Peer-learning and Reflective Thinking in an On-line Community of Learners

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Abstract. There is a growth in the use of Computer Mediated Communications (CMC) in teacher education and professional development, together with a strong interest in creating **reflective discourse communities** among teachers. With the use of CMC, geographically and socially isolated teachers can be brought together on-line to collaborate and co-construct knowledge by engaging in open and critical discourse. This paper looks at a specific on-line unit that was designed to bring together science and mathematics teachers from around the world for the purpose of familiarising them with technologies which they can utilise for their own, and their students' communicative learning.

Underpinning the design of this unit was the creation of a networked community of learners who engage with one another in**peer-learning and reflective thinking**. This study was conducted to determine the extent to which the intentions underpinning the design of this unit were fulfilled. In order to investigate this, data was triangulated from students' transcripts, end-of semester evaluations, and students' reflective stories. Analysis suggests that participants demonstrated a strong sense of belonging to this community, thus enabling them to share their experiences and knowledge. Peer learning became a significant feature of the community.

INTRODUCTION

With the increased use of on-line learning and with easier access to the Internet, there is a growing concern with the quality of teaching that we as educators provide our students in higher education. Four years ago when the first author began to use the Internet to teach her distance education postgraduate students, one of the goals was to overcome the intellectual isolation of the teachers who were enrolling in this postgraduate program from around the world. Today, the use of the Internet and the World Wide Web coincide with the goal of many universities to use new technologies in higher education to improve teaching and learning, to improve communication between students and their teacher, to make information more accessible and more relevant to the wider community and to implement professional development. However, while the Internet offers educators unique opportunities to enhance learning and reach out to a wider audience and more diverse learners, the traditional teacher-centred knowledge transmission model still dominates. That is, information exchange between the teacher and the students is still the primary practice of many networked groups. This suggests that a different approach is, therefore, required to bring about the advantages that the Internet is able to offer to teachers and their learners.

Due to the proliferation of education via the Internet, the second author was faced with the option of taking on-line courses that were supported with computer conferencing. This was a new learning experience for her and she subsequently went on to assist the first author in moderating an on-line course. The result of their exposure to on-line education led to their interest in research in this area of teaching and learning in higher education.

CONCEPTUAL FRAMEWORK

The first author is engaged in designing and facilitating on-line learning courses. She uses social constructivism as a referent for her teaching and the focus of the educational experience is on the web of interaction between herself and her students, and among students. Social constructivism describes an epistemology, or a way of knowing, in which learners collaborate reflectively to co-construct new understanding, especially in the context of mutual inquiry grounded in their personal experience (Maor & Taylor, 1995; O'Connor, 1998). Central to this collaboration is the development of communicative competence that enables students to engage in open and critical discourse with both the teachers and their peers (Taylor & Maor, 2000). This perspective positions the learner as an active constructor of knowledge within a socially interactive environment in which negotiation of meaning and co-creation of knowledge occur (Bonk & Cunningham, 1998). Knowledge can be constructed both socially and personally as a dialectical relationship existing between the individual's contribution and the social contribution to knowledge (Tobin, 1993).

From a social constructivist perspective, the significance of computer conferencing has been discussed extensively in the research literature (Berge & Collins, 1995; Jonassen & Reeves, 1996; Blanton, Moorman, & Trathern, 1998). The on-line unit discussed in this paper is designed on the basis of a social constructivist perspective (Tobin, 1993; Duffy & Cunningham, 1996) It aims to foster interaction and collaboration. This type of design is also supported by Berge and Collins (1995) who suggest that "as an agent for socialisation and collaboration, the networked computer has even greater potential in education for providing an active environment for social learning (p. 8)". Furthermore, the nature of Computer Mediated Communication (CMC) technologies has the potential to enhance reflection and community building among learners. This is particularly so for distance learning courses since they traditionally offer fewer opportunities for discussion and debate. In the field of Distance Education, Sumner, (2000), uses Habermas's theory of Communicative Action to asses whether the interaction is end-oriented action, or process –oriented action. She suggests that computer conferencing carries the potential for the interactivity that enables communicative action, but does not guarantee it. The use of the Internet has the potential to affect teaching in other ways. For example, the Internet changes the nature of interactions: "[u]nlike a live classroom, where conversations disappear, the Web allows every thought to be captured for future examination, elaboration, and extension" (Owston, 1997, p. 29).

Using a social constructivist framework, the first author set out to create a community of learners within which students could collaborate and learn from one another and reflect on their learning and on the contributions of their colleagues. In other words, peer-learning and reflective thinking were to assume significant importance in this community. In on-line learning, there is a general tendency to assume that a group of learners, connected via some kind of CMC technology and interacting periodically, constitute an "on-line community". The key to a learning community however, lies in a sustained and engaged interaction where students can collaborate and negotiate meaning with one another. Kaye (1989) states that "conferencing is primarily about interaction" (p.16). As students describe their own experiences dealing with the same crises and dilemmas they all face, they are able to check, reframe and broaden our own theories of practice. "Although critical reflection often begins alone, it is ultimately a collective endeavour" (Brookfield 1995, p.36). Reflective thinking involves gaining new perspective on our practice and questioning assumptions that we did not even realize we had. Critical reflection is a quest for insight, critical clarity and openness to alternatives as we seek to encourage these in others. Reflection is a personal and individual process, but at the same time it is a social one because the individual reflects through the language and the writing**.** Zhao & Rop (2000) raised the issue of a reflective discourse within a community of learners when they argued that the creation of a reflective discourse community is still a major goal to be achieved. They asserted that very few studies

have examined the extent to which the networks were indeed, communities that promote reflective discourse.

PURPOSE OF THE STUDY

This paper which looks into the issues of peer-learning and reflective thinking is part of a larger study which investigated the quality of students' learning experience and the quality of their interactions on-line. Within the larger study, the study presented here aims to address the question: To what extent does this type of on-line teaching enhance the creation of a community of learners that supports peer-learning and reflective thinking? In order to answer this question, data were triangulated from students' conference transcripts, end-of-semester evaluation, and students' reflective stories. The use of triangulation is advised by Mathison, (1988), to ensure reliability and validity in a study.

METHODOLOGY

The research approach was underpinned by a constructivist theory of knowledge in which the aim of the inquiry is to investigate and understand the quality of the learning experience on-line. A constructivist epistemology views knowledge as a construct of individual's understanding (Guba & Lincoln, 1994). In view of our study which aims to investigate the processes of social negotiation and co-construction of meaning, this methodology is the most appropriate. It recognises individual's construction of knowledge to be an interpretation and not a correspondence to an external reality (Von Glasersfeld, 1990).

In reviewing methodological approaches used in evaluating CMC, Mason (1992), reports that the majority of studies came out of a quantitative/positivist paradigm, using techniques such as survey questionnaires, interviews, empirical experimentation and computer-generated statistical manipulations which do not shed much light on the quality of learning taking place. In addition, only a few studies have sought to analyse the transcripts of students' on-line conferences using social constructivism as a referent for the investigation (Gunawardena, Lowe and Anderson, 1997). Our approach to this study was unique in that we sought not only to use qualitative methods in gathering our data and in our analysis, but also, our role was that of active participants who were engaging in joint communicative discourse with the participants.

Students who participated in this on-line unit were science and mathematics teachers from Canada, Vanuatu and various parts of Australia. These teachers had different prior knowledge in relation to the use of computers and different teaching experiences. Therefore, they also had different expectations form this unit. Their teaching experience ranged from zero to 15 years in the classroom. Most of the experienced teachers were also experienced on-line learners with positive attitudes towards the use of computers in education. The first-time on-line users were naïve in relation to use of computers, but they were also eager to learn from their colleagues and were open to new ideas. There were others in the group who were new to the use of computers and were sceptical regarding their application for improving teaching and learning.

The Unit and Its Structure

The purpose of the unit was to familiarise them with learning technologies and to engage them in utilising them for their own, and their students' communicative learning. In this innovative electronic community of learners, geographically and socially isolated students have carefully structured opportunities to establish communicative relationships with each other and to reflectively co-construct their knowledge by engaging in open and critical discourse. Within this community, students utilised computer-mediated communications

while examining current theories of learning with computers, evaluating educational software, and researching ways to incorporate the technology into their science, mathematics, or computer science classrooms.

The unit is made up of two components, a static and a dynamic component. The static component provides access to the main unit content and includes journal articles, book chapters, and other printed materials. The dynamic component, situated on the web, included personal e-mail communication, on-line readings, a resource room which initially housed some of the first author's basic links but which gradually grew from students' own contributions, and most important of all, the *Activity Room* where text-based asynchronous communication with the facilitator and students took place. The unit was a semester unit, covering a range of selected topics over 14 weeks of focused activities among students. Each week, they were required to respond at least once to the readings for the week and to engage with each other in communicative acts pertaining to the topics. Students' contributions and discussions in the*Activity Room* were compulsory and accounted for 40% of the assessment in which they were assessed for the quality of their participation and their role as a *Discussion Leader*. This would suggest that interaction was an integral aspect of the unit. The discussion leader role was a feature designed by the first author to promote students-centred learning in which students would take control over their own learning and be responsible for their learning and those of their colleagues. In this role, students take turns each week to introduce the topics, pose questions relating to the readings, facilitate the discussion and finally summarise their colleagues' contributions.

DATA SOURCES

Conference Transcripts. These represent students' ongoing contributions during the semester to the Activity Room and they provide us with direct evidence regarding their learning processes. Transcripts from the web site were first downloaded into a Word document which were then imported into the NUD*IST data analysis software (Richards, Simon, Maisans & Davis, 1992). From here, literature on social constructivism guided us in our analysis of emerging patterns, themes, phases and concepts relating to peer-leaning and reflective thinking. From the transcript analysis, initial assertions were formed (Erickson, 1986, 1998).

End-of-semester evaluation. In the 13th week of the semester, students were asked to provide an evaluation in relation to their on-line learning. The evaluation contained 16 open-ended questions which were divided into three categories: yourself as a learner, yourself as a discussion leader, and other aspects which are significant to their learning within the community. The purpose of the evaluation was to enable students to express their perceptions regarding their experiences and to provide the facilitator with critical feedback on the facilitation of the unit.

Students' Reflective Stories. During the semester, a few students had kept accounts of their journey and these were used to provide us with further understanding into their role as learners. According to Carter (1993), stories can become a central focus for conducting research analysis of teacher knowledge and to provide us with special access to understand the teaching and learning processes in on-line learning.

FINDINGS

Data obtained from on-line transcripts, end of semester evaluation and extracts from students' reflective stories provided us with rich information from which we discovered insights into how to evaluate the creation of an on-line community of learners. Data were analysed to form assertions as part of interpretive research methodology. Initially a process

of reflection on conference transcripts was used to form temporary or 'first level' assertions. Subsequently, the other data sources were used to support or reject the temporary assertions in order to form general assertions (Erickson, 1986, 1998).

In this section, each major issue in relation to a community of learners, reflective thinking and peer-learning is represented by general assertions follows by discussion in the next section.

Community of learners

As mentioned in the methodology, one of the goals of the on-line unit was to establish a community of learners in which students, especially geographically isolated and first-time on-line students, could feel a sense of belonging. A creation of a community was made possible by the facilitator through the learning environment she created when she engaged students in the self-introduction activity. As a learning environment, it also paved the way for the different styles of conversation and communicative strategies that occurred among students in the learning community.

Assertion 1: In order to establish and develop an on-line community of learners, it is important that the facilitator first creates a non-threatening and supportive environment in order to break the feeling of isolation.

The manner in which students interacted with one another reflected the manner in which the facilitator herself first interacted with her students. Their interaction is mainly informal, friendly and sociable, reflecting the collegial nature of a community. One of the students, Serani, highlighted the relationship between her on-line colleagues and her own involvement when she said in her reflective story, "I started the unit cautiously. I was testing the waters because I needed to know who my coursemates were as they would influence the way in which I contribute to the activity room." Through the ongoing processes of their interactions, students formed their own learning environment. However, it was within the initial learning environment created by the facilitator that students formed their own environment. As Serani continued in her story, "Although our discussions later proceeded quite independently of the [facilitator], it was made possible by the environment she had created."

The transcripts revealed that students' communicative style ranged from formal to informal tones of interaction and they are seen to be consistent with their approach towards one another. Students who write formally tended to be more individual in their interactions while those who are informal tended to engage their colleagues in more frequent conversations. The majority of students showed an informal style of writing; their tone of conversation displayed friendliness and the contents of their conversation contained many social exchanges. For example Jean described her winter break together with her effort to keep up to date with the on-line work:

> This is my second attempt-I somehow lost my posting before I could post.. agh! This is the first day of our 2 week winter break-yes winter-snow, ice sunny but -5 degrees. (Article No. 13).

Through their friendly exchanges, a feeling of collegiality developed amongst students, helping to ease the anxiety of geographical and psychological distance, and leading them to a sense of a community. Students' feelings regarding their colleagues' communicative style and the way in which it influenced their own participation in the activity room were corroborated in their end-of-semester evaluations. For example, Serani said, "…it was communicative and informal and the high interaction among everyone took away the

distance and isolation which I had earlier anticipated." Gary, further supported this feeling in his reflective story:

> One of the things I wanted to know about my colleagues was if they were fun loving learners or no-nonsense formal types. Such an understanding would affect how I write and address others in the activity room. But my questions was answered immediately. Some students started talking about themselves, their families, hobbies, footy teams, etc. This eased the tension I was feeling and soon I was also telling my own story and it was fun. (Gary's Reflective story)

The overall friendly exchanges between students also further provided for the same equitable learning environment amongst themselves. In this situation, they did not feel threatened by one another's ideas but could share their knowledge freely. This situation was highlighted by Jean and Kathy in their end-of-semester evaluation, respectively, when they said, "The fact that we introduced ourselves and a little historical information set up a rapport between the group. This allowed me to feel more at ease, particularly as I don't have a strong technological background" and, "Everyone has an equal opportunity to participate which I am sure would not exist in a classroom of teachers. There were no voices that were silenced – a huge equity issue for me." This suggests that the on-line environment created a sense of equity between for the dominant students and less dominant ones.

Assertion 2: In order to maintain a sense of belonging in an on-line community of learners, social exchange should be an ongoing and integral part of the learning process.

There were many instances in which students used the activity room for purposes beyond that of discussing the weekly topics. The transcripts showed many instances of social exchanges, sharing of difficulties associated with on-line learning, and requests for help, which created a sense of belonging in students. As a community, with similar professional interests, students learn from one another when they sought information from each other and from the facilitator. Beyond this, students' social exchanges were also sources of incidental knowledge to one another. However, the facilitator also cautioned students against treating the activity room as a "superficial fact gathering" area.

Another aspect which suggest a sense of community was reflected in the way in which students did not feel isolated in their learning experience. Of the nine students in this on-line unit, only three of them raised the issue of isolation. Kathy attributed this feeling to a preference for face-to-face learning: "There were certainly times when I felt isolated…I learn best when I can discuss and go back and forth with my ideas. There certainly is opportunity in personal email etc but I felt what I was able to say in writing was more limited". For Jean and Gary, their lack of experience in on-line learning and the difficulties they faced in using the technology were factors which caused them to feel confused in their initial learning experience. Jean felt confused when she lost touch with her colleagues for a week, whereas Gary expressed his feelings in the following way:

> There is a feeling of isolation sometimes…To tell the truth, I was completely lost during the first two weeks. It took my tutor twice to get me navigating successfully through the maze. However, once I got the hang of things, it all became just like normal computing experience.

When students feel confused by the difficulties they face, they feel a sense of isolation. Michelle, whose style of interaction was formal asserted that:

> Sometimes it is easy to feel one is learning in a vacuum and wonder if you are completely off the track and the collegial nature of this course prevented that to a large degree.

For most of the students, the on-line presence of one another was a strong contributing factor towards their sense of community, as they indicated in their end-of-semester evaluations:

> The main strengths associated with the way I learnt in the Activity Room were to do with the interaction between group members and the feedback from them that was received from questions asked… Being able to send responses directly to the website for discussion by the group gives the feeling of being in tutorials, when you be many thousands of kilometres apart (Jean).

Serani perceived that:

> Whenever I logged on to the Activity Room, I always sense the "presence" of other participants as well, it gives me the feeling of being separated yet not alone.

Roger described how the interactions in the activity room completely changed his perception of isolation as a distance education student:

> … The idea that other students could read responses which were once confidential between my lecturer and myself, affected my learning profoundly. Though our discourse in the activity room, I felt myself as part of a community of learners in which learning was social rather than an individual activity.

Responses like these attest that generally, students felt themselves to be members of a community. However, a preference for a different form of learning, a lack of prior experience with on-line learning, and technological difficulties were factors that could create a sense of isolation in students.

Reflective Thinking

Within a community, when students interact with one another and with the readings, it usually evoked reflection on students' own experiences as suggested by one of the students: "The combination of reflecting on your own experiences from the reading, and the reading of other participants experiences is particularly valuable" (article No. 127).

Assertion 3: Two major resources provoke reflective thinking in this on-line learning: the interactions with others and the readings.

Reflection is seen to occur from interacting with, and interpreting the meanings as intended by two sources:

a. *reflections based on others' contributions, including the questions raised by the discussion leaders and the facilitator.* As expressed by Roger in his end-of-semester evaluation, "The major strength in learning came from reading the comments of other students …The variations provoked thought…This differing perspective was a great thought stimulant." Reflective thinking in the students was not restricted only to differences in experiences and opinions, they also reflected when they agreed with their colleagues' perspectives. When students agreed with their colleagues' views,

they reflected on how they can apply these ideas and opinions in their own classroom practice.

Evidence of reflective thinking was also seen both *directly* in the comments that they made on how they had reflected on their colleagues' contributions as well as*, indirectly* in the manner in which students contributed to the activity room. The first quote illustrates the process of self reflection and the second one suggests reflection as a result of colleague's contributions:

I wonder how this sudden access to knowledge changed the mindset of people of that time who hitherto and not been privy to such a relative wealth of knowledge. Perhaps we have escaped such dilemmas and ensuing power brokerage to some small extent by the very fact that there is such a plethora of knowledge. (Article No. 75).

I really like the way [Michelle] put her thoughts about the value of this reflective process… In many ways I can't see a need to assess the value of computers in an inquiry-based classroom. The answer is obvious to any good educator. What's more important to assess is the way that they are used. Good teachers will pick them up and run with them like any other valuable classroom tool. Poor teachers will use them begrudgingly because they feel the need to be SEEN to do so. (Article No. 192).

In article no. 75, Michelle's reflections on the readings suggest that she posed questions to herself, and then she related a similar event to her own situation. In article no. 192, Kevin reflected on Michelle's contribution and related her experiences to his own. Reflective thinking was also seen in the way in which students agreed or disagreed with their colleagues' opinions, but first they reflected on their colleagues' perspectives before responding:

I'm sorry to say it but I do feel that the problem is much bigger than one courageous teacher can solve. It requires the re-education of a society to come to terms with, and to accept that in an age of technological graziness, things have to be different and this includes the re-conceptualisation of what a school should be and not to be. (Article No. 60).

As for students' direct comments on how they have reflected on their colleagues' contribution, this was seen in Roger's reflective story:

Each time before I contributed to the discussion room, I had to carefully interpret the meaning as intended by them, reflect on what I was going to post and mentally prepare myself to justify and defend my ideas, while at the same time be open to negotiation.

In providing her feedback on the way students had been contributing to the forum, the facilitator too acknowledged the occurrence of reflective thinking when she stated, "I am pleased with the improvement the group has made as a whole. There were great interactions and people have become more reflective on the readings and each other's views." (Article No. 521).

b. *reflections based on the readings in relation to their own experiences/understanding.* Most of the students' contributions to the activity room

were based on how they connected the readings to their own experiences. In the process of doing that, they reflected on the readings after which they provided their own opinions which included agreeing, critiquing or disagreeing with the readings. For example:

> I'd probably tend to disagree. McKenzie is long on rhetoric, but a little short on the pragmatic detail for me. I tend to feel that the Internet is just another tool for research, and that students should bring the same set of information gathering tools to it (logistical necessities aside) (Article No. 81).

This reflection on the readings and subsequent contributions to the activity room in turn, cause others to reflect.

Whatever the sources are which caused students to reflect, evidence of their reflective thinking was seen in the communicative strategies that they used when they contributed to the forum. These communicative strategies include giving opinions, presenting arguments, critiquing, suggesting, agreeing and disagreeing with the sources.

Assertion 4: In order to enhance a reflective discourse the nature of the readings, the way in which the discussion leader leads the discussion and the way the facilitator models the discourse are important.

In addition to the two resources for reflective thinking, there were three other situations which further encouraged students to reflect. They are: the nature of the topics, the way in which the discussion leader framed the questions for the week, and the way in which the facilitator modelled the discourse.

Students found most of the weekly readings either relevant to their profession, or interesting to the current situation they were in. As a result, the readings generated responses from students who frequently connected the readings to their experiences. Kathy provided additional evidence in her end-of-semester evaluation of the way in which the readings stimulated her contributions: "The number of interactions is interesting because some weeks there was lots of talk, because of the topics."

In relation to the way in which the discussion leader who conducted the weekly topic framed the questions for the week, they did not always promote reflective thinking. When a discussion leader posed close-ended questions which did not require reflective thinking, students respond accordingly. For example:

> Q1: Is there in your state a 'set-up' where everyone has access to "curriculum lists", or is it different and ad-hoc in each school/district?
>
> Q2: What do you personally rely on for lists?

As a result, most students merely reported events which had taken place in their respective schools, but this did not shake their assumption about their school practice. For example:

> A1: The official web site for WA is at http://www.curriculum.wa.edu.au/ The site is quite new but does provide a good access point for syllabus documents.

> A2: I do visit the curriculum council web site http://www.curriculum.wa.edu.au/ for up to date information on courses I am teaching, for example, common assessment tasks (cats). The web site is a quick way to get information out of officialdom.

The facilitator in her own discourse, frequently encouraged the students to reflect on the readings and on their colleagues' ideas, and to refer to messages prior to their own. It is likely that her advice encouraged students to exercise reflective thinking when they made their responses.

While reflective thinking was evident in students' transcripts, end-of-semester evaluation comments and in the facilitator's feedback, evidence pointing to the contrary were also exist in these sources. Some students responded to every colleague's message resulting in some superficial responses and "noise". This provoked their colleagues to comment in their end-of-semester evaluation, "Some responses from other members of the group were extremely short and did not seem to examine the issues at depth", "…I found some of the responses to be very limited in their quality and reflections…".

Clearly, the quality of reflective thinking differed among students, and in their perception of each others' contributions. However, it is important to note the occurrence of reflective thinking in relation to the learning community. It is within the context of the learning community that students exercise reflective thinking, and they did so when they responded to the readings and to their colleagues' contributions.

Peer learning and student-centred learning

In order for peer-learning to occur, students must first come together as a learning community and see each other's experiences and knowledge as resources towards their own learning. Evidence pointing to the existence and subsequent development of a community amongst students had been seen above. Whether they considered these experiences and knowledge to be learning resources was evident in their interactions and extensive contributions to the activity room.

Assertion 5:Peer learning in on-line community occur when learners share their experiential knowledge and support each other through their learning and difficulties.

When students referred to, elaborated on and reflected on their colleagues' contributions, they did so because they considered these contributions as worthwhile resources. The following postings are some examples of peer-learning taking place within the community:

> I am certainly learning more about classroom dynamics and am fascinated by all your experiences. And I agree that when we read a piece of reading, we bring our own conceptions into them. For example, even after reading the readings several times, I was still relating to all the software mentioned in CD-ROM format … Then [Roger] pointed out that it was only until recently that CD-ROMs are used … (Article No. 109).

Other students strongly expressed enjoyment from being able to understand other participants classroom experiences:

> I thoroughly, (and I cannot emphasise this enough!) enjoyed reading all your postings. They were very insightful and gave me an understanding to the complex dynamics of classroom teaching. (Article No. 172).

> I noted with great interest [Kevin's] method of using simple checklist approaches along with experimentation and intuition. … [I agree that] There needs to be something more comprehensive. (Article No. 130).

From article no. 109 and 172, it is evident that for students with little prior knowledge of the issues, their colleagues' contributions provided them with valuable insights which promoted their understanding.

In addition to the evidence from students' transcripts, their end-of-semester evaluation also confirm the notion that peer learning had a major influence on students' individual learning:

> The major strengths associated with the way I learnt in the Activity Room were to do with the interaction between group members and the feedback from them that was received from questions asked. (Jean, end-of-semester evaluation).

> I learnt a great deal from my course mates' real-life experiences and although I come from a different background from most of them, I felt that the differences enriched rather than restricted my participation. (Serani, end-of-semester evaluation).

Michelle suggested that the strength of her learning came from the on-line access to her colleague' opinions in addition to the reading materials. For her, it was interesting to see the different dimensions brought up by other participants into the discussions based on their varied career path, computer technology expertise, teaching experiences and their approach and belief about their teaching and learning. Similarly extracts from Serani and Gary stories suggested that sharing the personal experiences had the strongest impact on them:

> I also, and always, wanted to read about others' personal experiences… These personal experiences made the course relevant to real life situations. I was not just reading about untested theories but about real-life experiences of teachers who have tested out these ideas. (Gary, reflective story).

> Through the activity room, I learnt more about teachers and the relevance of the issues (discussed) to their professional practice than I did only from the readings. Their experiences brought a new dimension to the readings, giving it life I was no longer reflecting only on the author's perspective, but on eight other person's perspectives as well. (Serani, reflective story).

Through the contributions of their colleagues in the learning community, students were provided with a wider and richer perspective of the issues, as Gary and Serani's stories clearly showed. From their transcripts and comments, it is apparent that students considered each other's knowledge and experiences as important and essential learning resources. This is further emphasised by Roger:

> no longer were my work , responses and ideas directed to and read only by my lecturer, but they became open to comments, feedback and discussions from all of my course mates, each with their own rich and diverse experiences (Roger, reflective story).

Besides learning from each other's experiences, students also shared and suggested to one another on-line sites where they could go to for further explorations. Students also supported one another by providing helpful hints and feedback when their colleagues were faced with

difficulties, pedagogical advice on classroom activities, and by giving encouragement. This was evident their transcripts and end-of-semester evaluation:

> Not that I am an expert but I noted with interest your concerns about hardware and time limitations you experience with your students. In the process of looking for ideas on online education (or the use of computer in education) I came across this very interesting set of ten tales that were written especially to show an insight into online education. The one that would probably be of specific interest to you is tale number 7 by Susan Hixson entitled Desert Studies. (Article No. 28).
>
> …the support given by my peers was good, some of them making suggestions as to how I could overcome problems, or adding other useful responses to discussion points or resources (Jean, end-of-semester evaluation).

Common experiences among students also provided each other with support for they felt that their colleagues shared in their successes and failures in the classrooms. This was the experience of Gary: "We also discussed successes and failures, posed questions and gave reasons about our successes and failures."

When students were explicitly asked in their end-of-semester evaluation to comment on the support which they had received from their colleagues, every student except Gary felt pleased with the support that they had received. Gary singled out the difficulties which he experienced with the technology. As on-line learning was his first learning experience in using a computer to learn, he felt lost and did not feel that his colleagues adequately supported him when he encountered such difficulties. In his end-of-semester evaluation, he commented, "Very little support from peers although I would greatly have liked to get more. I do not have direct access to colleagues when I need their help." However, the lack of support which he experienced was a result of not having contact with his colleagues rather than not getting the help which he needed. Jean, also experienced her first on-line learning in this unit. Although she experienced a similar sense of lost and confusion with the technology, felt that when she was able to sort out her difficulties and get in touch with her colleagues again, they offered her suggestions and helpful hints on how she could overcome these difficulties in the future. As she stated in her end-of-semester evaluation, "Generally, the support from my peers was good, some of them making suggestions as to how I could overcome problems, or adding other useful responses to discussions point or resources." Subsequently, the peer support provided to Jean during the semester helped her complete her studies and encouraged her to be an active member in this on-line community.

Conclusions

The design of this unit and its implementation encouraged and sustained peer learning and reflective thinking. The literature suggests that this particular design promotes the use of social constructivism for teaching and learning using CMC (Duffy & Cunningham, 1996; Berge and Collins, 1995). As demonstrated in this on-line unit cooperative technology can be used from both cognitive constructivist and social constructivist perspectives (Bonk and Cunningham, 1998). The following section summarises the main assertions generated from the different data sources. These assertions enable us to make useful recommendations about helpful practices for successful on-line learning.

Assertion 1: In order to establish and develop an on-line community of learner, it is important that the facilitator first creates a non-threatening and supportive environment in order to break the feeling of isolation.

The way in which the facilitator establishes a non-threatening and supportive environment is through her own manner of interaction. A formal tone of conversation from her would indicate to students a formal environment. Likewise, an informal and friendly tone conveys a friendly environment where students are able to share their experiential knowledge freely. This is evident in the way in which the students themselves interacted in a friendly and informal manner with one another. As such, the importance and the extent to which the facilitator establishes a non-threatening and supportive environment is in both the example and opportunity that she creates for this to occur. Here, the opportunity is created by engaging students in the self-introduction activity. Having given the example and opportunity, students then form their own perceptions of one another, thus influencing their subsequent interaction and collaboration.

Hiltz and Turoff (1978) first identified the essential role of the facilitator in creating a stimulating and supportive on-line learning environment. Over the past two decades the role of the facilitator has, according to Tagg (1994) "been variously defined as one that motivates, provides support and stimulates…, guides or "weaves" the topic in order to keep it on the right track…, provides strong leadership…, coaches students on communication skills…, facilitates discussion…, while simultaneously attempting to "humanise the technology" (p. 40). The important role of the facilitator has also been mentioned by Mason (1997), Berge (1992), Harasim, Teles and Turoff (1995) and Klem and Snell (1996). However, the role of the facilitator which they have highlighted points more to her ongoing role throughout the unit rather than in the criteria that is required to establish and develop a community in the first instance. In this unit, students have at various times pointed to the important role that the facilitator played in creating this environment.

Assertion 2: In order to maintain a sense of belonging in an on-line community of learners, social exchange should be an ongoing and integral part of the learning process.

The importance of social exchange as a factor that gives satisfaction to students' learning and consequently to their sense of belonging in a community is also highlighted by Gunawardena and Zittle (1997). They maintain that students engage in various activities to enhance their socio-emotional experience. In this unit, students' sense of belonging to the community and feelings of collegiality with one another were enhanced by their social exchanges. Students who prefer to engage in social chats feel sense of belonging more so than colleagues who prefer not to participate in social interactions, consequently feeling more isolated than their colleagues. The consequence of feeling themselves as part of a community is that students engage more in social and collaborative learning with one another over individual learning. This implies that in facilitating on-line learning, equal attention must be paid to activities that enhance social presence. Eastmond (1993) has noted that characteristics often associated with computer conferencing – interactivity, collaboration and reflectivity – are not inherent within the medium but can result based on design, facilitator roles, and involvement. It is these skills rather than the medium that will ultimately impact students' perception of interaction and sense of belonging.

Assertion 3: Two major resources provoke reflective thinking in this on-line learning: the interactions with others and the readings.

As the notion of reflection suggests, it is a purposeful process which involves the learners through the process of sorting through familiar and new experiences and ideas, questioning basic assumptions and adding new understanding. The students' different prior experiences and knowledge contributed to a rich knowledge base, and the variation in their prior knowledge contribute to a process of reflection. In addition to their colleagues' contribution as a source of reflection, the students in this unit were able to reflect on their readings. However, although the students were involved in reflective thinking as a results of the two

sources, the amount of challenging reflective thinking was small. That is, students tended to agree with each other more than disagree or challenge one another's view, thus limiting the negotiation of meaning.

From a social constructivist framework, learning takes place when students socially construct meaning together (as opposed to individual construction) when they engage in meaningful dialogue through the use of a "common language" (Ernest, 1995). The opportunity to engage in meaningful dialogue presents itself most significantly when there is dissonance and inconsistency of ideas and concepts among students. Although there is evidence which shows that cognitive conflict occurred among students, they did not openly challenge one another's viewpoints, or seek clarification through active conversation.

Assertion 4: In order to enhance a reflective discourse the nature of the readings, the way in which the discussion leader leads the discussion and the way the facilitator models the discourse are important.

The question of how to engage in critical conversations with students and colleagues is a major concern for the practicing teacher in a traditional classroom environment and in particular in an on-line environment. The opportunities that the electronic medium provides through computer conferencing (Berge and Collins, 1995) suggest that a good facilitation will lead to the development of a reflective community of learners. Reflective thinking according to Brookfield, 1995, involves gaining new perspectives on our practice while*critical* reflection happens when we identify and scrutinise the assumptions that underpin our actions.

Different stimulus were introduced in this on-line learning. First, the literature that was provided and introduced during the semester enabled the students to view their practice within alternative theoretical frameworks. Second, the discussion leaders provoked students' thinking by introducing the questions for the weekly topic, encouraged and promoted discussion and summarised the discussion. However, occasionally the questions did not require deep thinking. This resulted in missed opportunities for reflective thinking and students simply reported on their experiences. Third, the way in which the facilitator modelled the discourse also influenced the reflective discourse. Although the facilitator explicitly encouraged reflective thinking throughout the semester, she was not aware herself of the constant need for her modelling role. Sometimes during the semester the demand for her constant feedback resulted in her being responsive and not reflective, thus reducing the quality of reflective discourse that she set out to achieve.

We accept and encourage the view that reflection is a purposeful process which involves the learner in sorting through experiences and ideas, developing frameworks for organizing and labelling them and assessing the extent to which their own frameworks could be generalised. This can be done through discussion, further reading, writing or testing out their practical implications. However, because this process was not done consciously by all members of the community we believe that sometime the opportunity for *critical* reflection was missed.

Assertion 5:Peer learning in on-line communities occurs when learners share their experiential knowledge and support each other through their learning and difficulties.

In designing this on-line unit, one of the facilitator's goals was to establish a community of learners who would interact with each other to exchange experiential knowledge, negotiate this knowledge and become self directed learners (Bonk & Cunningham, 1998). Furthermore, the exchange of experiential knowledge within an electronic community has the potential for collaboration and negotiation. This provide opportunities for the group to engage in peer learning within a social constructivist framework (Duffy and Cunningham,

1996). Jurgon Habermas in his Communicative Action Theory (1984) suggests that process-oriented action lays the groundwork for understanding how to enable such social learning in a world that is becoming increasingly fragmented, individualised and alienated (Sumner, 2000).

As a learning community, students shared their experiential knowledge with one another. This created rapport between the students as well as enhancing the learning among the group. With it came a recognition of stronger opportunities for peer learning and students took advantage of the computer conferencing to interact frequently and to learn from each other. They regarded one another's experiences and ideas as resources towards their own learning Peer learning also created a learning environment conducive to peer support. Students supported one another to achieve their learning goals by providing help when their colleagues were faced with difficulties, by providing feedback, helping hints and suggestions for one another to explore, and by giving encouragement in difficult times. Students who were learning on –line for the first time, generally needed more support from their peers.

In conclusion, our study of this on-line unit suggests that the use of CMC can enhance the creation of a reflective discourse community. By using computer conferencing the elements of reflective thinking and peer learning are effectively integrated in a way consistent with the theoretical framework adopted in the design of this on-line unit. Furthermore it enhances the facilitator role and the level of involvement of the members of the community. In addition, the peer-learning approach reduces the emphasis on the teacher-as-instructor and empowers students to learn from each other. It is hoped that the assertions presented in this paper will prove to be a useful guide to practitioners of on-line learning and may be refined through further research.

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