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1997

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### Recommended Citation

Else, Paul L., An experiment in applying distance education teaching techniques in science to on-campus students, *Overview - University of Wollongong Teaching & Learning Journal*, 4(1), 1997, 33-40. Available at: <http://ro.uow.edu.au/overview/vol4/iss1/8>

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# An experiment in applying distance education teaching techniques in science to on-campus students

## **Abstract**

This paper reports on an experiment involving the application of distance education teaching techniques to on-campus students. The on-campus and off-campus students were treated equally, being provided the same material and opportunity for tutorial consultation. Learning outcomes from the two groups of students were compared, as were the learning outcomes from the on-campus students taught in the distance education mode compared to students previously taught the same material in the normal lecture-tutorial paradigm. It was concluded that if on-campus students are to be taught in the distance mode they need to be introduced to this different approach as early as possible in their studies.

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**T**his paper reports on an experiment involving the application of distance education teaching techniques to on-campus students. The on-campus and off-campus students were treated equally, being provided the same material and opportunity for tutorial consultation. Learning outcomes from the two groups of students were compared, as were the learning outcomes from the on-campus students taught in the distance education mode compared to students previously taught the same material in the normal lecture-tutorial paradigm. It was concluded that if on-campus students are to be taught in the distance mode they need to be introduced to this different approach as early as possible in their studies.

### **Background**

Recently in the Australian higher education system there has been a general push from "above" to consider employing new modes of teaching (Jakupcic and Nicoll, 1994). These new modes of teaching appear to be a response by some universities to the ever increasing problem of the negative relationship between student numbers and funds and for universities to gain a competitive market share of potential students. Amongst those universities that teach both on campus and by distance mode the possibility exists of replacing on-campus the classical lecture-tutorial-practical paradigm with distance education materials and methods.

Recently, while teaching at Deakin University's Geelong campus such a opportunity presented itself. Deakin University has some well developed off-campus programs and a general interest in the development of various modes of educational delivery (for example see, Castro, 1990). The newly formed School of Biological and Chemical Sciences was developing a distance education stream in biological science. Under the prevailing circumstances I became involved in producing and running a 3rd year unit in Comparative Animal Physiology (SBL 315). This unit was produced because; i) it had ranked well with on-campus students ii) it involved no experimental practical component, iii) it was a compatible and natural extension to existing off-campus offerings and, iv) it could be produced within a time frame to meet the demands of students coming through the degree program. As subject co-ordinator of the on-campus unit and other off-campus offerings and with previous experience in teaching and writing distance education units (at Charles Sturt University) I was coerced into producing the unit. In this sense, the rationale behind the production of the unit was a mixture of educational values and pragmatism.

SBL315 ran in the normal on campus mode for the first time in 1992 and continued in 1993. In 1994 the distance education mode was applied to the subject for the first time. Evaluation of the subject each year took place

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in the final week of the teaching semester.

## Subject Design

The unit was produced with the idea of combining the on-campus and distant education students into the one teaching program using the same material and educational approach. The question was whether this form of teaching could be used by universities with established distance education and on-campus teaching modes. The use of the unit by universities with on-campus students at multiple campuses or even by different universities (to share and diversify their subject offerings to on-campus students) was also considered.

The subject Comparative Animal Physiology detailed the physiological solutions animals have evolved to cope with the problems posed by their different environments. The unit involved some advanced concepts and was developed to challenge rather than simply provide information to students. Prerequisite entry into the unit required studies in either human physiology, animal diversity or biochemistry at 2nd year level.

All students undertaking the unit were provided with a subject description, content outline and assessment information. Students also received a study guide (in 3 volumes) which referred to readings from a prescribed text (Schmidt-Nielsen, 1990), and included additional notes, reference material and a comprehensive set of problem based questions within each section. Comprehensively worked answers were also provided to all problems. All sections had specifically identified objectives.

## Assessment Requirements

The components making up the assessment (weightings shown in Table 1) remained constant over the period of evaluation (ie 1992, '93 and '94) and consisted of the following:

### 1) Literature Reviews

Since many experiments in comparative animal physiology are a demonstration of basic physiology principles and the majority of students were familiar with basic physiology, literature reviews were introduced

as an alternative to laboratory based practical sessions (see Kirschner and Meesher, 1988, Kirschner et al., 1993 for discussion on the assumed value of practicals in the teaching of science). In the first year that literature reviews were used in this subject (ie 1992) the reaction of the students to this form of assessment was surveyed (results of this survey are provided in Table 2).

To facilitate the literature reviews, students selected from a wide range of topical questions and were provided with material that explained how to produce a literature review. The on-campus students attended a 1 hour session in the library in the first week of the semester where they were shown how to access primary data (this was conducted by library staff). Students were given the opportunity to access the interlibrary loan system with the help of a supervising lecturer (a number of lecturers in the school participated in this activity) so that requests could be 'vetted' to avoid overwhelming the interlibrary loan system. Many students spent weekends up in the metropolitan university libraries researching their topics and special arrangements were made with some of these libraries (eg Uni. Melb. Medical library) to facilitate this work.

The literature reviews were also ideal for off-campus teaching. Instead of having to attend practical based weekends at Deakin University the students were expected to spend the same time at university libraries closest to them in order to research their topics.

### 2) Oral Defence

Oral defences were also used as a form of assessment. Students were required to defend their literature reviews. Defences were performed in small groups comprising 5-10 students who had studied the same area. During these sessions each student in turn was advised on how to improve their review ie both the strengths and weaknesses were commented upon. Each student was then challenged several times with questions specific to their review and then on general questions within the topic area. This provided students with experience in having to verbally respond to problems and questions in an open forum situation. The questions and answers often developed into lively debate within the group.

The oral defences could be co-ordinated with the off-campus students either individually or in conference telephone arrangements and again proved an excellent

way of reducing the requirement for the student to physically attend the campus. However, in a number of cases the distance students within Victoria drove to the university to participate in the on-campus group defences

### 3) Tutorial Sessions

The two timetabled lecture periods for the on-campus students were changed into repeat tutorial/discussion sessions. No compulsion was placed on the students to attend and individuals were not prevented from attending both sessions if they so desired. At the end of each tutorial session students were provided with worked solutions to problems (these were posted to the off-campus students). The solutions were also readily available to any student who chose not to attend the tutorial sessions.

Attendance throughout the semester showed initial high attendance followed by reducing and then increasing attendance nearing the end of the teaching semester. Overall, about half of the students attended regular sessions. During these tutorial/discussion periods material expected to be completed each week was discussed, often centring around the questions within the study guide on each section which effectively acted as tutorial questions.

Therefore the total amount of time spent face to face by the subject facilitator was not reduced but it was hoped that the amount and comprehension of the material associated with the unit would be enhanced by the fact that the students were coming into the class ready to discuss the material and problems set.

Therefore both the on- and off-campus students participated in the same assessment. Both groups were provided with the same support material. The on-campus students had the advantage of timetabled tutorial/discussion sessions whereas the distance students would phone in for similar help.

## Results

### The Students Speak

#### Past On-Campus Evaluation

Comparative Animal Physiology in 1992 (the first year offered) and in 1993 the ran in the normal on

campus lecture delivery mode. In this classic form the unit was ranked highly by those students who participated as shown in the student assessments reproduced in Table 3

In the new distance teaching format (ie autumn semester, 1994) the on-campus students ranked the unit quite differently as shown in Table 4. Unfortunately Deakin University used new student evaluation sheets in 1994 but the general differences in the evaluations were easy to detect (in total there were 8 off-campus and 70 on-campus students who took the unit in its new distance education form).

In its new form the majority of the on-campus students found this unit the most work intensive, challenging and difficult subject they had undertaken and generally claimed they hated it. These students were exclusively from backgrounds of on-campus study.

In addition to the use of computer evaluation forms, students were requested to express their likes and dislikes about the unit on the back of the evaluation sheet, which they did so in no uncertain terms. These were highly informative and a number of the representative views are expressed below.

#### Likes

*"topics relevant to biological sciences and to what I want to do when I leave Uni"*

*"topic and subject areas were interesting"*

*"literature reviews were very valuable enabling us to learn about research methods"*

*"questions and answers were a great help in understanding some material"*

*"subject guides were well planned"*

*"as much as I disliked writing the literature reviews, I think that I learned a lot about researching a topic and using the library to my advantage"*

#### Dislikes

*"the shitload of reading and summarising"*

*"off-campus style, it was not a successful combination for students doing on-campus subjects. Being left to pursue the course material by yourself without lecture notes is easier to do if a student has a lot of time like off-campus students ....it was difficult to determine*

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*important/relevant aspects of the course material*

*"workload for this subject was very high"*

*"no lecture and no one wanted to participate (ie in discussion)"*

*"excessive work load.....difficult to study without lecture notes ..... we were just told that we needed to know what's in the text book which is over 500 pages"*

*"the course was too independent for an on-campus unit"*

*"the format of the unit leaves a lot to be desired"*

*"I'd just like to inform you that it is impossible to do research on those stupid assignments, current research in journals is impossible, unaccessible and too time consuming as well as having to do 6hrs of reading and 2 more hours of answering the problems a week, as well as three other subjects that have been totally neglected due to this unit"*

In contrast 5 of the 8 off-campus students agreed that it was *"the best prepared and one of the most interesting units that they had done to date"*. This means that either the other units they had done were exceptionally bad or this one was OK. Their negative comments were restricted to some delays in getting materials on time (a common problem). Most of the off-campus students had a couple of years experience in off-campus study and most were employed in various full time jobs and at the same time taking doing part-time (half-load) study. The off-campus students considered the amount of material presented in the unit to be appropriate and said that they did not feel the unit excessive in terms of the work loads (although as they had just completed a unit which was one of the biggest off-campus units their comparative base may have been influenced by this other unit).

Two questions can be asked after comparing the students' reaction to the two forms of teaching. Firstly what changed for the on-campus students that turned the unit from one of the most popular to one of the most unpopular? Secondly why the difference in perception between the on- and off-campus students doing the same unit?

#### The Things That Stayed The Same

Comparing the old and new unit the factors that had

remained the same were the people involved, the type of the material covered and the assessment.

#### The Things That Changed

Apart from the lack of formal lectures, the things that primarily changed were;

##### a) Volume of Material

The volume of material covered in the unit increased by about 25%. This is an important point. This occurred as a result of being released from the constraints of the number and period of lectures available. Therefore the mode of delivery influenced the volume of content included in the unit. In my experience this commonly occurs with distance education units as most lecturers appear to want to give students what they think is the most complete coverage in the area. This can lead to excesses.

##### b) Teaching Approach

In writing the study guide for the new Comparative Animal Physiology subject the teaching approach changed from simply delivering the material to constantly challenging the knowledge of the students as they studied the material.

The on-campus students reacted unfavourably to the idea of weekly readings and exercise tasks. This reaction was not due to them being poor students but that they were completely unfamiliar with this form of teaching. The idea of constantly reading and being challenged throughout the semester was alien and not appreciated by the majority of the students. Not all the on-campus students were dissatisfied with the distance education approach, the upper 20% of the students, not surprisingly, seemed to enjoy the experience.

## Conclusions

Overall the subject was viewed as too much work by the average on-campus student but this view was not shared by the experienced off-campus students.

One way of addressing this disparity is to start early if science subjects are to be studied in the open campus mode by on-campus students (ie in the 1st year). The experience needs to be maintained throughout a student's university education so they are familiar

with and do not feel threatened by this form of teaching. Even in third year these students did not appear to accept it. They felt that they were being short changed, there was more work and less contact with the lecturers.

The on-campus and off-campus students in this experiment were very different types of students. Their expectations and preparedness to be academically challenged was different possibly resulting from a combination of life circumstances such as age, previous educational work loads and work force experiences. The majority of the off-campus students ended up in the top 20% of the class except for two students who changed from on-campus to off-campus half-way through the semester. Both of these students passed (ie 56 and 61%) with average marks. It suggests they studied like the on-campus students even when they changed to off-campus mode.

Once the students dislike a subject they seem to start to dislike all elements of the subject. Even the things that had previously rated highly and had not changed in the unit now rated poorly.

## Reflection

Upon reflection it is worthwhile considering that what the university might see as an ideal answer to the practical problems of education may not be a view readily shared by most on-campus students. There is a requirement to recognise the differences between these student groups and the likelihood of their very different reactions to the same teaching method. For example, something I considered academically challenging, a viewed shared by the off-campus students, was viewed as academically threatening to most of the on-campus students. The on-campus students were comfortable with the classical lecture method and at this stage appeared unwilling to change their study approach.

As a result of this short exercise trialing distance education methods on-campus I learnt a lot about teaching. The students, despite themselves, learnt a lot about comparative animal physiology (ie the failure rate in the unit was no different from previous years although the percent of credits and higher pass levels was down slightly possibly reflecting the increased content). In future I will be more careful about launching into the educational milieu without

canvassing some opinions from the likely recipients of my experimental design.

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**Table 1: Comparative Physiology**

Assessment Items

<u>Component</u>	<u>Number</u>	<u>Assessment Value</u>
Literature Reviews	2	30%
Oral Defences	2	10%
Final Exam	1	60%

**Table 2**      **Survey of Student Response to the Use of a Literature Review Instead of Class Practicals in 1992 (# Response = 32)**

Q1)	Would you prefer	weekly practicals	37.5%
		or two literature reviews	62.5%
Q2)	Do the literature reviews require	more work than a set of practicals?	
		more	54.8%
		similar	41.9%
		or less	3.2%
Q3)	Are the literature reviews _	to prepare than a practical course?	
		easier	0.0%
		similar	27.6%
		harder	72.4%
Q4)	Are the literature projects worthwhile?	yes	78.1%
		no	21.9%
Q5)	Do you think the literature projects have helped you understand concepts and/or other skills involved with the subject.		
		yes	81.3%
		no	18.8%



**Table 4 Student Evaluation of Teaching Performance as Principle Lecturer and Coordinator in Comparative Animal Physiology by On-campus Students Taught in Distance Education Mode in 1994**

<b>Goals and Information</b>		(N=70, responses =19 )
1) Aims of unit clearly defined		2.8
2) Unit content, assessment and other important information clearly communicated		3.4
<b>Learning</b>		
3) Work set challenged my understanding of the subject		3.8
4) Unit helped improve my problem solving skills		2.9
5) Unit helped develop appreciation of learning process		2.3
7) Experimental aspects (if any) challenge my lab. skills		-
<b>Workload and Assessment</b>		
8) Unit assessment provide me with adequate opportunity to demonstrate my knowledge and understanding of subject		2.8
9) Workload appropriate to level and goals of unit		1.9
<b>Organisation and Resources</b>		
10) Work graded and returned promptly		4.3
11) Components of the course were effectively organised (eg lectures, tutorial, practs)		2.2
12) Text book and library resources adequate for needs		3.3
<b>Instructional Material</b>		
13) I was able to use the text book effectively		4.0
14) Problems and exercises set helped me to understand the course material		3.4
<b>Multi Instructor Taught Units</b>		
15) Level of expectation consistent between instructors		2.8
16) Co-ordination between instructors was good and provided a continuous and effective learning experience		2.9
<b>Timetable</b>		
17) The timetabling for this unit allowed me to attend all lectures and practical classes		4.2
<b>Assessment of Coordinator/Principle Lecturer</b>		
18) Unit instructor encouraged excellence and helped to achieve highest potential		2.8
19) The unit was taught in an interesting and thought provoking manner		2.4
20) The concepts were highlighted and clearly explained		2.7
21) Lecturer was available and approachable outside of class		3.5
22) Lecturer showed genuine concern for student progress		3.3
23) The lecturers speech was clear and audible		3.9
24) The lecturers handwriting was clearly legible		3.7

\*Rating based on: Strongly Disagree Neither Agree Agree Strongly  
Disagree or Disagree Agree  
1 2 3 4 5