use of electronic resources to support learning makes two assumptions: first, that the technology actually does support learning, and second, that students will actually use these tools.

From a pedagogical perspective, student use of technology-mediated learning materials is important because of the impact it has on achievement of learning outcomes. Carini, Kuh and Klein (2006) showed that 'the extent to which students devote time and energy to educationally purposeful activities' (p. 4) was in general positively associated with educational outcomes (though with differences in the benefit obtained according to factors such as ability, student level and institution). Thus, one might expect that devoting time and energy to electronic learning resources would similarly have desirable outcomes. However, not all students may be comfortable with these pedagogical methods.

Differential use of information technologies

There is evidence that some people are more likely to make use of information and communication technologies (ICT) than others. Indeed, a very large literature has built up around the Technology Acceptance Model (TAM; Davis 1989) and a number of other models related to it. These seek to explain user adoption of technology in terms of, among other variables, its perceived ease of use and perceived usability. The key point here is that psychological variables influence the extent to which people use technology – for example, internet-mediated learning support tools.

Kennedy *et al*. (2008) report that among first-year undergraduate students in Australia, there was variability in familiarity with, and use of, online resources. They argue that 'While some students have embraced the technologies and tools of the 'Net Generation,' this is by no means the universal student experience. When one moves beyond entrenched technologies and tools (e.g. computers, mobile phones, email), the patterns of access to, use of and preference for a range of other technologies show considerable variation' (p. 117).

This variance in use of online tools is clearly demonstrated in Hoskins and Van Hooff's (2005) examination of student use of a VLE. They found that there was a great deal of variance in how many times individual students accessed the site, ranging from 1 to 310 visits over the course of a 12-week semester.

The important issue here is that many people who have the opportunity to benefit from an Internet-delivered service of some sort choose not do so, make only token attempts to do so, or cease their involvement (drop out) after a period of time. In the context of education, this means that learners who disengage from the technology may miss valuable learning opportunities. If personal characteristics influencing technology adoption are identified, this raises the possibility of either providing learning experiences more suited to the individual's preference (e.g. offline classes), or training the individual so that they are better able to take advantage of the online experiences on offer.

Citation: Research in Learning Technology 2014, **22:** 19585 - http://dx.doi.org/10.3402/rlt.v22.19585

ISE as an explanation for differential use

One theoretical construct that has been used to explain differential engagement with online services is that of Internet self-efficacy (ISE) (e.g. Eastin and LaRose 2000). The notion of self-efficacy, put forward by Bandura (1977) revolves around belief in one's ability to perform a given task. If a person has high confidence that they can do it, they are said to have high self-efficacy in that sphere of activity. Self-efficacy may affect both likelihood to attempt the task, and emotional reaction to it. Self-efficacy is best thought of as domain specific (i.e. beliefs about one's capability at certain types of tasks) rather than generalised (where people might believe they were good or bad at all tasks). It has been argued that people have such beliefs about their ability to use the Internet, and a number of questionnaires have been developed to measure ISE. Scores on these measures have been found to affect engagement with online services of various kinds. For example, Hsu and Chiu (2004) found that ISE was positively associated with electronic submission of tax returns. Whitty and McLaughlin (2007) found that undergraduates' self-reports of using the Internet for entertainment purposes were positively associated with levels of ISE.

ISE is closely related to an important variable in a family of models dealing with technology acceptance. In the classic TAM formulation (Davis 1989), two key variables – perceived ease of use and perceived usefulness – influence attitudes towards technologies, and in turn behavioural intentions to use them and actual use. While more recent variants and alternatives to the TAM have proliferated, they tend to retain the perceived ease of use construct as an important factor.

ISE and learning technologies

The relevance of the technology acceptance literature to the current research design is that ISE is likely to be strongly linked to perceived ease of use of internet-mediated tools. Park (2009) found strong evidence that 'e-learning self-efficacy' predicted perceived ease of use of e-learning systems. Thus, we would expect that students with higher levels of ISE would perceive VLEs and other online learning tools as easier to use. They should therefore have more positive attitudes towards them, and ultimately higher levels of use. Importantly, there is evidence that training can increase ISE (Torkzadeh and Van Dyke 2002). Given the findings outlined above, we would expect that increased ISE should lead to increased use of online services.

These ideas are very relevant to the Higher Education context. It may be the case that students who are reluctant to take full advantage of e-learning activities, are reluctant because they have low levels of ISE. There are indications that constructs related to ISE do influence attitudes and behavioural intentions towards use of e-learning. For example, Liang, Wu, and Tsai (2011) found that ISE was associated with positive attitudes towards web-based learning programs in nurses. Hartshorne and Ajjan (2009) found that levels of self-efficacy around use of Web 2.0 applications influenced students' perceived behavioural control, which in turn had a positive influence on behavioural intentions to use such tools to supplement in–class learning. If these attitudes and intentions translate into actual behaviour, then appropriate training programs could boost levels of ISE. This in turn should lead students to – in Carini, Kuh, and Klein's (2006) terminology – devote more 'time and energy to educationally purposeful activities' (p. 4), mediated by a VLE, with positive effects on educational outcomes.

Aims

The aim of the current project was to examine the relationship between ISE and use of educational technology. It builds on work demonstrating links between ISE and behavioural intentions, by examining actual behaviour. To maximise ecological validity, we measured students' actual use of technology in an educational setting. We hypothesised that ISE would be positively associated with use of various components of a VLE used on the course in question.

Study 1

Study 1 was intended to examine links between ISE and student use of educational technology. The study was conducted during a first-year undergraduate lab class dealing with Basic IT Skills for Psychology. As part of the course students were introduced to various forms of educational technology, accessed through the VLE (Blackboard) used by the institution. These included blogs, wikis (both commonly cited as examples of Web 2.0 tools) and a discussion board that were each used in different ways.

Students were required to keep a personal blog detailing their experiences in class. This was used as the basis for one of their coursework assessments, a reflective log which they submitted at the end of the course. Another of the coursework assessments was a group exercise, creation of a PowerPoint presentation. Groups of students were assigned to work collaboratively on this over a period of time, using wikis that had been set up specifically for that purpose.

Method

Data were collected towards the end of the semester, once students had done all these activities. Participants received credit towards the departmental Research Participation Scheme. The project received ethical approval from the departmental ethics committee.

Participants

First-year undergraduate psychology students registered on an IT skills course were offered the opportunity to participate in return for research participation scheme credit. The course was compulsory for all students, so included those with high as well as low levels of prior IT experience. It was intended to equip students with the digital skills required to complete their programme of study (e.g. how to use the VLE). The sample comprised 86 students, drawn from a potential population of 145 people registered on the course. Although an opportunity sample, it comprised almost 60% of the population from which it was drawn. Of the 86 participants, 73 were women, 11 were men, and 2 did not state their gender. Ages ranged from 18 to 47, with a mean of 21.8 years (SD = 5.72). The great majority (78, 92.9% of those who answered) had access to the Internet outside the University. Fifty-four participants (63.5% of those who answered the question) gave us permission to look at their VLE activity, and 54 (64.3% of those who answered) gave us permission to look at their grades and use them in analyses.

Citation: Research in Learning Technology 2014, **22:** 19585 - http://dx.doi.org/10.3402/rlt.v22.19585

Measures

ISE was measured using the scale developed by Eastin and LaRose (2000). This comprises an eight-item measure where respondents are asked to indicate on seven-point scales (strongly disagree – strongly agree) the extent to which they feel confident performing various Internet-related activities (e.g. troubleshooting Internet problems; turning to an online discussion group when help is needed). The measure has good internal consistency (alpha = 0.93 reported by Eastin and LaRose 2000).

To measure attitudes to blogs and wikis, a series of items as shown in Table 1 was developed. These were designed by the authors to capture a number of different aspects of students' experience with, and feelings about, the tools. They include affective, behavioural and cognitive components. The items were piloted informally to ensure that they were meaningful and comprehensible to students. The same items with minor changes to wording were used for both blogs and wikis. Participants responded to each item on a five-point scale anchored at 'Not at all' and 'Very Much'.

A principal component analysis conducted on the six items addressing attitudes to blogs extracted a single component with an eigenvalue greater than 1 (4.21, accounting for 70.2% of the variance). The blog attitude items were thus collectively treated as a six-item scale. This had good internal consistency, with alpha = 0.91. Similarly, a further principal components analysis indicated that the wiki attitude items also clustered together to form a six-item scale. Again a single component emerged from the analysis, with an eigenvalue of 3.87 and accounting for 64.5% of the variance. For this group of items, alpha was 0.89. For both sets of attitudinal items (wikis and blogs), item responses were thus summed to create an overall attitude score for each technology (where a higher score indicates a more positive attitude).

Data on participants' actual use of the VLE were acquired by (with their permission) noting the number of entries each had made on their blog, and the number of edits (page saves) they had made to their group work wiki. These figures were used as indices of students' use of learning technology. Those who had made more entries and edits had necessarily devoted more 'time and energy to educationally purposeful activities' performed using the VLE (Carini, Kuh, and Klein, 2006, p. 4).

Table 1. Attitude to electronic resources.

Text of attitudinal item
1. How useful did you find the wiki as part of your studies on this module?
2. How much do you think you engaged with the wiki (in terms of how much you used it)?
3. How much did you like using the wiki as part of your studies on this module?
4. Do you think you would have used the wiki if it had been available to you, but not compulsory to use?
5. Would you like to use wikis again in the future, as part of your studies?
6. Would you like to use wikis again in the future, as part of your life outside University?

Note: For different technologies the term 'wiki' was replaced with the appropriate equivalent ('blog' or 'discussion board'). Participants responded to each item on a five point scale anchored at 'Not at all' and 'Very Much'. For the discussion board items in Study 2, item 4 was omitted because the discussion board was not compulsory.

Procedure

Self-report data were collected using a single questionnaire comprising multiple components. Student volunteers were recruited in lab classes, where participation took place. They read information about the study, and having indicated consent to participate they proceeded with the questionnaire.

They first indicated their age and sex, and whether they had access to an Internet-enabled computer or other device outside the University. They provided an estimate of the number of hours they spent using the Internet each week (broadly defined as any online activities). They then completed the Approaches and Study Skills Inventory for Students (ASSIST; Entwistle and Tait 1996) and the Big Five Inventory (John and Srivastava 1999). Data from these measures were not analysed for the purposes of this study.

Participants then completed the ISE scale (labelled in the questionnaire as an 'Internet Confidence' scale). They then answered a series of questions about their experience with blogs and wikis (did they know what each of them was before starting the course, did they maintain or contribute to one before the course, did they currently maintain or contribute to one outside the course), then the questions on their attitudes to blogs and wikis as described above.

Finally, participants were asked for permission to look at their own use of the VLE, in terms of the number of times they had used the blogs and wikis, and their assessment grades. This was only done for students who explicitly gave us permission, and provided identifying information (name and student identification number) to make it possible. They were then debriefed and thanked.

Results

As Table 2 shows, the only significant correlation ISE had was with weekly hours spent online: people who reported spending more time online had higher ISE scores. This is consistent with the notion that people higher in ISE would be more comfortable pursuing online activities. However, there were no significant associations between ISE and attitudes to wikis or blogs, or between ISE and the extent to which these technologies were used. ISE was also not significantly correlated with any of the students' assessment grades.

Table 2. Descriptive statistics for dependent variables and relationship to ISE.

Variable	*n*	*M* (SD)	Alpha	Pearson's correlation with ISE
Age	85	21.80 (5.72)	–	−0.049
Hours online	83	14.63 (8.63)	–	0.35***
Blog entries	52	6.04 (2.65)	–	−0.054
Wiki saves	52	6.29 (6.73)	–	−0.13
Blog attitude	84	17.62 (6.36)	0.91	−0.038
Wiki attitude	84	17.11 (5.70)	0.88	0.16
Assessment 1[a]	52	63.45 (6.31)	–	−0.10
Assessment 2[b]	50	61.67 (7.49)	–	−0.016
ISE	84	34.29 (10.76)	0.92	–

Note: [a]Assessment 1 was a reflective log based on the personal blog. [b]Assessment 2 was on a group PowerPoint presentation file created using the wiki. ***$p < 0.001$.

Citation: Research in Learning Technology 2014, **22:** 19585 - http://dx.doi.org/10.3402/rlt.v22.19585

Some links between attitudes and behaviour were observed: students who had more positive attitudes to wikis did have more wiki page saves ($r = 0.42$, $n = 52$, $p = 0.002$). The correlation between attitudes to blogs and number of blog entries also approached significance ($r = 0.26$, $n = 52$, $p = 0.061$). A full correlation matrix is shown in Table 3.

Discussion

The finding that ISE was not linked to attitudes is inconsistent with work reported by Liang, Wu, and Tsai (2011) who found that ISE was positively associated with attitudes to web based continued-learning courses among nurses. However, there are key differences between the studies that may explain this. Liang, Wu, and Tsai's participants were asked about their attitudes in the context of continuing professional development (i.e. on-going updating/learning alongside their normal employment and other roles). They were also asked about hypothetical online activities, rather than any they had actually experienced: less than 25% of respondents had actually experienced web based continuing learning. In contrast, the respondents in the current study were students who had all actually used the tools as an integral part of a University course. Their attitudes are likely to be moderated by their actual experience, which may be a much more powerful factor than their ISE level. There was some limited evidence of links between attitudes and behaviour in the current findings.

Study 1 provided no evidence that ISE influenced use of online learning technologies. However, there were a number of methodological shortcomings in the study.

First, the data were gathered at the end of the semester, once students had already experienced most of a course designed to improve their digital skills. Given that training can improve ISE, it is possible that the less confident students were brought up to a higher level of self-efficacy by the end of the course, restricting range on that variable and thus attenuating any correlations.

Second, the activities examined were compulsory elements of the course: students were, for example, required to write a blog entry each week. Again, this would have the effect of restricting range, and constraining student behaviour. It is possible that different relationships would be observed with voluntary behaviours.

Third, the measures of VLE use were imperfect: they only captured information about active interactions with the materials (i.e. making a change to the wiki or blog). However, it is possible that on many occasions students used material without altering it (just reading wiki entries without changing them for instance). A measure that captures this behaviour as well would give more information. Accordingly, a second study was planned, varying the design to accommodate these concerns.

Study 2

Study 2 was again conducted during a first-year undergraduate lab class dealing with Basic IT Skills for Psychology. The study took place 1 year after Study 1, so while the same course was used, there was a different cohort of students.

Method

Data were collected in two waves, with questionnaires issued at the beginning and end of the course. The activities on the course were as described for Study 1. On this

Table 3. Pearson correlations between all variables in Study 1.

		Hours online	Blog entries	Wiki saves	Blog attitude	Wiki attitude	Assessment 1[a]	Assessment 2[b]	ISE
Age	*r*	−0.023	−0.016	−0.072	0.22*	0.018	0.31*	−0.18	−0.049
	N	83	51	51	83	83	50	49	83
Hours online	*r*		−0.26	−0.13	0.11	0.053	0.061	0.058	0.35***
	N		50	50	81	81	48	47	81
Blog entries	*r*			0.21	0.26	0.16	0.07	−0.09	−0.054
	N			52	52	52	46	45	51
Wiki saves	*r*				0.10	0.42**	−0.083	−0.24	−0.13
	N				52	52	46	45	51
Blog attitude	*r*					0.46***	0.25	−0.24	−0.038
	N					84	51	50	82
Wiki Attitude	*r*						−0.11	−0.24	0.16
	N						51	50	82
Assessment 1[a]	*r*							0.075	−0.10
	N							50	50
Assessment 2[b]	*r*								−0.016
	N								49

Note: Blog and wiki use data are included only for those participants giving permission for online activity to be examined. Assessment marks are included only for those participants who gave permission for their marks to be examined.

[a]Assessment 1 was a reflective log based on the personal blog.

[b]Assessment 2 was on a group PowerPoint presentation file created using the wiki.

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

occasion, student use of the different technologies was objectively recorded by examining the VLE logfiles (with the students' consent). Participants received credit towards the departmental Research Participation Scheme. The project received ethical approval from the departmental ethics committee.

Participants

First-year undergraduate psychology students registered on an IT skills course were offered the opportunity to participate in return for research participation scheme credit. The course was compulsory for all students, so included those with high as well as low levels of prior IT experience, and was intended to equip students with the digital skills required to complete their programme of study (e.g. how to use the VLE).

In the first phase, data were collected from 137 students (116 women, 21 men). This was again an opportunity sample, comprising around 84% of the population from which it was drawn (163 people were registered on the course that year). Ages ranged from 17 to 60, with a mean of 21.12 years (SD = 6.39). The vast majority (133, 97.1%) had Internet access outside the University. Of the 135 who answered the question, 98 (71.5%) gave us permission to look at their activity on the VLE, meaning that these activity data were available for around 60% of the population from which the participants were drawn.

In the second phase, data were collected from 104 students (83 women, 18 men, three did not state gender). Ages ranged from 18 to 58, with a mean of 20.87 years (SD = 5.22). The vast majority (97, 96.0% of those who answered) had Internet access outside the University.

A total of 163 participants – everyone registered on the course – supplied data in either the first or second phase. Not all of the students gave data in both phases: only 78 participants completed both questionnaires. Sample sizes will thus vary in the different analyses. There was a low level of missing data where students occasionally failed to answer single questions. Students with missing data are excluded from analyses pertaining to those variables, but included in analyses where they did supply the required data.

Measures

ISE and attitudes to technology were measured using the same instruments as in Study 1. Examining logfiles collected information about students' use of the VLE. Data were logged for five different time windows during the course that corresponded to different phases of the course (normal class work, assessment weeks, vacation, independent study periods). The number of times each participant 1) logged on to the VLE, and 2) accessed the class discussion board was noted. Total scores for VLE activity and discussion board activity were calculated by summing the 'hits' across the five time periods. Note that these two variables are related, as access to the discussion board was through the VLE. Further information about other elements of VLE use came from examining 1) the number of blog entries made by each participant, and 2) the number of edits each participant had made to their group work wiki.

Procedure

In the first phase of data collection, at the beginning of the semester, student volunteers recruited from lab classes were issued questionnaires in the classroom setting. As in Study 1, they first provided informed consent, then answered the same demographic and Internet-use questions. They then completed the ISE scale, Bargh, Fitzsimons, and McKenna's (2002) five-item Real Me scale (described as a measure of 'Internet expression'; data from this scale not analysed in the present report), and the questions about prior experience with wikis and blogs. Finally, participants were asked for permission to look at their own use of different elements of the VLE, in terms of the number of times they had (for example) used blogs and wikis.

The second phase of data collection took place at the end of the semester, 10 weeks later. The same procedure was followed, with students completing the demographic and Internet-use questions again, then the ISE and Real Me scales. They then answered the questions about their attitudes towards different forms of educational technology used on the course (wikis, blogs, and discussion boards). They were then debriefed and thanked.

Data processing

Initial examination of the VLE data indicated that some preliminary screening was required. It is possible for scores on the discussion board hits and VLE hits variables to be artifactually inflated – for example, by someone repeatedly clicking their browser's refresh button when a page is slow to load. For example, while the mean number of hits on the discussion board was 16.09, the maximum was 151 (over 5 standard deviations above the mean). While the mean number of hits on the VLE was 51.04, the maximum was 337 (almost 6 standard deviations above the mean). Such elevated scores could unduly influence patterns of association in the data in ways that do not reflect real relationships between the variables of interest.

Tabachnick and Fidell (1996) outline a procedure for detecting univariate outliers where any case with a standardised score in excess of 3.29 is treated as an outlier. Accordingly, z-scores were computed for the two 'hits' variables and any such score was deleted and subsequently treated as missing data. This led to deletion of both the VLE hits score and the discussion board hits score for a single person who had the highest scores on both these variables (151 and 337 respectively). The data from this participant for other variables were retained.

For the attitudinal items, the procedure from Study 1 was repeated to check whether they could be treated as coherent scales. For the blog attitude items, again a single component with an eigenvalue greater than 1 (4.07) emerged from the Principal Components Analysis, accounting for 67.77% of variance. The same was true for the six wiki items (eigenvalue 4.21, variance explained 70.22%) and the five discussion board items (eigenvalue 3.46, variance explained 69.19%). Responses to each set of attitudinal items were therefore again summed to create overall indices of attitudes towards the blog, wikis and discussion boards. All three scales had acceptable internal consistency (alphas of 0.90, 0.91 and 0.88, respectively). Higher scores on each scale were indicative of a more positive attitude towards the technology in question.

Citation: Research in Learning Technology 2014, **22:** 19585 - http://dx.doi.org/10.3402/rlt.v22.19585

Results and discussion

Among those students who supplied data at both the beginning and the end of the course, a repeated measures *t*-test ($t_{(72)} = -2.80$, $p = 0.007$) indicated that mean ISE increased significantly over the semester from 35.81 (SD = 9.26) to 38.33 (SD = 8.97), with an effect size (Cohen's *d*) of 0.28. This supports Torkzadeh and Van Dyke's (2002) finding that training can increase ISE, as the course dealt heavily with Internet skills.

However, neither at the start nor the end of the course was ISE associated with any behavioural or attitudinal variable other than hours reported spent online (Table 4). Thus, this factor did not appear to be linked to student use of educational technology.

Positivity of attitude towards wikis (measured at the end of the semester) was associated with the total number of wiki edits ($r = 0.47$, $n = 64$, $p < 0.0005$) and positivity of attitude towards discussion boards was associated with number of times students accessed the discussion board ($r = 0.35$, $n = 63$, $p = 0.0005$). However, attitudes towards blogs were not associated with total number of blog entries ($r = -0.07$, $n = 65$, $p = 0.58$). A full correlation matrix is shown in Table 5.

General discussion

The findings of these two studies do not suggest that ISE is an important influence on use of online technology in the educational field. It does appear to have an impact on (self-reported) online behaviour, at least in terms of the time spent online each week. However, it appears that this time spent online is not reflected in those educational activities whose use it was possible to monitor. It is thus more likely to represent personal rather than academic Internet use, or academic work outwith the bounds of the VLE. Furthermore, ISE does not appear to influence students' attitudes toward learning technologies.

These findings bear a mixed resemblance to those of previous research. Liang, Wu, and Tsai (2011) finding of a link between ISE and attitudes to web based courses was not replicated. However, as discussed earlier in this paper, important differences between the current work and theirs may account for the discrepancy. Hartshorne and Ajjan (2009) found that self-efficacy beliefs around Web 2.0 technologies were an

Table 4. Correlates of Internet self-efficacy at start and end of course.

	ISE1		ISE2	
Measure	*r*	*n*	*r*	*n*
ISE 2	0.64***	73	–	–
Hours online 1	0.36***	133	0.42***	72
Hours online 2	0.24*	72	0.16	92
Blog entries	0.10	95	−0.07	62
Wiki edits	0.03	95	−0.01	62
Wiki attitude	0.07	76	0.00	97
Blog attitude	−0.023	77	−0.13	98
Disc. board attitude	0.17	76	0.13	97
VLE hits	−0.02	94	−0.04	61
Disc. board hits	0.00	94	−0.11	61

Note: *$p < 0.05$, ***$p < 0.001$.

Table 5. Pearson correlations between all variables in Study 2.

		ISE 2	Hours online 1	Hours online 2	Blog entries	Wiki edits	Wiki attitude	Blog attitude	Disc. board attitude	VLE hits	Disc. board hits
ISE1	*r*	0.64***	0.36***	0.24*	0.10	0.03	0.07	−0.03	0.17	−0.02	0.00
	N	73	133	72	95	95	76	77	76	94	94
ISE2	*r*		0.42***	0.16	−0.07	−0.01	0.00	−0.13	0.13	−0.04	−0.11
	N		72	92	62	62	97	98	97	61	61
Hours online 1	*r*			0.72***	0.02	−0.04	−0.23	−0.21	0.25*	0.09	0.10
	N			71	95	95	76	76	75	94	94
Hours online 2	*r*				−0.02	−0.04	−0.20	−0.09	0.21*	0.03	0.00
	N				60	60	97	98	98	59	59
Blog entries	*r*					0.00	−0.14	−0.07	0.07	0.26*	0.32**
	N					97	64	65	64	96	96
Wiki edits	*r*						0.47***	0.25*	0.00	0.21*	0.02
	N						64	65	64	96	96
Wiki attitude	*r*							0.46***	0.16	0.20	0.03
	N							103	102	63	63
Blog attitude	*r*								0.02	0.18	0.09
	N								103	64	64
Disc. board attitude	*r*									0.31*	0.35**
	N									63	63
VLE hits	*r*										0.84***
	N										96

Note: Blog, wiki, discussion board and overall VLE use data were analysed only for those participants giving permission for online activity to be examined.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Citation: Research in Learning Technology 2014, **22:** 19585 - http://dx.doi.org/10.3402/rlt.v22.19585

important component of perceived behavioural control (that is, people who were more confident were more likely to think that they could use the tools effectively). However, this was only weakly linked to self-reported intentions to use the tools. Furthermore, Hartshorne and Ajjan (2009) report that 'while students acknowledge the pedagogical benefits of Web 2.0 applications in higher education, there is limited use of these tools to supplement instruction in their courses' (p. 196). All in all, this is consistent with the current finding that ISE did not influence engagement with blogs, wikis or discussion boards in the context of this course.

There was evidence that attitudes towards wikis and discussion boards were associated with level of use. The direction of causality cannot be ascertained from the present study. However, the finding is consistent with the notion, derived from the TAM, that perceived usefulness of a technology will predict its use (at least one of the attitudinal items directly asked about usefulness). Failure to observe the same relationship between attitudes towards, and use of, blogs may arise from the fact that blog use was compulsory and constrained by instructions to the class: they were expected to make a blog entry each week. Thus, the proportion of variance in blog entries accounted for by other factors is necessarily limited.

Study 2 indicated that training in digital skills does increase ISE. However, there is no evidence that this change is reflected in actual behaviour within the context of the course. This may lead educators to question whether it is worth pursuing such interventions.

One possible reason for the failure to find links between ISE and number of interactions with the online materials is that variables other than those measured may influence these outcome measures. For example, people who have problems dealing with technology (i.e. low ISE) might also need to spend more time on their work, correcting mistakes and so on. However, while this argument would apply quite strongly to wiki edits, it is less clear that it would apply to the number of blog entries posted or number of times a discussion board was accessed.

On the basis of the current findings, it would be premature to conclude that ISE does not influence use of Internet technologies for learning at all. The current studies examined use of specific technologies within a formalised learning environment. However, this does not address on the question of what might motivate people to use technology to support learning in informal settings. A prime example here is the phenomenon of MOOCs (Massively Open Online Courses) such as Udacity, Coursera, edX and many others. Learners engaging with these largely choose to do so voluntarily, and it is entirely possible that ISE and other personal traits could have an influence on such choices. The same is true of other technologies – different types of social media, for example, that people could leverage in creating their informal personal learning environments.

Another question might be asked about the present conclusion: is there sufficient statistical power to support the assertion that these variables are not related? Admittedly, sample sizes are small, and with greater power there would be a better chance of finding small effects. However, the answer advanced here is a pragmatic one. The samples used here were typical of the class sizes taught in many Higher Education institutions. If ISE has no discernible effect on behaviour or attitudes among such cohorts of students, then even if a small effect does exist it is unlikely to have any practical significance for educational practice.

Conclusions

In short, there is evidence from a number of fields that ISE can affect adoption of online tools and technologies. However, we found that ISE had no effect on either use of a VLE or attitudes towards its components. While we found that appropriate training led to significant increases in ISE, this appeared to have no effect on the use of technology. Therefore, educators who wish to boost student use of the facilities provided in online or blended learning courses might do better to examine other factors and interventions.

References

Bandura, A. (1977) 'Self-efficacy: toward a unifying theory of behavioral change', *Psychological Review*, vol. 84, pp. 191–215.

Bargh, J. A., Fitzsimons, G. M. & McKenna, K. Y. A. (2002) 'The self, online', in *Motivated Social Perception: The Ontario Symposium*, ed. S. J. Spencer *et al.*, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 195–213.

Carini, R. M., Kuh, G. D. & Klein, S. P. (2006) 'Student engagement and student learning: testing the linkages', *Research in Higher Education*, vol. 47, pp. 1–32.

Collis, B. & Moonen, J. (2008) 'Web 2.0 tools and processes in higher education: quality perspectives', *Educational Media International*, vol. 45, pp. 93–106.

Davis, F. D. (1989) 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *MIS Quarterly*, vol. 13, pp. 319–340.

Eastin, M. S. & LaRose, R. (2000) 'Internet self-efficacy and the psychology of the digital divide', *Journal of Computer-Mediated Communication*, vol. 6, [online] Available at: http://jcmc.indiana.edu/vol6/issue1/eastin.html

Entwistle, N. & Tait, H. (1996) *Approaches and Study Skills Inventory for Students*, [online]. Available at: http://www.etl.tla.ed.ac.uk/questionnaires/ASSIST.pdf

Hartshorne, R. & Ajjan, H. (2009) 'Examining student decisions to adopt Web 2.0 technologies: theory and empirical tests', *Journal of Computing in Higher Education*, vol. 21, pp. 183–198.

Hoskins, S. & Van Hooff, J. (2005) 'Motivation and ability: which students use online learning and what influence does it have on their achievement?', *British Journal of Educational Technology*, vol. 36, pp. 177–192.

Hsu, M.-H. & Chiu, C.-M. (2004) 'Internet self-efficacy and electronic service acceptance', *Decision Support Systems*, vol. 38, pp. 369–381.

John, O. P. & Srivastava, S. (1999) 'The Big Five trait taxonomy: history, measurement, and theoretical perspectives', in *Handbook of Personality: Theory and Research*, eds. L. A. Pervin & O. P. John, Guilford Press, New York, pp. 102–138.

Kennedy, G. E., *et al.*, (2008) 'First year students' experiences with technology: are they really digital natives? *Australasian Journal of Educational Technology*, vol. 24, pp. 108–122.

Liang, J.-C., Wu, S.-H. & Tsai, C.-C. (2011) 'Nurses' Internet self-efficacy and attitudes toward web-based continuing learning', *Nurse Education Today*, vol. 31, pp. 768–773.

Park, S. Y. (2009) 'An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning', *Educational Technology & Society*, vol. 12, pp. 150–162.

Tabachnick, B. G. & Fidell, L. S. (1996) *Using Multivariate Statistics*, Allyn and Bacon, Boston, MA.

Torkzadeh, G. & Van Dyke, T. P. (2002) 'Effects of training on Internet self-efficacy and computer user attitudes', *Computers in Human Behavior*, vol. 18, pp. 479–494.

Whitty, M. T. & McLaughlin, D. (2007) 'Online recreation: the relationship between loneliness, Internet self-efficacy and the use of the Internet for entertainment purposes', *Computers in Human Behavior*, vol. 23, pp. 1435–1446.

Citation: Research in Learning Technology 2014, **22:** 19585 - http://dx.doi.org/10.3402/rlt.v22.19585