

# Evaluating online collaborative learning: A case study in increasing student participation.

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## Abstract

This paper outlines the research methodology and findings of a unit development project on an online collaborative learning component, for a first year Bachelor of Education course run in 2001, at the University of New England. The original premise for the project was that the application of activity based processes that required students to participate with one another in focussed discussions on a bulletin board, would result in improved outcomes for student learning. Also, this planned approach to the use of collaborative learning activities on bulletin boards was designed to allow the teacher to adopt the role of facilitator rather than the constant monitor which is becoming all too prevalent. The Activity System Model by Engestrom and Cole (1993, cited in Owen 2000) and adapted by Hewitt (2001), formed the basis for the selection of the activity: the Online Jigsaw, the design and the choice of processes. This model also provides the categories for student evaluation of the activity, which result in the findings articulated in this paper.

## Introduction

In the last decade various forms of electronic communication, linking students and teachers, have proliferated including the global adoption of dedicated bulletin boards, discussions or forums, incorporated within web based products such as WebCT, FirstClass and BlackBoard. On the one hand, these dedicated bulletin boards provide a great opportunity for the development of what Fitzclarence & Kemmis (1989) in an earlier non-digital age of distance education referred to as a 'community of scholars' and where in the digital age various writers have proposed the possibility of utilising dedicated bulletin board communication to develop a sense of community amongst the student body (Berge 1995, Brockbank & McGill 1998, Draper 1997, Gibbs 1999, Lander 1999, Hewitt 2001, Muirhead 2000, Paulsen 1995 and Salmon 2000). On the other hand, it also generates challenges for teachers and students. These challenges are represented in an increase in workload, allocation of time and integration of computer communications into their courses, particularly, but not exclusively, at the undergraduate level. Despite these challenges, competency in the use of computer based communication technology is becoming critical for most fields of endeavour and represents a heightening of the information technology agenda. For example, the recent Ramsey Report (2000) to the New South Wales Government illustrates this point.

*In this society technological literacy is assuming an importance commensurate with English literacy and numeracy. Simply, our schools must teach technological literacy; our teachers must be well prepared to do so (Ramsey 2000:206).*

This represents a challenge to teacher educators in communicating this need to their students: the next generation of teachers. What we have found through this project is that some students are not ready for this change and do not see the importance of computer literacy, in particular the use of online bulletin boards as an aspect of the changing agenda inherent in this demand for computer literacy.

Some of the challenges for teacher educators have come about through the adoption of an inappropriate model for use in the digital environment. Such as the transference of the traditional tutorial model into a dedicated bulletin board environment, which fails to provide a suitable process for the students to effectively engage in cooperative discussions or to develop a knowledge-building community (Hewett 2001, Engestrom and Cole 1993, cited in Owen 2000).

While the authors of this paper recognise and acknowledge that there is a complexity of issues that can affect the success of online discussions, such as computer literacy, technophobia and connectivity difficulties for distance students, our position is that, much of what passes for bulletin board discussion activity is often ill defined or lacks purpose for the student and results in a considerable increase in workload for the teacher. The focus of this paper is on the evaluation of a first year undergraduate student cohort, their ability to participate in effective discussion processes through the application of an Online Jigsaw, and on the level that the teacher can participate in the process without the students becoming dependent on the teacher's input.

## **Outline of the project**

This project set out to use online communication with a task based approach utilising the Jigsaw approach (Aronson 1978, cited in Kagan 1992), often employed to develop a cooperative learning environment. This pragmatic approach required the task to have a clear focus, provide a defined process with a student-derived text as the outcome and an opportunity for closure on the task. The goals of the project were to:

- Improve student engagement Develop students' interdependence and autonomy Develop a knowledge base for teaching and learning through group processes Place the students at the centre of the process and create the opportunities for the teacher to adopt a facilitation role.

The Activity System Model by Engestrom and Cole (1993, cited in Owen 2000) was applied to achieve the above goals as it provided a structure to plan out the focus, the process, the outcomes and the method of closure while aiming to develop a sense of community across the student cohort.

## **Student profile**

The project involved a cohort of 68 first year Bachelor of Education (BEd) students who were enrolled in a yearlong unit (12 credit points), conducted at the University of New England, (at other universities a unit may be referred to as a course or subject). The cohort was drawn from three of the seven first year BEd class groups: class A, class B and class C with approximately 24 students per class (see Figure 1). The students' ages ranged from 19 to approximately 40 years and several had chosen teaching as a career change. The majority of students entered the degree from high school. A significant

number were working part-time jobs whilst studying and several students had parental responsibilities that impacted on their studies.

## **Assessment Requirements**

The assessment for the unit required students to: write an essay of their own choice; write a reflection paper about the nature of teaching and learning which referred to their own experiences; present two seminar papers to their class and undertake a final test which consisted of a written essay under exam conditions. At the beginning of semester two, the students were given six questions from which the content of the final test paper would be drawn. Of these six questions, three questions appeared in the test. The students were required to address only one of these three questions in essay form. However, they were expected to study all six questions as topic areas to become familiar with the related theories, issues, problems and solutions stemming from these questions. The Online Jigsaw activity (described below) was incorporated into the unit to further develop the students' understanding and meaning making of these topic areas.

## **Introducing the technology**

In semester one, students in first year undertake a core unit in computer studies covering a wide range of computer skills. This unit whilst giving students some grounding in online technology did not include WebCT. Therefore, the introduction to the use of WebCT was addressed during their first face-to-face workshop in semester two, as these first year students had no previous WebCT online training. This introduction to WebCT was designed to provide a purpose and motivation for developing the skills in using the bulletin board for discussion through sharing their recent experiences from their school practicum. In addition, this provided the teacher with the opportunity to address any technical difficulties and to ensure that students had the opportunity to become familiar with WebCT in a supportive face-to-face environment, within their class group, ensuring that students felt secure having already established relationships during semester one.

## **Online jigsaw**

The Jigsaw approach (Aronson 1978, cited in Kagan 1993) is characterised by its strength to develop interdependence among students. The main goals that we wanted to achieve were to develop this interdependence, to develop skills of autonomous learning and for students to develop a knowledge base for teaching and learning through group processes.

*Each student on the team specialized in one aspect of the learning unit, met with students from other teams with the corresponding aspect, and after mastering the material returned to the team to teach his/her teammates. The Original Jigsaw was developed to create extreme interdependence among teammates (Kagan1992:18:3).*

A Jigsaw approach usually begins with a class of students being divided into Home Groups, in our case four groups of six students, with each person in the group assigned to a topic, or component, to explore. An Expert Group is then formed for each topic whereby, through discussion and negotiation, the members of the group develop their

mastery of that topic area. Finally, the experts return to their Home Groups to share their piece of information. Thus each person in the Home Group has a different piece of information to share. One benefit of this approach is that it allows large amounts of information to be explored and shared in a relatively short period of time.

The Online Jigsaw project adopted aspects of the Original Jigsaw design with students from each of the three classes being organised into six topic groups or teams. Students were allocated their topics (which were based on the six final test questions) and over a period of five weeks were to become topic experts. By week two of the Online Jigsaw activity, students were encouraged to take responsibility for their team learning by negotiating further online roles and processes to achieve the defined outcomes. It was envisaged that the roles and responsibilities would include a moderator, collators of reference material, collators of annotated bibliographies, summarisers of key issues and editors to compile the final text for sharing. Tasks included students searching for sources to link their topic with related theories of learning and teaching, developing questions to be considered, constructing points to be explored and finally jointly constructing a text consisting of findings, issues or concerns and recommendations or questions to be shared face-to-face within their class Home Group.

Figure 1 below shows the selection of students at random for their Expert Topic Groups, from the three class groups.

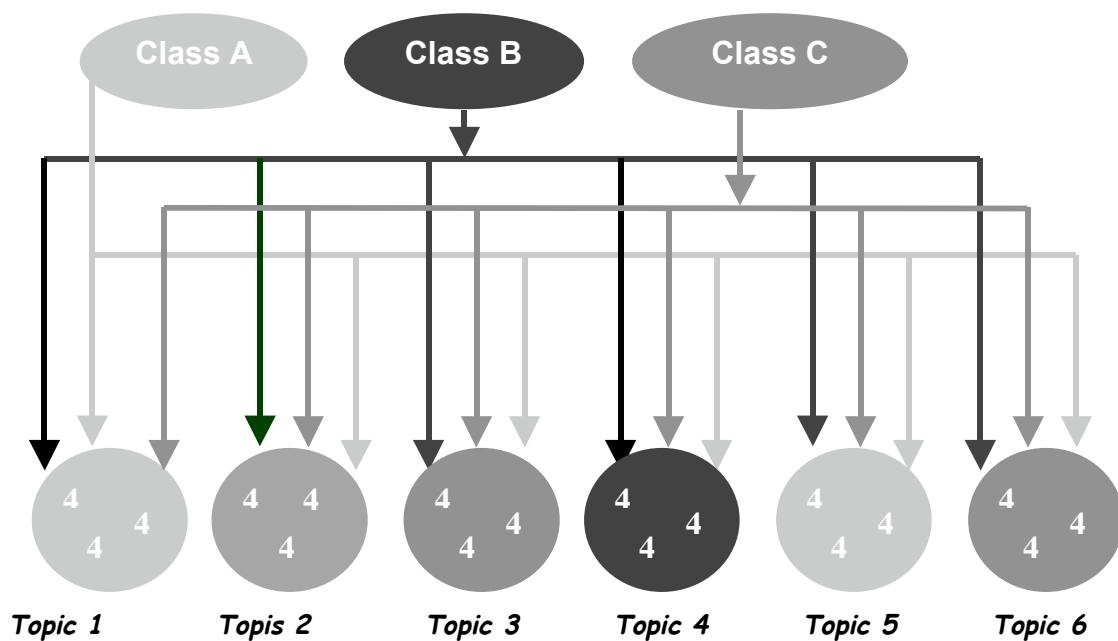


Figure 1 Online Jigsaw Expert Topic Groups

The study topics for each expert group were:

- Topic 1. Individual differences and school performance;
- Topic 2. Constructivism and how it relates to school children and life-long-learning;
- Topic 3. Learning difficulties and information processing;
- Topic 4. Knowledge and use of multiple intelligences;
- Topic 5. Acquisition/construction of new knowledge; and
- Topic 6. Implications for teaching in ethnically diverse classrooms.

Figure 2 below shows the coming together of the experts as a final face-to-face sharing activity. As with the Original Jigsaw, the experts come together to share their newly constructed knowledge and expertise. Over the remaining two weeks prior to the test, students continued to share their insights and provided explanations for their peers. Some of this sharing was online but a number of groups met face-to-face both inside and outside of class groups.

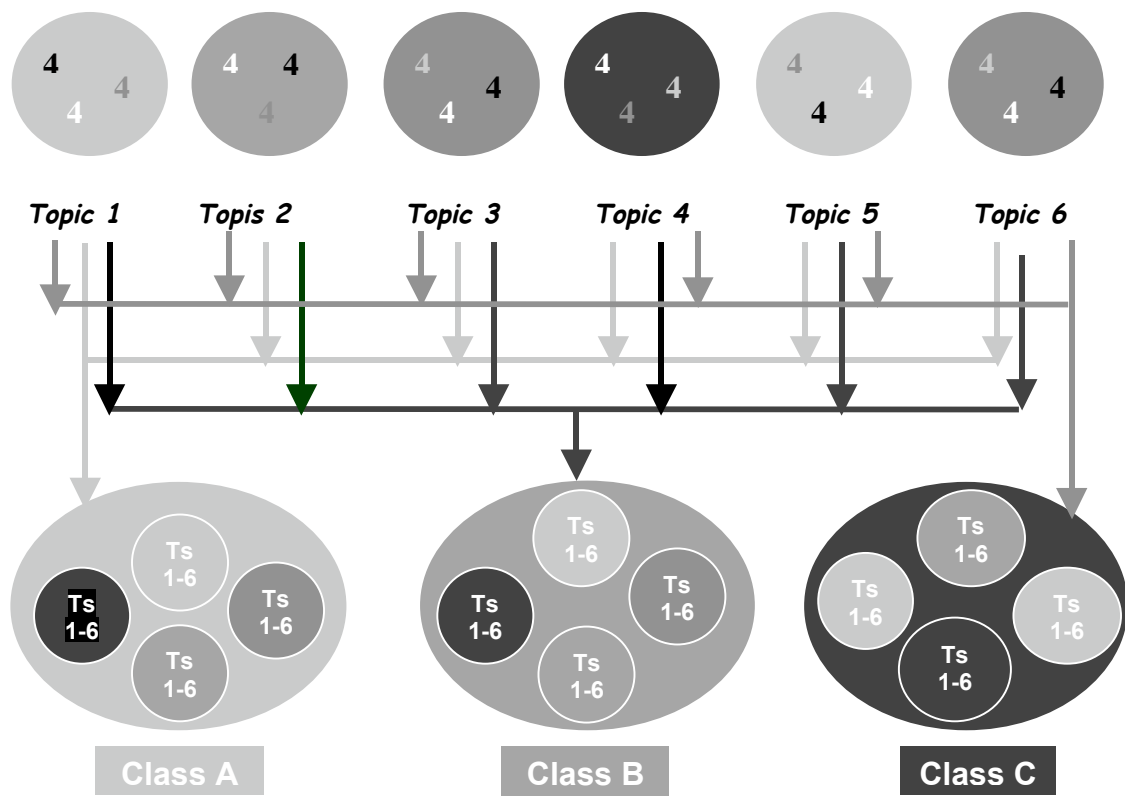


Figure 2: Face-to-Face combined topics 1- 6 in class Home Groups

## Teacher responsibility

The aim was for the teacher to provide the scaffolding rather than directing the process during the online tasks. We would argue that *task directed discussions* (Lee et al 1998, cited in Stenning et al 1999: 3) provide the opportunity for the teacher to adopt a less stressful role and require the students to participate in a structured, process oriented methodology, which will develop their skills to conduct and to drive the process themselves. The task design provided initial direction and scaffolding with a gradual reduction by the teacher of this support over the following weeks. A key issue for the Online Jigsaw was that while students have access to the teacher, the teacher is not online to respond to every posted discussion within the expert topic group, which places the onus on the students to cooperate with one another. One of the main roles of the teacher was to provide closure in the face-to-face sharing sessions through joint evaluation with the students on the final shared text.

## Activity system

As a means to establishing the desired relationships between the various elements of the Online Jigsaw activity, the Constructivist framework developed by Engestrom and Cole, which was developed to understand '*systems of distributed knowledge as cultural-historic activity systems*' (1993, cited in Owen 2000:4) was employed. Consideration was also taken of Hewitt's adaptation of this framework (Figure 3) that is described in '*The Activity Theory model for designing a Knowledge-Building Community*'. (Hewitt 2001).

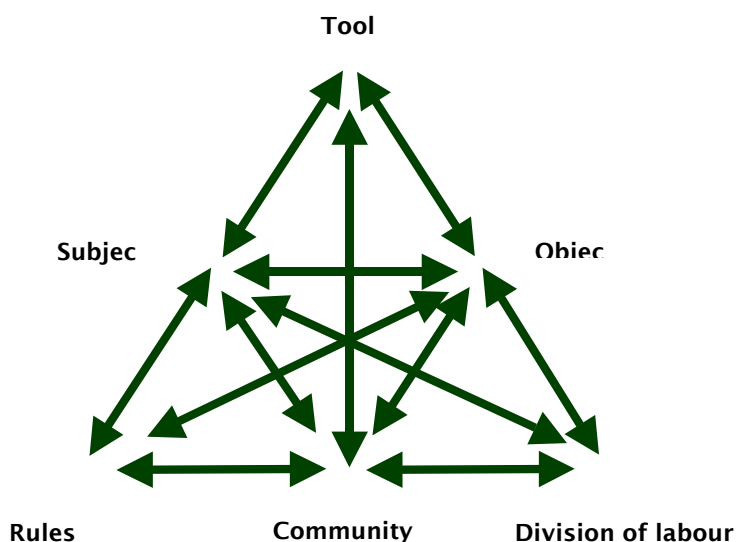


Figure 3 The Activity System Model: Engestrom & Cole 1993, cited in Owen 2000, further adapted by Hewitt 2001.

The six defined elements in the diagram interrelate and can provide a comprehensive understanding of the relationships between each element within any activity.

The following description outlines each element and each element represents a significant function or responsibility that needs to be considered in relation to the other elements, to achieve a successful knowledge building community for the students.

<b>Tools</b>	represent a knowledge forum, communication, communication technology, media and classroom resources.
<b>Subject</b>	represents the student/s as intentional learner/s.
<b>Object</b>	represents a student-generated problem of understanding, the subsequent discourse in shared discussion and an outcome that provides deeper understanding of the phenomenon under investigation.
<b>Rules</b>	represent the guidelines for class behaviour, the requirements for undertaking the activity and the standards for assessment.
<b>Community</b>	represents the classroom as a knowledge building community exhibiting pro-social behaviour.
<b>Division of labour</b>	refers to groups of students working collaboratively on different problems as well as the teacher as facilitator and resource person

(adapted from Hewitt 2001: 6).

## **Assumptions directing project**

Before undertaking this project, the authors of this paper based their Online Jigsaw design on a number of assumptions stemming from research in the field and their own learning and teaching experiences. The list below reflects these assumptions:

- Some first year students will find meaning making difficult
- Some students will not have had any experience with online bulletin boards
- Many teachers have difficulty in getting students to participate in online discussions
- Teachers apply marks to online contributions to motivate student participation
- Intrinsic motivation is better than external drivers such as the allocation of marks to online contributions
- Many teachers find they have to spend excessive time being involved in online discussions and marking contributions
- A task directed activity approach can reduce the teacher workload involved with online discussions
- Cooperative group learning is necessary for the building of a knowledge community
- Cooperative learning helps develop interdependence and responsibility for learning
- Some students will not immediately understand the value of interdependence

These assumptions were explored in more detail by the authors in a previous paper (Wylie and Hansford 2001).

## Survey design

At the end of the unit students were asked to evaluate the Online Jigsaw in several ways. Firstly, within class students were asked to give written feedback on the online component. Fifty-four of the sixty-eight students handed in an evaluation. Secondly, students openly discussed the positives and negatives of this component as a class forum. Finally, a survey was designed to allow students to respond anonymously. Surveys were mailed out to sixty-one students resulting in twenty-seven being returned, representing a 44% response rate. A six point Lickert scale was chosen instead of an five point scale so that students were required to commit to an agree or disagree position. The students could select from a range of: Strongly disagree, Moderately disagree, Disagree, Agree, Moderately agree and Strongly agree. This survey comprised 20 statements, listed below, and grouped under the six elements of the Activity System Model: (Engestrom & Cole 1999 cited in Owen 2000, and adapted by Hewitt 2001).

### Tools

- 1 The set textbook provided a suitable basis for my initial search of the topic.
- 2 It was easy for me to find additional material on my topic.
- 3 The bulletin board was an effective way to contribute to the discussion.

### Community

- 4 A cooperative environment developed within our group.
- 5 I was aware that interdependence (relying on others and being relied upon) was beneficial for my learning.
- 6 I was comfortable in contributing comments on the bulletin board.
- 7 Putting my ideas together with others was a legitimate way to develop an understanding of the reading material.

### Division of labour

- 8 The role of the lecturer was appropriate for me to undertake the online task.
- 9 The responsibilities within our group were shared equally.
- 10 The workload within our group was shared equally.

### Object

- 11 The consensus document of my group captured my thoughts about teaching and learning theory.
- 12 The online task enabled me to broaden my knowledge of teaching and learning theory.
- 13 I found the online jigsaw task a rewarding experience.
- 14 The jigsaw activity contributed to the development of my understandings for the final test.

### Rules

- 15 I would have preferred another method for contributing my comments for the task.
- 16 The designated topic for my group provided a stimulus for my learning.
- 17 I had enough information and direction to undertake the online jigsaw task.

## Subject

- 18 I made a reasonable effort in contributing comments for the task.
- 19 As a first year student I had adequate skills to undertake computer communications.
- 20 The initial training on the use of WebCT was sufficient for communicating through bulletin boards.

Finally, students were asked on the survey to comment on how they believed the online jigsaw could be improved.

## Results from the Survey

The following analysis of the survey is based on a comparison of each survey selection and the written response to the survey statement. Of the twenty-seven survey returns approximately fifteen consistently provided a written comment. A brief analysis of how the comments correspond to the survey results is provided along with examples from the students' comments, followed by considerations for a redesign of the activity.

## Tools

All three statements within this section received majority support with a strong match between the survey responses and the written comments. It would appear that the majority had little trouble in using the set text or finding additional resources, although 5 comments indicated that, additional texts for gathering information would have helped. It would appear that a small minority did not understand that they were meant to seek further resources to undertake the activity. The third statement produced the greater degree of divergence between the survey results and the written comments. However, the majority still agreed that the bulletin board was a useful tool.

### 1. The set textbook provided a suitable basis for my initial search of the topic.

*The textbook had all the relevant information in it but at times it was hard to understand.*

*At times the text was difficult to understand ie. The language was fairly advanced and full of jargon.*

### 2. It was easy for me to find additional material on my topic.

*Lots of material available ie, Library the hard part is knowing where to start looking.*

### 3. The bulletin board was an effective way to contribute to the discussion.

*If the bulletin board was used by everyone, with a contribution from each & everyone in the group it would have worked better.*

## Community

The first statement within this set produced the greatest range of responses across all sectors of the survey. Of the written comments only 2 were positive while the remainder suggested that they were not bothered to participate or that there were not enough contributions from others to keep them interested. A small number found it difficult to communicate with students they didn't know. We can clearly see that a number of students found that there was a cooperative environment in their group, however, because people didn't fully participate, this had an effect on other students' thoughts and feelings about the environment. Clearly a number of students were aware of the benefits of interdependence but were frustrated and saw some fellow students as being unreliable in not participating. This suggests that some students thought others were getting a free ride or cheating. This in turn could suggest that those who were aware of the benefits of interdependence did not understand that those who did not participate were not fully benefiting from the process. While the majority of students were comfortable with contributing comments on the bulletin board there were reservations about putting their ideas forward in front of others and concerns about being wrong, particularly with students whom they did not know. The strongest negative comment was from a student stating that giving away her ideas may prevent her gaining a high distinction. This attitude is not uncommon and represents a form of competitiveness, which is compounded at university for students by what Bruffee describes as that '*...long-prevailing academic prohibition on collaboration. Traditionally, after all, collaboration skates dangerously close to the supreme academic sin, plagiarism.*' (Bruffee 1999: 19), of which, students are only all too aware. Overall the overwhelming majority of students felt that putting ideas together with others was a legitimate way to develop their understandings. However, a minority had difficulty in dealing with students whom they did not know. It may be that in groups where the online interaction did not function well, the putting together of ideas only occurred when they came together at the end of the process in face-to-face mode.

### **4 A cooperative environment developed within our group.**

*Only some people put in the work and others did not, that was unfair and disappointing after making an effort to supply information, especially to strangers (ie.unknown students from other groups).*

*Most people cooperated in their groups though others couldn't be bothered at all. It really depends on each person's individual motivations.*

### **5. I was aware that interdependence (relying on others and being relied upon) was beneficial for my learning.**

*Yes I realised, but that doesn't mean to say I liked it. I think working with other people that we didn't know was stupid because to me, they were just names, not people, so it was easy to let the names down by not working without feeling guilty.*

**6. I was comfortable in contributing comments on the bulletin board.**

*I have a problem with others having too much access to my personal thoughts on a topic. And it may have been these thoughts which would have been able to give me an HD.*

*I liked/enjoyed contributing to the discussion and liked getting replies of other group members suggestions.*

**7. Putting my ideas together with others was a legitimate way to develop an understanding of the reading material.**

*I really liked the idea of combining ideas from a group of people and producing the best possible answers.*

**Division of labour**

There was a close correlation between the survey selections and written comments, however, the division of labour was not seen by most students as acceptable. While the majority suggest that the role of the lecturer was appropriate, three key issues emerge. Firstly, some students felt that they needed the lecturer on campus for their motivation to keep them on task, which related to the students' sense of inadequacy and anxiety about their online contributions. Secondly, some students wanted more direction and organisation for undertaking the task and ongoing scaffolding to remove confusion and ambiguity. Thirdly, some students expected the teacher to be on campus instead of overseas (the teacher visited China on Faculty business in the second week of the students' online task), which relates to the two issues above. Clearly students did not think that responsibilities were shared equally and there may have been some ambiguity about the statement as students have interpreted responsibilities as contributing instead of taking on the role of collator, editor etc. There was also some lack of reliability, as even though tasks were allocated, they were not carried out. It would appear that students did not differentiate between statements 9 & 10. Again the written comments show that a lack of contribution was a major issue for those who made comments.

**8. The role of the lecturer was appropriate for me to undertake the online task.**

*Considering that di was in China, I tend to think it was easy for us not to do it, because she wasn't here to tell us to do it. She could check to see if we had been online, but her "power" when it came to getting us to do it was very limited.*

**9. The responsibilities within our group were shared equally.**

*Many people cooperated and shared the responsibilities equally, but as I said before you will always get one or two people who just can't be bothered at all.*

*Could have been better allocated.*

**10. The workload within our group was shared equally.**

*Most people did what work they could, some did not do anything at all. I guess it just depends on how well you get on with people in your group.*

## Object

The responses to the four statements contrast with each other. Statements 11, 12 and 14 show strong positive support but 13 has a majority negative position, which may suggest that for some students the online Jigsaw did help their learning, but they were not comfortable with being involved. While there was a close correlation between the survey responses of agreement to the positive written comments, the majority of respondents disagreed that it was a rewarding experience. The major issues arising from the comments to statement 12 was the perceived lack of contribution, high workload and possibly students' level of skill in going online. Despite this, the majority of students did find that the online task broadened their knowledge of teaching and learning theory with a strong correlation with the positive written comments. There are a small number of students who have a preference for working on their own. However, their reasons were not universal for this preference. Clearly the majority of students agreed that the activity contributed to the final test understandings. So the outcomes of the activity, from a product perspective, were successful. Some of the contrast across the group of statements could indicate that some students have not made the connection between succeeding and enjoying the process. This may have something to say about what they expect at university as first year students and what constitutes an enjoyable learning experience.

### **11. The consensus document of my group captured my thoughts about teaching and learning theory.**

*Most members of my group did not really understand the question so considering that I think what we produced was reasonable.*

*Provided an opportunity for me to gather information on how I am going to teach children during my career. It hopefully has helped me and I realise how important teaching is.*

### **12. The online task enabled me to broaden my knowledge of teaching and learning theory.**

*The information presented on the group bulletin board was very informative and enabled me to broaden my knowledge on the topic.*

*Not really the only topic that you know thoroughly enough to do well in is your own I think.*

### **13 I found the online jigsaw task a rewarding experience.**

*Yes it gave me a chance to interact with not only my tutorial group but others as well.*

*In the end, everything seemed to finally come together. The activity gave me the basics of all the different subjects that would be in the exam..*

*Not that rewarding but informative.*

**14. The jigsaw activity contributed to the development of my understandings for the final test.**

*When all information from the groups was received the online jigsaw, gave a great understanding in preparation for the final exam.*

*Having the jigsaw activity open to all was a great idea at the end as it allowed for all of the information people contributed to be read and interpreted to be ready for the exam.*

**Rules**

Statement 15 provided the opportunity for students to opt for an alternative contribution method with the majority preferring another method for contributing their comments, however, the main issues raised in their written comments related to access, unknown students and the lack of contributions by others and the expectation that the teacher is controller of learning. The advantage of time independence for contributing does not seem to feature in the students thinking. In contrast, the responses and written comments to statement 16 indicate that the students did find their topics stimulating and a positive aspect was their realisation in the transferability of knowledge and the value of that knowledge. There is a close correlation between the survey results and the written comments. A small number of students did raise the issue of self-selecting their own topic, however this has implications for the balance within groups and also has implications for the final test, as their chosen topics may not appear in the test. The authors now consider statement 17 as flawed in that it inadvertently sought two different data sets ie 'information' and 'direction'. The statement should have directed the students to the issue of direction and not information. The students read this to mean content information and not information as to undertaking the activity. While the survey results agreed that they had enough information and direction there was a disparity with the written comments, which appeared not to support the statement.

**15. I would have preferred another method for contributing my comments for the task.**

*The class should be a group for the Jigsaw activity. This way it is easier to come together and discuss things. Also the slack people who did not do any work could be spoken to by the class members.*

*I am not sure what other method we could use that everyone has access to in such a short time.*

**16. The designated topic for my group provided a stimulus for my learning.**

*The given topic provided heaps of stimulus to my learning as there were so many possible answers and so much information that needed to be summarised in order to answer the question.*

*I wasn't really that interested in my group's particular topic but it was okay.*

**17. I had enough information and direction to undertake the online jigsaw task.**

*It was a little hard understanding the question and what was expected while. Di was in China.*

*A little more direction in the use of extra resources would have been handy. The curriculum centre and library did not have much on our topic..*

**Subject**

While statements 18 and 19 sought information from the students that could be perceived as negative, if they responded in the negative many were prepared to offer what could be termed open comments. While the majority of responses to the survey and the written comments were positive, some students did not become motivated and therefore involved until the end of the process. Lack of contributions by students impacted on those students who did become involved, which negatively impacted on their efforts. Towards the end of the activity it appears that for some students the realisation that participation could positively influence their results in the final test, increased the participation rate. It was evident that a number of students felt that computer studies had prepared them well for online participation. While the survey results indicate that students were satisfied with the level of training some written responses indicated that they would have liked more initial training. One positive is the suggested that while some students had problems with the initial training, they approached their colleagues, who had higher skills, to give them assistance.

**18. I made a reasonable effort in contributing comments for the task.**

*Nope, I didn't. Not until the end.*

*I put in a full effort to try and make this work, by completing each weekly task and giving my thoughts to other people's responses.*

**19. As a first year student I had adequate skills to undertake computer communications**

*Not a problem for me, as my computing skills seem to be of a fairly high standard – I use the things enough for it to be the case!!*

*Undertaking the computer class during 1<sup>st</sup> Year allowed me to develop my computer skills a lot more to undertake this online task.*

**20. The initial training on the use of WebCT was sufficient for communicating through bulletin boards.**

*I felt that it had been explained well of what was expected and how to use the WebCt. I had no troubles.*

*I think we could've had a little more training especially some people were totally new to the concept of bulletin boards.*

## Issues and changes to the process

Whilst having a number of students who did not participate effectively in the collaborative task-based Online Jigsaw it would be wrong to conclude from the results that the jigsaw is unsuitable for an online application. It is quite evident, and experience shows us, that in the face-to-face situation there are often a number of students who prefer to work alone and who do not contribute. We are not attempting to prove that either the online or face-to-face mode is superior to one another, but what we are attempting to do is to consider how we might improve the application of the Online Jigsaw from these findings.

The responses from students to collaboration and interdependence supports the belief that at the undergraduate level there are questions concerning how well equipped students are in question formation, putting forward their own ideas and meaning making (Perry 1981). Clearly the development of intrinsic motivation does not happen automatically and many undergraduate students have to undergo a process of 'reacculturation' (Bruffee 1999), becoming part of a 'transitional group': a group coping with the new 'language, mores and values of the community' (Bruffee 1999: 6). It is clear that some students have not come to this realisation and therefore, acceptance of the benefits of interdependence, cooperation and independent thinking, have not occurred.

Many students misunderstood what was required in the Online Jigsaw in that they only provided information to their groups and did not engage in an analysis of that information. Therefore, a significant number of the students only engaged in the activity at a surface level. By taking greater care with the framing of directions with a focus on analysis for future online tasks, the students' level of engagement with the content will be addressed. This care in the framing of directions will also be necessary for clarifying the rules, the use of tools, the roles and responsibilities and the type of community desired. This will ensure the directions are more readily understood especially if presented in multiple forms: verbally in class, as a written handout and on the bulletin board instructions themselves.

There is an ongoing tension between cooperative learning practices and the competitive nature of university environments. In future, this will be addressed through the introduction of cooperative processes earlier in semester one, as well as having a focus on what occurs through those processes. This should allow students to gain an appreciation, for not only the theory and the practice, but also what occurs through the process as a result of this practice. Placing the Online Jigsaw activity within smaller class-based groups should avoid the problem of lack of participation by students who found it difficult to communicate with students whom they did not know. In turn, this will allow peer pressure to be more effective by encouraging those who may be tardy in taking up responsibility for the roles within the jigsaw, to do so.

At one level, students were satisfied with the role taken by the teacher though many lost motivation when the teacher was overseas. This occurred when online scaffolding was difficult to apply due to poor infrastructure in China as well as the teacher travelling within China. In future, this should not be a significant problem, as the introduction to

the activity will be run earlier in semester one. In addition, greater care with directions should alleviate this problem. This is not to suggest that ongoing scaffolding is not important, however, the retiming will make it more possible for this to occur more regularly. In addition, this retiming should address the issue of assignments being due when students are expected to engage online. We would still argue that *task directed discussions* (Lee et al 1998, cited in Stenning et al 1999: 3) do provide the opportunity to change the degree of direct involvement required by the teacher and thus place greater responsibility on the students. This is a question of adjusting the balance between independence and interdependence of the students to the direction/scaffolding of the teacher.

While student motivation could be increased by allowing them to select their own topic, any method that could be employed to achieve this would be somewhat artificial, as the requirements of the unit will dictate what the range of topics could be. Furthermore, if students did choose their own topics there would be a protracted period of negotiation between students and teacher to achieve appropriate sized groups, to satisfy the needs of the students and to fulfil the requirements of the unit.

## **Conclusion**

The application of the Activity System Model (Engestrom & Cole 1993, cited in Owen 2000, Hewitt 2001) to the Online Jigsaw has provided a focus for the original design of the Online Jigsaw, its evaluation and its subsequent redesign. Most of the issues that the evaluation identified that need to be addressed, result not from a failure in the Activity System or the jigsaw activity but in the clarity of the expectations and the understandings of the students.

There is clearly a greater emphasis and requirement from society and governments for greater computer literacy and the ability to teach computer literacy within school systems. This represents a significant challenge to student teachers and teacher educators. This computer literacy includes classroom teachers using the Online Jigsaw, in a school situation.

Having addressed the issues identified throughout the evaluation it is anticipated that through the next application of this Online Jigsaw Activity, a greater level of meaning making, interdependence and a cooperative environment will be achieved addressing the changing agenda inherent in this demand for computer literacy.

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