



# In-class pharmacology conference: student communication and flexible delivery in an authentic learning experience

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*Abstract: In 2002, a student-led in class-conference was introduced as a flexible mode of delivery for the teaching and learning of 'Drug Metabolism' within the Human Biology degree at Edith Cowan University. This innovation was used to teach a section of the unit curriculum in contrast to previous years when the whole unit was taught in the traditional formal lecture and tutorial style. The in-class conference provided students with the opportunity to deliver their research in the form of presentations and publications in an authentic learning environment. The author will discuss the pedagogical value of student presentations to peers for the teaching and learning of Science subjects with high factual content. Moreover, the author will demonstrate that the authentic-learning project created opportunities for science students to develop their overall ability to communicate and disseminate knowledge resulting in a statistically significant improvement in the standard of student literature reviews. Additional outcomes of this alternate teaching method include better informed, more confident students who have the ability to perform authentic, meaningful research and are equipped with important industry-related communication skills.*

## Introduction

The past decade has seen increasing demands for reform of tertiary teaching and various modes of flexible delivery have been introduced. The aim of flexible delivery is to increase student interest and therefore improve learning outcomes. Among the most notable changes implemented are moves to increase independent learning in authentic environments.

In the past year an innovative approach was introduced to teach a segment of the course content for the unit, *Drugs in Society*, within the School of Biomedical and Sports Science. A student-led mini-conference approach was used to teach the metabolism of social drugs, a sub-division that covered a third of the unit content. In so doing, the students were provided with an authentic opportunity to enhance research and communication skills while using small group research teams. This article discusses the experience and provides evidence that the flexible learning experience improved student results, attitudes and communication, key indicators of positive learning outcomes.

## Rationale for introduction of flexible learning project

While awareness of drug abuse continues to grow, it has only been during the past few years that students have been encouraged to study and discuss the impact of drug abuse on society. Several units within our own and other universities worldwide concentrate on the social and psychological aspects of the problem. However, the *Drugs in Society* unit, at Edith Cowan University focuses on the biochemical metabolism of social drugs commonly used and abused within our society. Since published resources specific to pharmacological aspects of social drugs of abuse are limited, a project was initiated that encouraged students to research the topic. The students were then required to present their research at an in-class conference and produce a literature review for formal assessment.

The Human Biology degree at Edith Cowan University is similar to such degrees offered at universities worldwide in that the courses consist largely of formal lectures, tutorials and practicals and are information intensive. During the degree courses, students are given assignments that require some research. However the value of their research is not evident, and opportunities are not provided to utilise the acquired knowledge.



It can be argued that ‘it is the task of education to take learners past being merely well informed and on to being full-fledged professionals’ (Eisner 1967; p.251) with the skills and competencies required to perform at a highly professional level (Davidoff 1996). Knowledge alone is no longer at the core of our pedagogy; a student’s acquisition of communicative skills, power, confidence, and ability to assert oneself are of equal importance. In addition, creativity, judgment and responsibility form part of the very valuable, complex skills, and necessary objectives required in higher education in this age of supercomplexity (Barnett 2000).

Flexible delivery in an authentic learning environment was chosen as the key strategy for improving learning outcomes, as it best promotes student learning (McKenzie, Morgan, Cochrane, Watson and Roberts 2002). Therefore, to better prepare students as professionals suited to a career in Biomedical Science, a mini-conference was introduced as an authentic learning experience. It was thought to be a valuable pedagogical exercise as it would enhance student-led research, oral and written communication skills and would require complex learning processes covering a diversity of research, communication and computer skills, suitable for students likely to work in the science field.

The ability to perform complex tasks, where knowledge, skills and attitudes are all integrated, is universally regarded as an important graduate attribute (Hager and Gonczi 1996). Thus it becomes essential to provide opportunities for students to hone such skills, allowing students to gain confidence in their own abilities as competent professionals. In the flexible teaching strategy introduced here, students acquired knowledge, analysed published data, critically appraised the information, and integrated it all into a coherent oral and written presentation with a large degree of confidence and clarity.

### Aims of the project

- To involve science undergraduate students in flexible science learning and teaching
- To provide opportunities for authentic learning
- To improve science undergraduate students’ research and communication skills
- To enhance graduate attributes relative to industrial requirements

### Methods

#### Student cohort and implementation of the project

The students registered in the *Drugs in Society I* unit are in the second year of their undergraduate degree within the School of Biomedical and Sports Science. In 2002, the project was introduced to students in the first week of semester and students were encouraged to make suitable small groups (5 students per group). Students were given a choice of research subjects and a set of questions to guide their research (Table 1). Students presented their research to peers in a mini-conference over weeks six to ten of semester.

#### Guidelines For Student Research

1. Describe the drug, discuss its action and indicate the biochemical mechanism of action.
2. Discuss the chemical structure and mode of action of the drug in relation to its structure.
3. Describe the method of drug administration as it relates to the chemical composition. Describe the major sites of uptake, action, and rates of metabolism and catabolism.
4. Describe the short and long term effects and contraindications of the drug.
5. Discuss the addictive nature of the drug and provide reasons for this.

Table 1. Guidelines for student research

Two-thirds of the unit content, delivered as formal lectures, covered general principles of pharmacology and drug metabolism. The content delivered by students covered pharmacological and biochemical principles associated with social drugs. At the end of the semester, students were



required to produce a literature review. In this way, student research was used in a flexible mode to enhance student learning and formed part of a relevant, authentic-learning exercise.

### Implementation of the project

First it was necessary to ensure that students had sufficient critical appraisal skills to pursue the research project. Teaching of critical appraisal for undergraduate research, began with the lecturer providing critical analysis of relevant, quality, published information (Edwards, White, Gray and Fischbacher 2001), which provided a framework or working model for student research. Students were encouraged to perform their research utilising quality, peer-reviewed journal articles, Internet sites and textbooks. The choice of suitable research material was discussed repeatedly during the research process as students continually required assistance with this part of the project. Suitable referencing of research material was also impressed upon the students.

### Evaluation of student learning

Upon completion of their research, students presented their findings as oral presentations in a mini-conference, followed by a discussion session, chaired by student groups. Each group of five students presented their research topic over one hour – i.e. each student gave a 10 minute presentation and there was a 10 minute slot for questions. The research information was subject to an informal peer review process.

As in previous years, students were also required to submit a literature review of their research for formal assessment. The literature review was assessed relative to a standard set of criteria (Table 2). Student results from 2002 were compared with results obtained prior to introduction of the flexible teaching project, to assess improvement in student learning.

Students evaluated the unit through internal feedback questionnaires as well as through a formal questionnaire administered centrally by the Faculty of Computers, Health and Science.

Criteria	Mark Allocations
Evidence of research -use of texts, appropriate examples, own words	10
Clear definition of topic and a clear understanding of concepts	10
Content of paper - well planned, logical development of argument	10
Written expression -spelling, vocabulary, grammar, paragraph structure	5
Relevance to topic	5
References - appropriate in-text and end-of-text referencing	5
Presentation, figures, layout of text	5

Table 2. Criteria for assessing student literature reviews

### Summary

Students were required to perform the following steps in the project:

1. students formed small groups and within the group performed research on a chosen topic utilising the given set of questions/headings to direct their research;
2. together with members of the group, students presented their research findings to peers in a mini-conference and chaired a discussion on the subject; and



3. each student submitted a literature review based on his or her research findings for formal assessment by the lecturer.

## Results

The in-class mini-conference project introduced into the *Drugs in Society* unit proved to be highly successful. When formal literature reviews were assessed according to a standard set of criteria (Table 2), 2002 students attained a higher level of achievement relative to those in 2001 when assignments were similarly assessed but were not subjected to the flexible teaching program. In 2002, the number of students obtaining > 80% increased significantly (Table 3).

Percentage of students obtaining grades of A, B or C				
YEAR	A (80-100)	B (60-80)	C (50-60)	No. of students
2001	27%	73%	0%	40
2002	43% *	55%	2%	38

\* Statistically significantly different P<0.001 - assessed by students' t test.

Table 3. Assignment results for 2001 (no project) and 2002 (flexible teaching project)

Initially, when the project was presented to them, students were extremely reluctant to participate. However upon completion of the unit, students were enthusiastic about the project and the feedback was predominantly positive. All students welcomed the opportunity to participate in the mini-conferences, asking and answering questions. Thus student passivity associated with formal lectures was strikingly reduced and replaced by active participation in group activities and exchanges. Moreover students were made aware of the value associated with student-led research.

Overall, the better students tended to prefer the active involvement in their own education, liked the mini-conference environment and discussions groups, and preferred the opportunity for independent learning. The weaker students tended to dislike the informal learning style, preferring formal lecture material, and simple reproduction of the material in examinations. Waud (2002) observed similar trends in a comparative study of Pharmacology students in the United States.

Another important benchmark highlighting the success of the alternative teaching-learning project was the quality of the student presentations. Student *PowerPoint*® presentations were very professional and most students performed their presentations in a confident and entertaining manner.

The project also provided positive reinforcement for the lecturer; the students' enthusiasm was infectious and the lively, interactive nature of the conference sessions and quality of the student productions was inspiring. Problem areas that students encountered were more transparent and the lecturer was able to deal with these on the spot.

### Student comments upon completion of the project

- Very helpful, lecturer did a great job.
- Verbal and written skills improved.
- A great way of participating if shy in class.
- An opportunity to express your opinion without getting embarrassed.
- Reinforced material learned through formal lectures and enhanced subject matter.
- Suitable method of communicating student research.
- Valuable for all concerned.

## Discussion

The research project successfully demonstrated that science undergraduates can be taught self-directed learning, critical appraisal and effective writing skills through an alternate teaching program where students are required to present their research as oral and written papers in a mini-conference.



The pedagogical value of such a project lies in the ability to integrate learning and teaching with preparation of students for a professional career within the science field (Edwards et al. 2001). The use of a mini-conference as a flexible teaching approach was innovative and enjoyable while improving critical learning outcomes and professional skills.

In the academics' quest for curriculum implementation of flexible learning and delivery methods, the tendency, often, is simply to re-format subject materials and learning strategies to fit the new technology. When attention is focused on the technology rather than the educational underpinnings, both the students and the subject are compromised. A multifaceted approach, integrating technological, disciplinary and pedagogical expertise, was used here and found to be effective in improving student learning outcomes. Using the mini-conference approach we were able to focus on development of educationally sound practices: identifying the target learning objectives; consideration of the stages of learning development; and implementation of the project and evaluation. Favourable responses from participants, together with an increase in graded assignments, suggest that the practices are sound (Minasian-Batmanian 2002).

The use of a mini-conference provided active learning, team cooperation and problem solving, within a supportive educational environment. Students were introduced to the realistic situation of presenting material for dissemination of knowledge, in line with current objectives in any academic and industrial environment. This is particularly relevant in the current climate of industry driven research where it is becoming increasingly important to emphasise professional development in research, as well as communication and writing (Edwards et al. 2001). The high quality of the presentations indicated that the students had taken advantage of the opportunity to enhance their communication skills, talks were enlightening and entertaining and ideal for the target audience. Moreover students showed confidence in their ability to perform relevant research. Ultimately the students were made aware of the value of their research and the use of disseminating the acquired knowledge to peers.

In the past year, introduction of the project has had a powerful impact on students' attitudes (see student comments). Moreover, there was a statistically significant improvement in critical appraisal and writing skills as demonstrated by the improved student grades achieved in their literature reviews, compared with grades obtained by students from the previous year, when no authentic learning project was provided. Thus the unit has improved from several perspectives, and as part of the curriculum it is likely to be more in keeping with students' educational requirements (Barab, Squire and Dueber 2000; McKenzie et al. 2002; Reeves, Herrington and Oliver 2002).

Ultimately this exercise highlighted the importance of broader education requirements for students; clearly students benefit from self-directed learning and flexible teaching methods in authentic learning environments. Although success utilising these criteria is hard to measure, one can obtain an estimate of the project worth/value by assessing student satisfaction, productivity and enthusiasm (Harden 2002). Overall our students were highly productive, enthusiastic and generally satisfied with the outcomes. In future, more concrete evidence of improved learning outcomes will be sought by interrogating examination results. In conclusion, I believe my approach is an innovative, enjoyable, and effective method for teaching crucial professional skills to science students. Further research using more robust outcome measures and controls, is needed to evaluate the educational effectiveness of flexible teaching for provision of professional life skills and other suitable learning outcomes.

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