Evaluation of Cross-cultural Computer-Supported Collaborative Learning: Preliminary Findings for iCamp Challenges

Anh Vu Nguyen-Ngoc, Effie Lai-Chong Law
Department of Computer Science
University of Leicester
United Kingdom
{anhvu|elaw}@mcs.le.ac.uk

Abstract: This paper presents preliminary findings about the evaluation of a complex cross-cultural CSCL environment. 43 academics and students from four European countries were involved in a trial. It aimed to validate pedagogical concepts pertaining to online collaborative learning and to examine the applicability of selected evaluation methodologies to the trial. In accord with design-based research approach, multi-perspective data were triangulated. Results from social network analysis of communication diaries, content analyses of our first survey's responses, group-blog entries and student interviews yielded insights how to tackle iCamp challenge – the design of pedagogically sound online learning environments – in our future trials.

Introduction

The emerging landscape of information and communication technologies (ICT) and their wide deployments (e.g. the rise of social software; Bryan, 2006) lead to two major challenges: How should computer-supported collaborative learning (CSCL) paradigms be adapted to exploit potentials of the new ICT? How should existing evaluation methodologies be modified accordingly to validate the adapted paradigms and assess their impacts? The iCamp project (http://www.icamp-project.net) aims to tackle these challenges. It is pedagogy- and validation-driven with the overarching goal of identifying improvement suggestions to refine pedagogical models and technological requirements for successful online cross-cultural collaborative learning. Pedagogically iCamp is grounded in social-constructivist theories (e.g. Prawat & Floden, 1994). Technologically it is built upon a selected set of prevailing technology-enhanced learning tools by rendering them interoperable. Validation is realized through three trials, which have different foci and scales and involve different Higher Education Institutions (HEIs) in Europe. The research methodology embraced by iCamp is closely related to the *design-based research*, which, with the deployment of mixed methods, aims to meet dual goals of refining locally educational practice or intervention and developing more globally usable knowledge for the field. Whereas the first validation trial (Trial-1) (Oct 2006 – Jan 2007) are mainly exploratory, the second (April-July 2007, Oct 2007-Jan 2008) and third validation trials (May-July 2008) will be formative (or diagnostic) and summative, respectively.

In this paper we initially present the so-called *iCamp generic evaluation frameworks*, which are essentially applicable to all the three trials, with emphases varying with the design of individual trials (Section 2). Subsequently, we describe the structure and activities of our first trial (Section 3), and then specific evaluation instruments we have developed and deployed for data capturing and analysis (Section 4). Preliminary findings are presented next (Section5). Finally, we derive from our findings some ideas how to tackle the major iCamp challenge – the design of pedagogically sound online learning environments – in our future trials (Section 6).

iCamp Generic Evaluation Frameworks

Theoretical Backdrops

In the context of iCamp the intervention is *not* the traditional, formal approach of experimental psychology where neat manipulation of variables is required. Instead the intervention is the access to networked communications and interactions as well as the concomitant support enabling the effective use of such an access. iCamp espouses the *design-based research* (DbR) approach that attempts to bridge educational theory, design and practice (Educational Psychologist, 2004). DbR is essentially grounded in the situated learning paradigm (e.g. Lave & Wenger, 1991) emerged in early 1990s. The paradigm advocates the extremely significant role of context in learning and thus

promotes authentic learning settings. Compared to other lines of research that have been practiced in the field of education, the deliberate blending of theory-driven design of learning environments and interventions with empirical research renders the DbR promising.

The DbR uses mixed methods (Frechtling & Sharp, 1997) by blending qualitative approaches with quantitative ones to analyse outcomes of an intervention (i.e. provision of the CSCL environment of iCamp, integrating different roles, methods and tools) and to refine the intervention. In particular, the DbR typically triangulates multi-perspective data from different sources to link intended and unintended outcomes to processes of enactment. This triangulation can not only enhance the validity and reliability of empirical findings but also deepen insights into phenomena of interest. Each of the three iCamp validations trials, as a kind of sustained intervention being embedded in a about three-month regular curriculum in an HEI, are messy settings prone to complications. A complex intervention as such can involve tens of designers, theorists, evaluators, facilitators and students who aim to experience or improve the innovative practice. In these situations, it is extremely difficult to decipher or disambiguate causality; influencing factors are so intertwined that it is impractical to isolate or study them. Hence, mixed-method evaluations and repetition of analyses across cycles of enactment are indispensable.

Three Areas of Pedagogical Challenges and Three Key Competencies

The iCamp project team has three areas of pedagogical challenges, namely cross-cultural collaboration (CCC), self-directed learning (SDL) and social networking (SNW), which entail different analytic and empirical evaluation approaches. CCC is the focus of Trial-1, though SDL and SNW are investigated as well. We aim to evaluate two aspects of the collaborative process: quality of interaction and task performance (Table 1). For SDL, we look into how students make use of learning contracts (NB: to be implemented in the second trial) and self-assess their SDL competencies. For SNW, we analyse the social network development of the groups (for details see Law, 2006).

Table 1: An evaluation scheme for cross-cultural collaboration

Aspects	Rationale and Metrics	Data Analysis
Quality of Interaction	It comprises three factors: ▪ *Social* - How well individual group members are collaborating in terms of mutual respect, responsiveness, politeness, friendliness, etc. ▪ *Cognitive* - How well the group performs the task in terms of mutual stimulation, ease of drawing consensus, effective use of time, etc. ▪ *Affective* - How satisfied or frustrated the group members feel during the task.	▪ Content analysis of blogs and emails ▪ Conversation analysis of online chats and videoconference ▪ Questionnaire for measuring cross-cultural interaction
Task Performance	The extent to which the jointly created artefact meets the quality criteria such as scope coverage, innovativeness, presentation, etc.	▪ Review of the artefact by experts ▪ Peer assessment

The extent to which students can benefit from the online collaborative learning environment designed for Trial-1 depends much on their existing competencies, which in turn are shaped by their participation in the related learning activities. Three major categories of key competencies, which are interrelated, have been identified (Rychen & Salganik, 2003) to be relevant, including:

- *Category 1: Use tools interactively, including language and technology*
  The ability to choose appropriate ICT tools and use them interactively and effectively to accomplish specific tasks and the ability to communicate fluently.
- *Category 2: Interact in heterogeneous groups*
  Collaborations entail skills in communicating ideas to others, listening to ideas of others, turn taking, negotiating divergence, interpreting emotions, managing conflict, making decision, and sensitivity to cultural differences.
- *Category 3: Act autonomously*
  SDL competence is to understand the differences between teacher-directed and self-directed learning, to work collaboratively with others, and to select strategies skilfully and with initiative.

Trial Structure and Activities

Four academic institutions (or trial sites) in different European countries, including Turkey, Poland, Estonia and Lithuania, have participated in Trial-1 (October 2006 – Jan 2007). Three types of key actors were involved:

- *Facilitators*: four faculty members, who were responsible to teach a course on research methods at the respective institutions, scaffolded their students to accomplish the given collaborative task of Trial-1.
- *Site Coordinators*: researchers, who were engaged in the iCamp project and well-informed about pedagogical and technical requirements of the trial, provided constant support to the facilitators, thereby serving as bridges among the trial participants.
- *Students*: undergraduates and postgraduates majored in Social Sciences or Software Engineering.

Altogether four facilitators, three site coordinators (NB: in the Turkish site, the facilitator played the dual role), and 36 students have participated in the trial. Besides, the iCamp research team coordinated and monitored the progress of the trial, negotiating strategies and resolutions with core actors to deal with emerging needs and problems.

Pre-Trial Preparation Phase

To ensure effective implementation of the trial, it was critical that the facilitators could develop their collaborative relationship by negotiating their knowledge and views on the related aspects at the possible earliest time. This process of social grounding (Clark & Brennan, 1991) is deemed indispensable. Six months prior to the official launch of the trial, the four facilitators, who had hardly known each other beforehand, started to collaborate; several videoconferences have been held to identify the scope of collaboration, teaching/guidance approaches, group formation strategies, scheduling, etc. Apart from online discussion, the facilitators were provided a Web-based communication platform to exchange ideas and documents offline. Besides, to enable the facilitators to best manage the cross-cultural online collaborative learning environment, they were presented and encouraged to refer to sets of pedagogical activities, which were depicted in the form of charts with boxes representing instances of three major types of constructs: strategies (e.g. scaffold), people (e.g. facilitator) and objects (e.g. tool). Specifically, three key conditions for effective collaborative learning have been identified, namely, *group composition*, *task features*, and *communication media* (Dillenbourg & Schneider, 1995). In this preparation phase, we addressed these issues.

Identities of student participants in the four trials sites were not known till late September or even early October. To facilitate social grounding and thus group formation, two procedures were involved: First, a videoconference linking the four trial sites was held; each participant (facilitators and students) took turn to make a brief online self-introduction. Second, each student was required to set up a personal blog to introduce themselves, thereby enabling the students to identify potential collaborative partners. To maximum cultural heterogeneity, some constraints were imposed that each group should consist of members originating from the four different trial sites and that not more than two from the same site should be included in a group, for instance, a group of 5 could be composed of one Estonian, one Polish, one Lithuanian and two Turkish students. Otherwise, the students were free to join any group. Presumably such a self-regulated process could heighten the students' motivation to work with the partners of whom they had good impression. This strategy proved workable as seven groups (Group 1 – 7) with 4 or 5 members were formed. The last group – Group 8, however, could only be formed with the intervention of the facilitators. Nonetheless, it was expected that some students could be dependent and passive. Each facilitator then supervised two groups. Apart from culture, the groups had interesting mix of gender, prior knowledge, English language competence, and IT skills. Such heterogeneity is considered indispensable for triggering stimulating interactions among group members, but within the boundaries of mutual interest and intelligibility (Dillenbourg et al., 1996). This assumption is consistent with the social-constructivist theories such as Rogoff's (1990) notion of apprenticeship – interacting with abler others can be an effective means to enhance one's problem-solving skills.

The collaborative task to be accomplished was the development of a questionnaire (i.e. artefacts) with reference to key concepts "cross-cultural comparisons" and "e-learning". The task was selected based on several considerations: (i) Developing questionnaire is an integral part of a course on research methods that are commonly offered in the four sites; (ii) While heuristics for questionnaire developments are available, there is much room for planning and negotiation as questions can be formulated in various ways; (iii) The two key concepts are of high relevance to the online learning environment in which the students are embedded, thereby enabling them to reflect on their own situation. Given the heterogeneous backgrounds of the students and the objective of promoting self-directed learning, the students were given the leeway to specify the exact scope and theme of their questionnaire.

Collaboration may fail if communication media and tools deployed are inadequate, irrespective of whichever group composition and task features. There exist an abundance of multimedia tools supporting online collaboration and communication. To avoid overwhelming the participants, a subset of such tools was selected for the trial primarily based on their accessibility and ease of learning; one of the iCamp challenges is to render these tools interoperable. Blog, email and collaborative writing tool are deployed for asynchronous work whereas instant messages and videoconference systems are used for synchronous work. Pre-trial training was delivered to ensure that the facilitators and students, who had not worked with particular instances of tools prior to the trials, would feel confident and comfortable to use them.

In-Trial Collaboration Phase

The collaborative task was marked by four milestones (*M*): *M1* - Identification of the theme of the questionnaire; *M2* - Drafting the questionnaire; *M3* – Refining the questionnaire; *M4* – Evaluation of the questionnaires. While the first three have been accomplished by most of the eight groups, none of them is entering M4 at the time of writing up this paper. In general, the groups worked on a self-regulatory manner and sought advice from their facilitators when needs arose. Indeed, to foster self-directed learning competencies in the students, the facilitators tended to practise non-interference in the groups' activities on the one hand; they monitored the progress and provided solicited help on the other hand. During this phase, the facilitators and local site coordinators held videoconferences on a demand basis to share their observations about the progress of individual groups and to address emerging issues. In addition, they actively used the Web-based communication platform to exchange ideas.

Post-Trial Reflection Phase

The main objectives of this phase are to assess impacts of Trial-1 on the actors involved, to reflect on lessons learnt from this exploratory trial, and to draw implications for the subsequent trials, especially inputs for technical requirements, trial organization and evaluation approaches. Semi-structured online interviews with the facilitators, local site coordinators and selected student groups will be conducted. Data collected will be analysed with multiple methods and from multiple perspectives.

Evaluation Instruments

To evaluate a complex learning environment, it is deemed necessary to apply an evaluation approach combining multiple data sources and mixed methods. Hence, in this trial we have used different instruments to carry out the evaluation. The importance of each evaluation instrument may vary with the phase of the trial.

Surveys

Survey is one of the most popular instruments for evaluating a learning environment. In the current trial, we administered two different surveys to the students at the beginning and at the end of the trial period. The goal of the first survey was to obtain as much information about the students' motivations and previous knowledge as possible. This first survey would also enable us to find out the efficiency of the provided tools and how students learned to use these tools and applied them to their assigned tasks. The second survey would allow us to know the students' opinions and to check if the students' motivations have changed after participating in the trial, using the provided tools and collaboratively carrying out the tasks with their international peers. The surveys have been developed as an *online* survey system on the top of a PHPSurveyor system. This online system allows easy access to the surveys, thereby encouraging the respondents to complete them and enabling the iCamp research team to evaluate the responses. The first survey consists of 4 parts:

- Part One focuses on the general information of the student. This parts contains questions such as name, gender, university, department, major background, the main language used at the student's university, the student's competence in spoken and written English.
- Part Two contains questions related to ICT competencies. We were interested in knowing the students' previous knowledge in using tools, especially those proposed by the project, such as blog (i.e. wordpress in our case), collaborative writing tool (i.e. Google Docs & Spreadsheets), videoconference (i.e. Flashmeeting) as well as their knowledge in online learning, Learning Management System (LMS), and digital libraries. Specifically, we

wanted to know whether students have Internet connection at home, which is a very significant factor influencing students' participation in an online course, especially their collaboration with international peers.

- Part Three focuses on their cross-cultural experience. We wanted to know whether the students have experience in attending/teaching an online course, in a course where they have worked in groups, in communicating and collaborating with their peers and tutors, and if they have had any difficulty in attending/teaching such courses.
- Part Four addresses students' expectations, needs and motivations when participating in the trial. This part also contains some open questions asking students to express their opinions about an online or a distance course, about the trial and the like.

Another survey has been designed for the facilitators. Although this survey also contains four parts, it is much shorter and consists of more open-ended questions. The facilitators' survey was also distributed at the beginning of the trial. In the second students' survey, we focused mostly on their perspectives and opinions after participating in the trial. This second survey consists of two parts:

- Part One focuses on the cross-cultural collaboration and technology acceptance issues.
- Part Two contains some open questions for which the students are required to express their opinions on how their expectations have been fulfilled, what they like and dislike the most, and what they would do to improve the trial organization.

Communication Diary

Supporting collaboration is also one of the most important goals of the iCamp project. An important phase of the monitoring process is to select one or more high-level variables known as indicators, which can represent some states of collaboration among users in the learning community. To store, select and capture such indicators, we have designed what we called *Communication Diary*. Such diary allows students to keep track of the communications with their facilitators as well as peers. However, the students could choose not to use the Communication Diary, though they were much encouraged to do so. Basically, each student has his/her own diary to use for the whole trial.

The diary is constructed on a *weekly* basis. Each diary contains different parts representing different weeks in the trial. In each part there are several question blocks. Each one records the communication(s) that the students have had with *one* partner (either a student or a facilitator) and consists of 5 items from (a) to (e). The description of each item is presented as follows:

(a) To specify with whom this student has communicated.
(b) To specify if this student was the communication *sender* or *receiver* or both. Actually, a student is considered as a sender of a communication if he/she was the one *who initiated that communication*. For example, in email modality (i.e. if this student has used email to communicate), if he/she has sent an email to his/her partner, he/she has been the sender of that communication. As another example, in blog modality, assuming that student A has posted something on the blog, and student B has posted some comments on it, in this case student A has been the sender and Student B has been the receiver of this communication.
(c) To specify the frequency of the communication(s). This means that the student should indicate here how often he/she has communicated with his/her partner. There are 3 options, which are Low, Medium, or High. The student should update regularly the frequency of his/her communication(s).
(d) To rank the purpose of the communication(s). If the student had several purposes (e.g. he/she has communicated several times with the same partner), the most important purpose would be ranked *first*.
(e) To rank the modalities the student has used for his/her communication(s). If he/she has used different modalities to communicate, the most often-used modality would be ranked first. The modalities defined in the Communication Diary are based on what students are provided and encouraged to use during the trial.

Basically, the students should save their responses in their diaries and then update the responses regularly during the trial. The Communication Diary allows students to save their diaries in progress. Then the system in which the Diary resided provides the students with some information, which they can use to return to their diaries and continue where they have left off. Although the design of the Communication Diary is simple, it serves as a valuable instrument for researchers to construct the indicators of students' communications, thereby enabling the use of an analysis approach such as Social Network Analysis (SNA) to construct the social structure and social relationships of the learning communities formed by the student groups.

Other Instruments

All groups' synchronous and asynchronous communication data were indispensable for the evaluation of the students' shared activities. Evaluation of groups' asynchronous communication includes analysing entries in their group-blog, where the students discussed various ideas posted, and reviewing other shared documents such as versions of the questionnaire under development in each group's shared workspace (i.e. Google Docs & Spreadsheet). With these analyses, we could know how the group members developed their ideas and how they collaboratively resolved their assigned tasks. The groups' synchronous meetings via Flashmeeting were recorded and analysed as well.

Two student groups were selected as *target groups*. The selection was based on the facilitators' recommendations and on our observations of all groups' activities during the group formation phase as well as the first week of the trial. These groups were informed of being selected. The students in these target groups were required to do some extra works. For instance, they shared their exchanged emails with us. They also invited us to be observers in their Google Docs & Spreadsheets Web-based workspace; thus we could track the development of their questionnaire. At the time of writing up this paper, the trial is still ongoing and will terminate in January 2007. Hence, only some preliminary evaluation results are presented and discussed here.

Preliminary Findings

First Online Survey

Filling in the survey was not compulsory, thereby increasing the validity of the responses which were given out of the respondents' willingness and readiness to share. 27 students out of 36 (75%) have completed the survey. Their profiles were: 9 male and 18 female; 9 Turkish, 7 Polish, 6 Lithuanian and 5 Estonian; 17 major in social sciences and 10 major in computer science/engineering. None of the students is English native speaker; 12 students responded that the main language used at their university (probably at the departmental level) was English whereas the others were their respective local languages. The students were asked to self-assess their English competence and the average was 2.7 (out of 5 the highest). The students' self-assessed familiarity with ICT in general was 3.5 (out of 5). 25 had internet connection at home and used it rather often (i.e. between "sometimes a week" and "several times a day, everyday"). 17 of them frequently used communication tools such as chat, forum and audio/videoconference, nine sometimes and one never. The primary purpose of such usage was communicating with friends and relatives. More than half of the students had never used wordpress or Flashmeeting deployed in the trial. Surprisingly, two-third of the students had never used a learning management system (LMS) and one half of the students had never used digital library. Email was most often used communication tool for 22 of the students.

With regard to collaborative experience with co-located peers, only three students did not have it. Among those who had collaborative experience, six students had difficulty in working with team-mates such as time management, inactive members and sharing workload. Nevertheless, 22 of them liked working in groups. Interestingly 22 students had never enrolled in any online course prior to the trial. All except one student expressed interest in knowing and collaborating with peers from other countries. When asked to compare an online course with a traditional one, the students addressed different pros and cons (Table 2) that are consistent with general observations in CSCL practice.

Table 2: Students' perception about pros and cons of online courses

PROS	CONS
▪ Social: communicate with people from different cultures ▪ Economical: save travelling costs; fast and efficient information sharing; support large class size; transcend time and space constraints; flexible for working people ▪ Technical: improve computer skills ▪ Psychological: more exciting and fun	▪ Psychosocial: more difficult: work on one's own, lacking direct contact; less efficient discussion ▪ Technical: to be constrained by the access to internet connection

When asked whether they knew about the purpose of the trial (Table 3), about 28% of the respondents had a vague idea that it was something related to collaboration among students via the Internet. However, the same percentage of students did not have any idea about the purpose. Around 19% of the students expressed that the iCamp's concepts are useful, interesting, good, etc. In responding to the multiple-choice question why they wanted to take part in the

trial, "curiosity" was the most frequently selected option (18 students), followed by "make friend" (16 students). The average self-assessed motivation level for getting involved in the trial was high with the value of 3.9 (out of 5). Positive factors for high motivation were self-challenge, national pride, cognitive dissonance (i.e. to justify their participation) and other factors named as PROS in Table 2, whereas negative factors for low motivation were anxiety to interact with foreign students, language barrier, time constraint, and being forced to get involved in the trial as part of the course. The students were asked to identify their expectations for getting involved in the trial by selecting the given options and the results are displayed in Table 4. Other expectations named by the students included: Acquire skills for developing questionnaire; explore another research topic of interest; improve knowledge about e-learning.

Table 3: Distribution of the categories of students' perceived purposes of the trial

Category	Percentage
Collaboration among international students via the Internet	28.6%
Don't know, no idea, etc.	28.6%
Useful, interesting, good idea, etc.	19%
Learning and using new communication tools	4.8%
Part of a regular course	4.8%
Others	14.2%

Table 4: Distribution of expectation options

Expectation	Freq.
Improve your knowledge in using online communication tools	22
Improve your communication skills	22
Improve your English	18
Improve your ability to organize the activities	17
Have more (international) friends	17
Improve your self-confidence in studying	15
Learn in a flexible way (at anytime and from any location)	14
Improve your autonomy in studying	10
Learn in an easier way	9
Easy to obtain a high grade	3

In summary, the students in general were positive about the trial, had relatively high motivation and held reasonable expectation. Nevertheless, about one-third of the students had no idea about the purpose of the collaborative learning activities in which they were supposed to engage. Besides, half of the students lacked the experiences in using specific tools such as blogs and videoconference systems. These undesirable factors may undermine the overall effectiveness of online collaboration.

Social Network Analysis (SNA)

SNA (Scott, 1991) is an approach that focuses on the study of patterns of relationships between actors in communities. The SNA issues are located in the intersection of the sociometry, group dynamics, graph theory, and anthropology domains. We applied the SNA approach to evaluate the social structures as well as communication and interaction patterns of the student groups. Data from the Communication Diaries were extracted to create matrices suitable for being processed by the UCINET SNA package (Borgatti et al. 2002). For brevity's sake, in this paper we present only the results obtained from our SNA approach carried out on Group 6, which was a target group. This group consists of 4 students coming from Turkey, Lithuania, Poland, and Estonia. These students are designated as *g6.st1*, *g6.st2*, *g6.st3* and *g6.st4*, respectively. The facilitator of this group is from Turkey and designated as *fa2*. The iCamp research team providing different kinds of support is designated as *ra*. The term *participant* refers to either a student or a facilitator or a member of the research team. Basically, a group should spend the first week (6^{th} -12^{th} Nov) to get to know each other and to define the theme for their questionnaire. The second and the third week should be dedicated to the development of the questionnaire and the 4th week (27^{th} Nov. to 3^{rd} Dec.) should be used for the questionnaire revision. In fact, Group 6, like some other groups, has extended their work to the 5th and 6th weeks to finalize their questionnaire.

Table 5 shows the Freeman's centrality degree with which one can see outgoing degree (OutDegree) and incoming degree (InDegree) of each participant's communication as well as the corresponding normalised degrees (i.e.

NrmOutDeg and NrmInDeg) in the first and second week (i.e. Week 1 and Week 2) of the trial. The Freeman's centrality degree allows us to have a perspective about the activeness and the central role of the group members. The higher the centrality degree a student has; the more active this student is in the group. Figure 1 displays sociograms representing the social structures of group communications in the four weeks of the trial. In our sociograms, nodes represent participants and lines represent the communication between participants. Node shapes represent different types of users. For example, circles represent students, diamonds represent facilitators, and rectangles represent the research team members. Line size represents the tie strength, and arrows represent the direction of communications. The Communication Diaries also show that the most important purpose of the communications in this week is "social chat" and that email and blog have been used most frequently. It confirms that in this first week the main student task was to get to know each other and to prepare for the theme of the questionnaire.

Table 5: The Freeman's centrality degree in Week 1 and Week 2

	OutDegree		InDegree		NrmOutDeg		NrmInDeg	
	Wk 1	**Wk 2**	**Wk 1**	**Wk 2**	**Wk 1**	**Wk 2**	**Wk 1**	**Wk 2**
g6.st3	10	6	8	9	83	40	67	60
g6.st2	6	6	5	5	50	27	42	27
g6.st1	4	4	4	4	33	40	33	33
fa1	0	2	0	0	0	13	0	0
fa2	3	2	3	0	25	13	25	0
g6.st4	0	0	3	2	0	0	25	13

The Network Centralization of Week 1 is not high. The Outdegree Centralization equals to 56% and the Indegree Centralization equals to 35%. These degrees imply that no one really played the central role in this group in this first week. From the Freeman's centrality degree and the sociogram, one can see clearly that *g6.st3* is the most active student in Week 1. The facilitator played a rather modest role. He only contacted and was contacted by *g6.st3*. The most passive student was *g6.st4*. This student was only the *receiver* of every communication she had. To find network substructures, i.e. the fully connected students, cliques are detected. The clique is defined as a maximal complete sub-graph (Scott, 1991). That means it contains a subset of participants, all of them are adjacent to each other. Clearly, *g6.st1*, *g6.st2* and *g6.st3* form a clique and *g6.st2*, *g6.st3* and *g6.st4* form another one. The presence of *g6.st2* and *g6.st3* in both cliques illustrates their active roles in this group. In Week 2, *g6.st3* still played the most important role (see the Freeman's centrality degree shown in Table 5). In this week, this student had some contacts with her local facilitator from Poland (illustrated in Figure 1 as *fa1*). *g6.st4* was still a passive student.

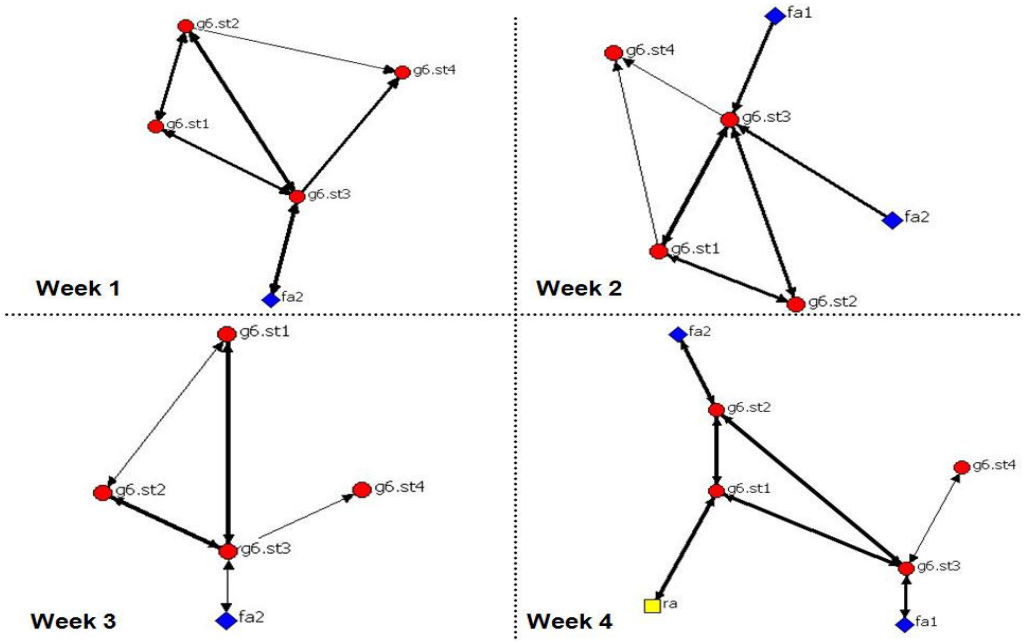

Figure 1: The social structure of Group 6 communications in the first four weeks of the trial

As shown in Figure 1, *g6.st3* always played the most active role in group communications and interactions. An interesting point is that in Week 4, this student contacted only her local facilitator. *g6.st1* had some communications

with two research team members who initiated the contact to obtain specific data. As g*6.st1*'s background is computer engineering, he has been selected by his group-mates to be responsible for technical matters. The most important purpose of the communications in these three weeks has been "developing collaboratively the questionnaire". Different tools, including blog, email and Flashmeeting have been used for such communications. The Network Centralization also confirms the "distributed nature" of the group (see Table 6). No one, even the facilitator, played the central role in the group knowledge distribution and construction. This coincides with what we expected because one of the goals of the project is to facilitate peer communication.

Table 6: The Network Centralization in week 2, 3 and 4

	Week 2	**Week 3**	**Week 4**
Outdegree	21%	58%	25%
Indegree	45%	37%	25%

Blogs and Interviews

Each group was required to set up a so-called "group-blog" to serve as a kind of online forum. Group 6 was the first group to implement and use this tool; throughout the six-week trial period, there were altogether 48 entries. These entries could be categorized into three major types (Table 7): Coordination – managing the blog technically, organizing meetings on proposed dates with proposed tools; Task-oriented – discussing matters related to the design of the questionnaire; Social chat – sharing non-task-related feeling and experience. It is interesting to note that most entries were related to Coordination and that there was a decreasing trend of using the group-blog, surprisingly low in Week 2 and Week 3 when they were developing the questionnaire. It can be attributed to the fact that they were using other instruments (e.g. Google Docs & Spreadsheets, Flashmeeting) during these weeks.

Table7: Communication patterns of Group 6 using blog

	Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5 and 6**
Entries	All 9 coordination	9: coordination, 6: task-oriented, 1: social chat	5: coordination, 1: task-oriented, 1: social chat	2: coordination, 4: task-oriented	6: coordination, 3: task-oriented, 1: social chat
Contributors (Freq.)	*st1*(2), *st2*(3), *st3*(4)	*st1*(6), *st2*(2), *st3*(7), *st4*(1), *fa2*(2)	*st1*(2), *st2*(4), *st3*(2)	*st1*(3), *st3*(1) *st4*(1), *ra*(1)	*st1*(3), *st2*(5), *st3*(7)

Furthermore, semi-structured interviews with *g6.st3* and *g2.st1* (Group 2, student 1) via Flashmeeting were conducted by two research team members. Similar interviews will be carried out with the other students of the two target groups. The interview lasted about 40 minutes; the elaborated responses given by *g6.st3* helped us identify some significant issues and gain insights how to resolve them. The facilitators and local site coordinators have been and will be interviewed with the focus on pedagogical issues.

Conclusions and Outlook

The preliminary findings presented above can already illustrate some interesting communication and interaction patterns in such a complex online collaborative learning environment as established in the iCamp first trial. More exciting results will be obtained when all the data are available and a holistic picture can thus be drawn. Nevertheless, some implications for the aforementioned iCamp challenges and for future trials can be inferred:

- *The role of the facilitator*: As derived from the data in the Communication Diaries, blogs and student interviews, the students tended to consult their local facilitators for advice, who were teaching the courses being taken by the students at the respective universities and thus more accessible as well as more responsive, rather than the remote facilitators who supervised their groups. This observation leads to the question about the share of supervising responsibility among the facilitators – a task that has not been explicitly or clearly defined in the current trial.
- *Motivation of the students*: One of the common motivations of the students to participate in the trial was to improve their English, as shown in the first online survey. However, some responses in the second survey (NB: the collection process for this survey is not yet completed) showed that the students were disappointed as nobody among their peers is native English speaker, and the English competence of most of them is rather limited. Apart from the language barrier, the passivity and non-committed attitudes of some students could either be attributed to technical constraint (i.e. no internet access at home) or their occupation with other duties

(i.e. some are part-time students). These findings have a significant implication for the selection of student participants. A set of selection criteria such as minimal technical requirements, fluency in English, availability, etc, which were already developed for the first trial, should more strictly be applied in the future trials.

- *Structuredness of the activities* – it can be a dilemma. Both interviewees expressed that, on the one hand, more guidelines and instructions could have improved the motivation of her peers; on the other hand, they perceived that the group seemed able to make good use of the freedom.
- *Heterogeneity of the group* – the group were a mix of academic levels (under- and post-graduates), disciplines (sociology, computer engineering) and levels of English competence; these differences hindered rather than fostered their collaboration. Interestingly, it contradicts with the pedagogical assumption about apprenticeship (Rogoff, 1990); the gaps perhaps are too big to bridge without some sort of support such as scaffolding and modelling provided by the facilitators.
- *Effectiveness of tool uses* – Apart from the access issue, the usability of the tools selected should be addressed as well. More systematic training of tool uses for facilitators and students prior to the start of the trial is required. It can enhance the participants' confidence to deploy the tools effectively. Besides, shifting among different communication tools might aggravate the students' confusion. Seamless tool interoperability remains to be a critical iCamp challenge.

In summary, the current first trial can well exemplify the complexity of cross-cultural CSCL. There exist several factors that tend to undermine the overall effectiveness of the iCamp Trial-1 learning environment: technical constraints, language barrier, inadequate self-directed learning experience of the students, lack of relevant cross-cultural online collaborative experience of the facilitators, and the (too) openness of the learning setting. It is difficult to strike a good balance to address all tradeoffs of every possible option. As the evaluation process is still in progress, further insights into the design of such a learning environment will be gained when various data sources are integrated.

References

Borgatti, S.P., Everette, M.G., & Freeman, L.C. (2002). *Ucinet 6 for Windows: Software for Social Network Analysis.* Harvard: Analytic Technologies.

Bryan, A. (2006). Web 2.0: A new way of innovation for teaching and learning? *EDUCASE Review*, March/April, 33-44.

Clark, H.H., & Brennan S.E. (1991). Grounding in communication. In L. Resnick, J. Levine & S. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 127-149). Hyattsville, MD: APA.

Dillenbourg, P., & Schneider, D. (1995). *Collaborative learning and the internet* [online document]. Available: http://tecfa.unige.ch/tecfa/research/CMC/colla/iccai95_1.html

Dillenbourg, P., Baker, M., Blaye, A. & O'Malley, C. (1996). The evolution of research on collaborative learning. In E. Spada & P. Reiman (Eds.) *Learning in humans and machine: Towards an interdisciplinary learning science*. (pp. 189-211). Oxford: Elsevier.

Educational Psychologist (2004). Special issue: Design-based research methods for studying learning in context, Vol. 39, No. 4.

Frechtling, J., & Sharp, L. (Eds.) (1997). *User-friendly handbook for mixed method evaluation*. Directorate for Education and Human Resources Division of Research, Evaluation and Communication, NSF, USA.

Lave, J., & Wenger, E. (1991). S*ituated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

Law, E. L-C. (Ed.) (2006). D4.1: iCamp evaluation framework. Restricted deliverable of the iCamp project.

Prawat, R. S., & Floden, R. E. (1994). Philosophical perspectives on constructivist views of learning. *Educational Psychologist, 29*(1), 37-48.

Rogoff, B. (1990). *Apprenticeship in thinking: cognitive development in social context*. New York, NY: Oxford University Press.

Rychen, D.S., & Salganik, L. H. (2003). *Key competencies for a successful life and a well-functioning society*. Göttingen: Hogrefe & Huber.

Scott, J. (1991). *Social network analysis: A handbook*. London: Sage.

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