

EMPOWERING DIVERSE COHORTS OF STUDENTS TO BUILD CONFIDENCE IN MASTERING COMPLEX FINANCIAL CONCEPTS BEYOND THE CLASSROOM

Carol Barry and Kay Salehi
Swinburne University of Technology
Australia

Abstract

This paper's purpose is to explore the value of providing a set of online learning and self-diagnostic resources (OLRs) for a diverse cohort of third year economics students as a way to enhance student mastery of mathematical/financial concepts, engagement and motivation. Quantitative and qualitative data was collected on student usage of the OLRs, their perceived self confidence in solving financial problems and their interest in the topics covered. Research results from the first phase of this project show that students in general were enthusiastic adopters of the OLRs and provide evidence of increased levels of confidence, interest and engagement.

Introduction

Innovative teaching and learning has become a focus of many universities as they seek to address the needs of increasingly diverse student cohorts. In 2010 the Faculty of Business and Enterprise (FBE) at Swinburne University introduced targeted funded projects for teaching staff to research ways to improve student engagement, learning outcomes, student progression and retention. This paper reports on one of these targeted intervention projects, designed to build students' confidence in their approach to complex financial economics concepts taught in a third year undergraduate unit — International Finance. The intervention consists of online learning resources (OLR's) designed to support students with varying mathematical abilities. Research data collected in the first phase (2010) of this intervention was directed at addressing the research question: "Do the online learning resources build confidence and lead to greater student motivation and engagement?"

Quantitative and qualitative data has been collected from two paper-based student surveys and used to analyse student usage of the resources, elicit their perceptions of the value of the resources to their learning experience, and their overall engagement with the subject material. Also, a wide variety of usage statistics are available from the online learning management system via the tracking of student use of the OLRs.

Background of the Study

Online learning environments (OLEs) have been widely adopted in learning and teaching institutions to meet the needs of diverse cohorts of students in an increasingly technology driven society. The literature relating to online learning resources (OLRs) and their roles in student skills development and learning outcomes is extensive and examines the relationships in a multitude of ways (Bolliger et al., 2010; Conole et al., 2008; Gkatzidou & Pearson, 2009; McGarr, 2009; Tallant-Runnels et al., 2006; Tang & Austin, 2009; Wieling & Hofman, 2010). According to Bollinger et al. including OLRs in instructional material “provides learners with choices and accommodates individual differences such as personality traits, cognitive styles, preferences and learning styles” (2010, p. 715).

Oblinger and Oblinger (2005) suggest that “net generation” students — Prensky’s “digital natives” (2001) — differ from previous generations in the way they process information, communicate and learn. These students have been born into the technology era and in general are comfortable with learning centred on the use of technology. Students who are capable within a technology-enhanced learning environment are more likely to be task orientated and experiential learners and suited to an active learning environment. A study of students’ use and experience of technologies found that “students are immersed in a rich, technology-enhanced learning environment” (Conole et al., 2008, p. 511) and technology “is central to how they organise and orientate their learning” and “enables them to take control of their learning” (p. 522).

The theoretical background for this study is Keller’s Attention, Relevance, Confidence and Satisfaction (ARCS) model (Keller, 1979, 1999a) that incorporates these four dimensions of motivation as interactive influences on learning and performance. The ARCS model was developed to provide a systematic method of diagnosing learner’s motivational problems and from there devise motivational tactics to integrate into curriculum design (Keller, 1999b). The model proposes a 10-step design process that includes pre-intervention steps, implementation steps and post-instructional steps to ensure the curriculum structure matches student characteristics and needs. Recently Keller has further developed the ARCS model to include volition or self-regulated learning behaviour in his theory of Motivation, Volition and Performance — the MVP theory (Keller, 2008). The goal of the MVP model, as stated by Keller, is to provide an “explanatory shell” or a “general systems model” within which a number of “micro” models are synthesised. The component theories or models share a number of attributes and the MVP model illustrates their mutual influences on aspects of learning and performance. By portraying the relationships between the component theories and constructs, Keller believes the MVP model may help teachers to diagnose and develop solutions to student performance problems and facilitate new directions in research (2008, p. 89). One of the problematic situations in tertiary learning is cognitive load, which relates to the amount of information a student can process in working memory, and is

particularly relevant when learning complex cognitive concepts. The MVP model considers how to best design instruction to maximise 'useful' as opposed to 'extraneous' cognitive load when teaching complex concepts.

The key role of confidence as an influence on motivation and performance in the ARCS/MVP models and other studies makes it a valid and useful factor to investigate. Maths anxiety and associated lack of confidence in tackling mathematical concepts has been observed over a number of years teaching third year undergraduates in International Finance. Each semester this has proven to be an obstacle to success for a number of students who have either dropped out, failed the subject or received lower grades than expected. This issue was addressed in semester two 2010 with an intervention program based on supplemental learning resources provided online.

Students enrolled in this unit come from varied backgrounds in terms of their study disciplines, language and mathematical abilities. The majority of students are accounting and finance majors, but there are also double degree engineering/commerce students and students taking the unit as an elective who may have very little economics/finance background. There is also a high proportion of English as second language students as Swinburne University attracts a considerable foreign student intake. The failure rate in this unit has averaged close to 20% over the past 5 years and it is hoped to bring this level down by providing additional learning support.

Use of OLRs to present the more difficult finance concepts at a time and place that suits the learner is intended to encourage students to take more responsibility for their learning, to become more active and self-regulated learners. Previously this material was presented once during lecture time in the traditional lecture format. From past experience it was felt by the researchers that students with weaker maths backgrounds found it difficult to successfully learn the complex concepts in a large class environment, where there is limited time for questions, critical thinking or reflection. By encouraging students to tackle these concepts in their own time, and by providing them with well-explained guideposts, it was hoped to build a student-centred learning environment that encouraged deeper and more meaningful learning strategies.

The intervention uses OLRs comprising video demonstrations, multiple choice quizzes and targeted feedback. The OLRs provide additional learning material to help students develop confidence in their ability to analyse financial concepts and apply them to real life financial problems. These complex skills can be quite challenging to master for students with less developed maths backgrounds. The students that face difficulties coming to grips with the complex economics/finance concepts and find the unit too challenging can be at risk of dropping out in the first few weeks of semester. Complexity of learning tasks can lead to student frustration and translate into confidence problems in the learner if the challenge is perceived as too great. This contributes to feelings of helplessness and students

may just give up. There is not enough time in face-to face lectures to provide the necessary in-depth coverage required by this cohort of students and at-risk students are often not identified until the mid-semester test or even the final exam. It is hoped that improved student confidence and motivation, promoted by encouraging learners to access the OLRs and to take more responsibility for their own learning, will lead to greater student engagement in the subject.

Purpose of the Study

This research study was designed to collect and analyse data to look at student usage of the resources, their perceptions of the value of the resources in building confidence and mastery and their overall engagement with the unit. This will inform the researchers and the faculty on whether targeted online resources and diagnostic tools have assisted students in building skills, confidence, motivation and engagement. Confidence is a key factor in student motivation (Bolliger et al., 2010, p. 720) and can influence student attitude to learning and performance. The intervention program is designed to help students build confidence in their problem solving capabilities and improve their mastery of challenging course material thereby improving their performance.

The intervention program uses OLRs comprising short video clips with audio narration demonstrating complex mathematical concepts, combined with skills-testing tools (quizzes) that provide supportive targeted feedback. The videos were developed using Mimio technology (electronic whiteboard recording technology) and provide demonstrations of concepts introduced in lectures. The audio narration emphasises key learning issues and aims to clarify the complex financial concepts. The concepts chosen for demonstration are those that have proven in the past to be difficult to master for many students. The video demonstrations are uploaded to the subject web site (Blackboard) and students are able to view them and listen to the explanation online, or download to their computers, at a time and place that best suits them. Students are also encouraged to attempt a self-test quiz where they work through a problem similar to the demonstration but broken down into a series of learning steps analogous to those shown in the video. Supportive targeted feedback is provided for both correct and incorrect responses for each step. The developmental quizzes enable students to determine the part of the concept that may be presenting difficulties for them and to self-diagnose their own skill level. Through statistics tracking in Blackboard teachers are able to pinpoint at which stage of the problem students experience most difficulties and then address these issues in face-to-face classes.

The audio component of the videos is intended to be encouraging as well as informative and to give students hints as to how to overcome common pitfalls. Feedback provided is at all times positive and constructive, irrespective of whether students get the 'right' or 'wrong' answer. These techniques are used to

help overcome possible feelings of frustration and helplessness and to build confidence in the student's ability to rise to the challenge.

Additional learning resources provided online through Blackboard are a simple and cost-effective means of providing students with help they can access when and where it suits them. OLRs give students the chance to move through the learning material adjusting the speed to their own needs, to take notes if desired and to rewind and repeat more challenging parts. The video demonstrations can be replayed a number of times until the student has fully grasped the concept and the quizzes may be attempted multiple times, so allowing students to practice, revise, re-test and build confidence.

Introducing these teaching innovations is designed to improve student learning outcomes by allowing students to give their full attention to complex concepts during lectures rather than note-taking and providing opportunities for them to absorb this complex information later at their own pace. However, it is acknowledged that due to the diversity of the student cohort, it is not guaranteed to work with all students. An empirical study by Honkimaki et al. (2004, p. 447) identified limitations on the ability of the teacher to change student approaches to learning, with some students recognised as not responsive to interventions and not amenable to innovations that encourage them to 'do their best'.

Methods of Data Collection and Analysis

This study was designed to collect and analyse data to address the research question: "Do the online learning resources build confidence and lead to greater student motivation and engagement?" Data was collected from two paper-based surveys and was supplemented by statistics available from the online tracking of student use of learning material. Participation in the surveys was voluntary and all data was de-identified. The surveys sought responses from students relating to their:

- demographics and background,
- self-reported sense of confidence in their ability to master financial economics concepts prior to and after use of the OLRs,
- usage of online resources as an additional study tool, and
- perceptions of the value provided to their learning by the OLRs

Data from the two surveys were divided into quantitative and qualitative responses and the quantitative statistics were further analysed using Predictive Analytics Software (PASW). The self-assessment quizzes provided online also generate a wealth of information about students' engagement with the subject via use of tracking statistics, and although the tasks are not graded a simple item analysis provides indications of their levels of understanding and skills.

Study Design

Pre-intervention survey conducted in the first lecture. The initial stage of the program consisted of gathering information about the learners and the learning environment. Student characteristics such as gender, full-time/part-time, English as first language and maths background were determined, as well as students' perceptions of their confidence and ability to perform well in the unit.

Post-intervention survey. This survey was conducted after the students had completed the lectures but prior to the final exam. The questions asked in the pre-intervention survey were repeated and were supplemented by questions pertaining to use and perceived value of the OLRs.

Results and Discussion

Table 1 provides a summary of the demographic statistics from the two surveys and the diversity in the group is evident with high proportions of international students and those with only secondary school level maths. The first survey was completed by 74% of enrolled students and 50% completed the second survey. Of the 55 students who responded to the second survey 85% reported accessing the video demonstrations, 68% attempted the self assessment quizzes and 79% viewed the online lectures. Female students, those with English as their second language and part-time students were more frequent users of the OLRs.

Table 1: Demographic and Background Data

Demographic information		Survey 1		Survey 2	
		No.	%	No.	%
Gender	Male	53	65%	38	67%
	Female	28	35%	17	33%
Study status	Full time	74	92%	47	92%
	Part time	7	8%	4	8%
Language	English (1)	45	56%	33	65%
	English (2)	36	44%	18	35%
Maths background	Secondary	55	68%	33	60%
	Tertiary	26	32%	22	40%
Number of respondents		81	74%	55	50%
Beginning semester enrolment of 110 students					

Some students were not engaged by the OLRs and this may be explained by the fact that the tasks were not summative. Students on the whole tend to be very assessment focused (for example, see empirical work by Bryson & Hand, 2007, p.

355) and since the quizzes did not ‘count’ towards the final grade, some students may have deemed them unnecessary or not a valuable use of their time. Students in this category may still be working hard in the subject but are not engaged with the material — rather with the assessment tasks.

Another explanation, related to students as superficial rather than deep learners, stems from studies showing that students do not always take full advantage of learning opportunities provided to them even when they have control over the use of the learning resources. Various authors suggest this reflects a lack of self regulation skills in learners — they cannot assess the benefits of the support or have the capacity to use the support devices optimally. See, for example, Perkins (1985), Aleven et al. (2003), Narciss et al. (2007), and Clarebout and Elen (2009).

Table 2: Effect of OLRs on Confidence and Interest

Confidence			Survey 1 Survey 2	
	Solving financial questions	High or very high	42%	51%
		Average	44%	44%
		Low or unsure	14%	5%
	Final result	HD	35%	30%
		D	44%	45%
		Cr	21%	21%
		Pass	0%	4%
OLRs Increase Interest	Quite a lot		N/A	36%
	A bit		N/A	54%
	Not at all		N/A	10%

Survey responses relating to the impact of the OLRs on student confidence and interest are summarised in Table 2. A comparison of Survey 2 data with Survey 1 shows the percentage of students whose confidence in solving financial questions was ‘high or very high’ rose from 42% to 51%, although this result was not statistically significant at the 5% significance level. The OLRs also appear to add to the level of student engagement with 90% of students reporting an increase in interest in the topics covered and this result was statistically significant with a p-value of 0.003. After the second survey students record somewhat lower expected result hopes, a reflection perhaps of their level of recognition of the difficulty of some of the material — a fact they were unaware of prior to the start of lectures — although again this result was not statistically significant.

Table 3: Cross-tabulations

		Gender	Language	F/T or P/T Study	Maths background
Confidence		0.001*	0.100	0.026*	0.020*
Use of OLRs	Lectopia	0.096	0.006*	0.538	0.419
	Videos	0.156	0.068	0.210	0.047*
	Quizzes	0.263	0.037*	0.164	0.454
Interest		0.429	0.011*	0.315	0.249
Result		0.965	0.043*	0.000*	0.047*

* significant at the 5% significance level

Table 3 presents the Chi-Square p-values showing the strength of the relationships between the dependent variables — student confidence, use of the OLRs, interest in the unit and grade result hope — and the students' demographic characteristics. Confidence in solving financial questions was strongly related to gender, study status and maths background with p-values of 0.001, 0.026 and 0.020 respectively. Males and full-time students with tertiary maths exhibit greater confidence in solving financial questions. Of interest is that there is no evidence of a significant relationship between confidence and language (p-value of 0.100). This may reflect the observation that English as second language students tend to struggle more with the essay writing and verbal explanation aspects of the subject but do equally well at the mathematical components.

Student usage of the self-help quizzes and recorded lectures was related to language, but not significantly related to gender, maths background or study status, while use of the video demonstrations was related to maths background. This is a noteworthy result as it indicates that the students with weaker maths backgrounds recognised the value of the video/audio explanations as an additional learning resource. Furthermore, full-time students with tertiary maths studies and English as their first language have expectations of receiving better results. It is pleasing to see that English as second language students' interest in the subject was raised through use of the OLRs with 74% of these students reporting their interest increased 'quite a lot,' a significant result with a p-value of 0.011.

Open-ended questions were included in the second survey to allow students to give more detailed feedback on their experiences with the OLRs and a sample of their views are provided below.

Comments from students on use of online videos

- Very helpful, a human voice and work throughs [sic] make more sense than words on a page a lot of the time.

- Great source of information and really helpful in understanding theories and principles.
- Online videos are good if struggling with a concept; allows you to hear the explanation another way.
- This was the only subject which gave me video demos and lectopia, and it gave me a much greater capacity to learn the information.
- More demonstration videos! It's much easier to learn something when you can pause the video, take your time to make proper notes, or watch it again until you understand the material.
- This is great. It gave me the opportunity to improve my understanding of the concept and contents properly without any distractions or disturbances.

Comments from students on use of online quizzes

- I found the quizzes quite good. I liked how you could attempt them a couple of times.
- Quizzes helped me out to test myself during the weeks and I was well aware of what I needed to focus on.
- I believe that quizzes enhance your ability to understand concepts.
- Helps to check whether I understood processes/theory.
- I have better understanding of concept after practice with quiz.

Twenty three students (42%) took the opportunity to write comments on their experiences with the online videos and the comments were overwhelmingly positive with 22 of the 23 using descriptions such as “very useful,” “very helpful,” “terrific,” and “engaging.” The only non-positive response was from a student who clearly missed many classes as the comment was “Did not know there was online video.” The response rate for the online quizzes was slightly lower at 35% (19 students), a reflection of the lower usage of the quizzes, but again comments were very positive.

Conclusions

This intervention strategy has been designed with Keller's MVP model as its basis and with the intention of integrating motivational and volitional support within the curriculum in the hope that students will gain confidence in developing the complex cognitive skills required in International Finance. Results from the initial stage of the intervention program are encouraging and positive with both quantitative results and qualitative feedback showing wide use of the materials and suggesting students' confidence, interest and engagement have been boosted. The resources are used differently by different cohorts of students in terms of time, place, frequency, and online versus downloads, reflecting the diverse needs, abilities and learning approaches of the group. There appears to be differences in students' perceived self-confidence and motivation related to particular demographic characteristics such as gender, maths background and full-time/part-time study. However, these methods cannot provide definitive results that identify the causal relationships between the variables, although they do help to identify variables worthy of future study. Furthermore, caution must be exercised in generalising beyond these students given the limitations imposed by a single subject and single semester study.

The intervention program is in its initial stages but it is intended to provide the OLR's in the same format as part of the learning materials over 2011. It is also proposed to augment the data with focus group analysis to elicit deeper reflection on issues around learning outcomes. This will enable a larger data base to be generated and more evidence collected on the levels of student confidence, engagement and achievement. In particular, test results and final exam results can be compared over time to consider the extent, if any, of improvement in summative assessments over successive cohorts of students. Trends related to student retention can also be determined. It is also expected that the learning resources or similar processes will be adapted for use in other units within the Faculty enabling a comparison across disciplines.

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