Open Research Online

Why some teachers easily learn to use a new virtual learning environment: a technology acceptance perspective

Journal Item

Version: Accepted Manuscript

oro.open.ac.uk

Why some teachers easily learn to use a new Virtual Learning Environment: a Technology Acceptance perspective

Abstract: After a decade of Virtual Learning Environments (VLE) in higher education, many teachers still use only a minimum of its affordances. This study looked at how academic staff interacted with a new and unknown VLE in order to understand how technology acceptance and support materials influence (perceived and actual) task performance. In an experimental design, 36 participants were split into a control (online help) and experimental (instructor video) condition and completed five common teaching tasks in a new VLE. In contrast to most Technology Acceptance (TAM) research, this study found that perceived usefulness of the VLE was not related to (perceived) task performance. Perceived ease of use was related to intentions and actual behaviour in the VLE. Furthermore, no significant difference was found between the two conditions, although the experimental condition led to a (marginal) increase in time to complete the tasks.

Introduction

Almost all Higher Education Institutions (HEIs) in the Western world, and in the UK in particular, have some form of Virtual Learning Environment (VLE) or Learning Management System (LMS) in place, whether it is based on a commercial package such as Blackboard or Desire2Learn, or an open-source one such as Moodle. However, many teachers use these VLEs as a simple repository for providing students with access to materials, such as PowerPoint files and reading lists. The consequence is that although there is clearly increased usage of VLEs, there is not widespread evidence of a change in pedagogic practice (Brown, 2008; Browne, Jenkins, & Walker, 2006; Kinchin, 2012). A large body of research has demonstrated that many teachers use only a minimum of the affordances of VLEs (Browne et al., 2006; Jenkins, Browne, Walker, & Hewitt, 2010; Jimoyiannis & Komis, 2007; Rienties et al., 2012; Sanchez-Franco, 2010). Despite this evidence, some authors (Brown, 2008; Watson, Watson, & Reigeluth, 2013) have suggested moving away from VLEs to Web 2.0 technologies, which are personalised, flexible and user-centred, and recognise students' extra

institutional experiences, notably communication through social software (e.g. Facebook, Twitter).

Two important factors stand out in research on teachers' usage of educational technology, namely technology acceptance and role of training. A first important predictor as to whether teachers start and continue to (actively) use technology in their classroom is their acceptance of technology (Sørebø, Halvari, Gulli, & Kristiansen, 2009; Šumak, Heričko, & Pušnik, 2011). Technology acceptance research originates from the information systems (IS) domain, and developed models have successfully been applied to educational settings (Author Z, In Press; Gong, Xu, & Yu, 2004; Pynoo et al., 2011; Sanchez-Franco, 2010; Sørebø et al., 2009; Šumak et al., 2011). Of the available models, the Technology Acceptance Model (TAM), which was developed by Davis and colleagues (1989; Davis, Bagozzi, & Warshaw, 1989), is the most widely used and proved to be highly useful in explaining teachers' uptake of educational technology (Šumak et al., 2011). Although an increasing number of studies are now available using TAM in educational settings, to the best of our knowledge no previous study has investigated the factors that influence the uptake by higher education teachers of a new VLE in an experimental, controlled environment.

The second important factor relates to the role of training. Several studies examining why the uptake of VLEs was below expectations indicated that teachers might be insufficiently trained and equipped with appropriate technological and pedagogical skills (Jenkins et al., 2010; Jimoyiannis & Komis, 2007; Lawless & Pellegrino, 2007; Mishra & Koehler, 2006; Rienties & Townsend, 2012). A recent study amongst 74 UK HEIs by Jenkins et al. (2010) indicated that after "availability of time", academic staff's knowledge of technology-enhanced learning tools is the second highest barrier for technology-adoption. Furthermore, although training and support have been identified as important complementary factors regarding the uptake and continuation of e-learning technology (Sørebø et al., 2009),

not a single experimental design research study is available in order to analyse the impact of the type of support on (actual) use of technology by academic staff.

Therefore, in this study we will compare how a control and experimental group of academic staff (N=36) completed five common VLE teaching tasks (i.e. upload a file; create an announcement; create a discussion forum thread; enrol a colleague to the module; and create an assignment) in a new and unfamiliar VLE system. The two conditions differed in the type of support that a participant could obtain. These different approaches were selected because research (Holmes, Clark, Burt, & Rienties, 2013; Mayer, 2003; Moreno & Mayer, 2007; Seidel, Blomberg, & Renkl, 2013) indicated that the type of online support (text-based, video) may impact how teachers are able to cope and work with new technology. In the experimental condition, videos or screencasts demonstrating how to undertake a particular task in the VLE were available for teachers to watch if they needed help to perform a task. In the control condition, teachers were only given an online searchable 'help' function. By extending the scope of TAM research to the usage intention of a VLE, this study holds both theoretical and practical value.

Technology Acceptance Model

In order to implement ICT in general, and a VLE in particular, it is important to adjust the content designed for the learners in line with the technology selected and the pedagogical approach used (Alvarez, Guasch, & Espasa, 2009; Lawless & Pellegrino, 2007). Mishra and Koehler (2006) showed that learning was most effective when teachers had appropriate awareness of the complex interplay between pedagogy, technology and discipline specific knowledge. Nonetheless, several researchers (Mishra & Koehler, 2006; Rienties & Townsend, 2012) have shown that technological knowledge is often independent from content and pedagogical knowledge. For example, in a review of 118 course designs Rienties

et al. (2012) found that teachers consistently aligned their content with their pedagogical approach. However, the use of technology in these 118 courses was not found to be correlated to the teachers' content or pedagogical approach.

One possible explanation why some teachers do not appear to link their technological knowledge with the design and pedagogical approach is related to their intentions to use technology. A factor that is considered pivotal in the degree to which teachers use ICT in their teaching is their acceptance of technology (Gong et al., 2004; Hu, Clark, & Ma, 2003; Sørebø et al., 2009). The Technology Acceptance Model (Davis, 1989; Davis et al., 1989) is a commonly used model in information systems research to explain a user's intentions to use ICT. The TAM model is founded on the well-established Theory of Planned Behaviour (Ajzen, 1991), which states that human behaviour is directly preceded by the *intention* to perform this behaviour. In turn, three factors influence intentions, namely: personal beliefs about one's own behaviour, one's norms, and the (perceived) amount of behavioural control one has.

Building on this theory, TAM states that the intention to use ICT (and thus a VLE) is influenced by two main factors: the *perceived usefulness* (i.e. the extent to which a teacher believes the use of a VLE will, for example, enhance the quality of his/her teaching, or increase students' satisfaction with the module) and the *perceived ease of use* (the perceived effort it would take to use a VLE). The influence of both variables has been consistently shown in educational settings (Gong et al., 2004; Pynoo et al., 2011; Sanchez-Franco, 2010; Sørebø et al., 2009). Although most of these studies involved students, a meta-analysis by Šumak et al. (2011) shows the relations between perceived ease of use, perceived usefulness, and the intention to use educational technology are equally strong with respect to differences in user types (e.g. students or teaching staff) and technology types. For example, in a technology training programme amongst 152 teachers, Gong et al. (2004) found that

perceived usefulness of PowerPoint was positively related to intentions to use this technology. In a study of 239 pre-service teachers, Teo (2010) found that perceived usefulness and perceived ease of use were key determinants of participants' attitudes towards computer use. Pynoo et al. (2011) found perceived usefulness and perceived ease of use were positively related to the use of a VLE.

However, a critical gap has been identified in TAM research in which most studies are based on the assumption that the intention to use ICT tools is directly linked to actual usage behaviour (Bagozzi, 2007; Giesbers, Rienties, Tempelaar, & Gijselaers, 2013; Pynoo et al., 2011). For example, according to TAM if a teacher intends to introduce a discussion forum to allow students to ask questions after the lecture, if this teacher expected to find the discussion forum easy to use, it should follow that the teacher will be more inclined to use these tools. Bagozzi (2007), however, pointed out that there is not necessarily such a direct relationship between intention and actual use.

Sørebø et al. (2009) argued that user training (prior to technology acceptance, but also when already engaged) is crucial to strengthen the intrinsic motivation to use ICT in education. However, no research specifically aimed at investigating the factors influencing teacher engagement with a VLE is available at this time. Yet, with most HEI institutes directing considerable resources towards the implementation and maintenance of a VLE, understanding teachers' VLE usage intention is crucial. This appears particularly relevant given that Šumak et al. (2011) found that teachers' e-learning acceptance processes substantially differ from those of students. Therefore, Šumak et al. (2011, p. 2076) recommended that "managers at educational institutions must be aware that the usability and utility aspects can have a greater influence on instructors, rather than on students".

In line with research recommendations by Teo (2010), more research is needed to consider the link between the intention to develop learning through ICT, the actual usage by

the teacher, and how these are related within a VLE. In this study, five tasks were selected that are common and exemplify different technological functions within a VLE. Although most participants in our experimental study routinely perform these activities in their daily teaching practice, the way how to perform these tasks and the look-and-feel of the new VLE required adjustment time. The findings by Šumak et al. (2011) led us to believe there would be a positive relationship between the TAM factors and each of the five VLE tasks. Task completion time has also been incorporated into the original development of TAM (Davis, 1989), and has later been argued to be an indicator of usability (Venkatesh & Bala, 2008). We might expect that if performing a task by using a technology takes considerable time, it may have a negative influence on the perceived ease of use and the perceived usefulness of this technology. Therefore, with respect to the uptake of a new VLE system, the following hypotheses were formulated:

H1 Perceived ease of use of a VLE is positively related to the perceived ease to complete five common VLE teaching tasks.

H2 Perceived ease of use of a VLE is negatively related to the time needed to complete the tasks.

H3 Perceived usefulness of a VLE is positively related to the perceived ease to complete the tasks.

H4 Perceived usefulness of a VLE is negatively related to the time needed to complete the tasks.

Training needs for technology

Several researchers (Lawless & Pellegrino, 2007; Rienties et al., 2012; Rienties & Townsend, 2012; Stes, De Maeyer, Gijbels, & Van Petegem, 2011) have suggested that HEI should

provide adequate professional development, training and staff support for teachers in order to increase their awareness of the complex interplay between technology, pedagogy and the cognitive content in their disciplines. However, research has shown that providing effective training and practice opportunities with technology for teachers is not straightforward (Alvarez et al., 2009; Ebert-May et al., 2011; Lawless & Pellegrino, 2007; Rienties, Brouwer, & Lygo-Baker, 2013; Stes et al., 2011). Some teachers prefer to learn a new VLE system using an auto-didactic approach: i.e. experimenting with the technology and testing the various functionalities by trial-and-error. Others teachers prefer some initial support (e.g., a one hour introduction in a training room) to help them get a general overview of the new VLE and afterwards some opportunity to experiment, while others prefer to be guided and supported with intensive training and support (Holmes et al., 2013). In the context of this study, it was anticipated that for those teachers struggling to solve the five common teaching tasks in the VLE, there would be a need to receive greater formal training and support. As a result, the following hypothesis was formed:

H5 Perceived ease of completing the tasks is negatively related to a need for training.

Design of self-support materials

When users of a new VLE technology struggle with a particular functionality, easily accessible, clear and searchable support materials are important factors accepting a new VLE. With the increased complexities and affordances of VLE systems, most VLEs provide comprehensive help-support and self-support learning materials to support users to design and implement technology-enhanced learning activities. Commonly these materials are in the form of searchable online help sheets, listed alphabetically or by categorisation of common

activities (e.g. communications; moderating discussion forums), similar to most ICT tools such as MS Office or SPSS.

Recently, several VLE systems as well as users of such systems have started to provide online help-materials in the form of audio-visual instructor videos and screencasts in their VLE and on YouTube, providing a step-by-step process for a user to mimic. Although to the best of our knowledge no study is available that demonstrates whether these training videos provide better support for teachers than the common help sheets, a large body of literature in instructional design highlighted that audio-visual materials combined with text are more suitable for a wider range of learners (Goldman, Pea, Barron, & Derry, 2007; Mayer, 2003; Moreno & Mayer, 2007). For example, Giesbers et al. (2013) found that students who used video tools in comparison to text-based tools were more likely to continue their study. Holmes et al. (2013) found that teachers were positive about the merits of YouTube-like short-clips in their teaching practice. More importantly, in an experimental study amongst 56 pre-service teachers, Seidel et al. (2013) found that videos can provide teachers with effective acquisition of factual and conceptual knowledge, such as performing an educational task. At the same time, watching a three-minute video in order to complete a task might be less effective than quickly searching the help function and seeking a relevant written explanation. Therefore, the final three hypotheses are:

H6 Instructor videos increase the perceived ease to complete the tasks.

H7 Perceived ease to complete tasks is negatively related to time to complete the tasks.

H8 Instructor videos reduce the need for training.

➔ Insert Figure 1 about here

In Figure 1, our core variables and the eight hypotheses are conceptually illustrated.

Method

Participants

The 36 participants within this study were academic staff from a research-intensive UK university in the south of England. These participants were recruited in the summer of 2012 in two ways. First of all, 80 participants from a graduate programme in teaching and learning were invited to join. Of those who accepted, 27 were able to join at the designated time of the sessions. These participants were mostly lecturers with a completed PhD and with one to two years of teaching experience. Secondly, nine academic staff were recruited who had indicated their interest in the new VLE system being implemented at the university. The average age of participants was 38.69 (SD = 8.54), and 46% of the participants were women.

Design and procedure

Participants were enrolled in one of five sessions in a computer lab according to their time preference. Participants worked on an individual computer and screencasts of their interactions with the VLE were recorded. Participants completed a pre-test of TAM before the start of their one hour session, which included two items (see next section) about their prior expertise with a VLE. At the time of this study, WebCT was used at this university, before a switch was made to the new VLE, namely Desire2Learn. Afterwards, participants were allowed to spend 15 minutes navigating around the VLE, which had not been accessible to academic staff before the pilot. Only the research team had access to the secured test-environment, where Desire2Learn version 9.4.1 was installed.

A substantial number of participants (68%) indicated prior experience of using the university's old VLE system in their daily teaching practice (see also Appendix), but none of

9

the participants had used Desire2Learn before. Participants were enrolled into a demonstration module as a student and were given time to explore the structure of materials provided, the navigation and look-and-feel of Desire2Learn in general. After 15 minutes, each participant was given access to a new empty module with full instructor access rights to the VLE.

In the remaining 40 minutes, participants were asked to complete five common VLE teaching tasks in an order based upon increased (technical) complexity: 1) upload a file (e.g. PowerPoint, PDF) into a module; 2) create an announcement; 3) create a discussion forum thread; 4) enrol a colleague to the module; 5) create an assignment (e.g. quiz or essay assessment). These tasks were chosen by a team of seven experts in technology-enhanced learning and academic development. They were selected to be representative of tasks that teachers typically need to undertake when starting a new module in a VLE. Although the tasks chosen were not particularly advanced, they commonly occur in working with a VLE and it was anticipated that they would present some challenges for staff working within a new VLE given the different navigation and look-and-feel.

For each participant, a designated observer was present to observe how the participant worked with the VLE and solved the various tasks, and where necessary "guide" the participant through the procedure, without giving any hints or the actual solution to the particular task. Only if a participant did not know how to proceed and explicitly indicated that (s)he needed help, the observer gave one of two non-directive suggestions (Control condition: Perhaps the help function may help?; Experimental condition: Perhaps the instructor videos may help?). All eleven observers, who were experienced users, trainers of and/or researchers in VLEs and technology-enhanced learning, were trained by the lead researcher in a one hour hands-on session prior to the computer lab sessions.

Intervention

The study assigned 18 participants randomly to receive the experimental intervention, which involved making audio-visual instructor videos available covering common activities in the VLE. These videos are structured to provide a basic explanation of the activity (e.g., enrolling a new student) and a screencast showing how the activity can be done in the VLE. These videos were listed in a categorised manner based upon the functionality of Desire2Learn. Most videos had some additional reading materials and in general took 2-3 minutes to watch. The instructor videos were provided through a separate tab in Internet Explorer for easy access and browsing, thereby limiting the need for participants to scroll back and forth from the module to the instructor videos. In order to maintain the distinction between experimental and control condition, the links to online help sheets were removed during the experimental condition, so that participants could only use the instructor videos for help.

Control-condition

In total 18 control participants were asked to engage in exactly the same problem procedure as the experimental group, except they only had access to the online searchable help sheets and the tab in Internet Explorer containing the videos was removed.

Instruments

Pre-test Measurement Technology Acceptance Model

The TAM scales of Davis (1989) typically consist of two times six items on perceived usefulness and perceived ease of use. As most TAM questionnaires have not addressed teachers, we rephrased the items to fit our context (see Appendix for items). During the pre-test, we asked teachers about their general notions of VLE usage (e.g., using a VLE will

make it easier to teach course content). In order to control for prior expertise with VLEs, two items were added to the pre-test.

Measurement perceived ease to complete task 1-5 by participant and observer and perceived training need.

After each task, both participant and observer independently filled in a short questionnaire consisting of three items about the perceived ease to complete the task and whether (or not) the task was successfully completed. In other words, if participants completed all five tasks, they would have filled in fifteen questions. In order to correct for potential over- or underestimation by the participants of the perceived ease to complete the tasks, the average of the observers' scores and participants' scores were taken as a proxy of perceived ease to complete the tasks.

Perceived training need

At the end of the experiment, participants completed a short questionnaire consisting three items about the perceived need for training. All three instruments use a Likert response scale of 1 (totally disagree) to 5 (totally agree), response rates were 100%, and the detailed items and cronbach alphas for each scale are provided in Appendix.

Time to complete the tasks

In order to measure the actual usage by participants of the new VLE in our experimental setting, the screencasts of the interactions of the participants with the VLE were ex-post coded by an independent researcher using a pre-defined solution sheet who scored whether the participants successfully completed the tasks (0 = fail, 0.5 = partially correct, 1.0 = correct), and added timeslots for each respective task. Afterwards, the total time in seconds

for completing the tasks was deducted from the number of tasks successfully completed in order to get an average score of the time needed to complete a task.

Data analysis

The metric that we used to estimate and describe the effects of the experiment was by taking the standardised difference of two means (Cohen's d) effect size when t-tests are significant at a 5% confidence level. In order to test whether the participants in the control condition were comparable with those from the experimental condition, we conducted separate independent sample tests of gender, age, discipline, prior expertise, perceived ease of use and perceived usefulness in VLEs. None of these factors were significantly different between the two samples (all t-tests: $p > 0.05$), indicating that participants were comparable across the two conditions before the start of the experiment.

Results

Basic descriptors

Before the start of the experiment, taking a positive cut-off value of 3.5 and a negative cut-off value of < 3.0, 53% of the participants indicated they found a VLE (in general) easy to use, while 25% of the participants found a VLE difficult to use. 69% of the participants were positive about the perceived usefulness of a VLE, while none of the participants were negative. At the end of the experiment, on average 4.08 tasks (SD = .78) were completed successfully, within a range of 2-5 tasks. 31% found the five tasks easy to complete, while 33% answered negatively. Uploading a file (62%) and an assignment (63%) were considered to be difficult activities, which may partially be explained by the fact that in the new VLE the procedures to do these tasks were substantially different from what the VLE teachers were used to working with.

In Table 1, the correlations between the core variables are illustrated. In line with our expectations, participants who stated that they found it relatively easy to work with VLEs in general also found it easy to complete the five tasks (r = .502), thereby providing support for H1. In addition, a negative relation between time to complete a task and perceived ease of use was found, thereby providing support for H2. While perceived ease of use seemed to be related to how academic staff engaged with the VLEs, the perceived usefulness was neither significantly related to either ease to complete the tasks nor the time to complete these tasks, thereby providing no support for H3 and H4.

➔ Insert Table 1 about here

In terms of perceived ease to complete the tasks, we found a strong negative relation with time to complete the task, thereby providing support for H7 and the notion that when academic staff can easily complete a common teaching task in a VLE, they will actually finish faster. In line with H5, a negative relation was found between perceived ease to complete the tasks and perceived training need.

Control condition vs. experimental condition
➔ Insert Table 2 about here

In Table 2, the core variables of this study are contrasted for the control and experimental conditions. In terms of the perceived ease of completing the tasks and the number of tasks completed successfully, no significant differences between the two conditions were found. However, the average time to complete a task was substantially longer in the experimental condition (t = 1.986, p = .055), with a moderate to strong effect size. Although only

14

marginally significant, participants in the experimental condition took on average 112 seconds or 1.51 minutes (36%) longer to complete an average task. In other words, participants in the experimental condition were spending on average almost 10 minutes longer to complete the five tasks than those in the control condition. Follow-up Spearman rho correlation analyses indicated no significant relation between the experimental condition and perceived ease to complete the tasks ($r = -.02$, $p = ns$) and perceived training needs ($r = -.05$, $p = ns$). In other words, we did not find support for H6- H8. In conclusion, the significant relations and supported hypotheses are illustrated in Figure 2.

➜ Insert Figure 2 about here

Discussion and conclusion

After a decade of "easy-to-use" Virtual Learning Environments (VLE), many researchers (Browne et al., 2006; Kinchin, 2012; Sanchez-Franco, 2010), practitioners and students found it puzzling that a substantial body of academic staff are not fully engaged with technology-enhanced learning. In this experimental design study, using the conceptual framework of the Technology Acceptance Model (TAM) of Davis (1989) we tried to understand some of the underlying reasons why some academic staff find it easier to work with a new VLE, while others struggle in comparison.

The first important finding is that technology acceptance of academic staff seems to be positively related to how easy they found completing the tasks. This is both in terms of their own perceptions (H1) and the (limited) amount of time (H2) required to successfully complete the tasks. However, only the perceived ease of use of a VLE showed a strong and significant relation to how staff engaged with tasks, while the perceived usefulness of a VLE (H3-H4) appeared to have no relation in our study. At first this might appear to be a puzzling finding, especially as most TAM studies indicated that perceived usefulness is the strongest

15

determinant of the intention to use ICT (Bagozzi, 2007; Gong et al., 2004; Sanchez-Franco, 2010). In line with Bagozzi (2007) and Giesbers et al. (2013), an important difference is that this study took the *actual* usage behaviour of the teachers in an experimental setting into account and not just the *intention* to use it. One could reasonably argue that academic staff who find it relatively straightforward to work with a VLE will struggle less in a completely unknown VLE than staff who express more difficulties with using a VLE, and perhaps technology in general. However, one would expect in line with TAM and findings by Jimoyiannis and Komis (2007) that this would still need to be combined with perceived usefulness of a VLE, whereby if academic staff are not positive about the benefits of using a VLE for their teaching practice, they would be expected to be less inclined or motivated to complete the tasks successfully.

Academic staff were in general more positive about the perceived usefulness of a VLE than about their own skills to work within this. As we found no significant relationship between perceived usefulness and perceived ease of use of a VLE, participants may have conceptualised the questions in two different constructs. Perhaps the perceived ease of use of a VLE is a proxy for the technological autodidactic skills of academic staff (or lack of anxiety) working with new (technology-enhanced learning) software. Several researchers (Pynoo et al., 2011; Sanchez-Franco, 2010; Teo, 2010) have found that when individuals find it easy to engage with new technology, they are more able to understand the architecture and affordances of a technology operating system and their respective tools, and therefore are more able to complete the tasks quickly. In contrast, the perceived usefulness of a VLE may perhaps represent a desired state of technology-enhanced learning design for some teachers to reach if they possess the appropriate technical skills to use the system effectively.

The second important finding from this study is that the experimental (instructor video) and control (online help) condition show no difference in terms of the perceived task

completion and perceived training need (H6-H8). However, participants spent more time completing each task in the experimental condition. A possible explanation may be that participants in this study were exposed to a completely new VLE platform, where they were trying to absorb and process a massive amount of complex information in a relatively short amount of time. Watching a video with both visual and audio information might have had an impact on their mental capacity to convey messages and hence led them to take longer in completing the tasks.

Limitations

A crucial limitation of our findings is that our measure of impact was based upon self-reported measurements of teachers' technology acceptance. However, in contrast to most studies on TAM (Bagozzi, 2007; Gong et al., 2004; Sanchez-Franco, 2010), we attempted to reduce this by measuring the actual behaviour of participants in a controlled environment, both in terms of the combined score of perceived ease of completing the task by the participant and observer, as well as the time and degree of success in completing these tasks. A second limitation is a possible self-selection of participants who joined the experiment. However, both the scores on the perceived ease of use, as well as the degree to which participants considered themselves as experts, indicate a wide mix of participants, who in general seem to resemble the typical profile of academic staff at university.

A third and important limitation was the relatively small sample size, which requires the reader to be careful in generalising the findings as it was not possible to conduct more advanced statistical techniques (e.g., Structural Equation Modelling) commonly used in TAM research (Šumak et al., 2011). As indicated by previous research (Rienties et al., 2013; Stes et al., 2011), while in educational research amongst students (or even pre-service teachers) obtaining sufficiently large sample sizes is relatively straightforward, given the limited

17

number of teachers/academics in an institution most research focussed on academics is conducted amongst samples of limited size, typically ranging between 10-40 academic staff.

A fourth limitation is that this study is conducted within a single university context, whereby the experiences with the (old) VLE were mixed, and not all academics used the VLE intensively. Although this may be similar to other UK HEIs (Jenkins et al., 2010), other institutions with a requirement to have a presence in the VLE, for example, may influence the findings. A final limitation is the limited time duration and the experimental setting. Teachers able to explore a new technology in the comforts of their own surroundings and not put under time pressure, may engage with a VLE differently. Nonetheless, the vast majority of participants were able to complete four out of five tasks successfully within the 40 minutes session and were given sufficient time to get used to the experimental nature of the study.

It would be useful for follow-up research to determine whether teachers' behaviour in our experimental setting is replicated in their daily teaching practice and whether teachers' behaviour actually influences students' usage of VLEs. A recent study by Author Z (In Press) amongst 45 online MBA courses followed by 633 students indicated that institutions get "most bang for its buck" in terms of optimising the learning experience of their students by investing resources in teachers' technological expertise (and teacher presence) rather than investing in elaborate VLEs, as teacher presence was found to be the most important predictor for enhancing the learning experience.

Practical implications

Several researchers (Gong et al., 2004; Hu et al., 2003; Jimoyiannis & Komis, 2007) have found that self-efficacy of computer skills is an important (initial) mediator of adaptation to technology. Findings from this study also showed that instruction videos did not significantly improve task completion in comparison to text-based online help. Some academic staff may

prefer to work with text-based media, while others prefer a mix of support mediums. Future research should also look into individual differences in terms of disciplines, preference towards research versus teaching, teaching beliefs and values, and cultural influence, which in turn may influence academics' usage of technology and their training needs.

References

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211. doi: 10.1016/0749-5978(91)90020-T

Alvarez, I., Guasch, T., & Espasa, A. (2009). University teacher roles and competencies in online learning environments: a theoretical analysis of teaching and learning practices. *European Journal of Teacher Education, 32*(3), 321-336. doi: 10.1080/02619760802624104

Author Z. (In Press). System, scholar, or students? Which most influences online MBA course effectiveness? *Journal of Computer Assisted Learning*.

Bagozzi, R. P. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems, 8*(4), 244-254.

Brown, S. (2008). From VLEs to learning webs: the implications of Web 2.0 for learning and teaching. *Interactive Learning Environments, 18*(1), 1-10. doi: 10.1080/10494820802158983

Browne, T., Jenkins, M., & Walker, R. (2006). A longitudinal perspective regarding the use of VLEs by higher education institutions in the United Kingdom. *Interactive Learning Environments, 14*(2), 177-192. doi: 10.1080/10494820600852795

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1002.

Ebert-May, D., Derting, T. L., Hodder, J., Momsen, J. L., Long, T. M., & Jardeleza, S. E. (2011). What We Say is Not What We Do: Effective Evaluation of Faculty Professional Development Programs. *BioScience, 61*(7), 550-558. doi: 10.1525/bio.2011.61.7.9

Giesbers, B., Rienties, B., Tempelaar, D. T., & Gijselaers, W. H. (2013). Investigating the Relations between Motivation, Tool Use, Participation, and Performance in an E-learning Course Using Web-videoconferencing. *Computers in Human Behavior, 29*(1), 285-292. doi: 10.1016/j.chb.2012.09.005

Goldman, R., Pea, R., Barron, B., & Derry, S. J. (2007). *Video research in the learning sciences*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Gong, M., Xu, Y., & Yu, Y. (2004). An Enhanced Technology Acceptance Model for Web-Based Learning. *Journal of Information Systems Education, 15*(4), 365-374.

Holmes, V., Clark, W., Burt, P., & Rienties, B. (2013). Engaging teachers (and students) with media streaming technology, the case of Box of Broadcasts. In L. Wankel & P. Blessinger (Eds.), *Increasing student engagement and retention using mobile applications: smartphones, Skype and texting technologies* (Vol. 6D, pp. 211-240). Bingley, UK: Emerald Publishing Group.

Hu, P., Clark, T., & Ma, W. (2003). Examining technology acceptance by school teachers: a longitudinal study. *Information Management, 41*(2), 227-241. doi: 10.1016/s0378-7206(03)00050-8

Jenkins, M., Browne, T., Walker, R., & Hewitt, R. (2010). The development of technology enhanced learning: findings from a 2008 survey of UK higher education institutions.

Interactive Learning Environments, 19(5), 447-465. doi: 10.1080/10494820903484429

Jimoyiannis, A., & Komis, V. (2007). Examining teachers' beliefs about ICT in education: implications of a teacher preparation programme. *Teacher Development, 11*(2), 149-173. doi: 10.1080/13664530701414779

Kinchin, I. M. (2012). Avoiding technology-enhanced non-learning. *British Journal of Educational Technology, 43*(2), E43-E48. doi: 10.1111/j.1467-8535.2011.01264.x

Lawless, K. A., & Pellegrino, J. W. (2007). Professional Development in Integrating Technology Into Teaching and Learning: Knowns, Unknowns, and Ways to Pursue Better Questions and Answers. *Review of Educational Research, 77*(4), 575-614. doi: 10.3102/0034654307309921

Mayer, R. E. (2003). The promise of multimedia learning: using the same instructional design methods across different media. *Learning and Instruction, 13*(2), 125-139. doi: 10.1016/S0959-4752(02)00016-6

Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record, 108*(6), 1017-1054.

Moreno, R., & Mayer, R. (2007). Interactive Multimodal Learning Environments. *Educational Psychology Review, 19*(3), 309-326. doi: 10.1007/s10648-007-9047-2

Pynoo, B., Devolder, P., Tondeur, J., van Braak, J., Duyck, W., & Duyck, P. (2011). Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study. *Computers in Human Behavior, 27*(1), 568-575. doi: 10.1016/j.chb.2010.10.005

Rienties, B., Brouwer, N., & Lygo-Baker, S. (2013). The effects of online professional development on higher education teachers' beliefs and intentions towards learning

facilitation and technology. *Teaching and Teacher Education, 29*, 122-131. doi: 10.1016/j.tate.2012.09.002

Rienties, B., Kaper, W., Struyven, K., Tempelaar, D. T., Van Gastel, L., Vrancken, S., . . . Virgailaite-Meckauskaite, E. (2012). A review of the role of Information Communication Technology and course design in transitional education practices. *Interactive Learning Environments, 20*(6), 563-581. doi: 10.1080/10494820.2010.542757

Rienties, B., & Townsend, D. (2012). Integrating ICT in business education: using TPACK to reflect on two course redesigns. In P. Van den Bossche, W. H. Gijselaers & R. G. Milter (Eds.), *Learning at the Crossroads of Theory and Practice* (Vol. 4, pp. 141-156). Dordrecht: Springer.

Sanchez-Franco, M. J. (2010). WebCT – The quasimoderating effect of perceived affective quality on an extending Technology Acceptance Model. *Computers & Education, 54*(1), 37-46. doi: 10.1016/j.compedu.2009.07.005

Seidel, T., Blomberg, G., & Renkl, A. (2013). Instructional strategies for using video in teacher education. *Teaching and Teacher Education, 34*(0), 56-65. doi: 10.1016/j.tate.2013.03.004

Sørebø, Ø., Halvari, H., Gulli, V. F., & Kristiansen, R. (2009). The role of self-determination theory in explaining teachers' motivation to continue to use e-learning technology. *Computers & Education, 53*(4), 1177-1187. doi: 10.1016/j.compedu.2009.06.001

Stes, A., De Maeyer, S., Gijbels, D., & Van Petegem, P. (2011). Instructional development for teachers in higher education: effects on students' learning outcomes. *Teaching in Higher Education*, 1-14. doi: 10.1080/13562517.2011.611872

Šumak, B., Heričko, M., & Pušnik, M. (2011). A meta-analysis of e-learning technology acceptance: The role of user types and e-learning technology types. *Computers in Human Behavior, 27*(6), 2067-2077. doi: 10.1016/j.chb.2011.08.005

Teo, T. (2010). A path analysis of pre-service teachers' attitudes to computer use: applying and extending the technology acceptance model in an educational context. *Interactive Learning Environments, 18*(1), 65-79. doi: 10.1080/10494820802231327

Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a Research Agenda on Interventions. *Decision Sciences, 39*(2), 273-315. doi: 10.1111/j.1540-5915.2008.00192.x

Watson, W. R., Watson, S. L., & Reigeluth, C. M. (2013). Education 3.0: breaking the mold with technology. *Interactive Learning Environments*, 1-12. doi: 10.1080/10494820.2013.764322
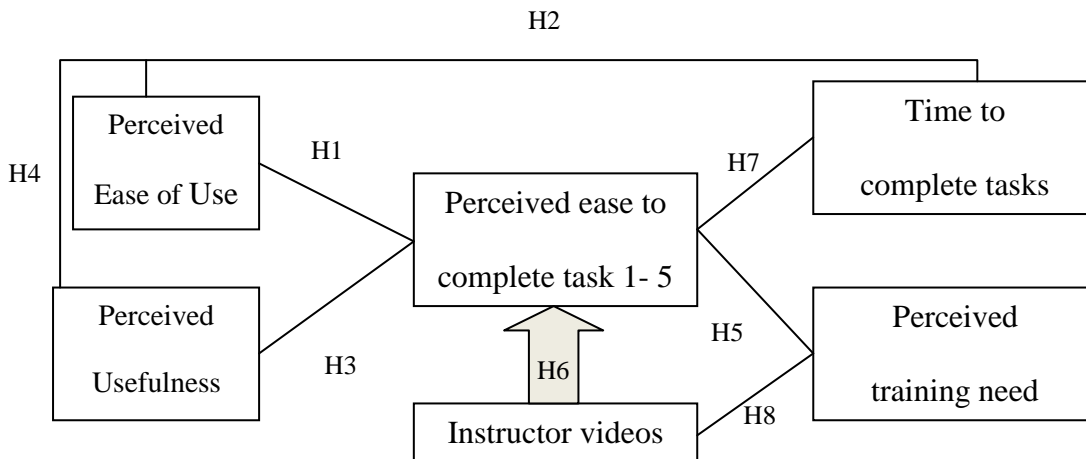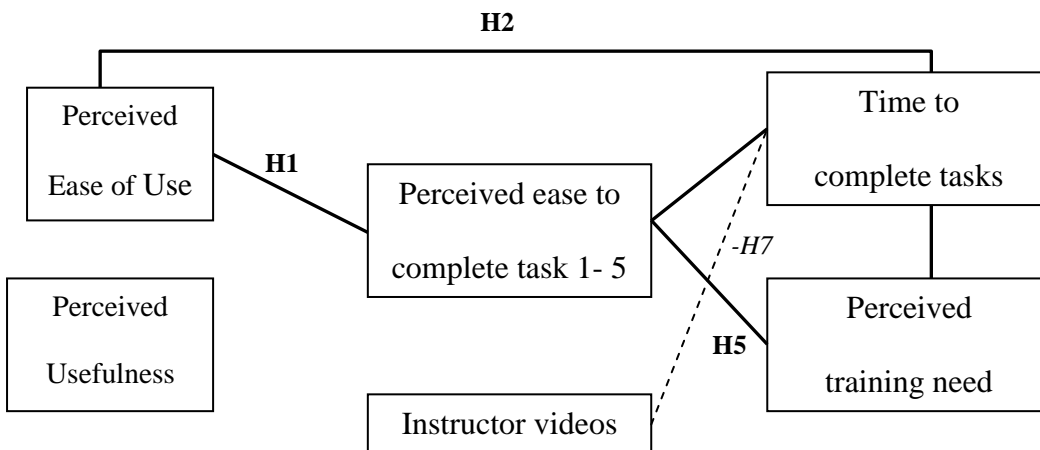
Figure 1 Overview of tested model

Figure 2 Final model

Note: Bold hypotheses are confirmed in the expected direction. Italic hypotheses with a negative sign are confirmed but in the opposite direction.

Table 1 Correlation Matrix of TAM, perceived ease to complete the task and training needs

Scale	M	SD	1	2	3	4
1. Perceived ease of use	3.47	.65	1			
2. Perceived usefulness	3.76	.50	.260			
3. Perceived ease to complete tasks	3.18	.56	.502**	.056		
4. Time to complete a task (seconds)	371.50	176.70	-.391*	.018	-.468**	
5. Perceived need for training	3.31	.48	.237	-.172	.494**	-.370*

**$p <.01$, * $p < 05$.

Table 2 Comparison of experimental vs. control condition.

	Control condition		Experimental condition			Cohen D-value
	M	SD	M	SD	T-test	
Perceived ease of use	3.50	0.75	3.44	0.55	-.253	
Perceived usefulness	3.81	0.49	3.71	0.51	-.599	
Perceived ease to complete tasks	3.22	0.65	3.14	0.47	-.386	
Tasks completed	4.06	0.66	4.11	0.90	.211	
Time to complete a task (in sec.)	315.32	113.71	427.67	211.35	1.986[†]	0.66
Perceived need for training	3.28	0.57	3.33	0.38	.342	

Independent sample T-test (2-sided) and Cohen d-value, [†] significant at $p < .10$

Appendix Instruments and items used

Scale	M	SD	Range
Prior expertise with VLE (α = .92)	3.46	1.34	1-5
I actively use WebCT in the module(s) I teach	3.61	1.54	1-5
I would consider myself to be an experienced user of WebCT	3.31	1.24	1-5
Perceived ease of use VLE (α = .68)	3.47	0.65	1-4.33
I find it easy to get the virtual learning environment to do what I want it to do	3.03	0.85	1-4
A virtual learning environment is useful for my teaching practice	3.86	0.80	1-5
It is easy for me to become skilful at using the virtual learning environment	3.53	0.85	1-5
Perceived usefulness of VLE (α = .79)	3.76	0.50	3-5
Using a virtual learning environment will allow me to teach learning tasks more quickly	3.61	0.69	3-5
Using a virtual learning environment will improve my teaching performance	3.75	0.65	3-5
Using a virtual learning environment will make it easier to teach course content	3.92	0.65	3-5
Using a virtual learning environment will increase my productivity	3.72	0.74	3-5
Using a virtual learning environment will enhance my effectiveness in teaching	3.80	0.63	3-5
Perceived need for training (α = .83)	3.31	0.48	2.33-4
I found Desire2Learn intuitive enough to work with that I would not need any training to use Desire2Learn	2.86	1.22	1-5
Based upon my experience with Desire2Learn, I expect that most staff will need formal training to use Desire2Learn*	3.47	1.13	2-5
Based upon my experience with Desire2Learn, I expect that most staff would be able to work with it	3.58	0.91	1-5

* Reverse