THE EFFECTIVENESS OF COLLABORATIVE PROBLEM-SOLVING TUTORIALS IN INTRODUCTORY MICROECONOMICS

by
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Introduction

In the last few years, Australian first year economics courses have been subjected to greater external scrutiny and evaluation than ever before (Lee *et al.*, 1996) due to a general disenchantment with the traditional lecture/tutorial teaching model, which has encouraged some experimentation with teaching methods. In a survey conducted by Lee, Burgess and Kniest (1996) results indicated that lecturers themselves wished to introduce a range of reforms to the organisation and teaching in first year economics. Experimentation with new methods of teaching economics has also been motivated by the dropping numbers of students electing to study economics (Lewis and Norris, 1997; Millmow, 1997; Underwood, 1998). Australian experience revealed that low priority is placed on acquiring problem solving skills in undergraduate economics degree programs (Siegfried and Round, 1994). Problem solving skills are essential for practical knowledge for decision making; thus it would be expected that students graduate from economic courses without the most important attribute an economist should possess (Abelson and Valentine, 1985).

This paper evaluated an attempt to introduce new methods of teaching in Microeconomics tutorials of first year level. The project aimed to convert the ECC1000 Microeconomics tutorials in second semester 1999, into collaborative problem-solving sessions. Implementation of this project required investigation of students' attitudes to tutorials, development of appropriate teaching and learning material, specialised tutorial training for assistant lecturers, evaluation of the outcomes and making recommendations. The purpose was to develop a coherent tutorial program based on the collaborative problem-solving approach. The project was a pilot program, which aimed to be extended to other economic subjects and

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to other subjects in the Faculty. The evaluation of the program revealed that students found collaborative problem solving tutorials enjoyable, provided assistance to their studies and students actively participated in the class. However, an issue of concern was the inability of the program to foster group work outside the tutorial. This issue has mainly to do with the nature of university study, which cannot be solved, with only the introduction of a new tutorial structure in one subject.

Background Literature

A "traditional" approach to teaching economics can be summarised as the standard lecture/tutorial format, whereby two-hour lectures per seek are followed by a one-hour tutorial, in which the tutor delivers answers to set questions. This traditional approach to teaching, with respect to the subject of economics, has seemingly resulted in a stagnation of positive learning outcomes and achievements. Dundas (1993) described that there was a significant problem of the "transfer syndrome", where students were passive participants in both the lecture, and more importantly, tutorial sessions. Students passively copied down notes and answers in tutorials without much interaction, active participation or verbal comprehension as to how the contents of the course may be applied to real world scenarios. In a survey of students, Bartlett (1995) revealed that students were competitive and interested in getting the right answer, and not concerned with, why the question was important. This consequently made the classroom climate a passive competitive experience. The traditional economics course is rather abstract, yet requires the students to be able to make practical application of the theoretical concepts taught. Therefore, it requires the student to be able to think and express complex ideas logically and fluently (Johnston *et al.*, 1997).

In order to take abstract information and apply it logically and fluently, one must approach a task with the ability to learn on a deep level. Marton and Saljo (1976) introduced the distinction between deep and surface learning. With deep learning or deep level processing, the student is directed towards the intentional content of the learning material, in other words, to find the significance of any given problem. With surface learning, the student searches for the obvious answer within the text and not the underlying significance of the problem. Thus, surface learners tend to use a "rote learning" strategy, triggered as a median to achieve a short-term goal (Marton and Saljo, 1976). Whilst students whom use this approach may be successful in memorising entire texts for the short term, they are less able to apply theoretical concepts and principles to varying contexts, and less likely to retain knowledge in the long term. Therefore, a tutorial approach, which fosters deep learning, seems crucial if students are to retain knowledge in the long term and be able to link complex theory with practical application.

A problem based learning (PBL) approach sets out to achieve this aim. Boud and Felletti (1991) define problem based learning as "... an approach

to structuring the curriculum which confronts students with problems from practice providing stimulus for learning". Thus, by using economic theory to find solutions to real world problems, students take an active role in their learning and move away from being passive participants in the learning process.

According to Dahlgren *et al.* (1998), PBL has three distinctive features. Firstly, it uses real life situations as the starting point for the learning. Real life situations help students understand the context within which the knowledge is to be applied, and thus the students' questions and problem formulations constitute the basis of the learning task. As a result, learning becomes self-directed, with students accepting responsibility for their own learning outcomes. Students have to be aware of what links need to be made between theory and application, and draw knowledge from a wider scope of areas. By using a problem solving approach and drawing on various sources of knowledge, students identify their prior knowledge and pose questions for which they actively seek answers.

Subsequently, PBL is seen to increase the perceived relevance of the subject, encouraging a positive learning environment where students experience greater medianing and flexibility (Sobral, 1995). Thus, the likelihood of students retaining the knowledge in the long term, and developing sound analytical skills increases. Dundas (1993) found that by adopting tutorial activities that concentrated on application questions and dealing with problems, the chances of "rote learning" were minimised.

One of the most characteristic features of PBL is the work in small groups, where tutorials make learning and problem solving an open and shared experience, as opposed to a traditional way of studying, where learning is preserved as a private activity (Dahlgren *et al.*, 1998). This is a fundamental component of PBL. Deep learning needs to be facilitated by problem solving exercises as well as co-operative group work.

Co-operative or collaborative learning encompasses a large number of structured, systematic, in class techniques that engage students in group work toward a common goal (Maier and Keenan, 1994). According to Gerlach (1994), "collaborative learning is based on the idea that learning is a naturally social act in which the participants talk among themselves; it is through the talk that learning occurs". Cognitive theory argues that in order for learners to retain and comprehend knowledge, it must be placed in a conceptual framework (Cooper *et al.*, 1997; Slavin, 1995). In the small group setting, the learner has the opportunity to rehearse their understanding with others and to be exposed to other conceptual constructs. Also, in order for knowledge to be internalised and a framework established, a social discourse must first take place. It is this discourse that leads to the conceptual framework in which to relate the new knowledge (Brufee, 1992). As MacGregor (1990) stated, knowledge is shaped, over time, by successive conversations, and by the ever-changing social and political environments. Educational literature shows that collaborative methods have a positive effect on student achievement (Slavin, 19990),

and promote higher achievement than the traditional competitive or individualistic efforts do (Mesch *et al.*, 1988).

Although it is not a panacea that solves all instructional problems experienced by assistant lecturers and lecturers, it has been demonstrated through various studies to be superior to competitive and individualist learning (Cuseo, 1992). A collaborative approach to tutorials, also encourages deep learning and the development of improved communication and teamwork skills (Kagan, 1992). In fact, research shows that students collaborating in groups learn more, use higher level reasoning, are more satisfied with their classes, are less likely to drop out, and more tolerant of ethnic and racial differences (Maier and Keenan, 1994). Thus, the use of collaborative learning is essential when combined with PBL, as students discuss, explain and understand new ideas more freely. Students communicate their understanding to their peers, and the tutorial session moves away from a traditionally didactic to student based form of instruction. By working in groups in order to solve a set of problems, students are responsible for their own learning outcomes, and come to rely on one another in order to understand complex notions and applications. Consequently, an individual student's achievement related to the level of help the student gives to others (Johnston *et al.*, 1997) resulting in the tutorial session moving away from its traditionally passive competitive format, to a more active cooperative experience. Therefore, a collaborative problem based approach to tutorials is conducive to increased student enjoyment, deep learning and subsequently, positive achievement of learning outcomes.

Methodology

Stage 1

This first stage of the project was concerned with sourcing and gathering literature on collaborative group work and problem based learning. It involved researching and analysing various pools of information which were all very positive and encouraging in their outlook. There was no evidence that openly discouraged collaborative nor problem based group work. Stage 1 consisted of preparing a written questionnaire to be completed by all students towards the end of the ECC1000 course, which aimed to assess the impact of the collaborative problem-solving technique on learning. A questionnaire at the start of the semester was also prepared to identify students' experiences with tutorials, however, it was revealed that 75% of the students were attempting ECC1000 for the first time and were not repeating the subject. Therefore, they could not state their past economics tutorial experiences, making the questionnaire not useful and thus, it was abandoned.

Stage 2

Stage 2 was primarily concerned with reconstructing the ECC1000

course so it would be suitable for the use of a collaborative problem solving technique. The changes were initiated in the tutorial format, where suitable tutorial questions had to be constructed and a tutorial plan had to be in place, for collaborative problem based learning to occur.

The tutorial plan highlighted the process of the first tutorial. The first tutorial was important because it was designed to allocate students into their groups. These groups were formed by the students themselves, rather than have the tutor put them into groups. This allowed the students to assert themselves within the group, and encouraged them to to communicate with one another. The students were given the task of selecting a name for their groups, which again encouraged a positive interaction between students. The students were then to work with their group throughout the semester and complete designated homework tasks such as tutorial group presentations of homework and group class tasks.

Stage 3

Stage 3 primarily dealt with the formation of the new subject outline for ECC1000, which included a new set of homework questions and class tasks. The new subject outline prepared, also listed key concepts and reading material relevant to each week's tutorial. The tutorial class was divided into two main stages; the first stage consisted of a set of homework questions which were to be presented by each respective group to the tutorial class as their turn arose, which was allocated in the first tutorial, and would take about 10 minutes. This ensured that students prepared homework tasks and worked together with their groups before the class. The course assessment also made sure that 5% of the students' marks to be allocated for group work presentation. After the completion of the group presentation and discussion with the whole class, the assistant lecturer distributed the class tasks: a set of unseen questions, which the students had to answer in 20 minutes. The last 20 minutes of the tutorial was allocated to answer and discuss the class tasks. The class tasks were questions developed prior to the Semester 2 implementation stage and were designed to have a problem-based format. Thus, the questions were directly linked to real life scenarios and real issues and problems that took the students out of the theoretical realm and into the area of real life problem solving.

Results

This final stage consisted of presenting the students with the questionnaire and to assess their experiences with collaborative and problem based tutorials. The aim was to detect students' response to the new teaching material and structure, and expose any problems. The results of the questionnaires provided sufficient information on the effectiveness of collaborative problem-solving tutorials. This enabled effective

evaluation of this pilot program with the aim of developing a coherent tutorial program to be implemented in ECX1100 in first semester 2000 for 1200 students. The number of questions on the questionnaire totalled 12. Sixty-nine students out of a total 70 who sat the final exam completed the questionnaires, and the student responses indicate a general satisfaction with the format of collaborative/problem based tutorials.

	60+ min.	45-60 min.	30-45 min.	15-30 min.	0-15 min.	Median[1]	Semi-Interquartile Range STR)[2]
1. This semester I spent the following time preparing for tutorials	4.3%	10.1%	14.5%	43.5%	27.5%	2.02	0.68

	Always	Often	Occas.	Rarely	Never	Median	Semi-Interquartile Range STR)
2. This semester I studied and prepared for tutorials with fellow students	0.0%	8.8%	35.3%	35.3%	20.6%	2.33	0.71
3. I found the ECC1000 tutorials easy to understand and follow	11.6%	52.2%	30.4%	5.8%	0.0%	3.76	0.56
4. The ECC1000 tutorials encouraged group tasks and activities	27.5%	43.5%	21.7%	7.2%	0.0%	3.98	0.64
5. I found the group tasks and activities helpful to learning	13,0%	42.0%	31.9%	11.6%	1.4%	3.62	0.67
6. I found the problem solving exercises in the tutorials helpful to my learning	17,6%	50.0%	25.0%	4.4%	2.9%	3.85	0.57
7. I found the ECC1000 tutorials enjoyable and worthwhile	11.6%	55.1%	27.5%	5.8%	0.0%	3.80	0.53
8. I have participated and participate in ECC1000 tutorials	25.0%	32.4%	32.4%	10.3%	0.0%	3.73	0.77

1. Median is an indication of the central point in the distribution of responses. It is calculated by assigning to each of the five possible answers, values from 5 for the best to 1 for the worst response. The higher the median for a particular question, the more the bulk of the students will have responded towards the best outcome of the scale.
2. The semi-interquartile range (SIR) is an indication of the spread of responses in a distribution. It is also calculated by using the same values for the median. The small SIR means that the students are in agreement on the question.

	All	Most	Some	Few	None	Median	Semi-Interquartile Range (STR)
9. This semester in ECC1000, the tutorials which maintained my attention and interest were	7.4%	36.8%	48.5%	7.4%	0.0%	3.38	0.58

	Positive	Unsure	Negative	Median	Semi-Interquartile Range (STR)
10. I found group work an experience that was	70.6%	26.5%	2.9%	2.79	0.85
11. I found the problem based exercises an experience that was	79.7%	14.5%	5.8%	2.87	0.31

	Greatly	Signifi-cantly	Some-what	Insignifi-cantly	Not at all	Median	Semi-Interquartile Range (STR)
12. I found that collaborative/problem based tutorials have helped my learning of ECC1000	8.7%	49.3%	34.8%	5.8%	1.4%	3.66	0.85

From the results, we can see that on the whole, collaborative problem based tutorials have had a positive impact on the learning outcomes of ECC1000 students. The new method adopted in the tutorials encouraged 28.9% of the students to study more than half an hour preparing for the class, while 72.4% (median 2.02) studied more than 15 minutes. Sixty-three point eight per cent (median 3.76) of the students found that the tutorials always or often were easy to understand, 71% (median 3.98) revealed that the tutorials always or often encouraged group tasks. Fifty-five per cent (median 3.62) argued that the group tasks and activities were always or often helpful to learning and 67.6% (median 3.85) argued that problem solving exercises always or often assisted their learning. Sixty-six point seven per cent (median 3.80) of the students found the tutorials always or often enjoyable and worthwhile and 57.4% (median 3.73) always or often participated in the class. Ninety-two point seven per cent (median 3.38) found the tutorials were interesting always, most or some of the time. Seventy point six per cent (median 2.79) and 79.7% (median 2.87) argued that group work and problem based exercises were a positive experience. Overall 92.8% (median 3.66) found the collaborative problem solving tutorials greatly, significantly or somewhat helped in their studies.

The areas, which the project found difficulty in implementing, were

establishing a solid group work ethic outside of the tutorials. Students still seemed to be under prepared for tutorials, and were studying individually, not as a group. For Question 2: *This semester I studied and prepared for tutorials with fellow students*, nobody answered always and only 8.8% often the median was 2.33. This can possibly be attributed to the nature of university life; learning is very individual and competitive, and one semester of collaborative group work is not enough to foster a change in this perception. In addition, students might experience difficulty in allocating the necessary time for group work due to extra curriculum activities and paid work. However, students need to understand the importance of preparing adequately for tutorials and need to understand the relevance of learning as a group. For the moment, university learning for a lot of students remained an individual and private experience, not a shared and collaborative one.

Conclusion

The introduction of collaborative problem solving tutorials in Introductory Microeconomics received a positive feedback. While the project was in its embryonic stage students were better prepared for the tutorial and they found the tutorial program enjoyable and worthwhile, which encouraged participation in the class. Overall the newly structured tutorials provided assistance in studying the subject and the feedback was quite positive for further developing the program. In addition, what is required is to encourage group work outside the tutorial. This can be achieved by development of appropriate materials to encourage group work outside the class and linking assessment with group work in and outside the class.

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