

**Innovative pedagogies for Family and Consumer Science/Home Economics
Education –
Utilising Computer Based Collaborative Learning to foster
lifelong learning attributes**

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Abstract

As we near the end of the first decade of the twenty-first century, the development in students of the attributes of lifelong learning is recognised internationally as a common goal of education systems. The field of Family and Consumer Science - in some parts of the world known by other names including Home Economics - is no exception to this trend. The use of Information and Computer Technologies (ICT's) as a medium to achieve this goal is an important consideration in this context, particularly given their proliferation and the trend towards pedagogical reform incorporating recent innovations relying on their use.

In the research reported in this paper the implementation of one particular pedagogical practice which utilises ICT - Computer Supported Collaborative Learning (CSCL) – is investigated. Specifically, this paper provides insights into an initiative to create CSCL experiences in higher education textiles classes at Hong Kong Institute of Education and to determine the lifelong learning attributes enabled by this process. The overall aim of incorporating CSCL was to enhance students learning experience and to foster lifelong learning capacities.

Findings confirm a strong relationship between the quality of collaborative processes embedded in the CSCL approach and the quality of cognitive and affective skills demonstrated, and the potential capacity of CSCL to enhance this collaborative process. High levels of social interaction and collaboration contributed to the establishment of a community of learning, nurturing a space for fostering higher order thinking, meta-cognition and social creativity through the co-creation of knowledge processes. In this paper, these capabilities are collectively identified by the acronym 'RICCCH'. This paper concludes with recommendations for the enhancement of practices for utilising CSCL in the tertiary education context, particularly in the Home Economics field.

Literature Review

Two key elements will be featured in this review as they form the basis for the study - lifelong learning, and in particular lifelong learning as interpreted in the Hong Kong education context; and computer supported collaborative learning as a pedagogical initiative.

Lifelong learning and lifelong learning in the Hong Kong context

At its recent centennial celebrations, the International Federation of Home Economics (IFHE) released a Position Statement titled *Home economics in the 21st century*, in which the following connection with lifelong learning was made explicit:

[H]ome Economists are concerned with the empowerment and wellbeing of individuals, families and communities, and of facilitating the development of attributes for lifelong learning for paid, unpaid and voluntary work; and living situations (IFHE 2008:1).

Beyond the boundaries of the home economics profession, lifelong learning is at the core of many educational reforms (Pendergast et al., 2005) including Hong Kong's education reform agenda (Curriculum Development Council (CDC, 2000), the context in which this study was conducted. Since the mid-1990s there has been a refinement of the concept of lifelong learning that includes all learning that enhances and contributes to knowledge and skills. In 1996 the Organisation for Economic Cooperation and Development (OECD) committed to the importance and relevance of lifelong learning (OECD, 1996). This has meant the enfolding of foundational and compulsory education into this broader concept, and the emergence of a 'cradle-to-grave' stance towards lifelong learning (Istance, 2003). Both the OECD and the United Nations Educational, Scientific and Cultural Organization (UNESCO) argue that lifelong learning is an essential component of social and economic wellbeing. This commitment was outlined in the OECD's *Lifelong learning for all* (1996) and the UNESCO report *Learning: The treasure within* (Delors, 1996). These two reports have been highly influential in establishing a broader sense of lifelong learning and a focus on identifying key competencies and abilities of the lifelong learner.

In the context of this study, lifelong learning is regarded as being a process of individual learning across a life span from cradle to grave. It embraces not only education in formal settings, but also 'life-wide' learning in informal settings at home, at work and in the broader community. From this perspective, lifelong learning is perceived as creating important economic and social effects. A combination of work productivity and education focuses on an entire life span rather than being restricted to the formal learning years. In contemporary times, promoting lifelong learning is a strategy for enhancing a nation's stock of human capital, which is seen as a necessary determinant for achieving rapid technological expansion and, by extension, macro-economic growth (Rubenson, 2001). Tuijnman (2002) argues that a framework for lifelong learning should foster the personal development of the individual, counter risks to social cohesion, develop civil society through

promoting democratic traditions, and enhance labour market flexibility. In this sense, lifelong learning can have a strong instrumental value. The Hong Kong education model adopts this vision of lifelong learning. In order to develop a school curriculum for the 21st century and to meet the needs of students and society, it is a policy priority to provide lifelong learning experiences through the school curriculum with emphasis on development of generic elements for lifelong learning throughout all stages of schooling and across the key learning areas (CDC, 2000). Hence, the flow-on effect of this is the need to prepare pre-service student teachers who have the capacities to impart learning to enhance lifelong learning attributes, and to serve as lifelong learning role models. This provides the platform for introducing innovative practices in pre-service teacher education, such as that investigated in this study.

Computer Supported Collaborative Learning (CSCL)

Collaborative learning is a pedagogical strategy which embeds the socio-cultural theory of constructivism, situated and distributed cognition with emphasis on authentic collaborative tasks and promotion of genuine collaboration with peer assessment, fostering learners with lifelong learning capabilities. Collaborative pedagogies utilise processes, methodologies and environments in which participants engage in a common task and in which individuals depend on and are accountable to each other. CSCL uses a computer based medium to encourage this collaborative learning. There are many computer applications that can be utilised to achieve CSCL, such as Computer-Supported Intentional Learning (CSILE) and Belvedere.

CSCL has received attention in a range of different educational scenarios in recent times (cf. Ewing & Miller, 2002; Daradoumis & Marques, 2000; Treleaven & Cecez-Kecmanovic, 2001; Nachmias, Mioduser, Oren, & Ram, 2000; Wang, Poole & Harris, 2001). A review of these applications indicates that while the scientific community has considered the principles of CSCL pedagogies highly promising for the development of future learning environments, educational practitioners in the home economics field have not generally engaged in the use of these applications, particularly in textiles education.

With the advent of computer technology, and more recently the wide accessibility of communication technology, the collaborative learning approach is undergoing reformulation because the way that learners assimilate information is changing radically, requiring concomitant pedagogical reform. There is a growing body of literature providing accounts of research that support the educational value of CSCL. The results of a meta-analysis on CSCL reveal that using collaborative techniques with technology is likely to increase high-level thinking skills, social interactions, critical reflective capabilities and creativity (Lehtinen, Hakkarainen, Lipponen, Rahikainen, & Muukkonen, 2003; Smith, 2003; Warschauer, 1997).

Higher order thinking

Several empirical experiments offer some evidence that the well-known CSCL environments like Computer-Supported Intentional Learning (CSILE) and Belvedere have proved helpful for achieving higher order cognitive processes and collaborative knowledge-building (Lamon, Reeve & Scardamalia, 2001; Lehtinen et al., 2003). The learning efficiency of CSCL is further confirmed by various studies (Lee & Chen, 2000; Nagai, Okabe, Nagata, & Akahori, 2000; Su, Chen, Chen, & Tsai, 2000; Wang, Tzeng & Chen, 2000) as through this articulation process, old and new knowledge is integrated and new knowledge expanded to other applications. In these studies, CSCL appears to engage students to participate in in-depth inquiry over substantial periods of time and to provide socially distributed cognitive resources for comprehension monitoring and other meta-cognitive activities. This, in turn, allows students to become aware of their conceptual advancement, as well as of changes in their practices of inquiry.

Social interaction

Introducing a computer environment to collaborative learning can also improve the amount and quality of social interaction among and between educators and learners as these tools make the sequence of interaction events more visible for participants, creating possibilities for mutual understanding. For example, a study by Hakkinen, Jarvela & Byman, (2003) showed that the participants had mutual negotiations in their web-based communication and they discussed issues from a variety of different viewpoints. With the help of technology such as groupware, it has been possible to create interactive processes in which learners are consciously constructing new knowledge on an inter-subjective or social level (Kreijns & Kirschner, 2002).

Critical reflection

Given its emphasis on interaction as requisite for learning, critical reflection can be encouraged and supported. Hawkes (2001) showed that collaboratively produced asynchronous network-based communication was significantly more reflective than face-to-face discourse between teachers. Some CSCL studies (Stahl, 2002; Huynh, 2005) confirmed that group reflection with learners in social contexts was made possible. These studies claimed that the use of technology supported an environment that facilitated shared understanding, enhanced group communication, and promoted equal participation, open communication, and diverse perspectives.

Creativity

Findings of some recent research on creativity reveals that CSCL can promote social creativity as well (Arias, Eden, Fisher, Gorman, & Scharff, 2000; Artman, Ramberg, Sundholm, & Cerratto-Pargman, 2005; Barab & Plucker, 2002; Csikszentmihaly, 1999; Fischer, 1999; Kvan, Yip, & Vera, 1999; Sosa & Gero, 2004). The computer supported environment allows space for bringing different points of view and resources together to create design communities in which social debate

and critique, discussion and reflection, and collaborative knowledge construction can lead to new insights, new ideas, and new artefacts.

In short, the literature reveals consistently affirming indications that CSCL leads to an improvement in student learning, particularly with respect to higher order cognitive processes and for skills that are defined as representing information social skills. These are skills that are generally considered to be crucial for lifelong learners when coping with the demands and opportunities of future work and other activities in the information society. By working together in the new computer-supported environment, it is argued that; (a) the setting of activity, (b) the dynamics of the interactions, (c) the support of members' equal opportunity to participate and contribute, (d) the configuration of the group; and (e) the variety of communication used for interacting will provide ample space for learners to achieve shared understanding and co-create knowledge (Nachmias et al, 2000, p. 95). These features in turn are argued to contribute to the development of lifelong learning capabilities, in particular: higher order thinking, social interaction, critical reflection and creativity, to cope with the exponential growth of knowledge in contemporary society as well as develop generic skills valued in the workplace.

Given this literature base, this study was designed to explore the potential benefits to a selected group of textiles education students through the utilisation of a CSCL model as the basis for the teaching and learning processes they experienced.

Study Design

Participants

Participants were first year students enrolled in the Bachelor of Education (Secondary) program in the field of Home Economics at the Hong Kong Institute of Education. The study was restricted to the module of Textile Studies in the academic year of 2003/2004 and for the module of Fashion Applications and Consumerism in the academic year of 2004/2005. Eighteen full-time students and 26 part-time in-service students participated in a total of four studies that together form the doctoral project.

This was a convenience sample, based on accessibility to the study participants by the researcher. It was assumed that the cohort of participants would bring marked differences in their learning processes due to their diversified experiences and the geographical variables. Ethical clearances were obtained.

Data collection and analysis

With an aim to investigate the quality and versatility of the CSCL learning processes and how this approach facilitates the development of lifelong learning attributes, this project comprised four individual but connected studies.

Study 1 involved six groups of 4-5 students involved in a 7 week project. The topic was an investigation on the evolution of fashion through culture, technology, society and civilisation and explicitly aimed to promote learners' higher-order thinking skills. Students participated in intragroup online discussions; submitted bi-weekly electronic reflective journals; and conducted intergroup online peer assessment. Data were analyzed with descriptive usage statistics to evaluate the level and intensity of participation. Data were also analyzed using measures of participative presence (Henri, 1992) to analyze the nature of interaction; cognitive presence to evaluate social construction of knowledge and higher order thinking skills (Gunawardena et al, 1997); along with social presence (Rourke et al, 1999) and teaching presence (Anderson et al, 2001). In each of these analytic approaches models of analysis were adopted that have been validated in previous studies.

Study 2 involved five groups of 4-6 students involved in a 5 week project. The topic was developed around an investigation, incorporating the social inquiry approach, of a consumer issue relating to the apparel industry. It was designed to foster learners' critical reflective capabilities. Students were required to conduct intragroup arguments online in the first 3 weeks of the project period and submit a final PowerPoint presentation for intergroup online debate in weeks 4 and 5. Participants were also required to submit intragroup weekly electronic reflective journals. As for Study 1, data were analyzed with descriptive usage statistics to evaluate the level and intensity of participation. Data were also analyzed using measures of participative presence (Henri, 1992) to analyze the nature of interaction, along with social presence (Rourke et al, 1999) and teaching presence (Anderson et al, 2001). In addition, Mezirow's (1991) categorizations on reflection to evaluate the levels of reflection were utilized, along with an instrument devised purposefully for this analysis based on Habermas's (1981) critical theory to evaluate processes of social reflection and the social cocreation of new knowledge for transformative actions.

Study 3 involved four groups each with three participants, involved in a 6 week project. The task was the development of a portfolio of fashion illustrations for specific interpretation or performance, utilising Photoshop as the electronic medium. The task was designed to cultivate learners' creativity. Students participated in intragroup developmental design where they provided feedback and design sharing to group members. Participants were required to submit intragroup weekly electronic reflective journals. As for Study 1 and Study 2, data were analyzed with descriptive usage statistics to evaluate the level and intensity of participation. Data were also analyzed using measures of participative presence (Henri, 1992) to analyze the nature of interaction, along with social presence (Rourke et al, 1999). In addition, Treffinger et al's (2002) categorizations of creative levels to

evaluate the level of creativity was utilized. Also utilized was a purposefully devised instrument based in Activity Theory (Engestrom, 1987) to evaluate processes of social creativity leading to the design of new artifacts and new knowledge.

Study 4 served as a culminating study. The cohort of one year of Bachelor of Education students were observed over a three year period. They were required to complete peer assessment utilising intergroup assessment online, and submit bi-weekly electronic reflective journals. A series of focus group meeting were conducted and content analysis utilised.

In summary, data investigating the quality and versatility of the CSCL processes of the learning groups were collected through reflective journals written by the students, four in-depth video-taped focus group interviews with students, texts of the online discussions and entries, and logs of the access to the online forum.

The underlying assumption of this study is that the behaviours associated with collaborative learning activities, the development of collaborative learning conditions and productivity of collaborative learning space can be identified by the online interactions of learners. Therefore, a detailed qualitative analysis of collaborative processes by using content analysis was used to examine the content of text contributions made by the group members in their online interactions via email messages and postings to the group discussion forum, to scrutinise utterances that may be indicative of the possible and typical processes of collaboration mediated with the different artefacts.

Each of the four studies utilized a combination of analytic techniques relevant to the attribute being investigated. The multimodal array of data and the analytic techniques in each case produced both quantitative and qualitative data. Quantitative data were typically analysed at the descriptive analysis level, while qualitative data was typically examined using content analysis and then a relevant analytic framework (as explained previously) was applied. Content analysis is a research tool used to determine the presence of certain words or concepts within texts or sets of texts. Meanings and relationships of such words and concepts are analysed by searching for inferences about the messages within the texts. Content analysis offers several advantages to researchers who consider using it. In particular, content analysis:

- looks directly at communication via texts or transcripts, and hence gets at the central aspect of social interaction
- allows for both quantitative and qualitative operations
- provides valuable historical/cultural insights over time through analysis of texts
- allows a closeness to text which can alternate between specific categories and relationships
- enables statistical analysis of the coded form of the text
- can be used to interpret texts for purposes such as the development of expert systems

- is an unobtrusive means of analyzing interactions
provides insight into complex models of human thought and language use.

To facilitate better communication, the collaborative tasks and the focus group meetings were conducted in Chinese/Cantonese. Team communication was first translated into English followed by full transcription. The transcripts were then coded by means of a schema that provided much insight into the affective, cognitive and social processes in which the groups were engaged. The main purpose of coding is to extract, and generalise significant themes from complex data in order to develop theories about the situation.

Findings and Discussion

This paper does not include the comprehensive details of the findings of each of the four studies, which will be reported elsewhere. Rather, it provides an overview of the general outcomes of the investigation.

The analysis of the data produced from the series of studies in this research project revealed that active engagement in CSCL tasks assisted learners to develop a comprehensive list of generic learning outcomes. While the presentation of data is beyond the scope of this paper due to its extensiveness, the acronym ‘RICCCH’ has been coined by the researcher to capture the range of these attributes, where RICCCH represents:

R- Research abilities

I - Information technology

C- Critical reflection

C- Collaboration

C- Creativity

H- Higher order thinking

These attributes, typically equated with lifelong learning attributes, were evident in the experiences of the participants of these studies. Like the word ‘rich’, RICCCH implies value and worth. The following definitions of the attributes are presented in Table 1 as a culminating set of benefits for the participants in the CSCL experiences, as derived in this series of studies.

Table 1 RICCCH Attributes

RICCCH Attribute	Description
Research abilities	Research-based CSCL tasks can be very interesting and engaging for students as they are often involved in real activities such as designing and conducting their own projects. Students are highly involved in the process of discovering things for themselves as they begin to learn how knowledge is co-created.

Information technology	CSCL tasks can provide highly motivating contexts for students to create group products online, to collaborate efficiently in this process, to exchange critical and constructive feedback with their peers, and to revisit and modify their work accordingly. Technology also allows for instant interactions between students and facilitators for advice, support, timely feedback and so on.
Critical reflection	CSCL tasks require students to critique their peers and to conduct peer debates in which learners are engaged with useful and constructive feedback, and act upon it to improve their learning and their perception of the world. Students are also involved in assessing peers and evaluating themselves so as to take responsibility for self-monitoring and making judgments about aspects of their own learning. Fostering of such critical reflective skills is important in their future working lives as they will need to ensure that their work meets the qualities required by their profession, their employers, or their clients.
Collaboration	CSCL tasks in terms of group project or team work are an excellent tool for developing students' knowledge of how teams function and their interpersonal social skills in working effectively with others. Working in teams also allows for peer learning as students learn with and from each other.
Creativity	Creativity can be regarded as not only a quality found in exceptional individuals, but also as an essential life-skill through which people can develop their potential to use their imagination to express themselves, and make original and valued choices in their lives. CSCL tasks require students to provide feedback on their peer's work to develop their creativity skills for originality, flexibility and elaboration of their ideas through the use of software.
Higher-order thinking	These skills include those of problem-solving, decision-making, analysis and synthesis, application and evaluation. CSCL tasks assist in higher order thinking because they require students to respond to complex tasks, to solve complicated life issues, to analyse critically what they are reading, and to reflect in depth on their experiences in the context of feedback and intra and inter-group discussion.

The use of pedagogical practices utilizing CSCL provides valuable insights for the home economics profession as it works towards creating the future of home economics in the 21st century educational context. This study provides a useful starting point for exploring what might be adapted in different situations in order to facilitate effective teaching and learning experiences, ultimately leading to the development of lifelong learning capabilities in students. Along with clear evidence that CSCL pedagogies facilitated RICCCH learning experiences, the study resulted in a number of guiding principles for the utilisation of CSCL. These will be presented briefly in four sections: 1) insights into what impedes the development of quality social interactions that support CSCL, 2) exploration of the collaborative interaction processes through which understanding is shared and cognitive knowledge is constructed, 3) examination of how computer supported environments enhance the collaborative interaction and formation of a learning community, and 4) evaluation of the most appropriate teaching strategies to foster CSCL

1. Insights into what impedes the development of quality social interactions that support CSCL

Analysis of the levels of social interaction across the four studies of this project indicated that learning was taking place in a collegial and trusting environment for most groups. Participants had a sense of affiliation with each other and a sense of solidarity with the group. Typical of the nature of the learning experiences is the following comment:

This was really my first experience. I felt my team members were 24-hours stand-by around me. Whenever I logged into the discussion forum, I received their responses to my questions, with inputs of some new exploratory information. I had the feeling that no matter you were in-service teachers, if you could spare your time and were willing to participate in the discussion, you could find your friends all around you.
(GA-S2)

It was confirmed that the supportive and caring psychological state of learners was strongly promoted through their successful performance of affective and cohesive roles. From this, team spirit and mutual respect was created. It was common to observe that if a member of the group gave utterance to an idea or summarised a thought, their team-mates would provide a cohesive explanation of interrelating ideas or clarify their position on an issue, committing them to evaluate and assess ideas or beliefs in light of new information or experience sharing. The cohesive roles played by the learners were found to be particularly significant in building team morale and group cohesion to facilitate collaboration and intellectual exploration. The affective roles were found to be particularly significant in building supportive and collegial interpersonal relationships to encourage honest and open argumentations in which confrontation was an essential feature of critical reflection and negotiation of knowledge in the CSCL learning processes.

Findings from the studies further confirmed that high levels of social presence with quality peer feedback were necessary to create an instinctually rewarding environment for learning. The informal ongoing peer feedback was found to be worthwhile as it was specific, descriptive, predominantly non-judgmental in tone and form, and directed towards the goals of the recipients. Such useful feedback helped engage learners at a greater level and depth of creative dialogue (Smith & Hatton, 1993), create intrinsic motivation for improvement (Kohn, 1993) and foster lifelong learning capabilities. For example:

I had chances to make a lot of good friends who gave me a lot of valuable suggestions in online discussion which had broadened my perception of the world. Our mutual trust had been built and became more open to others' comments. (GA-S3)

The role of facilitator as co-creator of a social environment could not be underestimated, as learners' views elicited from focus group meetings illustrated that the ongoing support of the facilitator played a significant part in building trust and strengthening team spirit among the groups. This is confirmed by the following typical statement:

Our lecturer had been following us very closely and her supportive feedbacks highly motivated us to pay more effort on discussion the next time. Her encouraging comments also helped us to build up our confidence on the tasks. (GB-S3)

It was clear that ensuring each member of the group received the help they needed from their peers and the facilitator was a key to promoting effective collaborative interaction.

2. Exploration of the collaborative interaction processes through which understanding is shared and cognitive knowledge is constructed

The literature on the effects of CSCL on learning and teaching revealed that using collaborative techniques with technology could potentially increase: high-level thinking skills, social interactions, critical reflective capabilities and creativity (Lehtinen, et al., 2003; Smith, 2003; Warschauer, 1997) with the socio-cultural assumptions that high levels of social interaction and collaboration would contribute to the establishment of the community of learning, nurturing a space for fostering lifelong learning capabilities through co-creation of knowledge. An analysis of the data from the four studies revealed that strong feelings of community increased learners' cognitive/reflective/creative flow, sharing of cognitive/reflective /creative load, engagement in the group's goals, openness and collaboration among members, as well as satisfaction with the group's efforts.

3. Examination of how computer supported environments enhance the collaborative interaction and formation of a learning community

When viewed in the context of socio-cultural learning theory, which emphasises the educational value of creating cross-cultural communities of practice and critical inquiry, these features appear to make computer supported environments a potentially powerful tool for collaborative learning. The findings of this research project confirmed what has been reported by others in the literature. The findings concurred that support mechanisms are essential, important, beneficial, and supplementary, and illustrated how support mechanisms for CSCL activities interact. Asynchronous tools have been demonstrated to be an effective tool for collaborative interaction. This is confirmed by this collection of studies. Most of the participants utilised the Group Page for intra-group discussion and discussion forums for inter-group critique and feedback. The analysis of participation levels of the four studies has indicated that the intra and inter-group discussion forum was used often by most groups who contributed regularly. The discussion was highly interactive as evidenced by the majority of direct responses and commentaries to messages, rather than postings of independent statements. The

discussion forum was evidently used for social interaction and reflection, creative negotiation and argumentation, administration, and social and technical support.

Learners in general were positive with the use of technology to support their collaborative learning in the technology-enhanced environment. Instant responses to inquiries, convenience in terms of time and geographical distance, storage of processed information and ongoing monitoring by the facilitator were noted as the main benefits of the system which promoted their interaction and communication, and encouraged peers' timely and constructive feedback.

The use of technology to facilitate the mastery of the lifelong learning capabilities within the learning community emerged as a feature of this project. For example, gains of fostering critical reflection from collaborating within the CSCL environment were identified as follows: (a) provided a way for learners to negotiate multiple and often contradictory positions, encouraging a dialectical encounter with others and a reflexive engagement with the self; (b) allowed for contribution of their understandings on issues from any place and at any time that was personally convenient as multiple discussions often took place simultaneously; (c) obtained access to and periodic review of the permanent electronic transcript generated in this medium encouraged reflection and promoted the synthesis of ideas. The added value of technology to collaborative learning was a fostering of creative discourse at a level which encouraged learners to co-design artefacts. Firstly, design proposals in different phases of the design process could easily be revisited and the development of a design concept could be traced. Secondly, the sequence of arguments supporting a certain design proposal could be accessed to facilitate the evolution of design proposals with input from divergent peer perspectives. Furthermore, most students who used the online assessment package indicated that the speed of the return of written comments for further refinement plus increased opportunity for self-reflection and review were identified as the main benefits of the technology-enhanced assessment system.

Technology is a process of enhancing teaching and learning; a process of empowering our learners; a process of equipping our students with necessary skills needed for the future; and a process of using tools to enrich learning. Learners in general claimed that the computer supported environments enhanced the collaborative interaction and formation of the learning community.

Inexperience in learning in the online environment, on the other hand, was found to be a challenge posed particularly at the initial stage of the project. The most common problems were related to the use of web technologies. The learners found that inaccessibility to the e-learn platform, instability of the e-learning services, and computers being affected by viruses were the most common problems encountered. However, most of participants gained confidence after becoming familiarized with the web technologies and with the prompt assistance of the facilitator and lab IT technicians. It was

reported that learners' collaboration came to maturity after their first experience with CSCL as their interaction entered a high intensity phase after the first week of the commencement of Studies Two and Three. In short, computer supported systems scrutinized in this project were found to be useful cognitive tools that could team individuals with technology to form a joint intelligence which shared the labour during the group process, with the explicit goal of promoting lifelong learning.

4. Evaluation of the most appropriate teaching strategies to foster CSCL

This project set out to explore different pedagogical approaches that CSCL could take to foster lifelong capabilities. It was predicted that these different approaches took on a considerable relevance when considered in relation to different domains of study. In this study, the successful pedagogical elements for supporting CSCL were identified as:

- the role of the e-facilitator
- flexibility to enable heterogeneous grouping
- design of collaborative tasks
- design of analytic tools

With respect to the e-facilitator, this role was identified as vital. They act as the driving force to promote collaboration within the groups especially during the early stages of learning activities. Learners' positive comments in the focus group meeting suggested that an emotionally supportive and open facilitator had a positive impact on learners' collaborative processes in which the validity of the learners' experience was acknowledged and their sensitivity and courage to take part in negotiation was fostered. The encouragement given to the groups stimulated them to construct as deep a knowledge as possible which was a necessary first step for collaborative learning, leading to forming a sense of community. It was equally important for the facilitator to take a non-interventionist approach to as much as possible eliminate the power relationships between the facilitator and learners. The facilitator tended to progressively withdraw from initiating threads and responding to queries, leaving students space to contribute to each other as they developed understanding and skills. The facilitator stayed in the background, while stepping in at crucial times to steer the group. Analysis showed that finesse was required to determine when to intervene and what sort of roles, such as designer of the educational experience, co-creator of a social environment or subject matter expert, would be appropriate for different stages of intervention. It was seen that insufficient scaffolding, providing guidance and comments to help the learners in a group to master the materials, failed to promote their move to a higher level of understanding. Also, it was evident that the importance of taking appropriate and prompt intervention to help resolve conflicts arising from open argumentations must not be underestimated as unresolved misunderstandings among learners seriously affected the group dynamic and the negotiation process.

The flexibility to establish heterogeneous groupings was vital. Socio-cultural theory is concerned with asymmetric pairs where members have different levels of skill to increase their mastery of critical concepts. The diversified academic background, cultural differences, various life experiences, as well as the geographical distance of the learners should be taken into consideration when planning collaborative tasks as they might cause a marked difference in the quality of roles exhibited such as expert-learner or modelling-mirroring agent in the collaborative learning process. The performance of participants in inter-group discussions confirmed that group heterogeneity comprising of in-service and full-time student teachers enhanced their learning with the input from knowledgeable, multitalented peers, with diversified backgrounds and life experiences. It was found that individuals could progress more rapidly with the help of more capable peers, relying on full social interaction such as peer critique, scaffolding, and modelling. For effective collaboration, it must be appreciated that the full complexity of the knowledge of the group was distributed amongst members of the group.

The design of collaborative tasks was the third factor identified as contributing to the effectiveness of the CSCL. Four collaborative tasks were undertaken. It should be noted that these learning capabilities were not acquired automatically. They required learning and reinforcement with appropriate use of strategies and scaffolding. The results of the four studies illustrated that the pedagogical strategies proposed were of practical value and underpinned the tasks and strategies that promoted CSCL. These useful practices included:

- Enhancing higher-order thinking skills using online discussion;
- Promoting reflection using reflective E-journals;
- Guiding critical reflection using asocial inquiry approach;
- Fostering social creativity with design work;
- Generating reflective and creative practices by means of informal ongoing peer debate/feedback; and
- Reinforcing the learning process and outcome of CSCL with peer assessment.

The fourth element is the design of analytic tools for evaluating the learning processes. One of the problems of researching learning in CSCL environments is the complexity of learning interactions that are under investigation (Laat, 2003; Lally, 2003; Lally & Laat, 2003). It poses even a greater challenge to devise appropriate analytical tools to investigate how individuals change their understanding, or create a new personal construction of knowledge as a result of social interaction and negotiation within the group. The scarcity of readily usable instruments to determine whether students engage in interaction and negotiation in a CSCL environment and if so, to what extent, has prompted this study to devise an appropriate analytical framework utilising different content analysis models to reflect the nature of the socio-cultural perspective for evaluating the quality of discourse in a CSCL environment. Details of these analytic tools are presented elsewhere. In brief, they feature:

- Evaluation of the social construction of knowledge distinguishing between five phases of knowledge construction, from Phase I to Phase V, indicating progress from a lower to a higher mental function and revealing how learners contribute toward the construction of knowledge
- Mezirow's (1991) categorisations on reflection to assess the level of reflection while a self-devised instrument based on Habermas' (1981) social inquiry model was utilised to examine the process of critical reflection
- Treffinger et al. (2002) categorisations of creative levels to assess the level of creativity while a self-devised instrument based on activity theory (Engestrom, 1987) was utilised to examine the process of social creativity; leading to co-design of new artefacts and new knowledge.

Conclusion

Like other fields of study in contemporary times, practitioners in Family and Consumer Sciences are striving for a curriculum and set of pedagogical and assessment experiences that lead to the development of lifelong learning attributes. This study has been important in terms of determining whether the study of Family and Consumer Sciences using CSCL contributes to the development of lifelong learning attributes in participating students. Taking textiles education as the case study in this project, it is clear that the values of CSCL practices lies not only in how they support student learning processes, but how these processes in turn led to desired learning outcomes and the development of one or more lifelong learning capabilities. Furthermore, this study has revealed some of the guiding principles for the effective adoption of CSCL in Family and Consumer Sciences teaching contexts, and has provided a set of analytic tools to determine the quality of learning experiences utilising CSCL. The confirmatory nature of the study should reassure practitioners that students engaged in Computer Supported Collaborative Learning approaches will benefit across the spectrum of RICCCCH attributes, providing confidence and optimism for the implementation of such approaches.

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