Does the Supply of Lecturer's Overheads to the Students Make a Difference? - A Water Engineering Case Study

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Abstract: *While the advent of modern computer and communication systems has opened up a plethora of methods for supplying students with teaching support material, a major question remains as to what is effective for student learning? This paper presents the outcome of a six-year case study on the effectiveness of supplying students with the lecturer's actual presentation notes (overheads) as a learning aid. Results showed that direct access to the notes did not appear to enhance student learning, suggesting that the lecturer's effort should be placed elsewhere when designing and supplying support material.*

Keywords: *lecture notes, teaching strategies, evaluation.*

Introduction

With the advent of faster and more accessible electronic communication methods, the tertiary educator now has a wide range of methods for supplying students with educationally significant support material. Computer simulations and aided learning packages (eg Dharmappa, Corderoy, and Hagare, 2000, Parkinson and Hudson, 2002, Wilbon, 2003), on-line chat groups and discussion forums and electronic print material (eg pdf files and Internet sites) are now supplementing the more historical forms such as books, papers, videos and audio recordings (eg Lemckert, Martin and Wong, 1995, Brostow, 2001). The success of this material as an effective teaching aid has come under increasing scrutiny as we endeavour to enhance student learning. Of course, it is also important to note the significance of other forms of non-electronic based educational strategies such as industry placement programs (eg Edwards, 1997, Dunai, Hufnágl and Iványi, 1998, Lyshevski, 2002).

As it is the lecturer's task to design and facilitate the learning process, it is they who determine the use of the abovementioned learning support systems. Certainly they should engage students in active relevant learning processes and encourage deep learning activities (eg Biggs and Moore, 1984 and Wilbon, 2003). However, the student cohort can also be involved in selection of the material in either a formal or informal manner. For example, with problem/project-based learning approaches the students can decide upon what material they find most informative and beneficial to their assigned educational task. In some instances self-driven site visits and interviews may be of significant use in the learning process.

This paper presents a case study undertaken during the teaching of a final year engineering course. The study, spanning six (6) years, offers a unique example of assessing the

importance the supply of lecturer's notes (overheads) has on student learning outcomes. The paper will first describe the case study and then comment on the outcomes. Results of this study showed that the form of material (if any was supplied) appeared to make little difference to student learning and that this form of educational material should not receive greater attention.

The Case Study

This paper uses data collected from the Water and Wastewater Engineering course, a 4th year core course offered within the Bachelor of Civil Engineering Degree at Griffith University (Gold Coast Campus). The subject aimed to introduce civil engineering students to key concepts relating to civil engineering components (including environmental and fluid mechanic processes) within water and wastewater treatment plants.

Subject Structure

The course was divided into two equal-sized sequential modules of 7 weeks' duration. The first module was presented in the 'traditional' manner, using formal lectures of three (3) hours per week and tutorial classes of one (1) hour per week, with the teaching emphasis being placed upon development of the understanding of theory and concepts relating to water treatment plant design. The lecture component predominantly considered the introduction of new concepts and theories, while the tutorials were primarily aimed at numerical-based problems.

The second module on wastewater treatment plant design was presented as a problem/project-based learning exercise, with no formal classes. In this module, the students were divided into small groups and asked to design the basic structure of a wastewater treatment plant. That is, they were asked to solve a real-life problem which could only be achieved by their seeking knowledge and learning about wastewater treatment plant processes. Informal contact sessions were regularly scheduled to allow students the opportunity to seek assistance with the recommended reading, the problem-solving list and the design project.

Throughout the duration of the course (from 1997 to 2002) the same lecturer delivered the lectures, with the tutorials either being undertaken by the lecturer himself or by professional tutoring staff. Typically, students were supplied with the lecturer's presentation notes (overheads), which were usually in the form of overhead transparency slides (a common and virtually standard practice within Griffith University). As a consequence of technology innovations and an effort by the lecturer to enhance student learning, the method by which students could access the material varied (see Table 1). Table 1 shows that the range of the method of supply extended from full electronic access to nothing. In 1999 no overhead material was available to the students outside the lectures; this meant the students had to write down all the material if they were prepared to do so (this approach goes back to the pre 90's when students had to write everything down). While this method may seem archaic and is maligned (supposedly because it prevents students from listening openly to the lecturer) it was trialled in order to address an issue raised from the 1997 and 1998 period. In 1997 and 1998 the students had access to the material but they seemed hesitant to make any additional notes during lectures, relying instead on the printed matter only as a learning aid. Feedback obtained from the students revealed they did not feel the need to write anything down as they already had it, which could result in poor knowledge development and retention. After 1999 material was supplied at different levels of content and accessibility. In 2002 all material used in lecture presentations was supplied to the students. This required significant effort by the

lecturer to ensure all the material was in a suitable format and professionally presented (ie. not hand written). The question examined here is "*Does the Supply of Lecturers' Overheads to the Students Make a Difference?*"

Year	Delivery Method
1997	Available from University library computer system. File printable only.
1998	Available from University library computer system. File printable only.
1999	Non handed out or made available
2000	Limited printed notes were handed out with only overhead summaries given.
2001	Limited printed notes were handed out with only overhead summaries given. Links to WWW sites relevant to the course were also supplied
2002	Full access to all material via student computer access system.

Table 1: Water and Wastewater Engineering Module 1 lecturer's notes delivery method

Student Performance Evaluation Process

The primary aim of this study was to consider the performance of the students following the completion of Module One over each of the six years from 1997 to 2002, inclusive. For the outcomes of Module Two, albeit over a shorter period, the reader is referred to Lemckert (1999).

At the completion of Module One each student was required to complete a formal examination (in addition to another at the end of the course). Like many traditional examinations, this one-hour exercise was designed to assess the student's overall understanding of the course material. In this case, it examined their understanding of the application of theory and concepts of the civil engineering design components used in water treatment plants. The examination paper consisted of three (3) questions with numerical and theoretical components. For completeness, a copy of the examination questions is presented in Table 2. Students were supplied with a formula sheet for use in the examination. The total weighting of the examination paper (in terms of overall course grade) was not high, and set to 10 %. All answers relating to the questions were addressed in lectures and/or tutorials.

The same examination paper was used in all years of the case study (students were not informed of this), thus permitting direct comparison between years. The examination was conducted 'in-house' and students were not permitted to remove the examination paper from the examination room, meaning no copies of the paper were available for students to keep and pass on to students in lower years. Indeed, it appeared that the students did not even pass on the details of the examination paper on a verbal level.

Student Performance Comparison and Discussion

While examinations are not the sole means of assessing student performance (and they certainly should not be) they are commonly utilised performance evaluation mechanisms. Figure 1 summarises the students' performance over the six (6) years of the case study. Here the average mark (plus or minus one standard deviation) from each year has been plotted.

Question Number	Question
1	a) List the four basic types of water quality groupings b) Define BOD_5 c) The BOD of a wastewater stream is determined to be 150 mg/l at 20ºC. The k_{20} value is known to be 0.23 per day. What would be the BOD_8 if the test was run at 18ºC ?
2	a) What is the primary function of screening ? b) Describe two methods by which grit chambers can be designed to have a constant through flow rate (sketches may be used). c) List the two main methods by which aeration can be achieved
3	a) What is meant by the two terms perikinetic and orthokinetic. b) List and describe the three steps of coagulation process and describe their purposes.

Table 2. Water and Wastewater Engineering Module 1 examination paper.

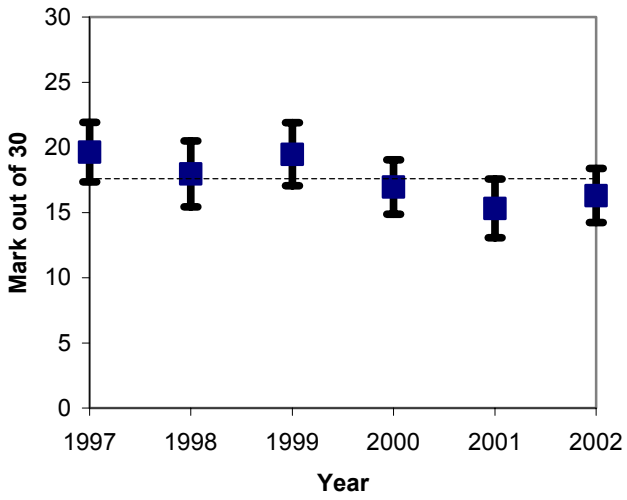

Figure 1: Plot of average module one examination mark against year. The graph also shows the level of one standard deviation from the mean. The dashed line indicates that there is no significant difference in the grades.

Initial observation of Figure 1 suggests that student performance changes from year to year. However, within one standard deviation there is no significant difference between results, suggesting that the type and delivery of the student support material may have minimal influence on student performance (when evaluated using formal examinations).

The result observed in Figure 1 warrants further examination and comment. The teaching of this course was conducted in a similar manner, from year to year, with the major difference in style being the method of supply of the lecturer's notes (overheads) to the student (see Table 1). In 1999 the notes were not directly to students, while in 2000 only complex formulae were supplied (ie no overhead copies) in order to minimise mistakes during the copying down process. In response to colleagues' suggestions and student feedback in 2002 the lecturer took significant effort and time to once again supply students with all of the lecturer's course notes. All material had to be made accessible through a Griffith University electronic delivery system (known as Learning@GU), which is assessable to all enrolled students.

Brostow (2001) supports a well-known observation in discussing how students will be expected to perform differently from one year to another, depending on the makeup of the student cohort. The variation in the mean grade observed in this case study might therefore be the result of the student or more importantly learning style only. Unfortunately, from this essentially limited investigation (even though it lasted 6 years) it is not possible to completely determine the cause in the mean grade differences. Whatever the reason, it appears it was not necessary to supply any material at all to the students in order to observe significant improvement in student performance. Therefore, it is recommended the lecturer should concentrate more on other methods to enhance student learning.

Conclusions

A case study was undertaken to evaluate how the supply of a lecturer's lecturing notes influenced the level of student learning. While students expect to be supplied with such material as a matter of course it is apparent that it does not impact significantly on their degree of learning, as assessed by formal examination. This outcome suggests the lecturer should not place undue effort on developing their own notes, with the intention of improving student learning, focusing instead upon developing adequate notes and improving student learning through alternate means. Therefore, in answer to the question "*Does the Supply of Lecturers' Overheads to the Students Make a Difference?*" it would appear that the answer is *NO*, but more study is required.

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Acknowledgements

The author would like to thank the School of Engineering for supporting educational research and development activities.