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ABSTRACT

This paper presents the results of a qualitative study of the interaction between computer assisted instruction (CAI) and cooperative learning. The constructivist perspective is discussed in relation to other learning theories, and is emphasized as the theoretical basis for the study because of its focus on prior learning, student characteristics, and the changing role of the teacher. Two college courses, one in critical reading and one in special education, were chosen for instructional development. A computer mediated communication system was used for course activities such as class discussion via electronic mail, student journals, and focus group discussions. The two courses offered some interesting contrasts which would help to understand how to implement the constructivist pedagogy. It was concluded that several factors must be considered in order to successfully utilize the constructivist cooperative learning model; these include changes in teaching practice, evaluation and feedback processes, and training and follow-up help in the use of microcomputers and the communication system. (38 references) (DB)

Applying a Collaborative Learning Model to a Course Development Project

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Abstract

This document describes a course development project in which a collaborative learning model was applied for language education and special education courses. The collaborative learning model was based on a constructivist perspective. Differences between objectivist instructional and learning theory, and that of constructivists are compared. The interpretive methodology was utilized to describe a case study. Two course were selected for the course development projects. The two course offered some interesting contrast which would help understand how to implement the constructivist pedagogy. In summary and conclusion, several factors are identified in order to design and apply a collaborative model: change in teaching practice, students characteristics, feedback and evaluation, and technology. In order to make the constructivist pedagogy successful, curriculum change and the role of instructional developer needed to be considered.

Introduction

Collaboration in learning has been of increasing interest to teachers, who realize that knowledge is not simply transferred but actively invented or constructed through interaction with people. Collectively, the literature supports the idea that collaborative learning results in learners' greater productivity, self-esteem, and acceptance of and mutual concern for people who are different from themselves (Johnson & Johnson, 1975; Slavin, 1985; Sharan; 1980). Collaborative learning in colleges and universities, however, has not been widely applied, since learning is considered by college faculty to be more individualistic, hierarchical and competitive work (Bruffee, 1984).

In order to enhance the use of collaborative learning, Brown (1985) argues that computer technology provides an excellent opportunity to create collaboration between the teacher and students as well as among students. Harasim (1989) and Romiszowski (1990) also argue that computer mediated communication (CMC) has potential for collaborative learning in higher education and hypermedia can be a sophisticated tool for collaborative work.

This is a case report on a project in which we are designing and developing collaborative learning environments in two particular courses in the School of Education, Indiana University. In this project, collaborative learning is based on a constructivist view, which regards knowledge as a socially constructed artifact.

The collaborative learning model in the constructivist perspective

Instructional design and development have traditionally been based on the positivist tradition as Lumsdaine (1964), Winn (1989), Reiser (1987) and other scholars describe instructional technology as the application of the scientific principle. Positivists view the world as hard, tangible and relatively immutable structures (Burrell & Morgan, 1979). They believe that the truth can be discovered by employing scientific methods to analyze the world. Knowledge obtained in this way can be value-free, and generalizable regardless of contexts. Positivists view teaching as the transfer of truth from the teacher's mind to the learner's mind, and learning as receiving, storing, and digesting the truth (Freire, 1970). Instructional design theories in the positivist perspective provide effective and efficient ways of transferring knowledge. Cooperative learning in this perspective, such as peer tutoring, for instance, is designed for effective ways of transferring knowledge from the tutor to the tutee in linear fashion (Damon et al., 1989). This cooperative learning is carefully structured in the way that extrinsic reward and punishment are provided according to the learner's work (Murry, 1990).

On the other hand, constructivists, such as Goodman (1984), believe that the very world we live in is "created" by mind (Bruner, 1984). Rorty (1979) argues that there is no way to account for the validity of knowledge; rather we justify our knowledge through a social process, an extended conversation (Gardner, 1985). In other words, knowledge is the product of people through collaborative and negotiative activities.

In the field of psychology, Piaget and Vygotosky derived theories for constructing knowledge from a developmental perspective. Piaget sometimes labelled his position constructionism to capture the sense in which the child must make and remake the basic concepts and logical thought-forms that constitute intelligence. Piaget prefers to say that the child is inventing, rather than discovering ideas (Bovet et al., 1989). For the most part Piaget focused on the cognitive conflict brought about by the disequilibrium that occurs as an individual acts on the physical and logical environment. Cognitive conflict could arise in the course of social interaction, in discussion between children who hold different views on an intellectual or moral issue. Such logical discussion allows children to see that there is a different perspective that may not easily fit into their own preexisting perspective. Piaget emphasizes collaboration as the ideal form of social interaction promoting cognitive development. He conceived of collaboration as a parallel form of logic in which children would discuss propositions provoking cognitive conflict (Tudge et al., 1989).

Vygotosky's theory was built on the premise that individual development cannot be understood without reference to the social milieu, both institutional and interpersonal, in which the child is embedded. Human beings are inherently social, mediated by the cultural context in which humans live (Tudge et al., 1989). This collaboration by a community of learners is seen as indispensable for cognitive growth. Vygotosky (1978) proposes a concept, "zone of proximal development (ZPD)," for understanding the social interactional nature of learner's development. In social interaction in the ZPD, learners are able to participate in more advanced learning activity than they are capable of independently, and in doing so they practice skills that will be internalized to advance what learners can do independently.

Applying the constructivist perspective for teacher education, Fosnot (1989) suggests that, rather than dispensing prescriptive methods of instruction to students for their use, students need to be immersed in an environment where they are engaged in questioning, interacting, investigating, collaborating, and negotiating. Bruffee (1984) argues that collaborative learning provides a particular kind of context for conversation in order to increase active participation, prolonged engagement, and negotiation. In this process of constructing and re-constructing their own

knowledge, students become increasingly adept at seeing the same set of events from multiple perspectives or stances and at entertaining the consequences as alternative possible worlds (Bruner, 1984). This is what Perry (1970) described as a scheme of cognitive development in higher education in which students move from dualistic views to relativistic views through college learning activities.

Designing a collaborative learning environment

Based on the constructivist perspective, we tried to develop a collaborative learning model which reflects three key pedagogical principles.

1. Learners are actively attempting to make sense out of their world, using their background knowledge as an index of understanding.
2. Learning must be situated in a real world context where knowledge is actually applied.
3. Conceptual growth comes from sharing multiple perspectives.

To reflect these principles, the collaborative learning model should provide learners with the rich learning environment in which they can interact and negotiate meanings in their knowledgeable community. The process involves:

- Starting with what learners know.
- Sharing learners' knowledge.
- Creating challenging, but supportive environments.
- Increasing divergent ideas.

We may need to include these processes in learning activities (Bayer, 1990), although it is difficult to define specific methods at the front end.

We tried to capture the collaborative learning model as a set of principles. We soon realized, however, that traditional instructional system design (ID) models did not fit our pedagogy. We compare and contrast several differences.

Optimality vs. meaning making

Traditional ID models, such as Dick and Carey (1985), Briggs (1985) and Branson and Grow (1987) are based on a systems approach, in particular, hard systems approach or systems engineering. This systems approach was borrowed from technological models which emphasize designing a range of precise objectives so that expected performance can be stated and criteria named by which performance will be precisely measured (Checkland, 1981). The systems approach offers rational and well-ordered steps to provide an

efficient means of meeting defined learning outcomes. Learning objectives need to be stated so that developers can prescribe what and how to be taught before actual learning takes place.

On the other hand, since constructivists see learning as a constructive process, developers cannot state objectives as clearly and unambiguously as traditional developers can do (Bednar et al., 1991). A design process in this perspective becomes a means of exploring the ambiguity and contains an additional stage which uses the design process as a means of organizing discussion, rather than means of prescribing optimal instructional strategies. In other words, a design process is a meaning-making process of designers: structuring conversation and constructing shared understanding, rather than prescribing efficient achievement.

Roles of the teacher and the developer

In designing the collaborative learning environment, we need to redefine the instructional developer's and teacher's role based on the constructivist perspective. In the traditional instructional design and development process, instructional developers play a central role since they are responsible for controlling and manipulating a whole instructional system. The role of the teacher is at best a component of instructional resource who transfers knowledge to students as prescribed by the instructional developer. Furthermore, teachers are viewed as hindering effective instruction because they sometimes do not follow the prescription. Technology based instruction can provide much more reliable, effective and efficient means than craft-based instruction (Heinich, 1984).

Constructivists, on the other hand, express the view that face to face human interaction plays a critical role in a learning process because meanings are constructed and negotiated in ongoing dialogue (Suchman, 1989). Bayer (1990) describes the teacher as a collaborator to set up a dialogue in which the learner can reshape his knowledge through interaction with others, rather than a dispenser of knowledge. Instructional developers in this collaborative model play a more modest role of supporting teachers by strengthening some aspects of teaching (Streibel, 1989). The best an instructional developer can do is to create an instructional environment where the learner's process of contextual meaning-making is enhanced.

Computers for collaborative learning

In traditional instructional design, developers regard a computer as a substitute for the teacher. CAI courseware relegates the teachers to a managerial function. Learning becomes more individualized to meet each learner's needs. Streibel (1986), however, criticizes drill-and-practice and tutorial approaches in CAI which embody positivistic notions and regard learning as mere systematic, algorithmic processes.

In the collaborative model, on the other hand, computers are used for social interaction. A computer mediated communication (CMC) system, including hypertext, introduces a unique set of capabilities that enable us to enhance our social and intellectual capacities (Harasim, 1990). CMC provides time-and-place independent group interactions beyond class activities. It encourages active involvement of the learner to present, receive, process and manage information.

The study

Indiana University and AT&T are currently involved in a research and development project for the purpose of creating Enhanced Learning and Information Environments (ELIE). Indiana University is one of the project sites in which we are designing and developing several technologies with new models of instruction and learning support. This study reports a research and development process for two course development projects in the School of Education, Indiana University. We selected two courses on the bases that they seemed to offer instructional opportunities which matched the constructivist pedagogy, and that they were taught by effective, well-regarded instructors who were willing participate in our project. The two courses are "Critical reading in the content area" in language education and "Introduction to exceptional populations." in special education. The two courses also offered some interesting contrasts which, we believed, would help us understand how to implement the constructivist pedagogy in diverse settings. The special education course is a large lecture class of mostly sophomore students. Constructivist pedagogy, such as collaborative learning, had not been a significant component of the course. Prior to the project, it had consisted largely of lecture- and audio-visual-based instruction. On the other hand, the language education course is an advanced seminar course with a relatively small enrollment, and the instructor had previously employed teaching and learning strategies such as collaboration, critical thinking and reflexive awareness.

Qualitative methodology (e.g. Lincoln & Guba, 1985; Merrian, 1988) was used to collect and analyze data. Observations, interviews and meeting records were the main methods of data collection. In addition, questionnaires, students' assignments, and journals were reviewed.

General questions were used to initially guide data collection. We started by attempting to answer two questions:

1. What kinds of factors affect the effectiveness of collaborative and situated cognition learning activities?
2. How can technology support collaborative and situated learning activities?

Critical reading course

"Critical reading in the content area" is an upper-level undergraduate and graduate teacher education course in language education. The students who take this course are mostly preparing to teach at all grade levels and in all subject areas. Therefore, their interests are divergent. The number of students enrolled in the course varies from semester to semester, ranging from 12 to 35.

The instructor of the course believes that students need to develop their own critical thinking skills first in order to practice teaching critical reading in their future careers. In order to develop the critical thinking skills, the instructor provides opportunities to engage in using some conceptual tools such as dialectical reasoning, different views of critical thinking and teaching and learning. Students analyze controversial cases such as censorship and grading by applying conceptual tools such as a framework for argument analysis. Based on articles, videos, and other materials, students practice critical thinking through class discussion, small group discussion, and micro teaching. They also maintain a reading log or journal.

Class discussion is one of the major activities in the course. However, the mixture of undergraduate and graduate students sometimes makes discussion difficult. Participation in discussions was not equal. Some undergraduate students felt intimidated in this activity because of their lack of experience in the field.

We have tried to employ technology in order to provide a more equal opportunity for students to express their opinions, and to enhance interaction between the instructor and students as well as among the students. Technologies such as computer conferencing and hypertext provided alternative means of supporting pre-existing interactions, rather than an entirely new set of interactions.

Computer Mediated Communication (CMC)

A computer mediated communication (CMC) system consists of electronic mail and computer conferncing. At Indiana University, students can access to IBM mainframe computers from computer clusters on campus as well as via modem from computers in office or at home. However, CMC has not been widely utilized for course activities. We introduced CMC technology to her course in order to provide an extended means of communication in addition to face-to-face and paper-and-pencil. Since the instructor had already been using various teaching strategies which could be considered constructivist pedagogy, use of CMC added another dimension to her teaching. Instead of making journal entries in a notebook, for instance,

students either sent electronic mail directly to the instructor or put their journals in an electronic folder of the computer-based conference.

In the fall semester class in which 15 students were enrolled, about four hundred comments were exchanged through computer conferencing. The students sent case analyses, reading log, and their own opinions regarding to the topics discussed in class. The instructor responded to the most students' comments. As a result, about forty percent of comments were sent by the instructor. Half of the students actively participated in the computer conferencing activity, ranging from 20 to 56 replies in a semester. After the instructor had used CMC extensively for a year, she was convinced that CMC provided more close and immediate communication than before. She installed a modem in her home computer so that she was able to access the CMC at home as well as from her office. The instructor felt that she could interact more with students, which helped their reflexive thinking. Students also felt more involvement since they had a sense of time- and place-independent communication with the instructor and classmates.

CMC was used for students to make case analyses, write journals and logs, comment on assigned articles and concepts discussed in class, and continue discussion outside of class.

1) Case analyses

The students made their case analyses in the computer conference so that they could read each other's analyses. For instance, the first case analysis involved the consequence brought on by a teacher's decision to allow students to research a controversial item in the Bible. The case described different perspectives regarding to the Bible, such as students, parents, and the principles. The students examined premise of different perspectives and were required to put their responses in the computer conferencing. Whenever students sent their analyses, the instructor commented on them and asked them to think further in depth. Several students also commented on others' analyses, but this kind of interaction did not continue further, except for a couple of cases. In the fall semester, for instance, 61 replies were posted for a case discussion. As a result of using the CMC to read other students' analyses, students were better prepared for in-class discussion and participated more actively than before.

2) Extended class discussion

Since class was usually held once a week, face-to-face discussion was sometimes cut off because of the limited class time. In the fall semester of 1990, for instance, the instructor asked students to continue a discussion on grading through the computer conferencing. She set up five positions related to grading for: measure of knowledge, measure of progress, measure of effort, comparison of students, and negative effects. She asked the students to take

some of these positions as a teacher and describe why they took the positions. Thirty-seven replies were posted in the computer conference about this topic. In this semester (Spring of 1991), she introduced news articles about the Gulf War as an example of critical thinking in class, and discussed several issues on the War: how media influence people's thinking, how we can think about it critically, etc. This topic, however, was too big to conclude in a class session and also was not a major topic in the course. At the same time, she did not want to trivialize this issue, so she set up the war issue in the computer conference. In this way, she tried to create more extensive discussion among students.

3) Individual Journal or log

The students sent their journals electronically to the instructor. Some students sent their journals by e-mail so that they could keep them private. Some used a folder in the computer conference for their journal entry. In this case, their journal became semi-public so that other students also could read and comment on the journal. The contents of the journals consisted of comments on assigned articles and readings, and sometimes more private reflections related to their experiences or interests. This folder became a dialogue between students and the instructor. Since the instructor usually replied to the students' folders within 24 hours, students felt that this was a more intimate and immediate form of interaction than the previous system of exchanging notebooks. A couple of students copied some replies in the computer conference which they thought relevant, and put them in their own folder so that they could organize replies to the conference in their own way. In this sense, the folders were a private area.

4) Creating topics and discussion based on students' interest

If students have their own interests which are different from course main topics, they can create a new folder for discussing their own topics. In the fall semester of 1990, for instance, a student challenged the instructor from the perspective of Christianity. Two students who were also interested participated in this topic. They became heavily involved and exchanged opinions via the computer conference in the last half of the semester. Some replies were getting longer, containing more than 100 lines, as the discussion progressed. At the end of the semester, the instructor held a face-to-face session in this topic outside of class for summing up. This kind of interaction was unique as the result of the computer conferencing.

5) Focus group communication and discussion

Students composed small groups according to their interests and/or majors. They worked on projects to create databases for their future teaching practice. CMC was used for exchanging opinions within a group, since everybody was busy and found it difficult to meet outside of class. When this

activity was started in the fall semester of 1990, the instructor had a vague idea of how groups work. As a result, the focus group did not function well. In this semester, however, she came up with a concrete idea and asked students to compose the focus groups at the beginning of the semester. A group consisted of three to four students based on their interests, such as bilinguals, home schooling, non-college bound, etc.

There are several points we need to consider concerning CMC as a tool for collaborative learning. The students need to reach a take-off point in which they feel comfortable in accessing computers and get a sense of taking advantage of CMC systems. Only those who have reached the take-off point continue to use it and actively communicate with others. The instructor did not force every student to use it. She thought that CMC is just a tool. If use of tools is not convenient or comfortable, we should not use that tool. We should not use a tool for the sake of using it, but we should use a tool to enhance our thinking. If students do not like to use CMC, they still use paper in the course. The instructor left options so that students can choose a way of communication mode with which they feel comfortable and which makes sense to them.

Although follow-up support for use of CMC is indispensable, the simple structure of CMC (VAX system) enables students to use it easily after they attend a training session. Once they get used to using computer conferencing, they can easily navigate by themselves even though one topic contains more than 50 replies. Some students, however, complained about long replies which consisted of more than 100 lines, four to five full screens of information.

Process Tool Research & Development

As one part of the ELIE project we have rapid-prototyped (see Trip & Bichelmeyer, 1990), using *HyperCard* and *Spinnaker Plus*, a networked electronic environment referred to as *RoundTable*[1] to test our notions of process tools (Goodrum & Knuth, 1991; Schwen, et al., 1990). In its current state of development, *RoundTable* includes: 1) electronic mail for personal, group, and class level communication; 2) a brainstorming tool; 3) an analyzing tool that provides a teacher-chosen logic or classification structure for the class to use; 4) extraction tools for both the content materials as well as the community created database; 6) update notification that informs the

[1] *RoundTable* is an on-going research and development effort, designed and developed by David A. Goodrum and Randy A. Knuth, as a component of the ELIE project at Indiana University.

individual of new mail and new contributions to the community database; 7) a journal tool for personal reflection; 8) individual and group paper-writing tools; 9) individual and group paper-reaction tools.

In the implementation for this class, *RoundTable* was used by students synchronously to share their idea from multiple perspectives. The students went to a computer cluster and were divided into small groups, consisting of three to four students in a group. The individuals had their own computers and group members did not necessarily sit near one another. The task that we attempted to support was the analysis of case study materials portraying different viewpoints towards grading in a high school situation. First, the students used a brainstorming tool to exchange personal opinions on the case situation and characters. The brainstorming tool allowed students to react to the issues in the case as they identified them and potentially to project themselves into a similar situation as beginning teachers. Second, an argument analysis tool provided a three part structure consisting of premises, conclusions, and evidence with which to analyze the positions taken by the characters in the case. It was the instructor's perception that the argument analysis tool changed the nature of the discussion compared to the brainstorming tool, allowing the students to focus more clearly on the task of constructing perspectives rather than interpreting issues(Pugh, 1990).

Whereas the computer conferencing provided an open, unstructured forum for group discussion, the process tools in *RoundTable* offered a structured discussion environment which provided students with the conceptual tools for critical thinking such as dialectical reasoning and argument analysis.

It was not possible to utilize *RoundTable* for the entire course or outside of synchronous group sessions because of the limited amount of Macintosh computers on campus and networking obstacles that proved frustrating for both students and developers. Compared to the CMC system (VAXNotes) on campus, we believe *RoundTable* provided powerful conceptual tools for students to utilize actively in an electronically supported collaborative setting. However, this hypertext application is still in an experimental stage because of the limited networking capability on campus. In our view the instructor and students should be able to access *RoundTable* from any place on campus as well as from home, providing a powerful tool for collaborative learning. We are continuing development along these lines, working with courses at Indiana University.

Special education course

"Introduction to exceptional populations" is an introductory course in the department of special education. The course focused on awareness of

special populations, broadly defined to include not only persons of differing physical and mental abilities, but also diversity in ethnicity, gender, etc. Every semester more than 100 students, mostly sophomore, enroll in the course from a variety of majors. The class was conducted in a large lecture hall style classroom.

Since content area is so wide and general the instructor felt it was difficult to cover all the necessary content in the limited amount of course time. In addition, she thought that an affective domain of learning was important to understand human exceptionality. She considered the following objectives to be important for the course: 1) students should become more aware of their values and attitudes toward people with disabilities; 2) students should realize that others may hold different, but equally valid perspectives; and 3) students should critically examine their attitudes and values.

The instructor always provided well-prepared, well-timed lectures. She usually presented audio-visual stimuli such as film, video and slides as a main instructional strategy. Although her lectures stimulated awareness of exceptional populations, the large lecture format provided few opportunities for students to consider value issues in depth. The instructor sometimes had class discussion, but some students could not express themselves loudly enough for other students to hear. As a result, class discussion did not develop profoundly and usually just resulted in a few comments exchanged between students and the instructor. Another problem in this course was that, despite the large enrollment, the instructor had no assistants to support her grading and other course related work.

When the project was initiated, we first engaged primarily in analyzing the course activities and determining how we could link constructivist pedagogy into instructional strategies. During the spring semester of 1990, we administered a questionnaire to the students in order to determine their prior experience with computing and collaborative learning. We found that most students had relatively little computing background. For instance, only 5% of the students were regular users of the university computing system. For collaborative learning, more than 90% of the students reported they had worked with classmates in some form and had a favorable attitude toward it. A few, however, expressed a strong dislike for collaboration. The questionnaire helped us identify several important issues such as computer literacy, and the need to cultivate group work skills.

Second, we conducted two structured discussion sessions with student volunteers. We tried to identify how we could help students explore a specific position in more depth than they were able to do in class. We began each session by showing a video-based case for group discussion. We found that the video-prompted discussion enabled students to consider the issues presented by the video in greater depth than they would normally. However,

in these discussions, the facilitator played a crucial role in initiating and maintaining productive discussion.

Third, we conducted a computer-mediated discussion among a group of student volunteers, using a system called PLEXSYS. Since the students had no previous experience using this type of tool, we had anticipated that some might have considerable difficulty. However, this did not prove to be the case, and the students' reaction toward this application was favorable. The students liked the computer environment because it created a more democratic environment in which they could express ideas without fear.

Although we found that these formative experiments using technologies helped small groups of students work collaboratively, we needed to know how the collaborative learning model could work in the full scale setting. However, in order to implement these activities, there were a number of challer.ges we needed to consider, mostly related to class size.

During the summer of 1990, we started to develop a case study approach as a collaborative tool. The instructor had a box of articles related to course topics which she had collected from past student assignments. Since these articles pertained to real incidents and issues of relevance to the course, we thought that guiding the students through an analysis of them might be useful for developing critical thinking and multiple perspectives. We selected some articles which seemed to be meaningful for the course and at an appropriate level of complexity for the students, and developed an analytical template which might help students think in a structured manner (see Appendix A). The template asked students to identify issues stated in an article; at least two positions which actors in the article can argue; evidence for both positions stated in the article; missing evidence which is not described and would help to defend a position; and underlying assumptions which support each position. Finally, students were asked to state and support their own positions. We planned to use CMC as a means of submitting the case analyses to the instructor and exchanging them with other students.

In the beginning of the fall semester, we asked students to attend one of five identical two-hour workshops which we had designed to train students in the use of the CMC. We also set up several foliow-up sessions for helping students send e-mail through the university computing system. We originally planned three case studies which required students to analyze the cases both individually and collaboratively. Following are the steps of the case study procedure we developed.

1. Four students are assigned to a group, based on alphabetical order.

2. We provide four different articles which are related by a common, broader issue. Each student in a group receives one of the four articles.
3. Each student analyzes his or her article independently, according to the analytical template we provided (See Appendix A).
4. Students send their analyses to the instructor through e-mail. These individual analyses were transferred to the computer conference after removing students' names. Students can see all analyses posted under four categories (one category for each article).
5. Each students reads other students' analyses within a category, each of which contained about 30 analyses.
6. A group meets outside class. Each student explains his/her own case analysis. As a group they identify the key issue which they believe the four articles have in common, then they generate a set of additional concerns or issues which related to that key issue.
7. Summaries of group discussion are sent to the instructor through e-mail. The instructor published all group papers in the computer conference.

Since this case study approach was new to the instructor, the development team, and the students, some confusion inevitably arose. For instance, we required students to meet in a group, outside of class time, to analyze the four articles and to synthesize their interpretations of them. However, every student had their own schedule so that it was difficult for students to meet together. Some students thought this course required a lot of unanticipated work and complained about it.

Another major problem was group grading. Students could get bonus points for group work, which was evaluated as a group. Some students were very conscious about their grading, because they planed to apply for admission to very competitive graduate schools. When they worked as a group, some students worked hard in order to get good grade, while others apparently did not take their grading seriously.

Feedback is a very important issue in learning. We tried to provide quick feedback so that the students could get a sense of whether they were doing correct work. However, it was not easy to set evaluation criteria for the case analyses. Even though we believed that the criteria were stated clearly, when multiple team members evaluated the same student's work, we found that our evaluations varied considerably. Reliable evaluation methods need to be developed for quick feedback.

CMC was not effectively utilized in the case analysis. We did not ask students to send individual case analyses directly to the computer

conferencing system because we were afraid of plagiarism among students. First, they sent their analyses to a special course account by electronic mail. After everybody sent their analyses, we transferred them into the computer conferencing, minus the students' names. The students had to use e-mail to send their assignment, but they were not required to access the computer conference except to read some announcements and others' case analyses. As a result, they forgot how to use computer conferencing. Even though we posted some model case analyses as feedback, few students read them.

We attempted to facilitate collaborative learning activities for a large-enrollment course by employing a case study approach. However, we encountered a number of constraints such as limited accessibility of computer clusters, lack of students' social skills, lack of assistant support, logistical problems, etc. The students also did not take advantage of possible group support processes in collaborative learning, since they met only twice a semester. Without the support of a facilitator, it was difficult for them to discuss issues in depth, even though we provided a highly structured guideline.

Summary and Conclusions

We have examined our experiences in applying a collaborative learning model to two university courses. There are several factors we need to consider when designing and applying a collaborative model. Reflecting on our project, we categorize four factors: change in teaching practice, students characteristics, feedback and evaluation, and technology.

(1) Change in teaching practice

Hargeaves (1984) suggests that teaching behavior and decision to change practice is influenced by mainly two factors: the organizational environment; and individual beliefs, attitudes and knowledge acquired from experience. Considering the university organizational environment, especially major research universities, Schon (1987) mentions that it is extremely difficult to achieve long term continuity of attention and commitment to work on problems of school collaboratively since the pervasive norms of the environment are individualism and competitiveness. Students also compete with each other and seek higher grades than their peers in order to pursue better graduate programs. In this environment, it is difficult to find support for promoting collaborative learning.

Richardson (1990) argues that when a teacher employs an activity in a classroom, it is embedded within the teacher's set of premises. The instructors' beliefs and attitudes about teaching were clearly different in the

two courses. The special education instructor believed that students come to class to listen to listen to an expert. Her teaching style is mainly lecturing and audiovisual presentation, with occasional discussion. She is an excellent lecturer and acts as a role model in front of a classroom. Naturally, the instructional mode is primarily one-way communication. The instructor was not quite convinced that a collaborative learning model was appropriate for her course. When students complained about some of the requirements of the collaborative system we had set up, she found this to be upsetting, and this added to her sense of mistrust about the system.

The language education instructor, on the other hand, has had more experience with student-centered teaching. She shares basic pedagogical beliefs with the constructivist perspective. When she incorporated CMC and a hypertext application in her instruction, these technologies just added another means of interaction, while her instructional style remained the same.

To apply the collaborative learning model, one instructor was expected to make substantial changes in her teaching, which were probably inconsistent with her belief systems, while the other was able to enhance different styles of collaborative learning which she had used previously. When we as IDers design a new learning model, it is important to construct shared meanings about pedagogy with faculty members so that we can work collaboratively.

(2) Students characteristics

We observed differences of students characteristics between the two courses. We needed to consider differences in the developmental level of social skills, expectations, learning style, and class size. In the special education course, students were mainly sophomores, majoring in diverse field not only in education, but also other areas such as physical therapy. Some of them had not decided their majors yet. Most students did not know each other and did not develop close relationships as classmates. The large class size is also a major hindrance to developing collaborative relationships. They have little previous experience with collaborative activity. They did not expect much work outside of class. Their mind set for taking the course was to read textbooks, to prepare for quizzes, write a short paper, and attend class. If the instructor requires more than that, they tend to drop the course, or complain about excessive work. They expect the instructor to employ didactic teaching and one-way lecturing mode.

In the language education course, on the other hand, students are junior, senior, and graduate level. Some students have been working as practitioners in schools. They are more interested in the content area and eager to discuss. Since most undergraduate students will work in elementary and secondary schools after taking the course, the material they discuss and

collect directly related to their future assignment as student teachers. Compared to younger students in the special education course, they work harder and collaborate without much support from the instructor. Because of the small ciass size and shared interests, some students develop further relationships outside of class.

For beginning level courses, collaborative learning may be more successful if the instructor employs in-class collaborative work, under supervision of the instructor, rather than asking for collaborative work to take place outside of class time without facilitation. As students move toward their speciality, develop their social skills, and develop their motivation, the instructor may assign collaborative activity working for their projects.

(3) Feedback and evaluation

Evaluation and feedback processes in the two courses were also quite different. Since students in the special education course used the template for analyzing cases, the development team also used the template for measuring the outcome of students' case analyses. Although the criteria of evaluating case analyses were stated clearly, the evaluations done by the team were probably not consistent and reliable enough. Yet, the instructor alone was not able to evaluate all the analyses by herself within a short period of time. As a compromise solution for this dilemma, we selected and posted four good analyses in the computer conference system. However, since the instructor did not explain and discuss the results of the case studies in class, students may have been uncertain as to how to apply these model responses to their own work.

Students in the language education course also used a template to analyze cases. The instructor, however, uses this template as a guideline or heuristics for stimulating further discussion, not for evaluating the end product. The instructor usually provided feedback to students' analyses within 24 hours since she accessed the computer conference at least once a day. Students enjoyed immediate feedback and could exchange comments with the instructor in order to further clarify the instructor's question. Before using CMC, she assigned students to keep a journal. Every other week, she collected students' journals and wrote her comments in the journals. Changing from notebook format to electronic format, she did not feel that the amount of work increased much. She rather enjoyed immediate interactivity with students. Compared to the special education course, this was possible because of the smaller class size.

For the larger class, we might have designed a peer feedback and evaluation mechanism so that the instructor does not necessarily provide all feedback, but instead serves as a monitor for students' activities. The template could be used for facilitating collaborative work or group discussion, not for an evaluation tool.

(4) Technology

We can conclude that students enjoyed collaborative work through the computer, if properly arranged. In order to provide an appropriate computer learning environment, several factors need to be considered. Accessibility is one of the most important factors. Since most students did not have a computer at home, they had to come to a computer cluster on campus, which they sometimes found to be very crowded. Especially during the daytime, students often had to stand in line to get to a computer, then had to tolerate slow processing speeds.

Training and follow-up help were indispensable since CMC was a new experience for most students. They need to use CMC continuously until they feel comfortable enough with a key board and a computer screen. Once they pass this stage, students usually continue to use CMC. During summer of 1990, students attended the intensive session of the language education course in which they came to class five days a week. In summer, computer clusters were usually vacant except for the students in this course. Before and after class several students came to the cluster and logged on to the computer conference. Since they worked together in a computer cluster, work groups were naturally composed and helped each other. Everybody accessed CMC and commented on each other's work. On the contrary, in the fall semester, only half of the students actively used CMC. After having a training session, those who were busy or were fearful toward computers were discouraged from using CMC because of accessibility and lack of support from peers. Some students indicated a strong dislike of the mode of computer communication.

In the special education course, on the other hand, we did not require extensive use of CMC although we provided training sessions and follow-up sessions. The students were asked to use the system twice a semester for both e-mail and computer conferencing. CMC was not set up in an interactive way: e-mail was for sending their case analyses to the instructor; and computer conferencing was for checking others' analyses. Students easily forgot the procedure of how to use CMC after a week if they did not use it. However, students generally did not complain about use of the technology as much as group meetings. This suggests that group activity could have been less problematic if we could have used the technology for exchanging ideas in a group instead of face-to-face meetings outside of class.

Instructors need to have a sense of control over technology. Much of this sense of control comes through unlimited access. The language education instructor liked that she could access CMC from both her office and her home. *RoundTable*, though designed with her and her students to support a specific learning process, was limited to in-class use, available only in a different location from the normal class sessions. As a practical impact on the course,

the CMC allowed her on a daily basis to fully integrate technology in course collaboration. As a research and development tool limited for this semester to synchronous use during one or two class sessions, *RoundTable* provided fewer opportunities for practical integration and, therefore, instructor ownership — though it provides an initial example of the type of environment best suited for full-time use in the course.

Future Research

We have been applying the constructivist pedagogy to two course development projects. However, we have realized some limitations of the course-by-course development approach because the university environment is not supportive of the collaborative learning model. For instance, both faculty and students' expectation toward university learning are competitive and individualistic rather than collaborative. The university curriculum is based on individual discipline and the grading system reflects the competitive perspective. Lack of budget forces university administrators to create more large classroom formats. We as IDers should recognize these aspects other than pedagogical strategies for instruction in order to develop a workable model for collaborative learning. Instructional development is not simply technical processes, but socio-political and economic activities.

Fosnot (1990) proposes an interdisciplinary curriculum reform to promote the constructivist perspective because the real world problem does not fit into the jurisdiction of single disciplines alone. She argues that change in teacher education is necessarily: (a) a linkage between liberal art and science faculty and education faculty and (b) a linkage between the public schools and university education departments. Schon (1987) also suggests curriculum redesign from the perspective of faculty participation. From his experience in MIT, he recommends that a small group of faculty members become committed to collaborative inquiry into teaching and learning so that they create traditions that channel faculty and student interaction in new ways.

To bring the constructivist pedagogy to full bloom, we need to inquire about the possibilities of change in the university environment. The role of the IDer, then, may become that of a change agent who can organize study groups, symposia and conferences to empower both students and faculty.

Bibliography

Bayer, A. S. (1990). *Collaborative-Apprenticeship Learning*. Mountain View, CA: Mayfield Publishing Company.

Bednar, A., Cunningham, D., Duffy, T. & Perry, J. (1991). Theory into practice: How do we link? In G. Anlin (Ed.) *Instructional Technology: Past, present and future*. Denver, CO: Libraries Unlimited.

Bovet, M., Parrat-Dayan, J. & Voneche, J (1989). Cognitive development and interaction. In M. Bornstein, & J. Bruner (Eds.). *Interaction in human development*. Hillsdale, N.J.: L. Erlbaum Associates.

Brown, John S. (1985). Process versus product: A perspective on tools for communal and informal electronic leaning. *Journal of Educational Computing Research, 1 (2)*, 179-201.

Bruffee, Kenneth A. (1984). Collaborative learning and the "conversation of mankind." *College English, 46 (7).*, 635-652.

Bruner, J. (1986). *Actual minds, possible worlds*. Cambridge, Massachusetts: Harvard University Press.

Bruner, J. (1990). *Acts of meaning*. Cambridge, Massachusetts: Harvard University Press.

Burrell, G. & Morgan, G. (1979). *Sociological paradigms and organizational analysis*. Portsmouth, New Hampshire: Heinemann

Cohen, E.G. (1990 October). Continuing to cooperate: Prerequisites for persistence. *Phi Delta Kappan*.

Damon, W., & Phelps, E. (1989). Critical distinctions among three approaches to peer education. *International Journal of Educational Research, 13 (1)*, 9-19.

Fosnot, C.T. (1984). Media and Technology in Education: A Constructionist View. *ECTJ, 32 (4)*. 195-205.

Fosnot, C.T. (1989). *Enquiring teachers, enquiring learners: A constructivist approach for teaching*. New York: Teachers college Press.

Freire, Paulo (1970). *Pedagogy of the Oppressed*. New York: Continuum.

Gardner, H. (1985). *The mind's new science: A history of the cognitive revolution*. New York: Basic Books.

Goodman, N. (1984). *Of mind and other matters*. Cambridge, MA: Harvard University Press.

Goodrum, D. A., & Knuth, R. A. (1991). *Supporting learning with process tools: Issues of theory and design*. Paper presented at the Annual Convention of the Association for Educational Communications and Technology, February 1991, Orlando, Florida.

Harasim, Linda M. (1990). *On-line Education: Perspective on a new environment*. New York: Praeger.

Hargreaves, A. (1984). Experience counts, theory doesn't: How teachers talk about their work. *Sociology of Education, 57*, 244-254.

Johnson, D.W. & Johnson, R. T. (1975) *Learning together and alone: Cooperation, competition and individualization*. Englewood Cliffs, N.J., Prectice Hall.

Lincoln, Y. & Guba, E. (1985). *Naturalistic inquiry*. Beverly Hills: Sage Publication.

Lumsdaine, A. A. (1964). Educational technology, programmed learning, and instructional science. In E.R. Hilgard (Ed.), *Theories of learning and instruction: The sixty-third yearbook of the National Society for the Study of Education, Part I*. Chicago: University of Chicago Press.

Merrian, S.B. (1988). *Case Study Research in Education: A Qualitative Approach*. San Francisco: Jossey-Bass Publishers.

Murray, F. (1990). Co-optative learning. In Entwistle, N. (Ed.). *Handbook of educational ideas and practices*. London: Routledge.

Perry, W.G. (1970). *Forms of Intellectual and Ethical Development in the College Years*. New York: Holt, Rinehart and Winston, Inc.

Pugh, S. (1990). *Examining student change in a teacher education course using dialectical reasoning as a strategy for critical reading*. Paper presented the National Reading Conference, Miami, FL.

Reiser, Robert A. (1987). Instructional Technology: A history. In Gagne, Robert M. (Ed.). *Instructional Technology: Foundations*. Hillsdale, N.J.: Lawrence Erlbaum Associates, Publishers.

Richardson, V. (1990). Significant and worthwhile change in teaching practice. *Educational Researcher, 19(7),* 10-18.

Romiszowski, A.J. (1990). Computer mediated communication and hypertext: The instructional use of two converging technologies. *Interactive Learning International, 6,* 5-29.

Rorty, Richard (1979) *Philosophy and the Mirror of Nature.* Princeton: Princeton UP.

Sharan, S. (1980). Cooperative learning in small groups: Recent methods and effect on achievement, attitudes, and ethnic relations. *Review of Educational Research, 50 (2),* 241-271.

Slavin, R. et al. (1985). *Learning to cooperate, cooperating to learn.* New York: Plenum Press.

Schon, Donald A. (1987). *Education the Reflective Practitioner.* San Francisco: Jossey-Bass Publishers.

Schwen, T. M., Goodrum, D. A., Knuth, R. A., & Dorsey, L. T. (1990). *Enriched learning and information environments.* Paper presented at the 1990 AERA Anual Meeting, April, 1990, Boston, MA.

Streibel, M. J. (1986). A critical analysis of the use of computer in education. *ECTJ, 34(3),* 137-161.

Tripp, S. & Bichelmeyer, B. (1990) Rapid prototyping: An alternative instructional design strategy. *ETR&D, 38*(1), 31-44.

Tudge, J. & Rogoff, B. (1989). Peer influences on cognitive development: Piagetian and Vygotskian perspectives. In M. Bornstein, & J. Bruner (Eds.). *Interaction in human development.* Hillsdale, N.J.: L. Erlbaum Associates.

Vygotosky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Process.* Cambridge, Mass.: Harvard University press.

Winn, W.D. (1989). Toward a rationale and theoretical basis for educational technology. *ETR&D, 37 (1).* 35-46.

Appendix A: Instructions for individual case analysis

1. Identify the issue. An issue is a matter that is in dispute between tow or more parties; a point of debate or controversy. If the case seems to contain more than one issue, identify the main one.

Example: Issue--Should pregnant, drug-addicted women who give birth to drug-addicted babies be charged with a crime?

2. Identify the two main positions on this issue which are presented in the case, and the individuals or groups which hold those positions. A position is an opinion or point of view held with regard to a particular issue. If more than two positions seem to be represented by a case, choose the two that you think are best represented.

Example: The Allen County prosecutor and a physician at Parkview Memorial Hospital have taken the position that the grad jury should consider charging these women with a crime. A physician at Lutheran Hospital holds the position that charging such women with crimes will only serve to keep them from seeking appropriate health care.

Do the next three steps for each of the two positions you have identified:

3. List the evidence presented in the case that seems to support the position. Evidence generally consists of facts or figures--not opinion or feelings.

Example: To support the position that the grand jury considering charging pregnant, drug-addicted women, the following statements are cited as evidence: "Nationwide, authorities estimate that about 400,000 babies are born annually addicted to drugs." and, "when...cocaine [is] smoked by pregnant women, the drug is passed though the bloodstream and to the developing fetus."

4. Give at least one example of missing evidence---evidence which might have been cited to support a position, but which was not cited.

Example: No evidence is cited to support the position that charging these women with a crime would prevent them form seeking health care. There may be some research studies which could be cited to help support this --or perhaps the opinion of someone who is an expert on providing health care to low-income people.

5. Indicate at least one value or belief-based assumptions that seems to underlie the position. An underlying assumption is a value or belief that cannot be proved or disproved by facts. Often times, these assumptions are not directly stated in the text describing the case.

Example: (1) "Unborn fetuses are living human beings and should have the same right as others." (2)"Until it is born, fetus is part of the mother's body and it does not have separate rights." (3)"Drug addiction is a disease, not a crime." (4) "Cocaine addicts are criminals and should be punished to the full extent of the law."

6. In your own words, state your own position on this issue. Indicate evidence, in the case or elsewhere, that supports your position. Indicate the value assumptions that underlie your position. Your position may be similar to one stated in the case, but do not just pick one from the case-- put it in your own words.

Example: When pregnant, addicted women enter the health care system, I think they should be offered reproductive counseling and drug rehabilitation programs. If they refuse these, then prosecution should be considered. I cannot really cite any evidence to support this position. My guess is that the threat of prosecution won't be much of a deterrent to either drug abuse (which is already a crime) or to pregnancy, so it makes sense to try rehabilitation approaches first. Perhaps some evidence could be found to support this. I'm not too clear about what my value assumptions are. Probably I hold the basic assumption that drug addiction is a symptom of underlying social or psychological conditions, and that merely treating it as a crime is not the best way of dealing with it.