Computer Supported Collaborative Learning and Social Creativity: A Case Study of Fashion Design

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Abstract

There is an increasing volume of literature theorizing on how social creativity can be fostered in the Computer Supported Collaborative Learning (CSCL) environment, however, a scant amount of research has been actually carried out to investigate how the dynamics and creative cognitive processes taking place in the CSCL environment create communities of design. The scarcity of readily usable instruments to determine whether students engage in social creativity in a CSCL environment and if so, to what extent, has prompted this study to derive an analytical framework for tracking the effects of the creative processes upon the design community. With reference to the social, situated, distributed nature of social creativity, a self-devised instrument based on the Activity Theory (Engestrom, 1987) is established for understanding creativity in the context of computer supported collaborations. It can be understood as a set of three phases that occur with relation to collaborative creative processes, namely: exploration/clarification (phase I), negotiation and argumentation (phase II), and evidence of evolution and redesign (phase III). Based on the Activity System Model of Engestrom (1987), a content analysis scheme is proposed in which the analytical framework of subject-community-object triad, subject-community-roles triad, and subject-community-tool triad will investigate the inter-relationship among the interactivity, creativity presence, and social presence within a CSCL community.

Findings confirmed that there was a strong interrelationship between the quality of collaborative creative process in terms of provision of informal ongoing peer feedback and the quality of social creativity fostered. Results confirmed that high levels of social presence with good quality of peer feedbacks were necessary to support the creative process in an intrinsically rewarding design community. The affective roles played by the peers were found to be particularly significant in building up the supportive and collegial interpersonal relationships to encourage open negotiation and argumentation in creative dialogues which was the core element promoting re-design and co-creation of new design. Self evaluation on the effectiveness of the self-derived investigative instruments was conducted with recommendations for future work given, and methodological limitations of this study were explored as well.

Keywords: social creativity, analytical model, CSCL, fashion design

Introduction

Computer supported collaborative learning (CSCL) is regarded as being a powerful pedagogical process to promote

social creativity (Arias, Eden, Fisher, Gorman, & Scharff, 2000; Fischer, 1999; Kvan, Yip, & Vera, 1999; Lipponen, 2003; Mulder, Swaak, & Kessels, 2002). A 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 artifacts. In this study, an initiative was undertaken to create CSCL opportunities and experiences using Blackboard Learning System ML$^©$ as an avenue for creative design, self-reflection, as well as ongoing peer critique and sharing. Participants were learners undertaking Bachelor Degrees who were assigned a fashion design project.

In this study the focus is an exploration of how the communicative practices in the CSCL environment promote social creativity. Studies investigating this aspect are scarce in recent literature. The study places emphasis on the interplay between collaborative creation of design sketches and argumentation/negotiation, as well as how design sketches that are created mediate discussions and argumentation and feed into new ones. The study also investigates to what degree characteristics of artifacts in the CSCL environment facilitate creative interactions. Using this platform, an attempt is made to derive an innovative content analysis model to identify creative processes and co-construction of creative knowledge that is taking place in the CSCL environment.

Literature Review

Social creativity is defined as a sociocultural process in which novel and appropriate products are developed. It is evidenced not only in a few outstanding individuals but is also perceived as a generic capability that can be fostered in every individual.

Csikszentmihalyi (1999, p. 314) sees creativity as a social construct that is the result of an "interaction between the producer and the audience". Creative activity grows out of the relationship between an individual and the world of his or her work, as well as from the ties between an individual and other human beings. Much human creativity arises from activities that take place in a social context in which interaction with other people and the artifacts that embody group knowledge are important contributors to the process. Creativity does not happen inside a person's head, but in the interaction between a person's thoughts and a sociocultural context (Csikszentmihalyi, 1996). Creativity is seen as a social construct (Saunders & Gero, 2001) or communal judgment (Gardner, 1993), where the creative individual is considered not in isolation but in interaction with an environment of physical and social dimensions. Creativity is defined by a set of complementary processes including adoption of a solution by a population, nomination by specialists or gatekeepers and colleague recognition (Sosa & Gero, 2004). By this way of thinking, attributions of what is creative are relative and grounded in social agreement.

It is argued that creativity can be fostered and developed in individuals within learning communities as creativity development is viewed as a transactional process that involves active transformation of individual, environment, and the sociocultural world. Creativity development is a process that involves doing, not acquiring (Barab & Duffy, 2000; Sfard, 1998). In this manner, creativity is a social entity, one that is both socially produced and socially validated (Dewey, 1938). Clearly, at some level creativity development involves the transformation of the individual. However, similar to Gibson's (1986) ecological description of effectivities, creativity development involves the transformation of the individual in relation to the contexts through which the individual transformation is realised. This individual transformation is characterised as the education of intention and attention (Barab & Plucker 2002).

Fischer (1999, 2000, 2001) and Reilly (2007) further term such kind of creativity development as social creativity. It is creativity that emerges from a context in which practices and discourses play a key role. The space between those in dialogue within which interactions happen is the cru-

cible of creativity. It is creativity that is based in systemic dynamics. It is creativity that is sustained and distributed in nature, which does not reside in a single cognitive or personality process, does not occur at any single point in time, does not happen at any particular place, and is not the product of a single individual.

This conception of social creativity is adopted for this study as it resonates highly with CSCL. The social, situated and distributed nature of CSCL can serve as the catalyst for promoting social creativity (Artman, Ramberg, Sundholm & Cerratto-Pargman, 2005; Barab & Plucker, 2002; Csikszentmihalyi, 1999; Fischer, 1999; Sosa & Gero, 2004). Collaborative design can be viewed as an activity driven by communicative practices and representations for mediating ideas (Artman et al., 2005). The significant area of common ground between online learning communities and frameworks for creativity is the importance of and potential for collaboration and communication with "a range of audiences" (Loveless, 2002). Collaborations demand far less individual investment in learning and therefore accelerate the process of experimentation in combining different kinds of expertise. Once the participants have learnt some of the objective facts surrounding the issue, they begin to explore the subjective opinions of other members of their community. Here they will begin to use the objective facts they have previously learnt to evaluate others' opinions. The turnover of ideas as indicated by the presentation and acceptance of contributions will increase mutual engagement that is indicated by increased modification of each others' contributions to the joint production (Bryan-Kinns & Sheridan, 2007), leading to the creation of a shared understanding and the co-construction of creative new knowledge collaboratively.

The speed and range of communications technology also enable learners to collaborate with others in immediate and dynamic ways during their creative work in progress. CSCL supports asynchronous, networked "brainstorming", eliminating the time and space restrictions that otherwise exist. Collaboration with artists, writers, and fictional characters in "nonresidence'' through e-mail or video conferences offers learners opportunities to work with knowledgeable/creative others to generate ideas, pursue purpose as well as evaluate ongoing and original work (Loveless, 2002). The creative processes are further supported by the immediacy of the presentation, the ease of manipulation, and the possibilities of tracing the development of ideas or revisiting them in order to explore other possible routes.

Collaboration in an intrinsic rewarding environment is perhaps perceived as a significant contribution of CSCL to foster creativity. Increased autonomy experienced in online communities gives a sense of freedom to explore and play within the community in a reduced risk environment. Exploration has been widely identified as a key process within creative action (Joubert, 2001). It is also acknowledged that a conducive environment where mistakes are acceptable is vital in encouraging learners to explore and take risks without real-world risk (Turvey, 2005).

The work of Fischer (1999, 2000, 2001), a pioneer who has conducted several research projects to experiment how CSCL artifacts and environment can enhance social creativity, helps to summarise the dynamics of creative processes that can be fostered in the CSCL environment. It is claimed that to make social creativity a reality, new forms of knowledge creation (externalisation, i.e., artifacts), integration, and dissemination are required.

In summary, creativity is a social construct that is highly promoted within design communities. It arises from the interaction among the intelligence of individuals and with knowledgeable others. The different viewpoints help in discovering alternatives and uncovering tacit aspects of problems and creating a shared understanding, leading to new insights, new ideas and new artifacts. The speed, time and place independence of the medium, the storage capacity of technology and the intrinsic rewarding nature of the computer-mediated communication are identified as adding value to the CSCL environment to foster social creativity.

Methodology

The definition of creativity is elusive. Although most researchers agree upon such aspects of creativity as originality, appropriateness, and the production of works of value to society, they have had difficulty agreeing upon appropriate instruments and methods in operationalising these concepts. The insufficiency of most creativity measures to capture the complex concept of creativity has been well established. Three decades ago, as a result of the lack of a unified, widely-accepted theory of creativity, Treffinger, Renzulli, and Feldhusen (1971, p. 107) argued that researchers and educators:

> have been confronted with several difficulties: establishing a useful operational definition, understanding the implications of differences among tests and test administration procedures, and understanding the relationship of creativity to other human abilities.

Sternberg (2001) goes beyond to argue that creativity should not be considered in isolation from other constructs of human abilities; rather, it is best understood in a societal context. He suggests that the "common thread" in the prolific research literature is the interrelations or "dialectic" among intelligence, wisdom, and creativity, where intelligence advances existing societal agendas, creativity questions them and proposes new ones, and wisdom balances the old with the new. Yet, the assessment of social creativity is still a young and conceptually undeveloped field today. An established language, terminology or conceptual framework shared by practitioners does not exist. The scarcity of readily usable instruments to determine whether students engage in social creativity in a CSCL environment and if so, to what extent, has prompted this study to derive an analytical framework for tracking effects of the creative processes upon the design community.

Self-Devised Content Analysis Model for Creative Processes in the CSCL Environment

Creative processes are complex phenomena. Like human beings, creative processes are situated phenomena, interacting with complex contingent contexts that cannot be reduced to a mathematical abstraction or a philosophical ontology. In focusing on the concepts of creativity, Barab and Plucker (2002) theoretically ground these in situated action, activity theory, distributed cognition, and legitimate peripheral participation. The authors suggest that instead of looking upon these concepts as properties of an individual, these should be looked upon as "…a set of functional relations distributed across person and context, and through which the person-in-situation appears knowledgeably skilful" (Barab & Plucker, 2002, p. 174). That is, in the dynamic transaction among individuals, the physical environment and the sociocultural context, creativity arises. In this view creativity is part of the individual-environment transaction and as such an opportunity that is available to all, but it may be actualised more often by some.

In this study, creativity is perceived as a social construct. Within the concept of social creativity, it is to move beyond the traditional conception of individual creativity. Creativity is discussed as a collaborative effort manifested in a computer supported environment rather than some exceptional individual trait. Much human creativity arises from activities that take place in a social context in which interaction with other people and the artifacts that embody group knowledge are important contributors to the process (Csikszentmihalyi, 1996). Clearly, the emergence of meaning involving synergistic interaction among creative individuals and with artifacts and tools is central to social creativity (Fischer, Giaccardi, Eden, Sugimoto, & Ye, 2005).

It is evident that the existing assessment models with a focus on individual design will not adequately address the distribution of the range of creative processes across individuals in the collaborative creation of knowledge in a computer supported environment. In particular, the interactive and dialogical nature of social creativity in which engagement at different phases of co-

design and co-creation of new knowledge are totally neglected. The switch of focus in creativity, from individual to collaborative design, has entailed an evolution of the theoretical frameworks. The purely cognitive framework is not sufficient to address issues related to the collective nature of the work. Theoretical frameworks in social creativity have integrated the social and situated aspects of collaborative design situations. This has led to more sociocultural cognitive frameworks, with the adoption of concepts developed in situated cognition and activity theory. The promise of collaborative creative communities and the distribution of creative work among a group of individuals engaged in creative production is one which deserves far more attention. In this direction, initiative was taken to derive an innovative content analysis model to understand the creative design processes taking place in the CSCL environment by analysing the ways codesigners of the design communities participate in the process.

Based on Activity Theory (Engestrom, 1987), design can be viewed as a mutual learning process among designers (Beguin, 2003) and can be described as a reflective conversation between designers and the designs they create. It is a cooperative work arrangement which facilitates the application of multiple perspectives on a given problem (Detienne, 2006). It is the business of a collective team whose different participants, with different competencies, responsibilities, and interests, see the object of design differently (Bucciarelli, 2002). It is generally believed that the centres of creativity tend to be at the intersection of different cultures, where beliefs, lifestyles, and knowledge mingle and allow individuals to see new combinations of ideas with greater ease.

Design is a process of negotiation among designers, resulting from a process of social construction (Detienne, 2006). Negotiation is a crucial part of the design situation, and the student has to appropriate such knowledge to be prepared for this. Designers have to learn how to negotiate the relation or the interplay between some actual system design and design of use (Arvola & Larsson, 2004). Collaborative creativity relies more on communication and dialogues as a vehicle for innovation. Designers have to justify their design choice so they need to produce arguments. The purpose of these arguments is to have a joint will to reach agreement, expressed through fashion sketches. Thus, in collective design, reaching an agreement on solutions is not only based on purely technical problem-solving criteria, but also results from compromises between designers through negotiation and dialogue. Eventually, a shared understanding of the design emerges when the codesigners establish a common frame of reference. Identifying when design teams have reached a shared understanding is advancement in understanding how design teams acquire and maintain their collective identity. Each communicative initiative directs the team to consider new aspects of the design. In this regard, creativity can be viewed as, and investigated as, one aspect of an ongoing dialogue in computer supported collaborative teams. Viewing creativity as dialogue might help to discuss creativity as a social and communicative transaction between individuals who share a mutual goal (Fischer, 2000).

Design sketching or drawing representing design ideas are found to be crucial to the design process and also to development of design ability (Ramberg, Artman, Sundholm, & Cerratto-Pargman, 2004). The design drafts are also used as an entrance to the history of the design and the process of idea generation and in this way serve as a collective or shared memory. Design proposals in different phases of the design process can easily be revisited and the development of a design concept can thus be traced. Further, arguments rejecting or highlighting a certain proposal, as well as sequence of arguments leading to a decision for a certain design proposal can be accessed through the file attachment in the discussion forum. Integrating designs relies on the group coming to an agreement on the design concept.

Information technologies have reached a level of distribution such that they are not restricted only to enhancing productivity but they also open new creative possibilities (National-Research Council, 2003). Web-based tools allow users to quickly and easily add or find digital representations of cultural products, annotate them with peer critiques, redesign them with new meanings, and dis-

seminate their work via the asynchronous medium. It is this sociotechnical network of influences that underpins the model of situated/distributed creativity that is proposed. Specifically, it is believed that free association of ideas as a central concept of creativity provides a useful lens for understanding the creative process in online communities of cultural production.

With reference to the social, situated, distributed nature of social creativity, a model of situated/distributed creativity is needed for understanding creativity in the context of computer supported collaborations, which can be understood as a set of three phases that occur with relation to collaborative creative processes:

Phase I-   Exploration/clarification – understanding of the reasoning behind design proposals and choices.

Phase II- Negotiation and argumentation – engagement in making meanings through a fashioning process of capture, manipulation, and transformation of media by means of social debate, critique, and discussion. It is the confrontation and combination of divergent perspectives among codesigners.

Phase III- Evidence of evolution and redesign – modification of artifacts, synthesis of diversity of perspectives, exploitation and building on the multiple voicedness of the past, emerging from exchanges with knowledgeable peers and mentors, leading to convergence among codesigners.

These phases may occur in any order and may repeat in an iterative cycle. In phase III, redesigned artifacts are externalised for the peer critique which will start over the cycle again. The final stage will be the dissemination of shared understanding comprising of co-design of artifacts and co-creation of new insights, new knowledge, and new understanding.

Proposed Content Analysis Scheme for This Study

The content analysis scheme proposed for this study is based on the Activity System Model of Engestrom (1987) in which the analytical framework of subject-community-object triad, subject-community-roles triad and subject-community-tool triad will investigate the interrelationship among the interactivity, creativity presence, and social presence within a CSCL community. A combination of instruments will be built to fit the use of reflecting a complete and meaningful picture of the CSCL community. Each instrument adopted has its own value and focuses attention on different aspects of the learners' involvement and social creative process as evidenced in the online community. The content analysis scheme comprising five different instruments based on five aspects is outlined in Table 1 as follows.

Table 1. Proposed content analysis scheme for this study

Instruments adopted	Aspect to be evaluated	Unit of analysis
	Level and intensity of participation	Usage statistics
Henri (1992) (participative presence)	Nature of interaction	Message unit
a. Treffinger, Young, Selby, & Shepardson's (2002) categorisations on creative levels	Creative presence- a. levels of creativity	a. Fashion sketches
b. Self-devised instrument based on Activity Theory (Engestrom, 1987)	b. process of social creativity; leading to co-design of new artifacts, and new knowledge	b. Message unit
Rourke, Anderson, Garrison, & Archer (1999)	Social presence – quality of peer feedback and critique	Message unit

Unit of Analysis and Content Analysis Procedures

To conduct the content analysis, message units, allowing for the possibility that a single message might exhibit characteristics of more than one category, were used as the unit of analysis. The actual analysis of the postings was carried out into two parts in this study. The online postings were first studied at the message level, and categories according to different aspects to be evaluated were identified as the appropriate units of analysis. The second part involved the use of the content analysis scheme with various chosen instruments on the identified units of analysis.

To ensure intercoder percentage agreement, the data were coded by the facilitator and the research assistant. Percent agreement was arrived at 98% on the unit of analysis, 95% on nature of participation, 88% on phases of social construction of new design and artifacts in the process of the peer critique of Group A, 85% on the levels of creativity of the fashion sketches of Group A; and 99% on categories of social presence towards Group A.

Findings

Learners were equipped with basic interpersonal and group skills at the beginning of the project to ensure that groups could function effectively with mutual respect and commitment in a learning climate reflecting encouragement and acceptance of mistakes, risk-taking, innovation and uniqueness. A blended mode of delivery was adopted for the fashion design module. Trigger sessions on fashion design basic and use of Photoshop to illustrate fashion sketches were conducted face-to-face. Intra-group creation of design sketches and uploading of the developmental intra-group design sketches for informal ongoing inter-group peer critique were conducted online. Four groups of 3 full-time learners were involved in a 6 week project of fashion design online. The collaborative task consisted of three aspects. Firstly, with the help of a Group Page, each intra-group of learners was engaged in design activities and negotiated and drafted developmental fashion sketches with their chosen theme. The intra-group refined their design drafts with inputs of inter-peer feedback and uploaded them for ongoing critique. Secondly, intra-groups completed reflective journals by critically reviewing their own design processes and examining their own learning progress (intra-group review). Thirdly, learners critiqued other group design projects by providing feedback throughout the course (inter-group critique) in the Discussion Forum. 20% of total marks were allocated to reward each group's level of participation. The instructor had the role of a facilitator during the process and provided overall feedback on learners' participation in the final week. Messages posted in this e-learning Blackboard Learning System ML$^©$ were collected and analysed for the study.

Interactivity

The level and intensity of participation were analysed in the form of usage statistics, comprising the number of messages posted, frequency of access, and the number of messages per student. Such rich sources of data illuminate how collaborative learning conditions are generated and maintained. The peer critique messages were collected and there were a total of 120 messages posted in the discussion forum with 112 messages from students and 8 messages from the facilitator.

Structure of Participation

The structure of the online peer critique was observed by recording the time of the day and the day of the week for each message. The data generated indicated the most favourable time pattern for group collaboration and at what stage their collaboration come to maturity.

Time of the day of posting message

Table 2 shows the divergent frequencies of message creation during the day. The bulk of postings usually took place between the late evening hours and the early morning hours (11:00 p.m. to 1:00 a.m.) which showed that the majority of online messages were generated from home, revealing the advantages of wide network connectivity for learners at home.

Table 2: Time pattern of users posting their messages

No. of messages per group	12–1 am	1-2 am	2-3 am	3-4 am	4-5 am	5-6 am	6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 pm	Sub-total
Inter-group	22	4	5	0	0	0	0	0	7	5	5	8	56
No. of messages per group	12–1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm	11-12 am	Sub-total
Inter-group	3	0	2	2	2	9	7	2	9	10	6	12	64

Day of the week of posting messages

The distribution of number of messages per week during the 6 week project duration was further broken down as shown in Figure 1. When the pattern of messages was analysed, it was revealed that week 1 was a warming up period to allow the group collaboration to be developed. Interaction entered a high intensity in week 2-4 which decreased gradually towards week 5 and 6 reflecting the completion of the collaborative tasks. This pattern of development of the collaborative learning space demonstrated that learners' collaboration came to maturity more quickly after some experience in CSCL.
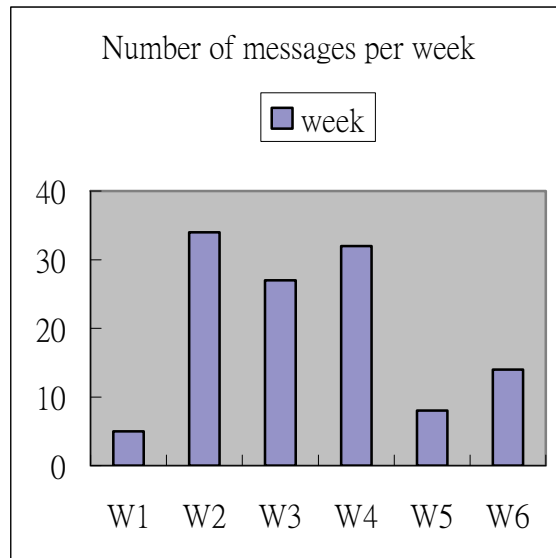

Figure 1. Distribution of messages during 6 week project

Intensity of participation

The intensity of postings can be observed by means of the numbers of messages per user per group. Such information can provide an indication of how collaborative dialogue conditions were generated and maintained.

The overall posting distribution per user and per group is shown in Figures 2-5. Figure 2 shows the varied frequencies of message creation. It was possible to highlight three categories of contributions; about 42% of the learners posted 1 to 10 messages, 50% of them posted 11 to 20 messages while only about 8% posted 21 to 30 messages. Student CLA was identified as the most active member for she contributed most in the peer discussion while students SYC and EMI were viewed as isolated participants who failed to contribute anything during the creative dialogue process.
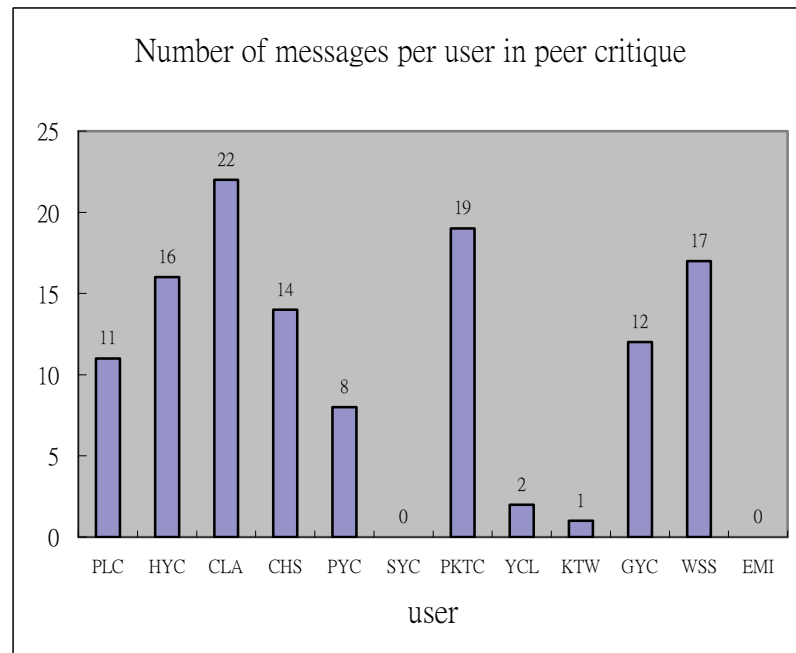

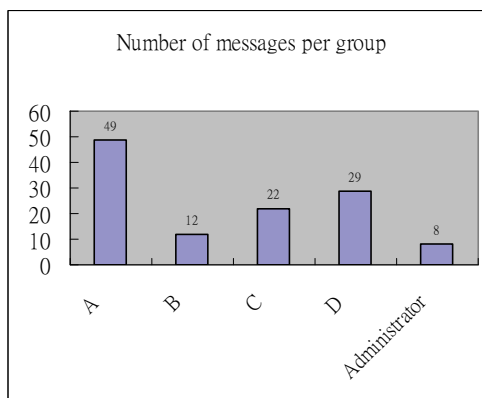**Figure 2. Number of messages per user in peer critique**

Figure 3. Number of messages per group

Generally speaking, most of the learners were involved within the peer discourse with Group A contributing the most messages and Group B contributing the least, as shown in Figure 3. Further breakdown of their involvement in peer critique is displayed in Figure 4 and Figure 5 which revealed that involvement in the collaborative creative task was found to have an even distribution of dialogue shared among members of Group A, while the creative tasks were not evenly distributed among Group B with learner SYC an inactive member in the group.
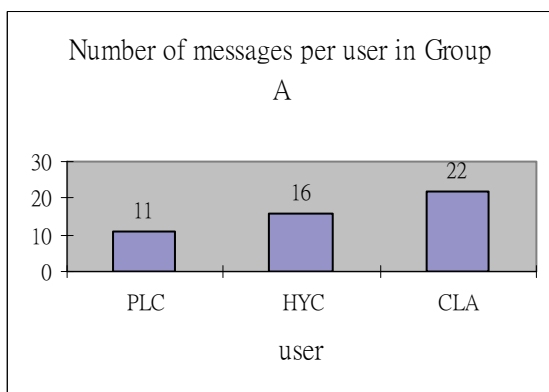
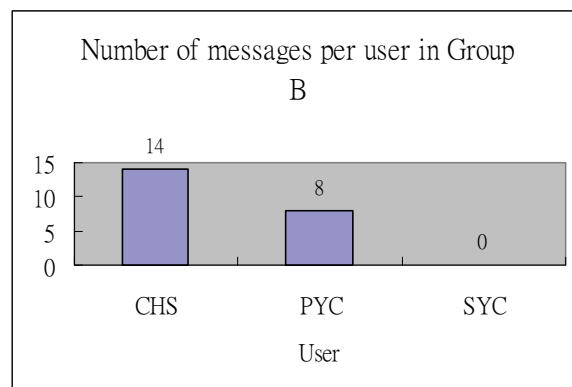**Figure 4: Number of messages per user in Group A**

Figure 5: Number of messages per user in Group B

Nature of participation

To understand the nature of participation, the messages were classified into four main categories, based on Henri's (1992) model, namely: administration, technical, social, and content as presented in Figure 6. For each main category, it is noted that the use of message unit may possibly have characteristics of more than one category.
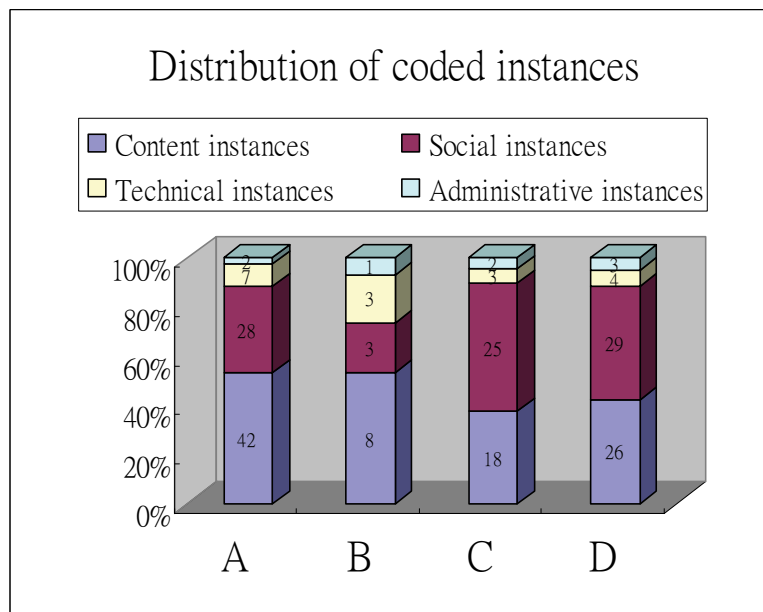
Figure 6. Distribution of coded instances showing the nature of participation of Group A-D

The findings shown in Figure 6 revealed that nearly half of the messages were attributed to content, revealing that the learners' main focus was the discussion relating to their creative tasks. Group C and Group D were the exception with social messages numbering more than one and a half times that of content messages. Group B posted the most technical messages, and their experience with technology was worth attention.

The analysis conducted on the level, intensity, and nature of participation illuminated interaction patterns taking place in the discussion forum. The following section will discuss in detail how such patterns of interaction contribute to fostering social creativity in terms of the levels of creative performance and co-creation of design artifacts and new knowledge.

Levels and Processes of Social Creativity

Two types of data are presented in this section. The first type of data was derived from the online peer critique. The second is an analysis of the fashion design sketches. Findings of these data illuminate the quality of negotiation and argumentation among the learners and how peer critique contributes to the co-design of new fashion sketches and fostering of social creativity.

Processes of social creativity in intergroup online discourse

To capture the progression of social construction of new design as they were reflected at different phases of social creativity, the coded content messages were divided into categories based on the self-derived model with activity theory underpinning the theoretical framework. This model demonstrates the creative flow and how the social interaction in terms of peer critique of fashion sketches has served as the vehicle for peer negotiation and argumentation, as well as co-creation of new knowledge and design. With reference to the design of the collaborative creative tasks, it is anticipated that phase I-III of the social creative process will be evident in the online peer critique:

> Phase I: Exploration/clarification
>
> Phase II: Negotiation and argumentation
>
> Phase III: Evidence of evolution and redesign

The analysis reported here focused on the online peer critique with sketches drawn by Group A. The following excerpt shown in Table 2 shows how peer critique is used for creating a common understanding of the design proposal, leading to co-creation of new design and fostering of social creativity as illustrated in Figure 7:

Table 2. An excerpt illustrating progression of social construction of new design being reflected at different phases of social creativity by means of peer critique provided to Group A

Date	Time	Coded content Messages	Phase I-III
23 Jan	14:26	*Here's the first fashion illustration draft. Please give us some comments so that we can make improvement on that. The theme of this fashion collection is 'Wild Animals'. (GA-PLC-I)*	I
23 Jan	23:31	*It's so sexy. Which kind of animal has stimulated you to come up with this design? Is it a fox? I think it's quite good in a way that it is ladylike with motion. If the pattern could be drawn in more details, it would be even better!!! As we are still in the beginning stage, don't give up and let's work harder! (GAR-GYC-II)*	II
24 Jan	00:17	*It's very good! I think your group will give some 'wild' colours and texture to the design, right? (GAR-CLA-II)*	II

Date	Time	Coded content Messages	Phase I-III
24 Jan	00:57	*Actually the ideas come from ferret and hunter. To enhance the texture of the design, I think the lower part of the skirt will be made of pieces of ferret feather while the upper part will be made of black calfskin. The collar of the black tight-fitting top will be made of ferret feather as well. We want to deliver a message of impregnable feeling and the model is taking a role of hunter. (GA-PLC-I)*	II
24 Jan	14:24	*I think the overall design matches with the theme. It strikes a good balance between 'wildness' and 'connotations'. Excellent!!! It also gives a strong sense of 'wild animals'. I like it!!!! (GAR-PKTC-II)*	II
25 Jan	23:09	*It seems that the design will be more balanced if the proportion of the ferret feather is increased. (GAR-PYC-II)*	II
28 Jan	11:34	*A very good start! The idea is good but more attention could be given to the balance of the design. For instance, the silhouette of the suit would look more balanced and interesting if the hemline of the top slants to the right while the hemline of the skirt slants to the left. (GAR-F-II)*	II
1 Feb	00:09	*Many thanks for all comments and a second draft is attached for your further comments. This is still a very rough draft. Material with leopard skin pattern will be used. We want to create a felling of wildness as leopard is a symbol for that ~~One of the characteristics of this design is that it is backless. There will be a diagonal ribbon across the back ~ (GA-HYC-III;I)*	III, I
1 Feb	00:24	*It's so wild. I think it's excellent. It would be even better if it is coloured!!! (GAR-PKTC-II)*	II
3 Feb	21:01	*It's really a wild design…good. I suggest adding some accessories and it will look better. (GAR-CLA-II)*	II
7 Feb	22:37	*Thanks for Emily for your comments and I have added some animal teeth like accessories to the design (see attached file) ~ I hope you can give us more ideas!!!!! Thanks. (GA-HYC-III)*	III
10 Feb	23:53	*Perhaps the sketch of the fashion model is so fine that it has attracted all my attention ~~ Wahahaha! Let's go back to our discussion…um…(the design) delivers a very strong wild taste! I suggest if the leopard skin pattern can be added to the boot as well to make the theme even more explicit. (GAR- PKTC-II)*	II
10 Feb	23:58	*Is it a one-piece design? Sorry, I can't really figure it out? (GAR-PYC-II)*	I
11 Feb	20:16	*It's a one piece dress. The most special feature is the godet at the back which gives you a feeling of gossamer. How do you feel about it? Please give us some comments! (GAR-WSS-II)*	I
11 Feb	21:29	*We cannot see the front design clearly ~~ 'The most special feature is the godet at the back…', but I can see only two 'tails' at the back!!! I think it will be better if the shape of the sleeve looks like the ears of elephants. (GAR-PYC-II)*	II
11 Feb	21:31	*I think the sleeve can be larger, shorter at the front and longer at the back, the cuff can be as large as possible, using very light and soft material, it will then look very cute!!!!!!!!!!!!!!! (GAR-PKTC_II)*	II
16 Feb	8:10	*I'm sorry to tell u that I can't feel it as an elephant. Or after you have illustrated the sketches with colour and patterns, it will be better. (GAR-CLA-II)*	II
23 Feb	01:01	*Attached please receive our final draft for your feedback. (GA-PLC-III)*	III

First drafts of fashion sketches
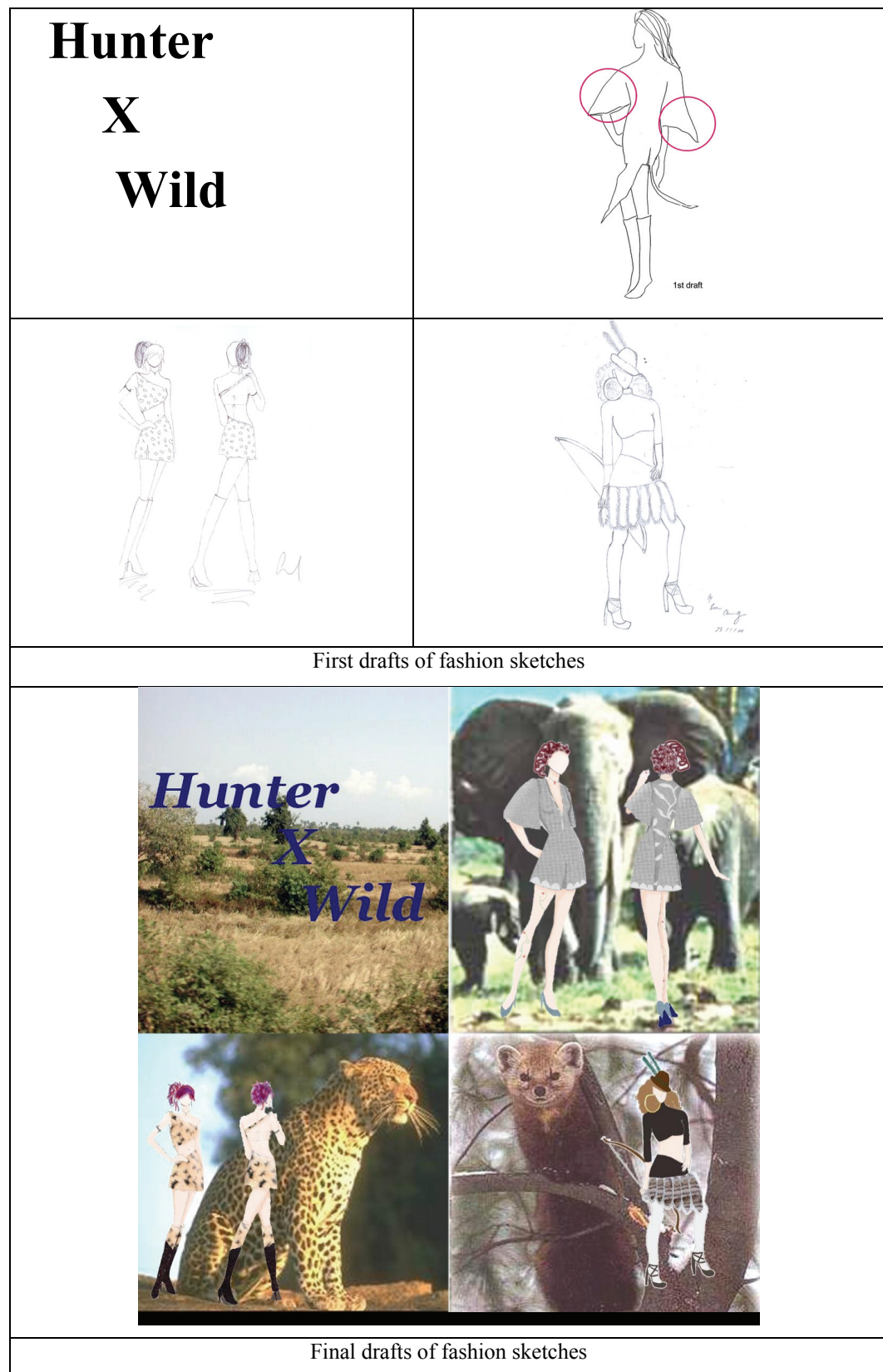

Final drafts of fashion sketches

Figure 7. First and final draft of the Group A's fashion illustration sketches

It was found that out of 19 coded content message relating to peers' feedbacks rendered to Group A's design sketches, 21% of the creative dialogues remained in the phase of clarification and explanation of design evolution, leading to co-design and co-creation of new artifacts and knowledge.

A closer analysis of the first and final drafts of Group A's design sketches with reference to the creative fln of the rationale behind the design proposals and choices (Phase I). Phase II comprised 63% of statements where students were confronted and divergent perspectives were discussed and combined. Phase III comprised16% of the creative dialogues which was the evidence that took place in the design communities illustrating clearly how new creative design ideas were formed from synthesis of multiple perspectives. The externalisation of their design sketches seemed to generate creative dialogue within the groups in which peers contributed to the overall creative work.

Levels of creativity displayed in the fashion sketches

A fashion sketch, largely a collaborative effort, is the external representation of a creative process in development (Artman et al., 2005). The analysis reported here focused on the sketches produced by Group A. Characteristics of two fashion sketches, the conceptual and detailed sketches were examined to evaluate levels of creativity displayed that had been shaped by the peer critique and stimulated by creative impulses. Measurement of the level of creative products present utilised a coding method that was based on the work of Treffinger et al. (2002) and is shown in Table 3.

Table 3.   Analysis of levels of creativity displayed in the conceptual and detailed fashion sketches of Group A's design

Developmental fashion sketches	Indicators of creativity: Generating ideas	Measures of the level of creative performance			
		Not yet evident	emerging	expressing	excelling
Conceptual sketch	Fluency		√		
	Flexibility		√		
	Originality		√		
	Elaboration		√		
Detailed sketch	Fluency			√	
	Flexibility			√	
	Originality			√	
	Elaboration			√	

Findings shown in Table 3 indicated that the detailed sketch was more creative in terms of ideas generation. It moved from the level of "emerging" to the level of "expressing" after synthesis of divergent ideas from peers and the co-design process. With reference to Figure 8, the conceptual sketch was quite limited regarding the variety of ideas and detailing the idea. The detailed sketch, on the other hand, was more elaborate and with richer details in terms of the usage of colour, pattern and texture. Colours reflecting the environment of wild jungles where hunters hunt, the pattern of animal skins, such as ferret, bird feathers and calfskin; and contrasting textures of softness and hardness, lightness, and thickness, as well as smoothness and fluffiness were utilised in the fashion design to enrich the details, echoing the theme of "Wild Animals". The perspective of the fashion sketch also enhanced the promotion of fluency and flexibility of the design.
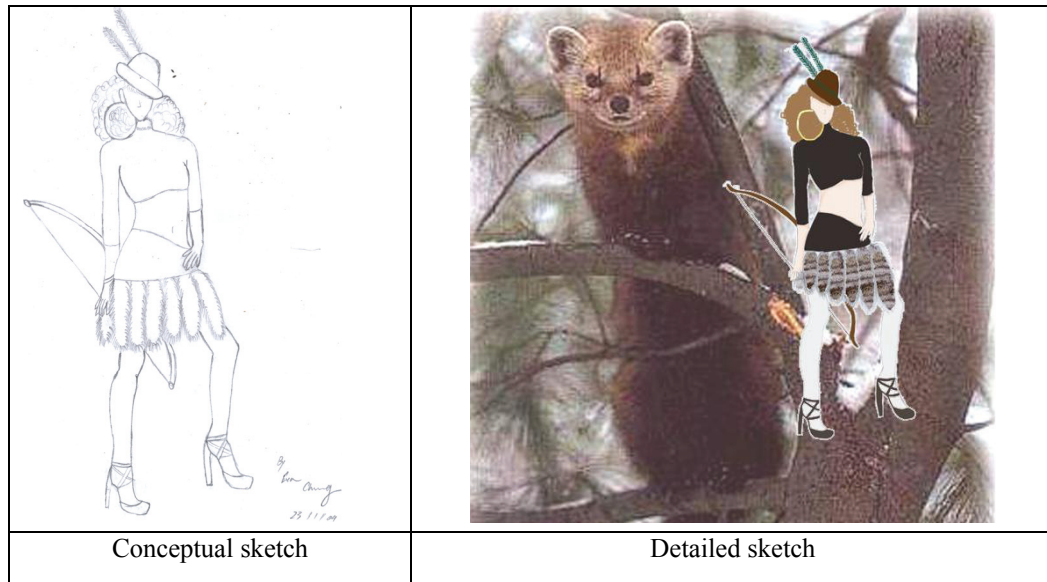
| Conceptual sketch | Detailed sketch |

Figure 8. Conceptual and detailed sketches of Group A's fashion design

In the process of creative development, the conceptual sketch served as an external representation for peer critique. With negotiation and argumentation, integration and redesign, peer critique and creative dialogue led to social creativity and co-design of a detailed fashion sketch. This is strong evidence of a marked improvement in design fluency, flexibility, originality, and elaboration.

Social presence

The messages classified as social were further divided into three categories based on Rourke et al.'s (1999) model in which the responses are classified as interactive, cohesive, or affective. A total of 38 coded instances out of 18 social messages posted by the other groups to as peer feedback to Group A were identified and analysed to reveal the level of social presence supporting social creativity in this CSCL community. Instances illustrating the concept of social presence found in the peer critique transcripts of Group A are shown below.

The response was interactive:

> *Here's the first fashion illustration draft. Please give us some comments so that we can make improvement on that. (GA-PLC-I)*
>
> *Which kind of animal has stimulated you to come up with this design? Is it a fox? (GAR-GYC-II)*

The response was cohesive:

> *Thanks for Emily for your comments and I have added some animal teeth like accessories to the design. (GA-HYC-III)*
>
> *I think the overall design matches with the theme. (GAR-PKTC-II)*

The response was affective:

> *As we are still in the beginning stage, don't give up and let's work harder! (GAR-GYC-II)*
>
> *Excellent!!!... I like it!!!! (GAR-PKTC-II)*
>
> *Sorry, I can't really figure it out? (GAR-PYC-II)*
>
> *it will then look very cute!!!!!!!!!!!!!!!! (GAR-PKTC-II)*

Of the interactive responses, 44.7% of instances of were identified in Group A peer critique, indicating their willingness to communicate mutual attention and awareness. The instances of cohesive responses were low at 10.6% of all responses, which was found not to be strongly established

within the design communities of Group A. On the contrary, as high as 44.7% of instances were affective responses, indicating that Group A received peer critique with ample interpersonal support and encouragement.

Technical factors

The message coded as technical were then divided into two categories; as either hindering or enhancing students' social creativity. (see Figure 9).

Group A, in particular, reported that they had encountered considerable problems regarding the uploading of files to the e-learning platform or formatting files for use in peer discussion. Their peers had offered to help solve their problems and luckily these did not affect their level of participation. A selection of messages from some of the technical problems encountered in Group A are illustrated as follows:

> *Does anyone know why I can't download the file…and can't open it…=((GA-PLC)*
>
> *We can only attach one file each time?...??? (GA-CLA)*
>
> *I don't know how to use zip to upload more than one file, and I don't want to separate two files in two messages. Anyone can teach me what/how to do? (GA-CLA)*
>
> *Sorry ~ I can't see the file ~~ because you used cpr format. Could you please convert it to jpg or bmp format? (GA-HYC)*

A selection of messages illustrating how their peers offered technical support to Group A is shown as follows:

> *Highlight the files required; 2. right click, choose 'send to' zipped'; try if it is OK? (GAR-PYC)*
>
> *I think you can refer to the user manual and procedure for this matte. (GAR-YCL)*
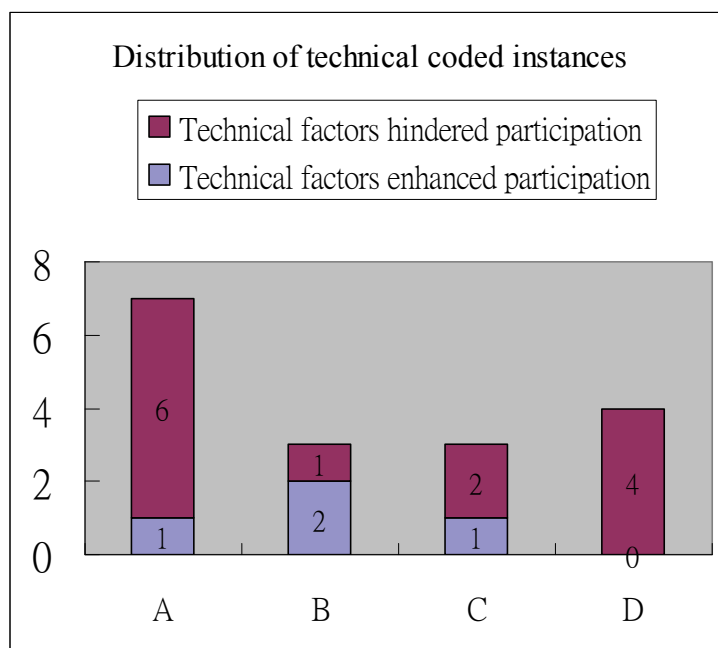

Figure 9. Summary of the analysis of technical factors hindering or enhancing participation for Group A-D

Overall, it was revealed that the technological collaborative environment was not user-friendly in terms of uploading huge files for the developmental design sketches for peer critique. Some

claimed that they would prefer to use ICQ, an instant messaging computer program, for communication as "*it is speedy and is convenient to transfer files*" (GB-PYC).

Discussion

The Activity System Framework (Engestrom, 1987) is useful for bringing together a wide range of factors that impact on the learning activity. To align with the theoretical framework, the following attributes will be discussed based on the findings to examine how design sketches that were created mediated discussions and argumentations and fed into new ones and to what degree characteristics of artifacts in the CSCL environment used in the process permitted creative interactions:

- Interactivity vs. Social creative presence;
- Social presence vs. Creative and affective objectives;
- Role of technology in computer supported collaborative creative dialogues.

Interactivity vs. Social Creative Presence

The analysis of participation levels indicated that the discussion forum was used often by most groups especially around midnight. Most of the participants contributed regularly with about 50% of them posting 11 to 20 messages with peak contribution during week two to four. Peer critique was interactive as evidenced by the majority of direct responses and commentaries to messages. The discussion forum was used for creative negotiation and argumentation, social and technical support. The study also revealed that the quality of interaction mediated by peer critique on design sketches significantly impacted on the quality of creative understanding and artifacts co-constructed by the groups. Taking Group A as an example, there appeared to be a positive relationship between the quality of collaborative creative process in terms of provision of informal peer feedback and the quality of social creativity fostered.

Group A was an active team who posted the highest numbers of messages (49 messages) during the 6 week project with most of them being posted to provide peer feedback to fashion design sketches of the other groups (about 60% of the coded messages related to content). Collaborative load among the team members was evenly shared, which showed commitment within the design community. It was also an encouraging team in that 35% of the coded messages related to social messages, offering support to their peers when it was needed. The depth, breadth, and spread of the postings among Group A members indicated that there were high levels of social interaction and collaboration, contributing to the establishment of community of designers.

In the creative process, Group A was found to be very focussed on their design work evidenced by the different ideas generated by the group. It was reported that as high as 63% of peer dialogue was in making meanings through the process of capturing, manipulating and transforming ideas by means of social critique, leading to confrontation/discussion and a combination of divergent perspectives among the co-designers (Phase II). After the project period of 6 weeks, they had three design proposals, and after negotiation and argumentation, they agreed upon one of them. During the design process there was on-going modification and redesign, leading to creation of new artifacts. Analysis on the final fashion design sketch indicated that it was more creative in terms of ideas generated when compared with the conceptual sketches. It had moved from the level of "emerging" to the level of "expressing" in terms of fluency, flexibility, originality and elaboration after synthesis of the group's divergent comments.

The online peer critique served as a collection of earlier discussions and negotiations which they all previously had agreed upon and now had access to. The digital representations gave the users the chance to renegotiate and re-represent the design proposals. The team members were open to

the ideas presented, and some took the ideas to a practical level of implementation by modification of the design draft with new interpretations and design considerations.

There was a general pattern of how ideas were processed within the computer supported collaborative environment. The first phase focused on clarification of design proposals and explanations. The next phase included discussion among peers where ideas were swapped, debated, and negotiated until some general stance of the ideas had been agreed upon. The final phase was the redesign and dissemination of design artifacts. It was clear that the deeper the group got into a design frame the quicker the cycles and also the more focussed the comments. The observations made in this study support the conclusion that design sketches can mediate negotiation and argumentation, and it is possible to contribute to the design process and co-creation of new design and shared understanding.

However, it should be noted that one group of students worked rather differently. Group B was an inactive team who posted the lowest numbers of messages (12 messages) during the 6 week project. Learner SYC did not provide any peer feedback to other group's fashion design sketches. The group did not consider different design proposals, instead they stuck to the initial ideas of the group members, and in this way the design evolved. Their work was completed in the sixth week of the project without considering any peer critique in the design process. The distinctive working behaviour of Group B might be due to their unfavourable perception of the usefulness of the CSCL environment to foster social creativity, which will be explored later.

Social Presence vs. Creative and Affective Objectives

Analysis of the levels of social interaction indicated that learning was taking place in a collegial and trustworthy environment for most groups in which learners had a sense of affiliation with each other and a sense of solidarity with the group.

Taking Group A as an illustrative example, it was found that about 45% of interactive responses and 45% of affective responses were identified in Group A's peer critique, indicating the members' willingness to communicate ideas and comments , as well as their readiness to render support and encouragement to promote negotiation and co-design in the design community. Findings suggested that their positive outcome in which they demonstrated social creativity, leading to co-creation of understanding and interpretations for creative design proposals, was directly related to the building of strong peer support.

It was evident that the informal ongoing peer critique formed the fundamental basis for social creativity as engagement of individual members in appropriate socio-technical settings amplifies the outcome of the group by augmenting and multiplying individual creativities (Fischer et al., 2005). The ongoing peer feedback is worthwhile if it is specific, descriptive, predominantly non-judgmental in tone and form, and is directed towards the goals of the recipients (Boud & Associates, 1995). Such useful feedback helps engage learners in a greater level and depth of creative dialogue (Smith & Hatton, 1993), creating intrinsic motivation for improvement (Kohn, 1993) and fosters social creativity.

Role of Technology in Computer Supported Collaborative Creative Dialogues

Overall, most of the learners expressed that their experience with the use of technologies was positive. The findings showed that CSCL was capable of facilitating creative discourse at a level which encouraged learners to co-design artifacts. Design proposals in different phases of the design process could easily be revisited and the development of a design concept could be traced. Furthermore, the sequence of arguments supporting a certain design proposal could be accessed

via the computer supported collaborative environment to facilitate the evolution of design proposals with inputs from divergent perspectives from the group members.

Although most of the learners were positive about their use of technology, one group raised the relevance of the online learning environment when students met regularly in a face-to-face classroom. Members of this group did not use the e-learning platform as the major communication channel as they preferred to exchange ideas face-to-face as:

> we are full-time students and we can get in touch with other members very easily…the interaction on e-learning platform is not as direct as the face-to-face one in which we can see others' facial expression. Sometimes, we shall also communicate via telephone' (GB-SYC).

This required the facilitator to seriously consider what sorts of online environments with user-friendly interface could be created to engage students in creative dialogue with digital representations.

Summary

To sum up, the analysis of the interrelationships among attributes of interactivity, social presence and technology indicated that they were important elements which might have contributed or discouraged social creativity in the CSCL community:

- Learners in general were positive about the use of technology to support their collaborative creative dialogue but it required a more user-friendly interface to facilitate the process.

- Findings confirmed that the quality of interaction mediated by peer critique on design sketches significantly impacted on the quality of creative understanding and artifacts co-constructed by the groups. There appeared to be a strong interrelationship between the quality of collaborative creative process in terms of provision of informal peer feedback and the quality of social creativity fostered.

- Findings confirmed that high levels of social presence with good quality peer feedback were necessary to support the creative process in an intrinsically rewarding design community. The affective roles played by the peers were particularly found to be significant in building the supportive and collegial interpersonal relationships to encourage open negotiation and argumentation in creative dialogues which was the core element promoting redesign and co-creation of new design.

Conclusion

In light of the methodological issues relating to coding reliability, limitations of the investigation in this project are summarised as follows:

- the current study was based on the earlier work of a number of researchers and it was not tested at the empirical level;

- the instruments used were administered to a small number of participants with limited numbers of messages and discussions over a short span of time; and the sample sizes used were not large enough to make any conclusive statistical generalization;

- the collaborative tasks and the focus group meetings were conducted in Chinese/Cantonese in order to facilitate better communication. It is a concern that translation into English might distort the meaning.

- only the written statements posted on Blackboard Learning System ML[©] for the intra and intergroup peer reviews and the intragroup E-reflective journals were analysed and it was possible to miss those instances of reflection that took place on other systems or in face-to-face meetings;

●   the self-devised assessment tools for creative processes took place in a CSCL environment which could be replicated in other settings of educational field. Educators, however, require pre-service training in the nature of social creativity and the means for identifying them as the lack of training might upset the validity of the test on the nature and level of creativity.

This study did not go without any challenges. The self-derived investigative instruments are useful in providing insights into how the digital fashion design representations created mediated discussions and argumentation, leading to co-construction of new design, obtaining global impressions of levels of creativity attained by learners, and in appreciation of the complexity of the creative process taken place in the social interaction by means of informal ongoing peer critique. Despite the fact that the self-derived assessment tools are useful, the main problem encountered is the issue of subjectivity when determining the level of creativity of the design performance (design sketches). It is suggested that the fashion design can be developed into artifacts and presented in the form of fashion show and expert judgment can be invited to supplement the assessment grades on level of creativity. Besides, computer supported analysis tools to be developed for evaluation efficiency, reliability and validity is urgently required as well.

As far as the pedagogical design was concerned, the duration of project time could be extended to allow learners to render more feedback at various design stages for improvement and Boud (1995) confirmed that one of the practical constraints on using peer feedback was the amount of time required for students to gain insights. It explains why most of the groups do not produce fashion sketches more than three versions as one of the learners remarked:

> If the project duration can be extended, I think we will be able to synthesize ideas from peers deeply for better improvement. The limited time will only allow us to upload the first draft, then we may have to do coloring for our second draft. There may not be significant changes within such two drafts. Furthermore, it seems the time for us to complete the storyboard or using Coral Draw for presentation is quite short. I think peer's feedback rendered during this stage will be very significant for re-design (GD-WSS).

Besides, letting students critique one sketch per week will make the discussion more focused and meaningful.

A closer examination on the content of peer critique found that the feedback provided was rather limited in the sense that they remained largely in the category of balance of the design and use of colour, pattern, and texture. More advanced tutoring on concepts of design and wider exposure to the appreciation of creative design artifacts of international designers could be provided to better equip the learners so that they could be more ready to provide richer, useful and constructive comments to foster social creativity.

Furthermore, the analysis revealed that some members of a group had a low level of involvement in the online discussion. There were two potential conclusions to be drawn from their low involvement. The first was their preference to use ICQ for communication as "...*e-learning seems having no limit in time and space, it differs from using ICQ or talking face-to-face that we can have instant feedback. Even this mode of communication is very interactive, we still have to wait for feedback*"' (GD-S1). Thus, students need further training in the use of virtual classroom features of the Blackboard Learning System ML$^{©}$ to promote synchronised chat. The second was that the group met regularly in a face-to-face classroom, so that online learning appeared redundant. The full-time learners preferred to exchange ideas face-to-face:

> We are full-time students and we can get in touch with other members very easily...the interaction on e-learning platform is not as direct as the face-to-face one in which we can see others' facial expression. Sometimes, we shall also communicate via telephone (GB-SYC).
>
> Though we got no problem with the IT, I think face-to-face meeting is the best communication mode for us. (GC-7-RJ-S3)

> *Communication in written form was also a problem. Sometimes I thought written words might not be able to fully express what I wanted to say, so communication via telephone or meeting face-to-face maybe a better way for us. (GC-S3)*

The habitual use of other message software such as ICQ for communication or preference to collaborate face-to-face was a problem, and would have resulted in a loss of some significant interactive process data for evaluation. The researcher had to consider how tasks could be designed to engage the students in a computer supported environment. A blended learning mode with online discussion and face-to-face meetings represented a challenging environment which had potential benefits and drawbacks. CSCL allowed the completion of tasks which could not be managed in a face-to-face environment. Its future use by the students for their own professional development needs to be emphasised. The use of technology means that students do not need to be co-located for meetings and discussions. They could engage in working or learning tasks at convenient times. Such rich experiences would equip learners to use technology as a learning tool, and opened more possibilities for their lifelong learning.

Overall, analyzing the transcripts from online discussion forum provided useful feedback for module improvement in terms of pedagogical and assessment strategies, design of collaborative creative tasks and choice of learning tools. The experience of using fashion design as the case study in this study indicated that pedagogical practices utilising CSCL would provide valuable insights to other areas of application. Utilising CSCL into the classroom calls for change and renewal of methods for teacher and student alike. Educators need to be more focused on creative outcomes that involve new social relationships, novel challenges, demanding more tolerance of ambiguity, risk-taking, and capacity devoted to experiment, variety and adaptation on the run.

Dissemination of innovative and good practice of CSCL is facilitated by regular, biannual CSCL conferences. A closer examination of the conference papers themselves suggests that few are cross-disciplinary in nature. Learning to be creative is a difficult process and entails the use of skills that few students possess at the beginning of their learning. It is true that the learner as a creative practitioner will not just happen simply because it is a good idea. Unless social creativity is planned as part of the process or becomes an objective of a task itself, creative activities will be sporadic at best. Ultimately, it is intended that, by building upon the good practice of this study, these studies can be tried in various disciplines or cross-disciplines to obtain a more conclusive generalisations.

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Biography

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