

Value of online resources for learning by distance education

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Introduction

An audit of a large regional University offering courses with an applied focus identified that in terms of learning and teaching activities, it was meeting the needs of its local region while providing support to the professions both within the State and nationally (AUQA 2004). The audit also found that in general terms, students reported very positively on their learning and teaching experiences and were appreciative of supportive teaching staff. The subject-based online discussion fora, which allow for discussion between and among students and staff, are found to be a highly positive supplement to other forms of support (AUQA 2004). Students studying by distance, in particular, find participation in the forum very useful since it lessens the sense of isolation and allows them to communicate with fellow students studying both internally and by distance. Other features of the online environment, such as online submission of assignments, are also valued by students. The University has a priority to promote an institutional climate which values and supports flexible teaching and learning practices to enhance learning (CSU 2003). This has been achieved by, among other things, development of online subject outlines and promotion of the use of the University's Learning Resources Bank. Palaskas and Muldoon (2003) noted that the current online environment at the University is characterized by the capability to involve students in online forum discussions, deliver learning resources online and to provide online administrative services (Figure 1).

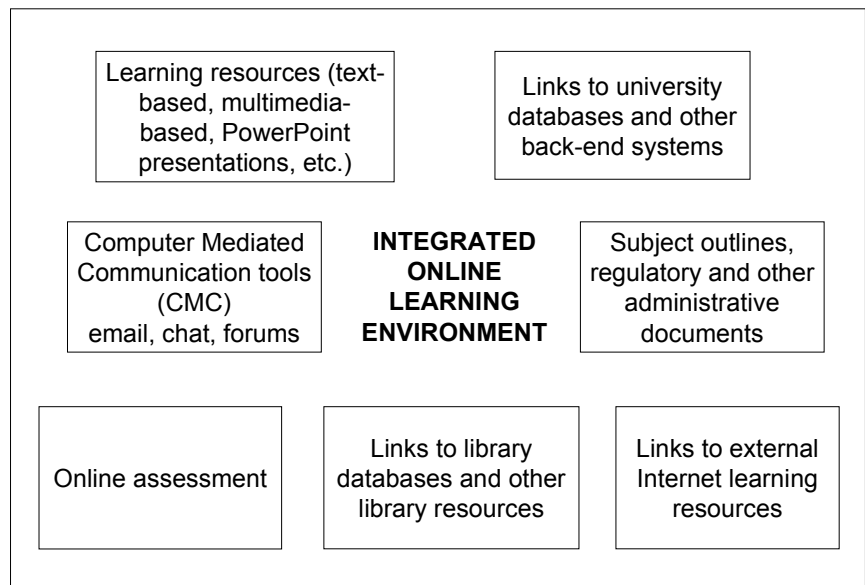


Figure 1. Components of an integrated online learning environment at the University (adopted from Palaskas and Muldoon 2003)

It has also been reported that an interactive multimedia CD-ROM with supplementary resources was regarded by many students as a valuable source to enhance their learning and helped the students to understand the subject well (Sivapalan 2003). This demonstrated the possibility of utilising extensive multimedia techniques and resources to promote student learning by distance education. Aziz (2003) examined the impacts of online technology on student engagement and learning in a first year engineering course. He concluded that online technology could be used to supplement good instructional methods and stimulate and maintain student interest. Schuhmacher (2003) reported that the use of an e-learning environment complements the process with online discussions, student portfolio management, and assignment submission and assessment. The study reported in this paper attempts to quantify the use of online resources by distance education students and identify the value of these resources for their learning of a first year undergraduate subject at a large regional University.

First year subject

The subject under study was one of the 56 subjects offered by the School at the University to undergraduate students in different courses. It is offered in the Autumn (first) session of each year and recommended to students in their first year of study. The teaching of the subject was shared by four academics and supported by a Maths Skills Advisor and the practical component was assisted by a Technical Officer. The subject covered topics such as Unit factor method, Mechanics of solids, Mechanics of liquids, Heating and cooling, Basic electricity, Surveying, Petrol and diesel engines, and Farm structures. The subject aimed to develop skills to relate theoretical principles to practical solutions, think logically in solving problems, develop teamwork in problem solving, and use mathematical techniques in everyday calculations. Each student enrolled in this subject received a mail package which contained printed materials including a Subject Outline and Modules (1-8) with notes and readings. The students completed three written assignments (Assignments 1-3, each worth 10 marks) during the session and sat for a closed book examination (worth for 70 marks) towards the end of the session. The subject had an online subject outline which provided direct links to access various resources such as email

communication with the Subject Coordinator, subject forum, library, 'EASTS' (Electronic Assignment Submission and Tracking System), 'OASIS' (Online Assessment Submission Information System), 'New Resources' (Flexible Publishing Tool), etc.

Distance education students

In 2004, the University had 33,736 student enrolments of which approximately 71% through distance education mode (OPA 2004). A total of 84 students undertook the learning of the subject through distance education mode of study in Autumn Session of 2004 (Table 1). The student number in 2005 decreased to 59, primarily due to the recommendation of an alternative subject to those students in the Viticulture program by their course coordinator. The great diversity of backgrounds of these students should be taken into consideration when assessing their ability to learn a common subject. It should be noted that student learning by distance education is influenced by many factors as illustrated in Figure 2. Student performance in any assessment task will be a reflection of their exposure to these elements. The effect is rather cumulative and depends on the degree of their exposure to each element.

Table 1. Number of distance education students who studied the first year subject in 2004 and 2005 as classified according to their undergraduate courses

Undergraduate Courses	2004	2005
Associate Student	1	1
Bachelor of Education (Technology and Applied Studies)	-	3
Bachelor of Applied Science (Environmental Horticulture)	9	4
Bachelor of Applied Science (Viticulture)	21	3
Associate Degree in Applied Science (Winegrowing)	22	11
Bachelor of Applied Science (Wine Science)	1	-
Bachelor of Science (Agriculture)	18	17
Bachelor of Science (Agronomy)	2	7
Bachelor of Science (Animal Production)	10	2
Bachelor of Science (Horticulture)	-	10
Bachelor of Science (Irrigation)	-	1
Total number of students	84	59

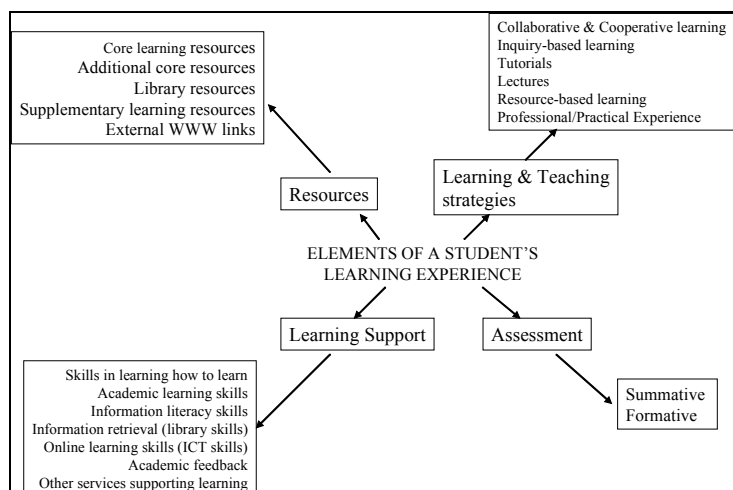


Figure 2. Elements of a student's learning experience (adopted from Palaskas and Muldoon 2003)

Table 2. Student participation in Online Assessment Submission Information System (OASIS)

Test	Topic	No. of questions	No. of students	No. of attempts
Test 1	Unit factor method 1	5	24	37
Test 2	Unit factor method 2	5	16	24
Test 3	Unit factor method 3	3	4	9
Test 4	Mechanics of liquids 1	10	7	16
Test 5	Mechanics of liquids 2	10	1	1
Test 6	Basic electricity	10	6	13
Test 7	Surveying	10	3	3
Test 8	Farm structures	10	2	2

Online resources

A range of online resources were created to support the learning of this subject in Autumn Session of 2005. OASIS was developed by the Division of Information Technology in conjunction with Centre for Enhancing Learning and Teaching (CELT) at Charles Sturt University. It is a user-friendly system whereby CSU staff can create online multiple choice tests to enhance their particular subjects and courses. OASIS allows students the choice to take a test at a time and place that suits them, and provides instant feedback on a particular topic or part of the course. Teaching staff can access students' test results and thus assess group and/or individual student progress and course participation. Table 2 gives details of tests created for the students and their usage of these tests during the session. It should be noted that these test results were not counted towards the final score in the subject. This prompted the students to attempt these tests more than once.

Flexible Publishing is a tool that teaching staff can use to publish supplementary learning material on the University's online web server (Plunket 2003). *Flexible Publishing* will enable teaching staff to upload a file to add to an online subject during session so that students have access to this material. Several multimedia supplementary resources as listed in Table 3 were created and published to the online environment using the *Flexible Publishing* tool. These supplementary materials do not affect assessment; however they aid learning and support in relation to the subject's core learning materials (Figure 2). Movie clips were based on *Windows Media Player*, *PowerPoint* presentations were based on *Microsoft PowerPoint*, tutorial questions and solutions were based on *Microsoft Word*, and past examination papers and supplementary readings were based on *Adobe Acrobat Reader*. These resources were found under the link called 'New Resources' on the online subject outline for the use of all students enrolled in this subject. Students were able to access these resources any number of times with the option of just viewing on computer screen or saving in their local drive for future usage. File sizes were kept to a minimum to enable quicker downloading times.

Impact on learning

Results of students' final score in assessment tasks in 2004 and 2005 were used to provide a preliminary indication of the impact of the usage of these online resources on their learning of the subject. Final scores in 2004 ranged from 2% to 88.9% with an average of 52.9% while in 2005 they ranged from 3.2% to 91% with an average of 55.1%. Percentage of students in different ranges of final score for

2004 and 2005 are presented in Figure 3. While there was 42.3% students scored less than 50% in their final score in 2004, this decreased to 35.3% students in 2005. On the other hand, 57.7% students scored more than 50% in 2004 and this figure increased to 62.7% in 2005. These preliminary findings are an indication of a positive response to the use of online resources by students in 2005.

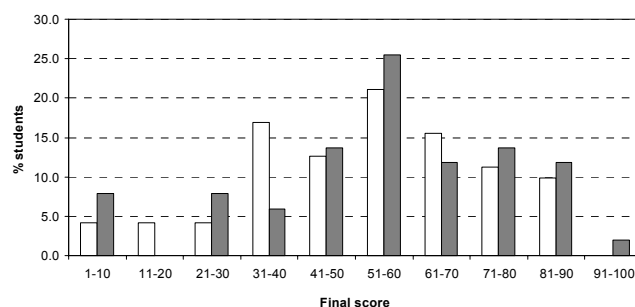


Figure 3. Percentage of students in different ranges of their final score in 2004 (unshaded bars) and 2005 (shaded bars)

The degree of student usage of online facilities was also evident from the number of postings in their subject online forum in 2005 as shown in Figure 4. The session officially started in Week 4 and examinations were held in Week 20. From Week 9 to Week 11, students attended Residential Schools. A total of 254 messages were posted on the forum by 35 individuals including 29 students. It is interesting to note that those students (except one) who posted more than 10 messages on the forum achieved a score which was greater than 74%. The highest scoring three students were also active users of the forum. In other words, 60% of the students who scored more than 70% in the final score were in fact regular users of the forum. A similar trend was also observed among the students who used OASIS tests. A classic example was where a student attempted a particular test a total of six times progressively scoring 20, 50, 60, 80, 90 and 100% correct in his/her answer. This proved to be a valuable exercise helping independent learning.

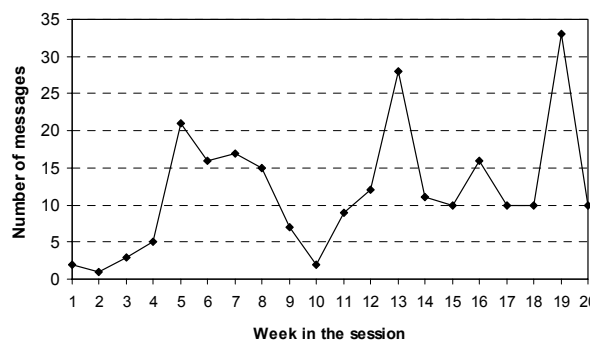


Figure 4. Weekly number of messages posted in the subject online forum during the session

CAL-laborate, November 2005

Table 3. Details of online resources created to support learning by distance education

Resource category	Number	Topic	Size (KB)	Content
<i>Movie clips – Set 1</i>				
	Clip 1	Introduction to unit factor method-Part 1	2,089	3min 19sec
	Clip 2	Introduction to unit factor method-Part 2	4,062	6min 30sec
	Clip 3	Introduction to unit factor method-Part 3	2,422	3min 51sec
	Clip 4	Units	425	40sec
	Clip 5	Converting units	3,454	5min 32sec
	Clip 6	Worked example-Fuel consumption	2,612	4min 10sec
	Clip 7	Worked example-Tree spacing 1	3,776	6min
	Clip 8	Worked example-Tree spacing 2	2,923	4min 39sec
	Clip 9	Worked example-Irrigation allocation-Part 1	2,134	3min 23sec
	Clip 10	Worked example-Irrigation allocation-Part 2	1,682	2min40sec
	Clip 11	Worked example-Volumetric moisture	2,230	3min 33sec
	Clip 12	Worked example-Siphon flow rate	2,829	4min 29sec
	Clip 13	Worked example-Flow rate as a function of velocity 1	2,500	3min 59sec
	Clip 14	Worked example-Flow rate as a function of velocity 2	2,165	3min 26sec
	Clip 15	Worked example-Linear expansion	2,554	4min 04sec
<i>Movie clips – Set 2</i>				
	Clip 1	Dimensions	776	1min 13sec
	Clip 2	Dimensions-Units	590	55sec
	Clip 3	Dimensions-Combined	804	1min 16sec
	Clip 4	Unit prefixes	783	1min 14sec
	Clip 5	Worked example-Car velocity	1,389	2min 12sec
	Clip 6	Worked example-Soil excavation	1,568	2min 29sec
	Clip 7	Contact details	198	18sec
<i>Tutorials</i>				
	Tute 1	Unit factor method	30	11 questions
		Unit factor method-Solutions	47	
	Tute 2	Mechanics of solids-1	39	10 questions
		Mechanics of solids-1-Solutions	67	
	Tute 3	Mechanics of solids-2	52	11 questions
		Mechanics of solids-2-Solutions	159	
	Tute 4	Mechanics of liquids	32	9 questions
		Mechanics of liquids-Solutions	74	
	Tute 5	Basic electricity	36	6 questions
		Basic electricity-Solutions	58	
	Tute 6	Petrol and diesel engines	39	10 questions
		Petrol and diesel engines-Solutions	76	
<i>PowerPoint presentations</i>				
	Presentation 1	Mechanics of liquids 1	176	26 slides
	Presentation 2	Mechanics of liquids 2	418	24 slides
	Presentation 3	Mechanics of liquids 3	564	31 slides
	Presentation 4	Mechanics of liquids 4	5,861	21 slides
	Presentation 5	Basic electricity	1,341	53 slides
	Presentation 6	Surveying	522	35 slides
	Presentation 7	Farm structures 1	1,018	62 slides
	Presentation 8	Farm structures 2	247	49 slides
<i>Supplementary readings</i>				
	Reading 1	Protected cropping	52	2 pages
	Reading 2	The greenhouse	53	2 pages
	Reading 3	Building a greenhouse	56	2 pages
	Reading 4	Covering materials	53	2 pages
	Reading 5	Light in the greenhouse	98	2 pages
	Reading 6	Greenhouse horticulture beyond Australia	576	38 pages
<i>Past examination papers</i>				
	Paper 1	Final examination 2001	534	12 pages
	Paper 2	Final examination 2002	548	12 pages
	Paper 3	Final examination 2003	364	12 pages
	Paper 4	Final examination 2004	590	12 pages

Conclusion

A range of online resources were created to support the learning of a first year mathematics-based subject by distance education students in 2005. Results of students' final score in the subject in 2004 and 2005 were compared to assess the impact of these online resources on their learning. There is clear evidence to suggest that the overall performance of students in 2005 was better than that in 2004. In addition, students who demonstrated an active participation in online activities also scored better marks compared with the rest of the students. Overall, the use of online resources has helped distance education students of learning of the first year subject and improved their performance in assessment tasks and final score of the subject. Hence the value of online resources for learning of a first year subject by distance education is high.

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