

Smooth sailing - designing effective online learning spaces

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In response to the issue of a wide variability and structure in the Learning Management System (LMS) design across subjects at the school level in an Australian university, the researchers of the study developed a research-informed LMS template. The template drew on the critical factors identified in the literature that could contribute to students' positive learning experience in online learning spaces. The study aimed to evaluate the usability and continued use intentions of the template by trialling it in four Business subjects and applied a mixed method approach to explore lecturers' and students' perceptions. Results showed that both students and lecturers responded to the new template positively in terms of its usability and suggested strong intentions to use it in the future.

Keywords: Online learning spaces, LMS template design, usability, use intentions, evaluation.

Background

With higher education moving towards blended and online learning (The New Media Consortium, 2017), there is increasing discussion around creating effective and efficient online learning spaces. Part of this discussion centres around the quality of student learning experience in the Learning Management System (LMS) which is widely used in universities to manage and support student learning (Coates, James, & Baldwin, 2005). It is noticed in the research literature a variability of the structure and quality of LMS design (Lonn & Teasley, 2009; Mestan, 2019; Rankine, Stevenson, Malfroy, & Ashford-Rowe, 2009). This is partly related to lack of support and resources for individual staff, for instance, guidance for LMS design and design exemplars (Ellis & Calvo, 2007).

In the university where this study was conducted, a wide spectrum of quality in LMS design was noted across subjects, from poorly structured to interactive use of the learning platform (i.e., Moodle). The LMS layout and format adopted across subjects also varied largely and therefore lacked consistency. This issue caused students' negative learning experience. Students often had to spend extra time familiarising themselves with the different designs and layouts in order to locate information needed or to fulfil task requirements. On various occasions, staff expressed strong desire for effective LMS usage with the faculty teaching and learning team.

Researchers of the study attempted to address this constant issue by designing a research-informed, evidence-based LMS template. First of all, the development of the template drew on the four perspectives on the design of learning environments proposed by Bransford, Brown, and Cocking (2000). These include 1) a student-centred perspective, focusing on learners' use of current knowledge to construct new knowledge; 2) a knowledge-centred perspective, highlighting the achievement of interconnected understanding of discipline knowledge; 3) an assessment-centred perspective that aims to create feedback opportunities; and 4) a community-centred perspective to promote interaction between students, teachers, and the wider community. Alignment among the four perspectives were taken into consideration in the development of the template, as suggested by Bransford and colleagues. The layout of the template also aimed to create a user interface that was clear, concise, familiar, responsive, consistent, aesthetic and efficient (Garton, 2012). The template also allowed opportunities for active learning, self-reflection, assessment understanding, formative feedback as well as community learning.

Figure 1 shows a screen shot of the main page of the new LMS template as trialled in one of the subjects involved in the study. Moodle's built-in 'grid' format was adopted for the page layout design. Subject coordinators' photo and contact details were provided on the top right corner (photo removed due to privacy concerns). Specially designed icons were used to represent individual sections (i.e., Subject Overview, Learning Resources, Assessments, Interaction and Subject Feedback).



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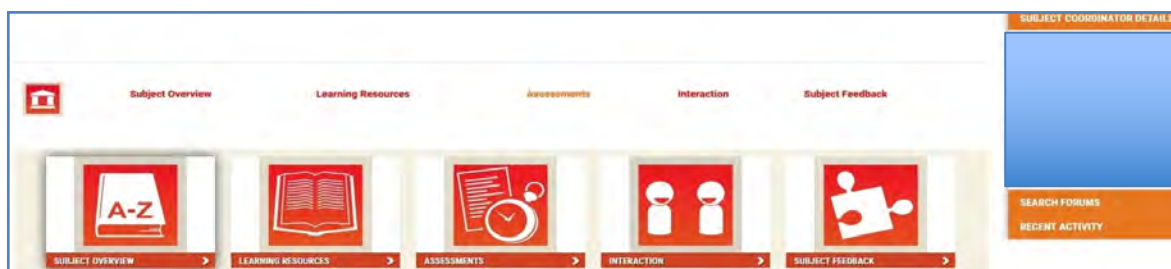


Figure 1: A screenshot of the subject main page

Figure 2 shows screen captures of the individual sections. The Learning Resources section contained learning materials and activities, organised by weekly topics. All materials and activities were presented in the form of an ‘e-book’ for easy access and navigation. The Assessment section comprised of assessment help resources, detailed task descriptions, rubrics, submission guidelines and links. The Interaction section included subject announcements and discussion forums for asynchronous interactions and general discussions. The Subject Feedback section provided spaces for students to express their opinions on any critical issues related to the subject early in the semester as well as at the end of teaching period. The Subject Overview section is not shown in the figure below, however, it contained the subject learning guide and links to various help resources such as student support, library and relevant policies and procedures.

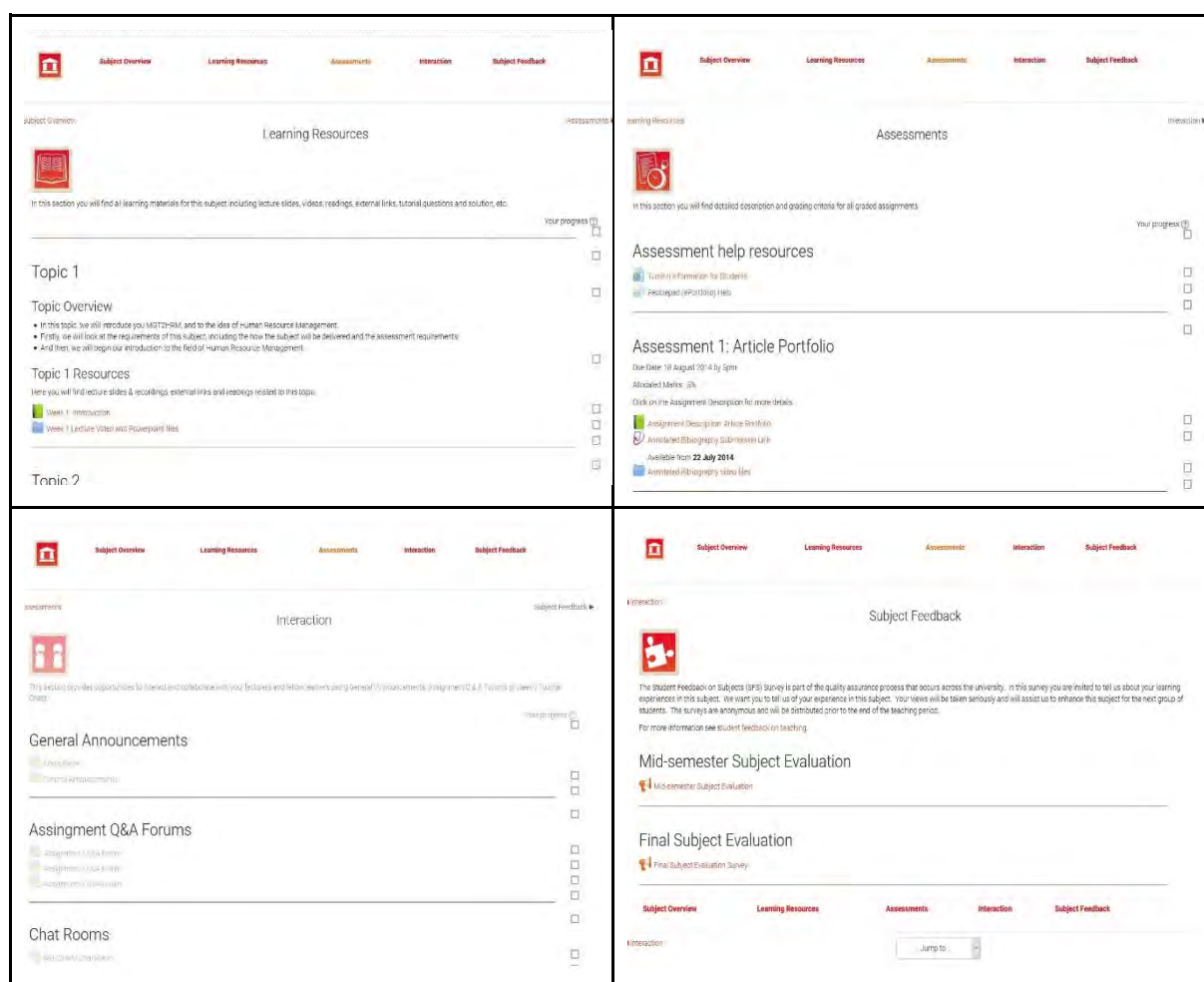


Figure 2: Screenshots of the individual sections

The LMS template was trialled in four Business subjects during semester 2, 2016. A user study was conducted at the end of trial period to evaluate the usability and continued use intentions of the proposed LMS template. Usability evaluation focused on how well students could learn and used the LMS to achieve their learning goals. It also looked at students’ satisfaction with the use process (Pangestu & Karsen, 2016).

Methodology

In order to gain a thorough understanding of the perceived effectiveness of the template among lecturers and students, the study applied mixed methods approach drawing on both quantitative and qualitative methods in data collection and analysis (Burke & Onwuegbuzie, 2004).

An ethics approval was granted to conduct the user study. The students in the subjects were invited to take part in an online survey via email with clear explanation that participation in the survey was purely voluntary and would have no bearing on their performance or grades. Out of 240 students enrolled in the four subjects, only 18 responded to the survey.

The USE questionnaire (Lund, 2001) was adopted to evaluate the usability through the constructs of usefulness, ease of use, ease of learning and satisfaction. The construct of continued use intentions adopted from Venkatesh et al. (2003) was also included in the questionnaire. All items were measured on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). (The questionnaire is not included in the paper due to space limitations but is available upon request.) The survey also included open-ended questions seeking students' opinions of what they liked and disliked about the trialled template, their suggestions for further improvement, as well as their comparison of the template with those of the other subjects that they enrolled in.

The collection of survey data was followed by a short interview with selected students and the subject coordinators involved, at the end of teaching period. The interview questions aimed at investigating in depth both the students' and the teachers' experience with the trialled template and triangulating with the findings from the survey data. Each interview lasted between 10-15 minutes and conducted by the researchers who were not involved in the teaching of any of the trialled subjects.

Results

Student Survey

Table 1 provides descriptive statistics of the survey constructs. The mean scores demonstrate that majority of the students tended to strongly agree that the trialled template was useful, easy to use, easy to learn and they were satisfied with its usage, thus indicating their positive attitudes towards the usability of the trialled design. The students also seemed to prefer to use it in the future.

Table 1: Descriptive statistics

Variable	Mean	Standard Deviation
Usefulness (Use1-8)	4.26	0.68
Ease of Use (EoU1-11)	4.28	0.65
Ease of Learning (EoL1-4)	4.36	0.64
Satisfaction (Sat1-7)	4.11	0.86
Intention to Use (Int1-3)	4.26	0.55

In order to analyse the most influential element(s) that could support students continued use intentions, Davis' technology acceptance model (TAM) (Davis, 1989) was adopted. TAM is widely used in Information Systems research to explain or predict individuals' acceptance of computer-based systems in various scenarios and organisational contexts (Chakraborty, Hu, & Cui, 2008). TAM posits that user perceptions of usefulness and ease-of-use determine attitudes towards using a system or technology. In order to measure the overall effect of usability on continued use intentions, we extended the original TAM by including satisfaction and ease-of-learning constructs in addition to basic TAM constructs of usefulness and ease-of-use. The PLS (Partial Least Squares) analyses of the structural model revealed ease-of-use as the most significant predictor of continued usage followed by usefulness. However, satisfaction and ease-of-learning only indirectly impacted usage intentions via usefulness and ease-of-use constructs. (The details of PLS analyses are not included in the paper due to space limitations but are available upon request.)

When asked to compare the proposed LMS template with those of the other subjects on a scale of 1 (Much Worse) to 5 (Much Better), 66% of the students reported that the trialled template was 'better' or 'much better' than any template they have used in the past (1=0%; 2=0%; 3=33%; 4=44%; 5=22%).

As reported in the open-ended questions, the features that the students liked the most, of the new template, included clear format, informative design, ease-of-use, ease-of-access and the logical arrangement of materials. No issue was reported, nor any further improvement needed according to the students' responses to the open-ended questions.

Student Interviews

The interview findings indicated the students' very positive attitudes towards the trialled template. The students' overall experience of the LMS was reported as unique. Simplicity and ease of navigation were the most frequent comments that the students made about the new layout. Most students encountered no challenges in navigating through the LMS except one who reported some difficulty in finding the needed documents. In fact, simplicity and ease of navigation were the two distinctive advantages of the trialled LMS as compared to those of the other subjects the students enrolled in. These qualities of the LMS, as the students pointed out, contributed to their learning in that they were able to focus on learning rather than waste time looking for information they needed, as they normally did in the LMS of the other subjects. Below is an example of the students' comments:

The reason I did really so well in this subject I would say because of this design layout and because it was lot easier to find what I was looking for. Whereas in my other subject it took longer to find what I was looking for. I was wasting time.

Unanimously the students strongly agreed that the new template was their preferred design and suggested it should be implemented across their future subjects. One constructive feedback from the students in terms of further improvement was to provide subheadings or brief descriptions to the audio/visual recordings to facilitate search for relevant information.

Staff Interviews

The subject coordinators of the four subjects involved in the trial were interviewed at the end of study period with the aim to get their perspective on the new LMS template. Overall, the subject coordinators reported very positive experience with the new template. The clear and simple interface made it easy to set up, use and navigate. They considered the 'e-book' feature in the LMS particularly helpful in terms of presenting and sequencing materials as well as learning activities. For example, one lecturer commented:

...because I think the subject was blended and we have a lot of online stuff and if you put a lot of stuff on the LMS the student won't be able to find it easily and they tend not to search for things. So, I thought the design was quite intuitive so those kind of boxes (sections/grids) were clearly marked and students were able to find things relatively easy, so I think the design is as good as we are going to get.

Other useful features in the template, as they reported, included a dedicated section for communication and the use of icons. The lecturers also mentioned that they received very positive feedback from their students about the LMS design.

Interestingly, when comparing the LMS templates with those they had used previously, the lecturers pointed out a strong pedagogical thinking underpinning the new template with an emphasis on content, communication, assessment and feedback, which was missing in the other templates. These are in fact the key elements of an effective learning environment identified in the research literature. Overall, they found it much better as compared to other templates they had used before, as evident from the following comment:

I think, it's a million times better!

All the subject coordinators expressed strong intention to continue to use the new template in their future offerings. They even suggested that the template should be rolled over across all subjects in the school for consistency reason to avoid students getting confused with different templates used in the school.

With regards to further improvement of the template, it was suggested to set up a separate section for lecture materials to save students from scrolling through all the other materials to locate what they needed.

Discussion and Conclusion

The survey results suggest that the proposed template scored high on all aspects of usability measurements namely efficiency, effectiveness and satisfaction. This means that the new design could help in achieving the intended learning goals. This aspect is also echoed in the interview data as the majority of students suggested that it saved time, provided easy access to learning materials and activities and was visually pleasing. This is a significant finding when compared to similar studies of usability evaluation of online learning (Pangestu & Karsen, 2016) where only some aspects of usability appeared significant. The results also showed the participant's strong intentions to use the trialled template in the future. Further, the empirical evaluation of an extended TAM revealed ease-of-use as the strongest predictor of use intentions, followed by usefulness. This is in line with several TAM studies (Halawi & McCarthy, 2007; Lee, Cheung, & Chen, 2005) and suggests that the more students find online learning spaces easy to use, the more likely they will use it in the future and ultimately get engaged with them. The results also suggest that teachers need to motivate their students about the usefulness of online learning spaces if they wish to enhance the usage. The strong continued use intentions are also confirmed in the student interviews.

The results of staff interviews are also in line with the student survey and interview results. All subject coordinators agreed that the new template helped in their teaching as it was easy to use, easy to navigate and was hassle free. These findings are very encouraging in that innovative teaching practices may be facilitated, and student learning enhanced through the design of effective and efficient online learning spaces where students have easy access to relevant content, clear guidelines on assessments and opportunities for feedback and communication.

This study has made several useful contributions. First, it attempts to design a research-informed evidence-based LMS template and to validate its usability with the key stakeholders. Second, it will help provide a consistent online learning experience to students across various subjects and courses. Third, the study findings may help validate the usability of similar online learning spaces in varied contexts. Finally, it helps understand students' continued intentions to use the LMS or other similar online learning platforms.

Admittedly one limitation of our study is the small sample size, as it was a trial study conducted on a small scale where participants voluntarily chose to take part in the online survey and the interview. Also, as the study was conducted using a particular LMS (Moodle), the findings may not be generalised to other learning management systems. The next steps would be to roll out the trialled LMS template across a larger number of subjects and conduct a similar usability evaluation with a larger sample to validate our findings.

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