Reflective Analysis on Knowledge-Building Community: Case of a Graduate Course

Hyunmi Chung*

Education Research Institute, Seoul National University

Abstract: This study focused on investigating design issues associated with establishing a classroom-based Knowledge-Building Community. Three design issues for establishing a KBC were investigated: (1) How to coordinate the efforts of individuals effectively in building collective knowledge, (2) How to support self-directed, knowledge-creation processes of individuals, (3) How to facilitate students' ownership of a Knowledge-Building Community.

An instructional team designed a graduate course, Alternate Views of Teaching and Learning (Altviews), to foster a Classroom-Based Knowledge-Building Community toward studying alternative methods of teaching and learning. Instructional activities (interventions) for making effective distribution of individuals efforts, facilitating self-directed learning, and promoting the ownership of the KBC were embedded into the Altviews course. The course had three main phases: the Guided Reading Phase, the Sort and Sequence Phase, and the On-line Research Group Phase. The course was supported by Construe, a type of groupware, and Web Board conferencing software.

The purpose of this article is to provide instructional designers with insights or guidelines for designing a Knowledge-Building Community in classroom settings by describing the graduate course designed with Knowledge-Building Community approach and reflecting on the course in terms of fostering a Knowledge-Building Community. In this article, the design features of the Altviews course, reflection on the Altiews course and emerging issues in building a Knowledge-Building Community were described. Also, implications for the design of Knowledge-Building Community were suggested.

Keywords: knowledge-building community, instructional design, coordination mechanism, ownership, self-directed learning

I. Introduction

Knowledge-Building Communities (KBCs), also known as communities of learners, have

---
* Corresponding Author Tel: +82-2-880-7615; fax: +82-2-889-6508
  E-mail address: mizi106@snu.ac.kr

been suggested as an alternative approach for current classroom teaching and learning. Scardamalia and Bereiter (1994), who first used the term of "Knowledge-Building Communities", claimed that "schools need to be restructured as communities in which the construction of knowledge is supported as a collective goals". KBCs contrast in a variety of ways with teacher-centered approaches that emphasize direct instruction (for example, lecture). A KBC is defined as a group of individuals in which all members actively participate in generating and advancing the knowledge of the collective on common knowledge problems that require the improvement of understanding (Scardamalia & Bereiter, 1994; Hewitt, 1996; Hewitt & Scardamalia, 1998). In classrooms structured as a Knowledge-Building Community, learners share a goal of building collective knowledge and participate in generating new knowledge. A characteristic that distinguishes KBCs from other alternative approaches is a shift in focus from individual learning and performance to the construction of community knowledge.

For the past two decades, Canadian scholars including Bereiter, Scardamalia and their colleagues have researched on how to realize the KBC model in school settings (Bereiter & Scardamalia, 1993; Scardamalia, Bereiter & Lamon, 1994). They point out that it is important to clarify instructional strategies as well as developing technological supports such as groupware to facilitate collaborative knowledge building. This study focused on investigating design issues associated with establishing a classroom-based Knowledge-Building Community. An instructional team designed a graduate course, Alternate Views of Teaching and Learning (Altviews), to foster a Classroom-Based Knowledge-Building Community toward studying alternative methods of teaching and learning. Instructional activities were designed to include coordination mechanisms for effective distribution of individuals efforts, facilitate self-directed learning, and promote the ownership of the KBC.

The Altviews class was implemented once a week for three hours throughout the 15 weeks semester during Fall 1998 at Florida State University. The participants in the Altviews course were 13 graduate students consisting of 5 female students and 8 male students, varying in age from mid 20s to mid 40s. There were 6 international students representing 46 percentage of the total participants number. The researcher participated in the course as a TA and conducted a case study to investigate if the instructional activities designed in Altviews facilitate the formulation of a Knowledge-Building Community. Data was collected using multiple sources including: Background Surveys, Learning Preference Assessments (LPA), Reading Records, Article Data Sheets, Interim Reports, On-line discussions threads, Interviews, Questionnaires, Course Reflection reports, and the Researcher's journal.

The purpose of this article is to provide instructional designers with insights or guidelines for designing a Knowledge-Building Community in classroom settings by describing the graduate course designed with Knowledge-Building Community approach and reflecting on the course in terms of fostering a Knowledge-Building Community. In this article, the design features of the Altviews course, reflection on the Altviews

course and emerging issues in building a KBC will be described. And, implications for the design of Knowledge-Building Community will be suggested.

II. Design of the Altviews Course

A. Description of the Altviews Course

Altviews was divided into three main phases: Guided Reading Phase, Sort and Sequence Phase, and On-line Research Group Phase. Each phase was supported by Construe, a type of groupware for facilitating collaborative knowledge building and WebBoard which is an asynchronous computer network conference system. Construe has a feature that maintains databases in which knowledge artifacts produced by individuals are accumulated. It includes several sections: A Concept Section in which definitions of concepts are accumulated, an Article Section where articles as resources are shared and students post their personal reactions on articles, and a Report Section where individuals or groups reports are posted, etc.. Appendix A shows the Altviews courses weekly schedule and activities.

The Guided Reading Phase was implemented to help student read articles critically during the first six weeks of the semester. The instructor assigned appropriate reading articles to each student based on his or her interests. Students were asked to do assignments designed for novice students to critically read articles. Students had the following responsibilities during the Guided Reading Phase (week 1 through week 6).

a. Reading assigned articles and self-selected articles. Individuals received a list of 4-6 assigned articles that they were assigned to read during the first four weeks. They read one or two assigned articles and one self-selected article every week.

b. Completing Personal Reactions (PR). Students posted Personal Reactions to articles they read in a Construe course site. A Personal Reaction is a brief, one or two paragraph reflection describing an individuals immediate thoughts about an article. Personal Reactions are a kind of knowledge artifact that the community members produce. They are accumulated as a community database (PR database) into the Article Section of Construe.

c. Completing Data Sheet (DS). Students filled out Data Sheets of articles that were assigned to them. An individuals assignment was to write Data Sheets for assigned articles and Personal Reactions for all articles they read. A Data Sheet was a webform located in the Reports Section of Construe. Students identified key excerpts where the author defined key terms or stated key principles from an article. They then posted the

excerpts in a Data Sheet for the article. On completion, each Data Sheet included a field of Key Excerpts and a list of key terms. Also, students entered key terms meaning excerpts into the Concept Section of Construe. The Data Sheets of articles were accumulated in a database of the Altviews community.

The Sort and Sequence Phase was implemented to help learners identify knowledge gaps and find emerging patterns from the data. Data included all of the Data Sheets created by class members. This phase lasted for five weeks (week 7 through week 11).

a. Creating a concept map of key terms/Card sort game. In week 7, the instructor distributed around 180 key term excerpts cards to students. These were compiled from Data Sheets accumulated during the Guided Reading Phase. Each key term card included an excerpt explicating the meaning of a key term. For some terms, two or more cards appeared representing alternative meaning perspectives. Students conducted a card sort game to facilitate their understanding relationships among concepts. They read the key term cards and arranged the cards in an order that made sense to them. Students repeatedly read and sorted or rearranged the key term cards until they discovered meaningful relations among the concepts. The card sort game was a brief activity of the Sort & Sequence procedure. The instructional team expected that the card sort game would provide students with an opportunity to practice for the following Sort & Sequence procedure with excerpts documents. Also, students were required to create a concept map of key terms as a by-product of the card sort game.

b. Finding the meaning excerpts of undefined key terms. The instructor distributed a key terms list of the Altviews community that marked defined concepts and undefined concepts at week 9. Defining all concepts in the key term list was a task of the Altviews community. Students were encouraged to find the definitions or key excerpts of the undefined key terms from articles, and to post them into the Concept section of Construe course site.

c. Conducting Sort & Sequence procedure. The Sort & Sequence procedure is one method for organizing and synthesizing a large amount of text-based information. The goal of the Sort & Sequence procedure is to link new information to what students already know and to identify emerging patterns to generate new knowledge. At week 8, the instructor distributed the combined excerpts document that was summarized from all Data Sheets. For the Sort & Sequence procedure, students critically read the excerpts document. They then cut the excerpts documents into individual excerpts and arranged them in a way that reflected each individuals current understanding. They then grouped excerpts and created several sorted piles that represent themes of thinking. They reviewed the product of the first sorting activity and continuously revised it.

d. Completing an interim report. An interim report was the final product of the Sort and Sequence Phase. Through the Sort & Sequence procedure, students identified their knowledge gaps, and found new associations and emerging patterns. Students submitted an interim report in the Report section of the Construe course site. The interim report included the following items: (a) knowledge gaps identified, (b) questions raised, (c) associations noticed, (d) emerging patterns recognized, and (d) a plan of action for learning.

In the On-line Research Group Phase, students formed research groups for generating knowledge in the research areas that were identified as the community's knowledge gaps. Students selected articles related to their research focus, read them and wrote Personal Reactions or Data Sheets of articles. Also, students participated in on-line discussions for sharing information, coordinating the efforts among groups members, and summarizing activities on a weekly basis. This phase was planned to run 4-6 weeks, but actually lasted for two weeks (week 12 through week 13).

a. Participating in on-line research conferences

Students selected one major on-line conference for research and participated in on-line discussions. Each research group posted a weekly summary of on-line discussions. Students were also encouraged to monitor other conferences and participate in on-line discussions of other research groups.

B. Course Design

1. Mechanisms of coordination

Coordination mechanisms refer to mechanisms by which individuals distribute their efforts in ways that promote the efficient operation of the whole community. The coordination of individuals labor or efforts can generally be categorized into two types: centralized mechanism of coordination, and decentralized mechanism of coordination.

In the *centralized mechanism of coordination,* a person with authority (manager) decides individuals tasks and assigns tasks to each person. The members of the organization perform their assigned tasks under the direction of the manager. The centralized coordination mechanism is likely to be effective in a situation where individuals do not have enough knowledge or skills to decide their tasks autonomously.

In the Altviews course, the centralized mechanism of coordination was applied to the Guided Reading Phase, which was the beginning segment of the course. At the beginning of the course, students were not expected to know enough to choose learning tasks in the subject domain of alternate views of teaching and learning. As most of them were novices with little background in the subject, the teacher took the role as expert in the subject domain. We assumed that only the teacher had the ability to decide the individual tasks necessary to achieve the community's sub-goal in this phase.

In the Guided Reading Phase, the community's sub-goal was to build the community databases which included Personal Reactions and Data Sheets of 63 key articles, and meaningful excerpts of key terms. The community's sub-goal was determined by the instructional team in the course design stage.

In the Guided Reading Phase, the instructor assigned appropriate reading articles to each student based on individual interests. In order to identify each students interests, we conducted a background survey at week 1. The instructor tried to find the best match between each student and the initial 63 key articles selected by the instructor. Each student had an assigned reading articles list which showed required reading for the first four weeks of the semester. Assigned reading articles differed from student to student. Their task was to write Data Sheets and Personal Reactions on assigned articles every week. Also, they wrote Personal Reactions on additional self-selected articles that they read.

In the *decentralized mechanisms of coordination,* individual tasks are autonomously decided by themselves. Individuals have the authority to decide their tasks. Decentralized coordination mechanisms are appropriately used in situations where individuals have enough knowledge or skills to decide their individual tasks.

The decentralized mode of coordination requires devices that help individuals to monitor the community's needs and needs of other members. Each individual has easy access to information about the needs of the community through the devices. Each member is thus able to make an informed decision about what task to perform next in the interest of the community.

In the Altviews course,decentralized coordination mechanisms were implemented in the Sort and Sequence Phase and the On-line Research Group Phase. Three devices for decentralized coordination were provided to the students.

First, the article index in Construe showed how many students read each article. It was expected to provide students with information about how to distribute their reading efforts in order to achieve the community's goals.

Second, the master lists of concepts (initial list of key terms, priority key terms list, key terms monitor) were provided. An instructor identified an initial list of key concepts that students should know in the course. The instructor distributed the initial list of key concepts (week4) and assigned students to compile excerpts from the articles that revealed meanings of key concepts. Students were asked to put the meaning perspectives or definition excerpts of the concepts into a database of key concepts in Construe. The master list of concepts is a visual representation that shows which concepts have been identified by the community members and which remain as knowledge gaps. The list shows not only which key terms have been noted by members of the community, but also how frequently they have been identified. It was continuously updated according to the efforts of students to identify definition (or meaningful) excerpts of the key concepts. The master list of concepts was distributed with the name of priority key terms list (week 9 and week 10) and key terms

monitor (week 11) during the course. The master list of concepts was intended to provide students with an indicator that represented the breadth of the community knowledge about important terminology.

Third, on-line research groups were used. In the On-line Research Group Phase of the course, four research groups were formed in order to resolve the knowledge gaps of the community identified at the end of the Sort and Sequence Phase. Four research groups were as follows: Restructuring school for knowledge-building (conference 1); Frameworks, theories, models, and approaches (conference 2); Individual differences, motivation, collaboration and learning strategies (conference 3); Implications of the cognitive and digital revolutions for ISD and WBI (conference 4). Students chose one major research group that they were most interested in and participated in the on-line discussions. Basically, the instructor did not control the participants activities in this phase. Individuals decided their own tasks necessary to solve the community's knowledge gaps (research topics in this case).

The on-line research conferences were implemented by using WebBoard. WebBoard is a tool for on-line conferences. It has features which allow students to make discussion threads by posting and replying to messages, as well as a function for chatting.

Each on-line research conference had several discussion topics that represented the knowledge gaps of the community. Students carried on discussions in the on-line conference mode, read relevant articles for solving the knowledge gaps and posted their ideas about the discussion issues. We expected that on-line discussion threads using the WebBoard would provide information about the activities of the research groups, so that students could monitor the community's knowledge-building.

These centralized and decentralized mechanisms of coordination were incorporated into the Altviews course in order to provide efficient distribution of individuals efforts. These coordination mechanisms were expected to result in high group coherence of the community.

2. The Guided Learning Strategy in the Sort and Sequence Phase

In the Sort and Sequence Phase, students implemented the guided learning strategy, called Sort & Sequence procedure, for facilitating self-directed learning processes. The strategy was intended to promote students self-directed learning and generative learning process.

Self-directed learning is a form of study in which learners have the primary responsibility for planning, carrying out, and evaluating their own learning experiences (Merriam & Caffarella, 1991). Knowles (1975) describes the process of self-directed learning as the follows: (1) diagnosing learning needs, (2) formulating learning goals, (3) identifying resources for learning, (4) choosing and implementing appropriate learning strategies, and (5) evaluating learning outcomes. The Sort & Sequence procedure is expected to support the process of self-directed learning by asking students to identify their learning needs (knowledge gaps) and make a learning plan. After identifying their

learning needs, students were encouraged to decide learning activities for solving the learning needs and implement the activities.

In addition, the Sort & Sequence procedure may facilitate students knowledge-generation process. New knowledge is generated by linking new information with existing knowledge in meaningful ways (American Psychological Association, 1997). The Sort & Sequence procedure introduces a method to make meaningful connections among information and to find out emerging themes.

The guided learning strategy was embedded in the activities of the Sort and Sequence Phase as follows. Students received the master document of excerpts collected from all Data Sheets created during the Guided Reading Phase. Their learning task was to read this document critically, identify knowledge gaps, read related articles for filling the knowledge gaps and find new associations or emerging patterns from the data. After completing these activities, students were asked to submit an interim report that included (a) knowledge gaps identified; (b) research questions raised; (c) associations noticed; (d) emerging patterns recognized; and (e) an action plan for further learning. These learning activities emphasized a self-directed learning process, and knowledge-generation process. Two guidelines for the Sort & Sequence procedure were provided to students: guidelines for the first reading of the excerpts document and guidelines for sorting and sequencing of the excerpts.

3. Instructional conditions for promoting ownership of Knowledge-Building Communities

a. Creating Data Sheets, personal reading reactions, and key concept excerpts for the database of the Altviews community.

Participation in Community's activities fostered participants ownership of KBC by making them realize the benefits of the knowledge-building community approach Participants should get involved in creating knowledge artifacts that are accumulated in the community's database.

Students were asked to create Data Sheets of assigned articles in the Report section of Construe and to post Personal Reactions of all articles they read in the article index. Additionally, they were asked to post the excerpts of key concepts which were listed on the master concept list in the Concept section of Construe. The purpose of these activities was to create a database that all students could access and use as a resource or scaffold for the higher level activities. Students would realize the importance or benefits of the collaborative knowledge-building by using the database of the community. By providing participants with opportunities to experience the benefits of a KBC approach, students may add more value to the community.

b. Implementation of on-line research groups using the WebBoard.

We used the format of on-line research groups to facilitate the participants active involvement in a collaborative knowledge-building process. To foster members ownership of a KBC, members should be allowed to control the community's work and management. Members of Each group decide and manage the research groups activities. They discuss questions of the research group and conduct learning activities to solve the research inquiry. We expected that students would gain a greater sense of ownership of the community by participating in the on-line research groups.

In order to formulate research groups, the instructor and TA identified knowledge gaps and research issues of the Altviews community based on a summary of interim reports submitted by students at the end of the Sort and Sequence Phase. The research groups topics reflected the community's common inquiry at that time. By allowing each student to select a research group that was most interesting to them, we tried to provide a motive that would lead students to actively participate in the research group.

III. Reflection on the Altviews course

In this section, I will provide a more detailed description about how the Altviews course appeared to build a Knowledge-Building Community, and discuss issues that emerged during the course.

The Altviews course had three phases: the Guided Reading Phase, the Sort and Sequence Phase, and the On-line Research Group Phase. The course was designed with

the expectation that each phase would make a unique contribution to building a Knowledge-Building Community. Table 1 shows the overall summary of research findings of each phase in terms of building a KBC.

Table 1
Overall Summary of Each Phase and Research Findings

	Centralized mechanism	Decentralized mechanism	
	Guided Reading Phase (W 1- W 6)	Sort and Sequence Phase (W 7 - W 11)	Online Research Group Phase (W 12 - W 13)
Community's sub-goals in each phase	Creating the community's database to improve the understanding about the alternative view of teaching and learning	Continuously building up the databases, Identifying knowledge gaps of the community by synthesizing all members interim reports, Learning the Sort & Sequence method for the organization of the information	Solve the community's knowledge gaps represented as topics of conferences
Activities & assignments	- Creating Personal Reactions and Data Sheets of 63 key articles - Creating excerpts of key terms	- Conducting the Sort & Sequence activities - Submitting individual interim reports - Posting continuously PR s and excerpts of key terms	- Participating in the on-line conferences - Continuously posting PR s and excerpts of key terms - Submitting a final paper or project - nominating articles
Sense of community	Little sense of community	Gaining more sense of community	More sense of community than in previous phases
Ownership of KBC	Little ownership	Little ownership, but gaining more ownership	Gaining more ownership
Group coherence	High group coherence		High group coherence

The Guided Reading Phase was implemented during the first 6 weeks. It was originally planned for 4 weeks of the semester, but there was an unexpected class cancellation at the beginning of the semester, so the course actually started on week 3. We intended that the Guided Reading Phase become an initial stage of forming a community, in which the community's sub-goal was to create the community's databases that would be used in the next phase.

The community's databases included excerpts of key terms, Personal Reactions and Data Sheets on articles. These databases are considered as artifacts of collaborative

knowledge-building. According to Bereiter (1994), knowledge-building means creating knowledge artifacts that capture the individuals perspective in the form of explanations, theories, solutions and algorithms. What kind of knowledge artifacts was produced in the Altviews community? We assumed that most students were novices in the subject area of alternate views of teaching and learning at the beginning of the course. Typically, when novices are asked to provide their perspective on articles, they produce low-quality reports indicating lack of thoughtful reflection and understanding. They need to spend more time reading articles in the subject area. The first task of novice learners would be to read the articles critically and understand the main points of each article. The artifact that they are expected to generate in this stage is a high quality-summary including excerpts that represent key concepts and principles of the article. Therefore, the instructional team defined artifacts of knowledge-building in the Guided Reading Phase as databases of Personal Reactions, Data Sheets, and excerpts of key terms.

At the community level, individuals were expected to contribute to building the community's databases of key terms excerpts, Personal Reactions and Data Sheets of articles. In the Guided Reading Phase, the community's sub-goal was to create a database of concepts and excerpts representing the essence of key articles. The instructor selected 63 key articles in the subject area of alternate views of teaching and learning. Each student was assigned 4-6 articles in accordance with individual interests obtained from the background survey. The instructional team expected that the community's database on 63 key articles would represent the distributed efforts of individuals during the Guided Reading Phase in which a centralized coordination mechanism was implemented. The community's sub-goal determined by the instructional team was achieved at a 99% level. As the instructional team anticipated, the centralized mechanism that was implemented at the beginning of the course resulted in high group coherence.

However, students did not have a clear sense of community during the Guided Reading Phase. Evidence from questionnaires and interviews showed that most students had little sense of community and little ownership of KBC. In this phase, students focused on reading new articles individually rather than on working together. The instructor provided guidelines for critically reading articles and creating Data Sheets (DS) of articles. Also, the instructor explained how Data Sheets and Personal Reactions of articles they were creating would be used for the community and how important it was to correctly create DSs on articles. Students, however, did not have opportunities to experience concretely how the Altviews community would work. Although some students understood how their individual task would contribute to the community, evidence indicated that students did not have the sense of what they would achieve as a member of a community. In addition, students did not view themselves as stakeholders in the Altviews community.

The Sort and Sequence Phase proceeded for five weeks. In the phase, the main intention

of the instructional design team was to introduce the Sort & Sequence procedure. This procedure allowed students to organize and synthesize large amounts of information and identify their knowledge gaps in the Altviews domain. The community's sub-goals in this phase were to identify knowledge gaps of the community and to continually build the community's databases. In week 7, the instructor distributed all excerpts of key terms which had accumulated in the databases of the community. He then demonstrated the   card sort game   which was intended to facilitate structural knowledge building (knowledge of how key terms are related to each other) by sorting and sequencing the excerpts of key terms. Students were then asked to create a concept map that reflected the results of the card sort activity. Since this activity was similar to the Sort & Sequence activity, we expected it would provide students with a chance to practice the Sort & Sequence procedure. In the next week(week 8) students discussed their concept maps in class.

In week 8, the instructional team distributed the excerpts document that was a compilation of 63 DSs that the community had produced during the Guided Reading Phase. The excerpts document was a resource that summarizes many research findings, theoretical assumptions, and principles of the Altviews domain from the 63 key articles. The instructional team provided a guideline for the first reading of the excerpts document. One problem we did not anticipate was that there were too many excerpts for students to manage. The excerpts document of 200 pages made many students feel overburdened. Most students could not finish the first reading of all the excerpts by the following week.

In week 9, the instructordemonstrated the Sort & Sequence procedurewiththeexcerpts document. The instructional team provided the second guideline for the Sort & Sequence activity. The instructor suggested that if students had trouble reading the whole document, they could eliminate about half of the excerpts by focusing exclusively on 32 specified articles. Also, the instructor distributed a list of key terms which he categorized and in which the key terms identified by the community were presented in bold style. The instructor encouraged students to continuously post meaningful excerpts of key terms that were not defined during the phase. The next week, students received a revised priority list of key terms in which less important key terms were eliminated. In the Sort and Sequence Phase, a sub-goal of the community was to identify the community's knowledge gaps. The instructional team identified the community's knowledge gaps by synthesizing all interim reports that students submitted. An interim report was an output of the Sort & Sequence activities. Individual interim reports included each students identified knowledge gaps, questions raised, associations or emerging patterns, and a plan of learning action. These reports reflected individual knowledge gaps and understanding in the Altviews domain. In a Knowledge-Building Community, community's knowledge gaps are based on the community members knowledge gaps. The common area of individuals knowledge gaps can be considered as the knowledge gaps of the community. The instructional team summarized the common

areas of knowledge gaps that students reported in their interim reports. These common inquiries were represented in the form of four conference topics and a Knowledge Gaps section on WebBoard.

In the Sort and Sequence Phase, students began to gain a greater sense of community and ownership in the Altviews community. They had a chance to use artifacts (DSs, key term definition excerpts) in the community's databases accumulated during the Guided Reading Phase. This seemed to make students experience benefits of the collective effort in a KBC. If they had to individually create 63 Data Sheets, it would have taken many times longer than distributing the task among community members. Students now realized why they had created the DSs and PRs during the Guided Reading Phase.

One problem that we faced in this phase was that some students had a hard time in adapting to the Sort & Sequence procedure. They had their own learning styles and strategies for organizing and synthesizing new information. We expected that the Sort & Sequence method we demonstrated to students would be a useful tool for generating new knowledge. Evidence showed that most students eventually adopted and recognized the value of the Sort & Sequence method. But, several students did not use the method much and were not convinced of its value.

The last phase of the Altviews community, the On-line Research Group Phase, was implemented for two weeks. A sub-goal of the community was to implement a collaborative research in order to solve the community's inquiries and knowledge gaps. The community used WebBoard as a medium for conducting on-line conferences. The instructional team structured the on-line conferences to include four different research topics, a Knowledge Gaps section, and an Ask David section. Students were required to chose one conference as a major research group and encouraged to participate in other on-line conferences. Each conference had three or four students as main members, and each conference group posted a weekly summary of their discussion.

In this phase, students seemed to gain a greater sense of community and ownership of KBC. The formation of research groups in which participants had similar interests facilitated productive interaction among members. Students could actively participate in the discussion of their on-line group, because each conferences topics were based on inquiries raised by students and students could select their major conference. This gave students more ownership in the Altviews community. Also, the Altviews community showed a high group coherence. Students seemed to identify more clearly the community's needs in this phase. They recognized that on-line conferences topics and questions which students posted represented community's needs or knowledge gaps. Without the assignment of individual tasks by an instructor, students were able to decide what they would do in order to fill the needs of the community.

As mentioned above, the Altviews community developed gradually as each phase of the course was implemented. Students gained an increased sense of community as a whole and developed ownership in the Altviews community. One notable phenomenon is the relation between group coherence and ownership of KBC. In the Guided Reading Phase,

the Altviews community showed the status of low ownership, but high group coherence. However, during the On-line Research Group Phase, the community still showed high group coherence, but it had more ownership of KBC than in the Guided Reading Phase.   Figure 1 represents the change of the Altviews community in the dimension of group coherence and ownership.

High group coherence

In the Guided Reading Phase   In the On-line Research Group Phase

✳ - - - - - - - - - - - ➤ ✳

Low   High
ownership   ownership
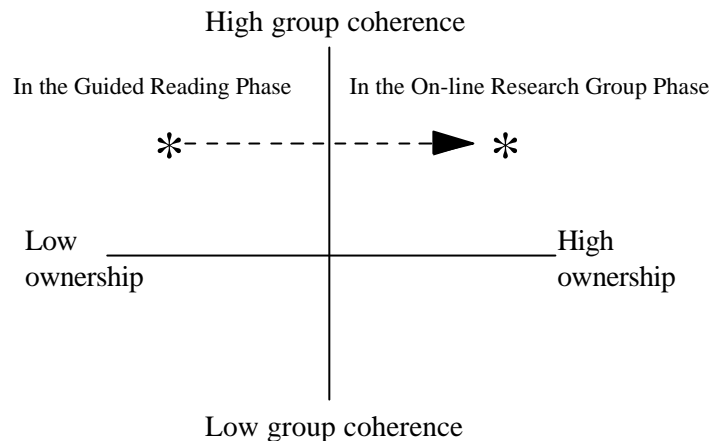
Low group coherence

Figure 1. Change of the Altviews Community in the Dimension of Group Coherence and Ownership

How do we interpret the community in which members show little ownership, but result in high group coherence? In the beginning stage of the community, individuals did not usually feel a sense of community and did not have ownership of the community. There was, however, an effective centralized coordination mechanism that assigned individuals tasks necessary for achieving the community's goal, leading to high group coherence. The high group coherence of the community results from the performance of individuals conducting the assigned tasks. Strictly speaking, group coherence comes from an outside force, not from group members autonomy. The existence of an instructor who assigns individuals tasks represents an outside force that compels students to perform their tasks. Arguably, students act out of obedience and compliance rather than commitment and choice. High group coherence does not result from the community members voluntary decision on their tasks. It is expected that the community would not continue to show high group coherence if this outside force did not exist.

In contrast, high group coherence in the On-line Research Group Phase results from community members autonomy in making decisions about tasks. High group coherence is achieved without any centralized mechanism directing individuals tasks necessary to achieve the community's goals. Community members have a greater sense of interdependence and ownership about the community. Individuals identify the community's knowledge gaps or community needs and decide which tasks will contribute to filling the community's needs. This autonomous decision-making process of individuals results in a high level of group coherence. It is an ideal status of a

Knowledge-Building Community that we pursue. In the On-line Research Group Phase, the Altviews community was in the middle of the process of moving toward forming a more authentic Knowledge-Building Community.

A. Discussion about Instructional Activities in Altviews

Did the instructional activities implemented in the Altviews course support the formation of a Knowledge-Building Community? I will discuss how each instructional activity actually worked in Altviews.

1. Personal Reactions on articles

Students created Personal Reactions to articles that they read. The instructional team asked students to write Personal Reactions. These are brief, one or two paragraph essays describing immediate thoughts about the articles. We did not set up a special format or components of PR, but encouraged students to include recommendations about an article for others who had not read it yet. We expected that students, in choosing what to read next, would get overall information about each article by referring to the PR database of the community. Evidence showed that a few students used other students PRs as a useful resource in deciding which article they would read. However, many students did not use the PR database in selecting articles to read. One reason that they did not use others PRs was that they did not have enough time to read them. Reading other students PRs seemed to require more time commitment from students than they were willing to make.

Several students mentioned that they used classroom discussions more than Personal Reactions in choosing which articles to read. Classroom discussion provided more convenient way for students to get information about articles. Students could immediately exchange their opinions on articles that they had read and recommend the articles to others. Direct conversation about articles among students made more impact on choice of articles.

2. Data Sheets on articles

The instructional team designed Data Sheet forms as a template for knowledge artifacts that the Altviews community would produce. The Data Sheet of an article includes key excerpts representing principles or showing the meaning of key terms in the article. In previous research about the Altviews community by Gilbert (1997), it was reported that main ideas of articles were usually identified after about three or four reading reactions to an article, and there was repetition of information in Reading Reactions on the same article. Instead of using Reading Reactions on articles, we therefore designed Data Sheets for creating knowledge artifacts that extract the essence of the articles. A Data Sheet includes key points of an article in the authors own words rather than students personal opinions.

As the instructional team planned, students created Data Sheets on their assigned articles during the Guided Reading Phase, and the 63 Data Sheets of key articles were used as material for the Sort & Sequence activity. Overall, most students followed the guidelines for creating Data Sheets;but, during the initial period, students had difficulty in creating Data Sheets. Some students who lacked critical reading skills found it difficult to identify excerpts of key principles in the article. Many students were not confident about the quality of Data Sheets they wrote. In retrospect, the instructional team should have provided more frequent feedback on Data Sheets that each student created. Students needed more detailed guidance and examples of Data Sheets, even though the instructor provided an example of Data Sheet.

Creating Data Sheets of articles seemed to facilitate more critical reading: Julie mentioned, I found that I read the articles in a more in-depth way than I did before. One complication in creating Data Sheets is that if the electronic copies of articles are not available, students must spend more time in creating Data Sheets of the articles. Don pointed out that manually creating Data Sheets was very inefficient as it requires keying in each excerpt. Students may reduce the amount of time necessary to create Data Sheets by copying and pasting key excerpts from electronic articles

3. Master list of key terms (Concepts Database)

In order to achieve the goal of collective understanding of diverse approaches to teaching and learning, it is essential that participants in Altviews develop a knowledge of key concepts. To support this goal, the master list of key terms, concept mapping activity, and card sort game were designed.

The instructional team provided the master list of key terms as a scaffold for facilitating development of structural knowledge of concepts in the domain of Altviews (alternate views of teaching and learning). At the beginning of the semester, students received the master list of key terms including over 200 key concepts from the Altviews literature base. We expected that it would serve as a guide to help students identify important terms and concepts while they read articles.

Students identified meaning excerpts where the author defined key terms or used a key term in a context that revealed its meaning and posted the excerpts in the Concept folder of Construe. The instructional team continuously monitored the community's database of excerpts of key terms and distributed the updated master lists of key terms that showed which terms were and were not identified by the community. We expected that the updated master list and the current monitor of key terms would serve as a device that represented the community's knowledge gaps orneeds. That is, we assumed that students would use the master list of key terms as a tool for identifying the community's knowledge gaps in order to coordinate their individual tasks.

Evidence showed that students used the master list of key terms as a guide in identifying important concepts at the individual level and used the updated master list of key terms and current monitor of key terms less frequently in order to identify the

community's needs. However, contrary to our expectation, the updated master list of key terms and current monitor of key terms were not used popularly by students as a device to monitor the community's knowledge gaps or needs.

4. Sort & Sequence activities

The Sort & Sequence procedure was introduced as a useful strategy for organizing information and generating knowledge from the information. The Sort & Sequence procedure was designed to facilitate students metacognitive processes. To identify knowledge gaps, that is, to determine what I dont know, is a vital part of intentional learning (Bereiter & Scardamalia, 1989). It provides a motive that leads them to conduct self-directed learning. The Sort & Sequence procedure included steps to guide students to identify their knowledge gaps and find new associations or patterns.

It was clear from evidence that the Sort & Sequence procedure facilitated students learning processes in synthesizing information and generating knowledge. Also, the Sort & Sequence procedure was employed as a useful strategy for self-directed learners to accelerate their learning. Students reported that they experienced the value and benefits of the Sort & Sequence method. The Sort & Sequence procedure worked successfully for all but two or three students.

One thing that we did not anticipate was that the procedure was uncomfortable for some students because the Sort & Sequence strategy did not match their cognitive styles. We encouraged students to use a more individualized Sort & Sequence method by modifying the Sort & Sequence procedure that the instructor suggested, if they felt uncomfortable or if they were already comfortable with their own strategy. Nevertheless, I noted in my research journal and, also, in students responses to questionnaires that students who lacked metacognitive skills or adhered to their own cognitive style had difficulty in completing the Sort & Sequence procedure. The instructional team should have provided more support to students who had difficulty in using the Sort & Sequence procedure.

5. On-line conferences

On-line conferences were implemented during the On-line Research Group Phase. The structure of on-line conferences was designed to facilitate participants knowledge-building processes in Altviews. The instructional team identified four research areas that represent the community's knowledge gaps by synthesizing all interim reports that students submitted at the end of the Sort and Sequence Phase.

The on-line research group activity was successfully implemented. Most students participated in their on-line discussions. Although the on-line research group activity was implemented for only two weeks, many research topics were discussed. On the other hand, students did not deeply discuss the conference topics. Students did not have enough time to activate their on-line research group activity. The performance of on-line research groups seemed to depend on each groups members. Research groups

that had students who more actively participated in building the Altviews community discussed more actively in the on-line conference. Collaboration with other members in the earlier phase of the course emerged as an important predictor of high performance in the on-line conference activity.

Another point emerged through the on-line conference activity concerns the facilitators role in stimulating students participation. The instructor served as facilitators who posted questions and feedback on students opinions in the on-line conferences. For example, the instructor used a form of survey to stimulate students discussion about teachers role in alternative learning environments. The role of instructor as a facilitator seems to be an important factor in supporting students collaborative knowledge-building .

In conclusion, a classroom-based Knowledge-Building Community seems to be demonstrated through the Altviews course. If the Altviews course had been implemented much longer than one semester, we would have seen more evidence of the formation of a Knowledge-Building Community. However, many aspects of the course still need to be improved to develop a successful KBC.

V. Emerging Issues in Building a Knowledge -Building Community

Several emerging issues in building a KBC were found through the investigation of the Altviews course. The issues are as the follows: tension between individual knowledge gaps and community knowledge gaps, a shared concept of community's knowledge gaps, a change management issue, the use of appropriate technological supporting system for a KBC, and long-term planning for establishing a KBC.

Regarding the first issue, there was a tension between individuals knowledge gaps/needs and community's knowledge gaps/needs. The Knowledge-Building Community pursues the improvement of the collective understanding of the community as well as advancing individual knowledge (Scardamalia and Bereiter, 1994). In Altviews, some students had difficulty in connecting individual knowledge gaps to the community's knowledge gaps. There was a tendency for students to separate their efforts to close individual knowledge gaps from their contribution to close the community's gaps. Carol said,   At some point I started feeling disconnected from the community because I didn't really think that anybody else really cared about my personal knowledge gaps. So, I felt disconnected from the course. How do we make harmony between knowledge gaps at the individual level and at the community level? The other issue is about sharing the community identity and having a consensus of community's knowledge gaps/needs. It is a critical issue in a KBC for individuals to have a sense of community and to recognize the community's knowledge gaps that

require the collaborative efforts of members in order to advance the collective understanding of the community. In Altviews, evidence shows that students did not have a shared understanding about whatthecommunity's knowledge gaps were in each phase. Han said, there was no point in my head about community needs. I didn't think that the on-line conferences topics were something that the community people needed to know. I just responded to several sub-discussion areas.

Although the instructor emphasized the goals of the Altviews community and explained how students would work as members of the community, students did not reach a consensus regarding knowledge gaps of the community in each phase of the course. A consensus regarding the community's goals and the community's knowledge gaps should have been achieved among members of the community. After acquiring a shared understanding of the community's goals and knowledge gaps, students can continuously monitor knowledge gaps of the community.

Change management is another issue. The Knowledge -Building Community is a new approach to students who are accustomed to teacher-centered classroom settings. When a new approach applies to an existing system, members of the system are likely to show resistance to the new approach rather than accepting it. In the classroom settings, students generally are not motivated to make the course a Knowledge-Building Community. They do not feel the necessity to adopt the KBC approach at the initial period of the course. In this context, it is hard for students to actively participate in building a KBC. Students resistance to new approaches should be considered in establishing a classroom -based Knowledge-Building Community.

Another issue is that the community should have an appropriate technological system that manages the database of the community and supports the process of knowledge -building among the community members. The technological support system for a KBC is an important infrastructure of the community. Multi-user communication tools and community-based information filtering tools embedded in the technological system may provide a powerful infrastructure to facilitate the community's discourse. Using an effective technological system for supporting a KBC seems to be critical in creating a KBC successfully.

Final emerging issue is related to the amount of time that should be spent in establishing a KBC. Building a KBC in a classroom setting seems to require more than one semester period. It should be implemented with a long-term plan. In Altviews, many students expressed that one semester was too short to make a successful KBC. Instructional designers should consider time issues in building a classroom-based KBC.

VI. Implications for the Design of Knowledge-Building Communities

The Altviews course was designed to promote a Knowledge-Building Community approach in a classroom setting. Based on reflection about the Altviews course and the

results of this study, the following guidelines are suggested for designing a future Knowledge-Building Community type course.

1. Facilitate shared values, beliefs and understanding about the KBC approach among students.

It is important for students to form shared values, beliefs and understandings about KBC approach to motivate students to work as members of community. My research shows that initially, students do not have a clear understanding about what KBCs are. They do not possess a rationale about why they should participate in a course that adopts the KBC approach. An instructional team should provide activities that enable students to learn the concepts and rules of the KBC approach, and discuss the value of the approach. For example, students may read key articles that introduce the KBC approach, analyze the example cases of KBC, and discuss the KBC approach. In particular, an instructor can lead students in discussion about how the KBC approach may apply to the course. Since community goal setting is one concept associated with KBCs, by allowing students to participate in setting initial goals of the community, the students may acquire a sense of community. In Altviews, students seemed to not reach consensus about the KBC approach during the initial phase (Guided Reading Phase). The instructor explained how the course would adopt the KBC approach and students followed the blue print of the course planned by the instructor. Students were not involved in the process of setting the community's goals and planning the community's tasks.

2. Provide mechanisms to help students identify the community's knowledge gaps/needs and continuously monitor them.

The goal of a knowledge-building community is to advance the collective understanding of the community. The collective understanding of the community is improved through the process of identifying the community's knowledge gaps and taking learning actions to close the community's knowledge gaps. In order for individuals to identify the community's knowledge gaps and effectively distribute their efforts, the community should have mechanisms by which individuals can get information about the community's needs. The mechanisms should provide information about the community's knowledge-building progress; that is, what the community knows and what the community does not know. Students should be able to identify the community's knowledge gaps by using the mechanisms. Also, the mechanisms should promote the effective distribution of work among members of the community. In deciding their individual tasks necessary to advance the community's knowledge, students may refer to information obtained from the mechanisms. Such mechanisms are likely to result in high group coherence of the community.

In Altviews, the article index, the master lists of concepts (priority list, key term monitor) and on-line conferences were provided as decentralized coordination mechanisms. In other words, the instructional team expected that these mechanisms would help students coordinate the distribution of tasks. We expected that article index would convey information about the Personal Reactions database of articles which the community was creating. Also, we expected the master lists of concepts (priority list, key term monitor) would help students monitor the current status of key terms database in the community. These expectations were partially satisfied. Some students used the devices as useful information sources which helped them to monitor the community's needs. Some students, however, did not use the devices as tools for identifying the community's knowledge gaps. It appears that providing mechanisms to help individuals monitor the community's knowledge-building situation does not ensure that they also consider the community's needs in deciding their individual tasks. When students express a willingness to fill the community's knowledge gaps, they refer to information obtained from the devices in deciding what tasks to complete.

3. Support productive interaction among students.

In a KBC, the community's discourse is emphasized because it facilitates the knowledge-building process. Some strategies should be used for supporting productive interaction among students. Productive interaction among students refers to interaction that results in knowledge building of the community. Face-to-face conversation and computer-mediated communication such as on-line discussion should be used in a classroom-based KBC. Formation of research groups or facilitating students discussions about common topics which emerge as community's knowledge gaps may be possible strategies for facilitating the community's discourse. The class meeting time can be

used to reach consensus about the community's knowledge gaps and resolve the conflicts of individual opinions. Effective use of face-to-face conversation and on-line discussion mode is recommended for facilitating the community' discourse.

4. Use an appropriate technology system for managing the database of the community.

A Knowledge-BuildingCommunity needs an infrastructure which store the database of the community and manage it. Technological support such as a networked computer system using appropriate groupware provides the infrastructure of the Knowledge-Building Community. The technological support should allow students to distribute knowledge artifacts thatthey generate and accumulate them in a database available to all members. The community's knowledge would be accumulated in the database of the community. Using an appropriate technology system which supports the community's knowledge-building is an important condition for the realization of a successful Knowledge-Building Community.

The Construe system was used as an infrastructure of the community in the Altviews course. To some extent, Construe functioned positively to promote collaborative knowledge-building by allowing students to store and manage knowledge artifacts in the community's database. The Construe system, however, had a limited capability in supporting the community's knowledge-building process, because it was difficult to retrieve information in a wide variety of formats. Knowledge Forum supported by knowledge maps, developed by Scadamalia andBereiter, has been suggested as a better groupware for a KBC (Hewitt & Scardamalia, 1998; Web Knowledge Forum website).

5. Provide learner supports for improvement of an individuals knowledge generating skills.

Individual knowledge generation skills become important in a KBC, because collective knowledge-building within the community is based on an individuals ability to generate knowledge. An individuals ability to generate knowledge impacts the performance of the community's knowledge building. A community where most members lack knowledge generation skills would produce low performance in knowledge-building. Students who have difficulty in generating knowledge should besupported by a peer or an instructor. As an example of learner supports, the instructor can introduce to students learning strategies to generate knowledge and guide them individually. In Altviews, we introduced the Sort & Sequence procedure to students as a learning strategy for facilitating the process of knowledge generation.

In addition, instructors should provide learner supports to students who have difficulty in adopting the KBC approach. Students who are accustomed to traditional classroom settings may have resistance to working as a community member. It is helpful if the instructor guides them so that students adjust to the KBC approach.

REFERENCES

American Psychological Associations Board of Educational Affairs (BEA). (1997). *Learner-Centered Psychological Principles: A framework for school redesign and reform.* [On-line] Available:

   http://www.apa.org/ed/lcp.html [2000, March 30]

Bereiter, C. & Scardamalia, M. (1989). Intentional learning: As a goal of instruction. In C. Resnick (Ed.), *Knowing, learning and instruction.* (pp. 361-392). Hilsdale, NJ: Lawrence Erlbaum.

Bereiter, C. (1994). Constructivism, Socioculturalism, and Poppers World3. *Educational Researcher, 23(7),* 21-23.

Bereiter, C., & Scardamalia, M. (1993). *Surpassing ourselves: A inquiry into the nature and implications of expertise.* La Salle, IL: Open Court.

Gilbert, N. (1997). *Collaborative knowledge-building environments : A case study.* Unpublished doctoral dissertation, Florida State University, Tallahassee.

Hewitt, J. (1996). *Progress toward a Knowledge-Building Community.* Unpublished doctoral dissertation. University of Toronto, Toronto, Canada.

Hewitt, J. & Scardamalia, M. (1998). Design Principle for Distributed Knowledge Building Processes. *Educational Psychology Review, 10(1),* 75-96.

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers.* Chicago, IL: Follett Publishing.

Merriam, S. B. & Caffarella, R. S. (1991). *Learning in Adulthood.* San Francisco: Jossey-Base Publishers.

Scardamalia, M. & Bereiter, C. (1994). Computer support for Knowledge-Building Communities. *The Journal of the Learning Sciences, 3* (3), 265-283.

Scardamalia, M. & Bereiter, C. (1998). *Schools as knowledge-building organizations.* [Online] Available:

   http://csile.oise.on.ca/abstracts/ciar-understanding.html

   [2000, March 30]

Scardamalia, M., Bereiter, C. & Lamon, M. (1994). CSILE: Trying to bring students into world 3. In K. McGilley (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp.201-228). Cambridge MA: MIT Press.

Appendix A. Altviews Courses Weekly Schedule and Activities

Data	Course Phase	Course activities	Assignments (submit)	Administration
Week 1	Introduction to Altviews, Guided Reading Phase start			Background Survey
Week 2	No class		Initial concept map	
Week 3		Demonstration of creating a data sheet	Data sheet on one assigned article	
Week 4		Distribution of the master list of key terms that should be identified by the community	DS on one assigned article Personal reaction on one articles from last week's class	LPA
Week 5			DS on one assigned article Personal reaction on one articles from last week's class	
Week 6			DS on one assigned article Personal reaction on one articles from last week's class	
Week 7	Sort and Sequence Phase start	Distributions of all key terms excepts Demo of Card Sort Game (sorting & sequencing key concepts excerpts)	DS on one assigned article Personal reaction on one articles from last week's class	Questionnaire (at the end of Guided Reading phase)
Week 8		Providing a guideline for FirstReading of excerpts documents Discussion about Card Sort Game activity Distribution of excerpts documents Demo of Sort & Sequence procedure	Conducting the first reading of excerpts documents	

Data	Course Phase	Course activities	Assignments (submit)	Administration
Wee k 9		Providing a guideline for the Sort Sequence activity Distribution of the master list of key terms identified so far	Conducting the Sort & Sequence activity	1st Questionnaire (for the First Reading of Sort & Sequence phase)
Wee k 10		Distribution of the master list of key terms revised (Priority key term list)	Conducting the Sort & Sequence activity	
Wee k 11		Demo of the on-line conference activity Information about final paper assignment	Interim report (11/7)	
Wee k 12	No class on-line Research group phase start	Providing the e-mail guideline for on-line conference activity	Participating in on-line discussion (self-selected articles reading) : PR in two articles of DQ on new one article	
Wee k 13		Discussion about the on-line conference activity	Participating in on-line discussion (self-selected articles reading) : PR in two articles of DQ on new one article	2nd Questionnaire (for the Sort & Sequence phase)
Wee k 14			(self-selected articles reading) : PR in two articles of DQ on new one article	
Wee k 15	last class	Summary of al course activities and result	Nominating as article in the Construe Final Papers/projects Final concept map	Final Questionnaire LPA