A CASE STUDY OF THE BARRIERS AND ENABLERS AFFECTING TEACHING STAFF E-LEARNING PROVISION

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Abstract

The present paper reports the outputs of a focus group examining the perceived uses, enablers and barriers of utilising virtual learning environments (VLEs), amongst a small group of postgraduate teachers. Sixteen pedagogical/teaching functions were identified and were mapped to MacLean and Scott's (2011) model of VLE elements. Whilst a number of enablers of VLE use were apparent, participants' insights and inputs indicated a larger number of VLE barriers. It appears that the biggest barrier to overcome in using VLEs is finding the time to develop the materials and navigate the technology.

Introduction

The knowledge and skills of those generating and maintaining e-learning content is pivotal to successful e-learning provision (Rogers, 2003). Skill retention within a virtual learning environment (VLE) is a multifaceted construct, dependent upon the arduousness of the procedural steps involved in skill use (e.g., the number of steps required to perform the skill and the availability of feedback and support tools; Cahillane, MacLean, & Smy, 2015) and, of present importance, the frequency of skill use (e.g., Arthur, Bennett, Stanush, & McNally, 1998). Previous research by Cahillane et al. (2015) applied a predictive skills retention model that indicated variability in retention rates for VLE content organisation activities. A clear distinction was found between those tasks whose underpinning knowledge and skills are indicated to fade rapidly (11 activities) versus activities that were indicated to fade very quickly (5 activities). These technical activities, ranging from setting up a quiz through to adding files to a page, enable core teaching functionalities. In particular, tasks representing components of formative and summative assessment (e.g., quiz design), which support learning through interaction and feedback, were predicted to be highly susceptible to skills fade where no practice occurs over a period of 12 months.

Since the frequency of skill use (e.g., Arthur et al., 1998) is a known strong moderator of skill retention, the extent to which teaching staff use VLE and the factors which influence use need to be considered. Socio-cognitive factors are known to moderate the frequency of use of VLEs. Such factors include attitudes and perceptions concerning ease of use and the perceived utility of the VLE (Collis, Peters, & Pals, 2001; Mahdizadeh, Biemens, & Mulder, 2008; Samarawickrema & Stacey, 2007; Wang & Wang, 2009). Enablers of positive attitudes and perceptions here may include the relative advantage afforded by VLEs, perceived compatibility with teachers' existing values and practices, and institutional policies mandating or promoting e-learning capability (Rogers, 2003; Samarawickrema & Stacey, 2007). Barriers might include scepticism towards e-learning outcomes, time concerns, and workload (Mahdizadeh et al., 2008; Njenga & Fourie, 2010).

This paper presents an exploratory case study that investigated academic staff perceptions regarding the functions supported by VLEs along with perceptions concerning the barriers and enablers which moderate perceived ease of use. The perceptions and experiences of Cranfield University teaching staff were sought in a focus group setting. Both individual opinion and group consensus were collected through a variety of open and closed questioning techniques, outputting both quantitative and qualitative data. It is envisioned that the outcomes of the research can be used to determine how best to support effective e-learning provision through VLEs and to recommend methods of assessing the teacher capability component of the university's e-learning provision.

Method

Participants

Four Cranfield University teaching staff took part in the research on a voluntary basis. All participants were from Cranfield Defence and Security (CDS), one of the four research schools catering to postgraduate students only. CDS is unique in that it provides teaching provision closely aligned to the academic needs of the military

Materials and Design

Qualitative and quantitative data outputs were collected. Flip charts and post-it notes were used to record and organise responses. Two targeted activities were conducted with corresponding probes. A survey at the individual level was conducted. The first half collected demographic information including: age, gender, teaching discipline, teaching experience, teaching workload, current VLE involvement related to role (e.g., course lead/course contributor/course administrator/module lead/module contributor/module administrator. The second half asked participants to identify: (a) different functional ways in which they use the VLE and, given their experience, (b) what they felt were enablers and barriers to the use of the VLE. The second half of the survey therefore acted as an introductory exercise to engage participants in thinking about their experience of using the VLE.

Upon completion of the individual surveys a focus group was conducted. At the beginning of the focus group, each participant was invited to describe his or her experience of using VLEs for teaching provision, including length of experience and use of differing VLE platforms. The latter probe enabled the research team to establish whether there was diversity in VLE platform use amongst participants or if participants had experience of all using a particular platform. The focus group then progressed to discussing the collective impressions of the differing features and functionalities afforded by Cranfield University's Moodle-based VLE. The final part of the focus group captured and facilitated discussion of the perceived enablers and barriers associated with the use of VLEs as part of teaching practice.

Procedure

Participants were welcomed and the research context, objectives and workshop agenda (as indicated above) was outlined. After first completing an informed consent form, participants were given 10 minutes to complete the pre-survey. For the open-ended questions within the pre-survey participants were informed that whilst they did not need to provide great levels of detail, these topics were going to be revisited during the focus group. Upon completion of the pre-survey, participants were invited to briefly outline their teaching role, responsibilities and their experience of using VLEs. Building upon

the individual survey data, participants were then asked to describe aspects of their teaching practice that are carried out online and to identify which VLE they use (Moodle or Blackboard). Whether they felt any elements of teaching provision are not supported by the current VLE platform was also ascertained. The barriers and enablers of using the Moodle VLE platform were then considered.

Throughout the focus group the research team used probes to facilitate focus group discussion. At the end of the focus group, the participants were debriefed on the full nature of the study and provided with the opportunity to ask any questions.

Results

Demographics

The length of time participants had been teaching ranged from six months to 21 years. Two of the four participants had taught for a relatively significant number of years (19 and 21 years). Only three of the four participants reported their teaching discipline which represented a diverse range, including applied maths and computing, engineering and information systems, and the social sciences. On average, 45% of work time was dedicated to teaching. Teaching here referred to all aspects of preparation, delivery, assessment, administration and supervisory contact. All participants (100%) reported the use of the Cranfield VLE. Figure 1 shows that all participants were module leaders and the majority also contributed to modules led by other academic staff.

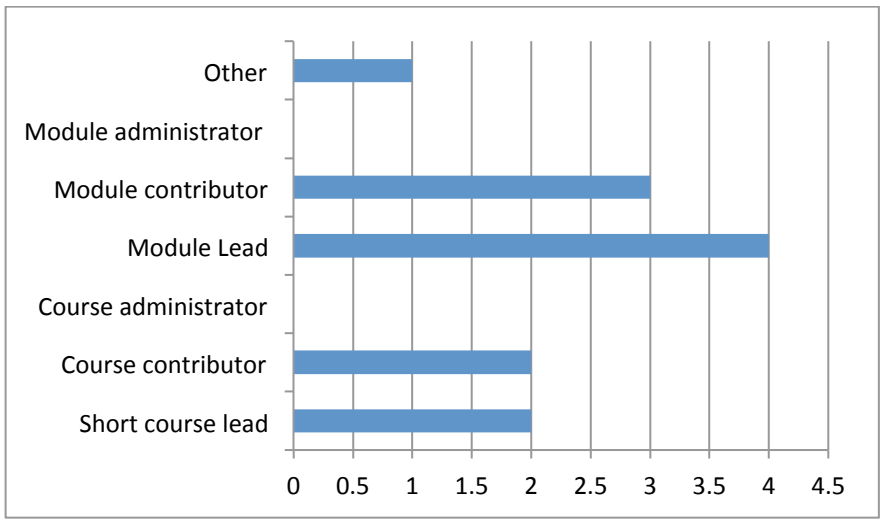

Figure 1. Frequency of teaching roles undertaken.

VLE Functionalities

The results of this focus group activity were analysed by taking an interpretative approach, indicated in Figure 2. The focus group items captured were firstly organised into the teaching and pedagogical functionalities perceived by participants as supported by the VLE. These teaching functionalities were further explored through discussion of the various ways in which each teaching function could be translated into appropriate VLE content. This approach enabled the identification of pertinent technical VLE skills (such as those identified by Cahillane et al., 2015) along with discussion of other VLE components such as the type of media and presentational affordances, providing a richer descriptive explanation of the differing teaching functionalities. Subsequently, the teaching/ pedagogical functionalities, their subcategories and corresponding focus

group items were mapped to three major components of academic teaching activity derived from a published model (Maclean & Scott, 2011). The model is outlined below.

MacLean and Scott (2011) Model

MacLean and Scott identified three high-level VLE functionalities generic to many different e-learning platforms: (a) teaching and learning, (b) assessment, and (c) administration. Appropriately designed teaching and learning activities aim to promote student learning, whilst formative assessment shapes student learning through the provision of constructive performance-related feedback. Assessment refers to summative assessment, which enables academic teaching staff to check learning goals are being achieved and informs the award of academic qualifications. Administration can include a range of activities which together form the structure supporting the organisation and provision of the taught component of courses. Administrative activities can include, but are not limited to, course timetabling, student tracking, and archiving course materials. Administration also includes the collection of data regarding student satisfaction and experience, which helps higher education institutions identify where changes are required.

The results of the interpretivist analysis with respects to the teaching functionalities identified and their superordinate pedagogical categories are captured in Table 1. Each superordinate category is further unpacked in the following sections. Overall, 16 teaching functionalities became apparent through participant discussion.

Table 1

Alignment Between MacLean and Scott's (2011) Pedagogical Categories and CDS Staff Perceived Functionalities

Learning and teaching	Assessment	Administration
Formative assessment	Summative assessment	General administration
Participation and interaction in learning discussions	Grademark (Feedback)	Archiving/curating course materials
Provision/delivery of pre-course materials		Co-ordinating part-time and full-time students
Promoting student self-directed learning		Course evaluation
Delivery of blended learning options		Meeting course teaching expectations and contractual requirements
Optimisation of face-to-face contact time		Assessing student engagement with course content
Providing feedback to students		
Developing practice and revision opportunities		
Tailoring content to student ability and understanding		

Learning and teaching. For learning and teaching the focus group items were organised into nine subcategories. The conduction of formative assessment was reflected through the reported use of the VLE in the development of quizzes and questions, for example mathematics by multiple-choice. The promotion of participation and interaction in learning discussions was evidenced through the perceived use of the VLE for peer-to-peer discussion, teacher-to-learner interaction, online content, and discussion contributions through implementation of forums and blogs. The VLE was perceived to be useful for the provision of pre-course reading, papers, technical basic concepts, sound files, podcasts, presentations, and content for VLE only modules. These functions were categorised as representative of promoting student self-directed learning.

The perceived utility of the VLE for the delivery of blended learning options was categorised as promoting flexible access for and coordinating part-time/distance students. However, the extent of the perceived utility of the VLE for blended learning was limited to the provision of basic content and optimisation of face-to-face contact time. The Grademark feature of the VLE (a digital environment/tool for grading and commenting on student work) was viewed as useful for the provision of feedback to students. However, Grademark, which is used to provide feedback on summative assessments, was the only feature of the VLE reported as supportive of the provision of feedback.

Feedback refers to knowledge of performance or results. It is thought to have a beneficial effect on learning, especially if it is immediate and detailed such as, providing the correct answer or explanation straight after an incorrect answer is given (Pashler, Rohrer, Cepeda, & Carpenter, 2007). Also, combining immediate feedback with the opportunity to answer until the right answer is provided has been found to support retention (Dihoff, Brosvic, & Epstein, 2003). Feedback not only emphasizes successful performance; it highlights performance deficits that need correcting. Given this is a key teaching functionality found to drive learning, more examples of supportive features would be expected.

Within disciplines that are highly technical and require a lot of practical activity, the focus group indicated that it may be a challenge to develop practice and revision opportunities for students. It was suggested that in some contexts only technologically savvy teaching staff are able to generate practice/revision content. These technical *work-arounds* may not be directly hosted within the VLE. Instead they may require the generation of separate webpages that could then be linked to VLE courses through hyperlinks.

A final functionality linked to learning and teaching was the ability to tailor content to individual ability. Perceived as being achieved via a VLE affordance (and not necessarily the deliberate output of course design), hosting teaching content within the VLE provides students with the option of skipping over content that they already understand and indicates the VLE has utility in tailoring content to student ability and understanding.

Assessment. Two VLE assessment functionalities were identified through focus group discussions, with several features of the VLE supporting different aspects of teaching practice in respects to summative assessment. Learner engagement, student task completion metrics, and time tracking logs enable the capture of contributions to

summatively assess group project work. As discussed under the learning and teaching 'super category' of teaching practice, feedback is a key driver of learning. However, in respect to summative assessment, Grademark may be the sole feature within the VLE that can be used by Cranfield teaching staff for the provision of feedback to learners.

Administration. Five administrative teaching functions were identified. Teaching staff felt a number of features within the VLE, including completion and time tracking logs, Turnitin, and repository functionality supported the tracking of learner engagement. Teaching staff also reported using the Internal Evaluation (INVAL) link, Qualtrix, and the Moodle spreadsheet features. These were seen as supportive of course evaluation, and therefore collectively these features were categorised as generating course evaluation and feedback from learners. Many of the courses and modules taught at CDS are delivered as part of the Academic Provider (AP) contract Cranfield has with the Ministry of Defence (MoD). This function is therefore representative of the fulfilment of contractual requirements. Furthermore, given that VLEs are today widely implemented across higher education institutions, the reported competitiveness with other universities its use provides is arguably representative of the fulfilment of student and institutional expectations.

Barriers and Enablers of VLE Use

Table 2 clearly shows that, in general, participants viewed the VLE as enabling easy access to teaching and learning content and activities for part-time and distance learners. Good technical and flexible support for use of the VLE on courses was also reported. The standardised template formats available within the VLE platform were also seen as key to standardising the look and feel of teaching materials and supporting documentation across courses.

Analysis of the barriers displayed in Table 2 indicates that time to develop and organise content and generate the tools to check student understanding is a major barrier to the use of VLEs in teaching practice. In addition, use of the Grademark feature was viewed as lengthening the assessment and marking processes, and to mitigate this negative feature teaching staff reported setting shorter essays in order to ensure the marking process was completed and feedback provided to the students within the period of time mandated by the university. Platform specific limitations for technical content, for example, inputting symbolic mathematics, were also reported as restrictive to the effective use of the VLE for technical subjects. Teaching staff resistance to the use of the VLE for teaching activities was reported as due to limited technical literacy of many staff. The lack of face-face physical presence associated with the use of VLEs was seen as reducing student engagement.

Development of a shared understanding of a given topic in a reasonable amount of time was also seen as problematic as was the fact the VLE cannot adapt to individual learner knowledge states. The latter is particularly problematic for whole module delivery within the VLE. Finally, accessibility in VLEs was perceived as a barrier. For example, the compatibility with screen reading software presents accessibility issues for blind students. This barrier is widely recognised in the wider e-learning literature (e.g., Kelly, Phipps, & Swift, 2004; Nganji & Brayshaw, 2015).

Table 2

Perceived Barriers and Enablers

Enablers	Barriers
• Access to students • Students can study at their own pace • Good for part-time/distance learners • Good for distance learners in different time zones • Good technical support. Good level of flexibility • Environmentally friendly (paper-free reduced admin, costs, environmentally friendly) • Auditability • Shared communication • Can host student-generated resources • Appropriate course/teaching standardisation	• Platform specific limitations for technical content • More time is required to develop content • No additional time is available to develop content • Resourcing • Longer assessment/marking process • Essays need to be shortened to maintain marking process/workload • Difficulty in maintaining consistency across all teachers/content aligned to each course • Teacher resistance to adopting new technology, technical literacy • Lack of face-face physical presence reduces student engagement • Difficult to develop a shared understanding in a reasonable amount of time (asynchronous communication theories of for supporting learning0 • Usual cues that students are engaged not available (gestures, visual cues) • Takes time to develop the tools required to check student understanding (e.g. formative quizzes) • Not adaptive to individual knowledge states of learning • Accessibility problematic in VLEs for some students (e.g. blind students and compatibility with screen reading software)

Discussion

Although the flexible and technical support offered to teaching staff was reported as an enabler to using the VLE, several barriers to its efficient and effective use were reported. Time to develop and organise content and configure the tools that drive learning emerged as a major barrier. The effective organisation of content within VLEs requires teaching staff with relevant technical knowledge and skills (Rogers, 2003). It is therefore likely that the reported resistance to the use of the VLE due to poor technical literacy in many staff, may further compound the perceived barriers related to the time required to develop teaching materials. That platform specific limitations for the input of technical content (e.g., symbolic mathematics) were also perceived as a barrier to teaching practice, suggests that certain platforms do not provide a standardised capability supportive of teaching practice across all academic subjects. The finding that

technically knowledgeable teaching staff can create work-arounds further exemplifies the need for foundational technical skills to support use. The reported technical literacy issues are mirrored by the fact that little consideration has been given to the impact of technology on the technical knowledge and skills requirements and teaching experience of academic staff (Attwell & Hughes, 2010; Cahillane et al. 2015). The barriers of time and technical literacy thus indicate the need for staff training in the efficient and effective use of VLEs.

Given time has a perceived impact on use, it is important to acknowledge that frequency of use is an important moderator of skill retention. Through the application of a predictive skills retention algorithm, Cahillane et al. (2015) indicated that less than 10% of tutors will be able to perform rapid fade VLE activities successfully (i.e., without errors or further training) after 12 months of no practice. This indicates that the use of training alone to support the acquisition of VLE content design, development and organisation skills would not support the retention of such skills. Therefore, mandated refresher training for those staff with little or no practice should be considered by higher education institutions.

Teaching staff felt the VLE was not adaptive to individual knowledge states of learning. VLEs by their nature are not equivalent to adaptive systems such as Intelligent Tutoring Systems (ITS). The latter facilitate learning through their ability to assess and adapt to individual learner knowledge states during progression towards proficiency (Sottilare & Goldberg, 2012). Developing an ITS is much more of a time consuming task compared to developing self-paced learning materials within the VLE. Moreover, providing staff with the skills to develop an ITS is unlikely within a conventional higher education institution. The more efficient approach would be to train staff in the development of tools and also ensure that learners are equipped with the appropriate skill set for learning within the VLE.

Conclusions

Given the very small sample size used for this focus group, only tenuous conclusions can be drawn regarding VLE use in teaching practice. This exploratory study, small scale and qualitative as it is constituting an important first step towards the more quantitative and generalizable in-house research that will provide strategic direction to the university exceptive and may be exploitable beyond the organisation.

Future Research

Time to develop and organise content and configure the tools required to support learning emerged as a major barrier, as indicated by the number of references to time. Future research would do well to rank the barriers and enablers according to their perceived impact and influence on teaching practice and the learner experience. It is only then that it will be possible to understand those factors that are perceived to have the most impact (negative and positive) so that mitigation strategies can be better targeted and prioritised against resource limitations. It would also be wise to develop metrics to capture how well the implementation of these strategies is contributing to the development of institutional e-learning capability.

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