COMPUTER SUPPORTED COLLABORATIVE LEARNING

Overview

The purpose of this paper is to scaffold or support students in learning together effectively through internet or in a digital classroom. CSCL is a method for bringing the benefits of collaborative learning and cooperative learning to users of distance or co-locative learning. The purpose is to facilitate group communication and productivity. Online Collaboration tools are the means and mediums of working together on the Internet that facilitates collaboration by individuals who may be far apart. The use of collaborative tools is increasing, however many teachers are still new to what tools are available on the internet and how to use them effectively. The projects proceeding for CSCL are ENFI which describes about computer aided writing, early chat type functionality. Early efforts focused on suspected detrimental effects of communication filtering of computer mediated communication (CMC) and ignored the potential benefits of CMC. In general, there is a strong theoretical parallel between principles of CSCL and tele-collaboration I which CSCL research focuses largely on group learning via CMC, making it particularly relevant to tele-collaboration whereas CSCL platforms include enhanced CMC tools that may be useful in tele-collaboration. In short, CSCL tools and principles may provide a framework for increasing dialogue and collaboration among tele-collaborative partners [1].

BACKGROUND AND RELATED WORK

Collaborative learning has been frequently seen as a stimulus for cognitive development, through its capacity to stimulate social interaction and learning among the members of a group.

(1) THE RELATIONSHIP BETWEEN COMMUNICATION, NEGOTIATION, COODRINATION AND INTERACTIVITY IN CSCL

Communication is basically possible in three different ways such as verbal means another person receives this message through auditory or visual senses, physical means by reading the other person's body language and or movements, and graphical by using written signs and drawings. Students tend to communicate effectively about the problems that arise while performing highly coordinated face to face tasks. There is evidence of increasing problem-solving and enjoyment when two children work closely together on coordinated computer-based tasks .The coordination supported by CSCL seems to lead to more and better communication and vice versa.

According to Haythornwaite (1999), CSCL is not just collaboration around computers with the computer providing a means to coordinate tasks or to simulate problem solving situations. The anywhere anytime characteristic of the Handhelds and its potential to support interactive communication between group members have convinced many educators to believe Mobile CSCL environments to be the promising next generation of educational tools (Danesh et al., 2001; Inkpen 1999; Soloway, Norris, Blumenfeld, Fishman, Krajcik, & Marx, 2001) [2]

(2)CHILDREN AS USERS OF FACE TO FACE CSCL

Children enjoy playing together and are very good at engaging in fruitful face-to-face social interactions (Inkpen, 1995). Research has shown that social interactions in a CL environment lead to significant academic and social benefits (Hymel et al., 1993; Johnson & Johnson, 1999; Wood & O'Malley, 1996). Also, research in psychology and education has consistently demonstrated that children working in pairs, or small groups, and interacting with computers can have advantageous effects on learning and development, especially in young children [4]

(3) HANDHELDS AS SUPPORT TO COLLABORATIVE LEARNING ACTIVITIES

The design of the Handhelds may enable collaborators to be aware of the state of the activity (e.g. visibility) despite the apparent restricting aspect of limited size of the Handheld's screen Roschelle and Pea (2002). A small screen size does not have to be, and indeed is not, a barrier to collaborative work (Stanton & Neale, 2002). There are forms of interface design that allow children to collaborate around a Handheld by paying

attention to the detail of the interaction taking place and enabling pairs to share technological and social information.

CSCL PLATFORMS

CSCL platforms are linked, navigable individual and shared spaces. They can be either personal or group or course which means that it allows the users to work either personally sitting from the home or as a team or a group and course. It is also flexible to read and writes permissions. File sharing and versioning are made easier. It reaches consensus on when a file is presentable to a larger group which is termed as Consensus building. Their emphasis is on providing environment for collaborative construction of knowledge artifacts other standard CMC tools such as email, chat, and so on.

GENERAL TASK SEQUENCE FOR COLLABORATIVE ARGUMENTATION BASED LEARNING

The task sequence shown in Figure 1 aims to prepare students for debating, in terms of acquiring appropriate knowledge of the domain, the tools to be used, argumentation itself, and consolidation of knowledge co-constructed in the debate [1]

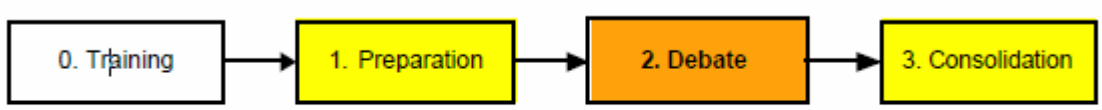

Figure 1. Generic task sequence for Collaborative Argumentation-Based Learning

The training phase say 60 minutes of duration which is comprised of a short introduction to argumentation notions and techniques that would be necessary during the debate phase including use of Toulmin like diagrams to represent these pro and contra arguments. During the preparation phase, students were given the teaching materials on particular topics to read (during their own time), together with a table for noting arguments, structured according to views. At the beginning of the part of phase 1 that took place in class, after re-familiarizing themselves with the particular topic say "Artificial Intelligence", the students were asked individually to write a short text presenting their own opinions, and associated arguments, on the question "Artificial Intelligence". The pedagogical rationale of this sub-task was rendering explicit, reflecting upon and restructuring argumentative knowledge in preparation for debating. The ensuing debate phase was carried out either using a CHAT interface, or else using the CHAT in combination .In both cases, students were asked to each express their opinions and provide arguments for them, then to explore and deepen the question together in order to subsequently enrich their individual texts. Within the last 10 minutes of the debate, the students were asked to sum up their points of agreement and disagreement. The pedagogical rationale of this phase was that by interacting together, students would deepen and broaden their understanding of the space of debate, by various means such as acquisition of new arguments from their partners, refinement of their own understanding

by expressing arguments and by understanding criticisms of them, negotiating refined meanings of key concepts In the final phase of the task sequence students return to individual work, and are asked to improve their individual texts, in the light of the discussion that had just taken place. This task was intended to help students to integrate the knowledge they had acquired during the debate, and as a result of it.

Roles in Collaborative Learning Environment

In a collaborative learning environment, where the goal is split into subtasks to be carried out by individual peers, it is often found that the peers are assigned roles that are natural and directly applicable in the domain. Blaye et al in 1991suggest the roles of executor, the one who solves the problem and reflector, the one who observes and comments on the problem solving.

In general, a collaborative learning environment can have the following set of roles: decomposing, defining, critiquing, convincing, reviewing, and referencing. For a peer, the system should maintain a model of each of these roles [McCalla1990].

Decomposing refers to the job of splitting the given problem into tasks. Each task is a logical sub-unit of the given problem. Each of the tasks can be further split into a number of goals, which the collaborative learning system recognizes. The goals are the learning objectives for the student. A list of goals comprises a task. Proposing a goal from a task is referred to as defining. The goals defined can be traced from the task state to the goal state. Critiquing essentially means countering the hypothesis proposed by a peer with an alternative hypothesis. Convincing is an act of comparing a number of hypotheses and supporting one of them. Reviewing is the job of ensuring that the collaborative interaction leads to constructive learning. The reviewer summarizes the actions taken in the collaborative session for a particular goal. Referencing is the job of providing facts and related material, whenever requested by a peer.

The design of a collaborative learning environment should also consider the number or group size of collaborating peers. Most of the experiments are conducted with small numbers of peers to reduce the complexity of deriving inferences. It is natural to assume that the number of peers is dependent on the requirement of the collaborative learning task. [3]

CSCL TOOLS

Computer-supported systems are often categorized according to the time or location matrix. They are synchronous (same time) vs. asynchronous (different times), and face-to-face (same place) vs. remote (different places). Synchronous tools support the simultaneous interaction among group members. Say for example, videoconferencing call or chat. Asynchronous tools support individual work alone to contribute group process. E-mail is an example of asynchronous tool.

(1) COLLABORATIVE LEARNING ENVIRONMENT TOOL

CSILE is an educational knowledge media system, which was developed by Scardamalia & Bereiter at Ontario Institute for Studies in Education. This system is designed to support students in purposeful, intentional, and collaborative learning, in a local network environment. Students can select different communication modes such as text, video, audio, and animation to generate nodes. These nodes contain ideas or information that related to the topic under study. Nodes are available for others to comment on, leading to dialogues, and an accumulation of knowledge. The body of CSILE research presents the most complete view to date of the educational potential of LAN for support collaborative learning (Breiter & Scardamalia, 1984, 1987, 1989,1992, in press).[2]. CSILE based on Zimmerman's (1989) self regulated learning which is also intentional learning and constructivists' view of learning. It emphasizes on building a classroom culture supportive of active knowledge construction that can extend individual intentional learning to the group level. The purpose is to make students think and reflect their thought process which provoke question asking and answering in a public forum. The ultimate goal is to get students involved in knowledge itself rather than improve one's mind, say a World 3 view, which shifts from individual mastery learning to improve the quality of public collective knowledge (Scardamalia, et al., 1994). [3]

(2) COLLABORATORY NOTEBOOKS

Collaboratory Notebook is a shared hypermedia database designed to provide a scaffold for students to conduct collaborative open ended inquiry, created by Learning through Collaborative Visualization (CoVis). The Collaboratory Notebook has been designed to scaffold students as they learn to conduct open ended inquires in a collaborative context. A primary function of Collaboratory Notebook is to allow teacher to monitor and guide students' process of learning. It emphasizes learning process instead of learning outcomes. Edelson, et al., (1995) analyzed Collaboratory Notebook usage, indicated that students with more positive attitudes about science and more experience using online communications media took better advantage of the features of the environment.

PROBLEM CENTERED INSTRUCTION

Problem centered instruction is widely used in professional education, frequently is built around collaborative learning strategies. Dewey endorsed discussion-based teaching and believed strongly in the importance of giving students direct experiential encounters with real world problems. Guided Design, cases, and simulations are all forms of problem-centered instruction, which immerse students in complex problems that they must analyze and work through together. These approaches develop problem solving abilities, understanding of complex relationships, and decision making in the face of uncertainty.

Guided Design is the most carefully structured approach to problem centered instruction. The approach asks students, working in small groups, to practice decision making in sequenced tasks, with detailed feed-back at every step.

Case studies have long been a staple for teaching and learning in the professions, particularly in the fields of business, law and education and they are now being used in many other disciplines as well. A case is a story or narrative of a real life situation that sets up a problem or unresolved tension for the students to analyze and resolve. The use of cases does not necessarily imply collaborative learning or small seminar discussion. However, case method teaching frequently asks small groups of students to tackle cases in class or in study group sessions.

Simulations: Simulations are complex, structured role-playing situations that simulate real experiences. Most simulations ask students, working individually or in teams, to play the roles of opposing stakeholders in a problematic situation or an unfolding drama. Taking on the values and acting the part of a stakeholder usually gets students emotionally invested in the situation. The key aspect of simulations, though, is that of perspective taking, both during the simulation exercise and afterwards. Following the simulation, there is usually a lengthy discussion where students reflect on the simulation and explore their own actions and those of others. This is where important concepts and lessons emerge. There are now a large number of simulations or educational games, as they are sometimes called, relating to many disciplinary areas

Collaborative Learning: Challenges and Opportunities

Creating a collaborative classroom can be a wonderfully rewarding opportunity but it is also full of challenges and dilemmas. Designing group work requires a demanding yet important rethinking of syllabus, in terms of course content and time allocation. If the classroom time is considered an important social space for developing understandings about course material, or if some of the out of class time is devoted to study groups or group projects, how should we design the rest of the class time by giving lectures, assignments, or examinations?

Classroom roles change both teachers and students take on more complex roles and responsibilities. The classroom is no longer solo teacher and individual students. It becomes more an interdependent community with all the joys and tensions and difficulties that attend all communities. This degree of involvement often questions and reshapes assumed power relationships between teachers and students, and between students and students, a process that at first can be confusing and disorienting. Not only is course content reshaped, so are our definitions of student competence.

Because the public nature of group work makes demonstration of student learning so continuous, collaborative learning both complicates and enriches the evaluation process. Student to student interaction, careful examination of ideas, the hearing out of multiple perspectives the development of an intellectual community all these are hard to

accomplish under these constraints. Collaborative classrooms stimulate both students and teachers. In the most authentic of ways, the collaborative learning process models what it means to question, learn and understand in concert with others.

DOMAINS OF COLLABORATIVE LEARNING

In general, collaborative learning is found effective in domains where peers engage in skill acquisition, joint planning, categorization, and memory tasks. The idea is that peers learn the prerequisites of the topic to be learned and reinforce or internalize the topic using the collaborative environment. There have been a number of studies that propose collaborative learning to help learners understand complex tasks. For example, Miyake [Miyake1986] shows that the complex understandings of the working of a tailoring machine is better understood when the peers interacted collaboratively and attempted to understand the problem.

In collaborative learning domains, the domain knowledge to be imparted is complex, hierarchical, and requires deep understanding of each level in the hierarchy. It is difficult to observe a conceptual change if the task is purely procedural and does not involve much understanding. Some domains are less shareable than others, like solving anagrams since the processes involved are not easy to verbalise. Domains like air traffic control are inherently distributable and hence can be effectively learned using collaborative learning.

The domain of computer aided language learning inherently supports collaborative learning because language is learned in situations that are collaborative. It is observed that the subject domain plays an important role in deciding the success and effectiveness of collaboration in learning.

Some experiment shows the strong underlying need to use collaborative learning as a follow up for regular learning to reinforce the learned concept as well as to remove fundamental misconceptions. On the other hand, collaborative learning could also be used to teach the domain knowledge the first time that could later on be reinforced. For instance, teaching conversational knowledge could use collaborative learning as the starting point.

EDUCATIONAL IMPLEMENTATION

Education should shift from individual, technology free cognition to a resourceful collaborative learning and distributed intelligence. Learners should be empowered through thoughtful use of technologies as well as through innovative use of technologies, and benefit from social distributions of cognitions. Salomon et al.'s comment (1991) says that education should pay more attention to the "effects of" technology rather than the "effects with" technology, so that autonomous performance may be achieved.

Scaradamalia et al. (1989) argue that it should be students not the computers to solve problems, make planning, and set the learning goals. The role of computers should be to promote and facilitate learners to maximize use of their intelligence and knowledge. In other words, the intellectual tools design should focus on Salomon's suggestion to provide quality scaffolding that entails meta- cognitive guidance to facilitate students learning how to learn (the "effect of" technology), rather than off-loading and task dividing that try to ease student's cognitive burden (the "effect with" technology). The idea of distributed cognition is relatively new yet crucial.

TUTORING IN COLLABORATIVE LEARING

A number of tutoring methodologies are identified that inherently support collaborative learning.

Practice

The peer is asked to apply a goal learned on a specific problem.

Socratic Learning

The student is prompted with a series of questions about the domain, to which the student reacts with a hypothesis or a question of his/her own.

Learning by Teaching

This methodology supports learning by having the student teach the system, a variation on the use of a simulated student. Palthepu, Greer, & McCalla1991 and [Nichols1994] have built systems to support learning by teaching.

Situated Learning

In this methodology, the student becomes a participant in a socio-cultural practice, where the learning skills and the social process go together.

Negotiated Learning

In this methodology, the student and the system negotiate mutually acceptable learning goals. The student model is expected to keep track of goals of mutual knowledge.

Discovery Learning

The student explores an environment specially crafted to encourage learning. Peers could take individual roles in discovering the environment.

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