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# Constructing Knowledge Building Communities in Classrooms

Chai Ching Sing and Tan Seng Chee

## Introduction

The present knowledge-based economy places great demands on today's workforce. Much of the higher-level work requires workers who are able to do self-directed learning, possess good thinking skills and work collaboratively. For our society to sustain continual economic growth and to remain competitive, our schools have to change responsively to equip our students with the necessary attitudes, skills and knowledge of workers. One of the key competencies of a knowledge worker is working with novel ideas: generating, discussing, testing and refining ideas. As knowledge work is best carried out in collaborative settings, learners must possess communication skills that promote productive group processes. This is also the rationale underpinning the reform-oriented initiatives in Singapore such as *Thinking Schools, Learning Nation*, as well as the IT Master Plans.

In this article, we will introduce an approach known as Knowledge Building Community (KBC) that provides an hospitable social context for learner's ideas to be seeded and developed (Scardamalia, 2000). It changes the knowledge telling discourse structure of traditional classrooms, which typically occurs in the following sequence: teacher initiates questions → students answer → teacher evaluates and elaborates on students' answer. Instead, KBC engages students in knowledge transforming discourse through collaborative improvement of ideas. It is closely related to collaborative learning advocated by Johnson and Johnson (1997) in which a small group of students works together towards a common goal. We believe that KBC is an appropriate approach for promoting thinking and communication

skills in our local context. In the following sections, we will explain the fundamental philosophy behind the KBC approach, illustrate the ideas with some of our research data and provide some guidelines on how to implement this approach in our local classrooms.

## **Review of Research**

### ***Knowledge Building Community***

The overall approach of a KBC emulates research work in an intellectual community in which members work collaboratively to advance the knowledge of a domain (Scardamalia and Bereiter, 1992). A research team is usually formed by members who have some common research interests. The team members formulate research questions and sub-questions, generate some initial ideas or hypotheses based on what they already know, identify what they need to understand and proceed with the research. To answer their research questions, team members usually have to make use of existing materials collected from a variety of sources such as journals, books and the Internet. They have to conduct empirical studies such as experiments, field trips or surveys to verify their hypotheses. The data collected are then compared with the team's initial ideas and are used to refine the ideas. This process helps the research team in understanding the phenomenon being investigated. The process inevitably requires members to meet regularly either face-to-face or online. The meetings allow members to share information, build on each others' findings and ideas, and thus advance the team's collective understandings. Naturally, such processes involve serious discourse as the mediator of learning among team members.

Implementing KBC in the classroom is, then, a task of creating research teams in the classrooms. The overarching goal for this seemingly daunting task is to enculturate students to be knowledge workers who can transform and add value to ideas through collaborative discourse (Bereiter, 2002). In so doing, the students are also learning to talk and think like the experts in the intellectual community. This is important because the thinking processes that the experts employ are embedded in the forms of discourse.

### ***Technology Supporting KBC—Knowledge Forum***

To support the implementation of KBC, a piece of software known as Knowledge Forum was designed by the founders of KBC (Scardamalia and

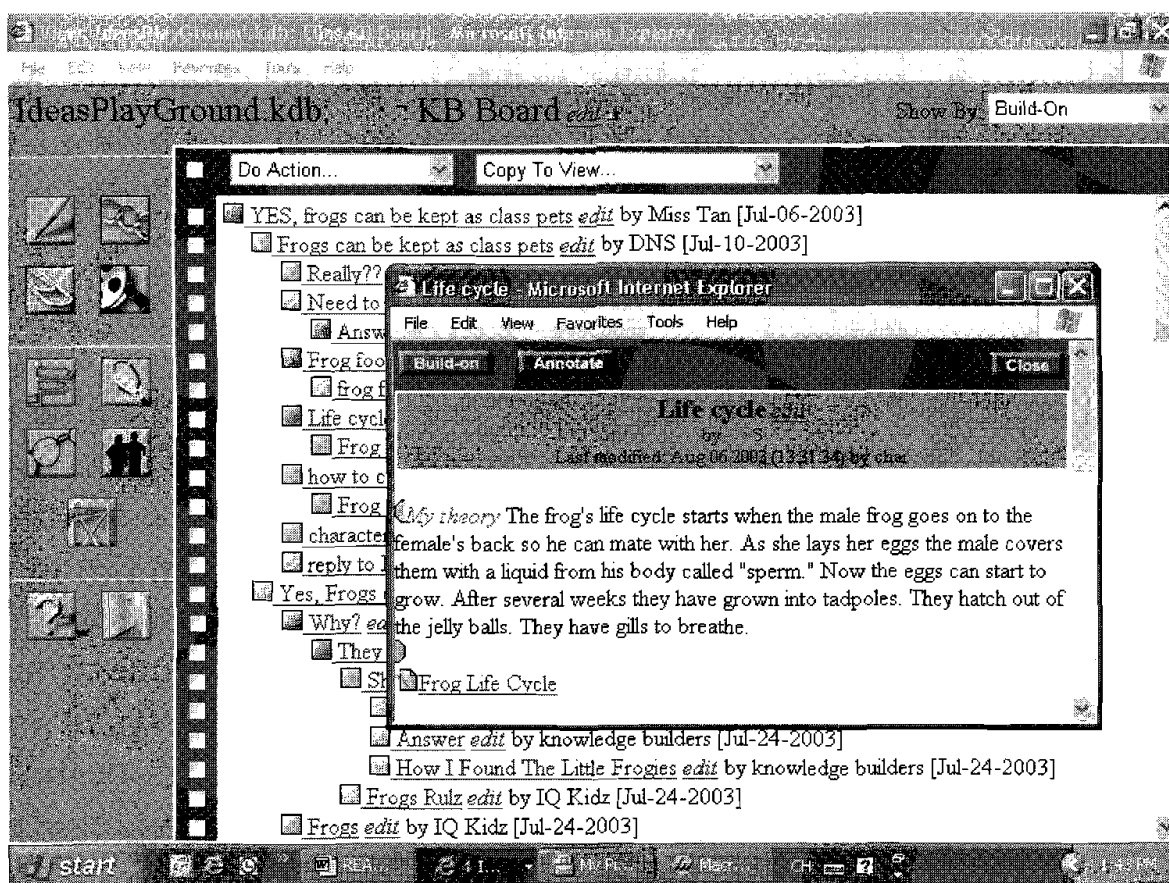


Fig. 1. The interface of Knowledge Forum.

Bereiter, 1994). It is an asynchronous discussion forum that acts as a collective database. Any member of a community can submit a posting (which is called a Note) and read each other's Notes. As a communication platform, it eliminates turn taking that is required in face-to-face discourse and alters the teacher-centred structure that is prevalent in ordinary classrooms. Figure 1 shows a screen capture of the software from one of our local databases.

Although it may look like an ordinary discussion board, it has a number of features that are specially designed to support knowledge building discourse. First, it allows teachers to provide prompts for students known as scaffolds. These are metacognitive prompts guiding the students in online discourse in the discipline that students are learning. For example, the generic scaffolds include prompts such as "My Theory is", "I need to understand", "New Information", which are designed specifically to engaged students in making scientific hypothesis, identifying gaps in knowledge and sharing new information. Teachers can design scaffolds, such as "This theory cannot explain", "A better theory is", to encourage students to challenge each other and thereby fostering a progressive

inquiry. Second, features such as “Build On” and “Rise above” encourage students to build on each other’s ideas and summarize ideas at a higher level of conceptualization. Third, the Notes can be revised as students’ understandings improve. These features help to foster a knowledge transformation discourse among the participants.

### **Research Evidence**

Although implementing KBC is not an easy task, it will repay the time and energy invested. Results of studies conducted in Canada and Singapore provide some support for the claim that implementing KBC in the classroom helps to better equip students for the knowledge society. Studies conducted in Canadian primary schools have to date indicated that students participating in KBC outperformed students in ordinary classrooms in terms of depth of learning, inquiry and reflection (Scardamalia and Bereiter, 1994). In terms of traditional assessment such as standardized reading and vocabulary tests, KBC students scored significantly higher than other students (Scardamalia, Bereiter, Brett, Burtis, Calhoun and Smith Lea, 1992). Interview transcripts from grade six students who had experienced KBC show that they developed a sophisticated view about research and a commitment towards thorough research (Lamon, Secules, Petrosino, Hackett, Bransford and Goldman, 1994).

Local studies in the context of scientific inquiry at secondary school levels showed significant improvement in students’ scientific inquiry skills (Tan, So and Hung, 2003). Teachers who had participated in implementing KBC generally valued the accessibility provided by the technology. They employed Knowledge Forum in problem-solving projects, scientific inquiries and project-based learning for a variety of subjects. They were happy that given accessibility of the technology, their students were able to engage in independent learning, conduct wider research and share their knowledge. They were also pleasantly surprised by the ability of students in handling complex problems of understanding in a KBC (Chai, Tan and Hung, 2003).

### **Application Guidelines**

In the following section, we will attempt to illustrate the steps in fostering a KBC in our classroom environment. The examples used are adapted from

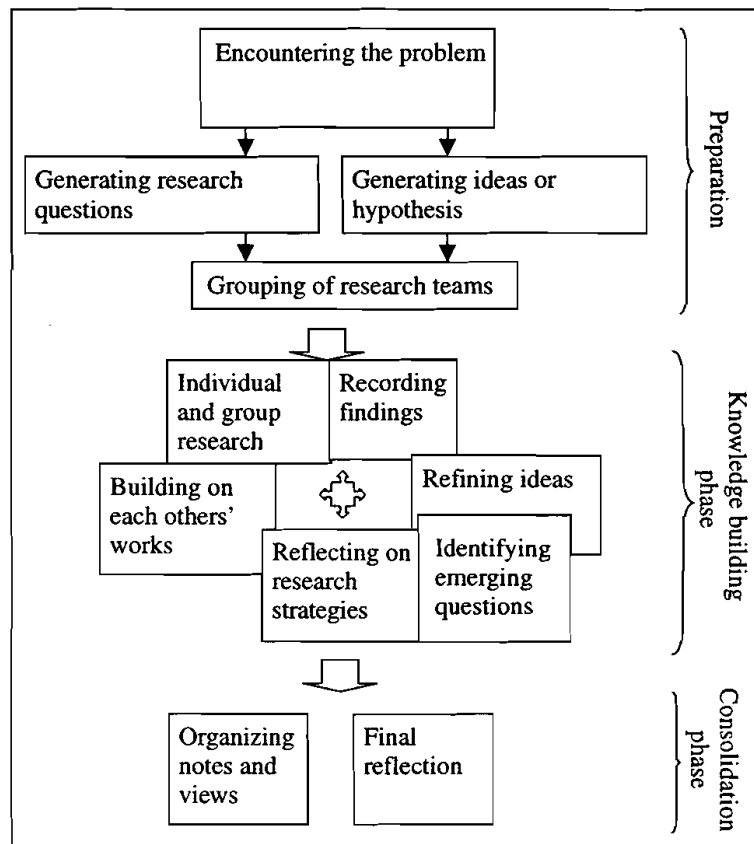


Fig 2. Implementation model of KBC.

one of our local teachers' efforts. Figure 2 shows a model that we have formulated culminating from the results of research studies (e.g. Caswell and Lamon, 1998; Lamon, Reeve and Scardamalia, 2001).

### ***The Preparation Phase***

In the preparation phase, the key task is to engage the students with authentic problems. Authentic problems are problems that students care about (Scardamalia, 2002). Unless teachers have a very good understanding of the students they teach, it is difficult to craft authentic problems that are sustainable in research. As such, we recommend that teachers craft a main theme in the form of driving questions and allow the students to modify the theme or generate sub-questions pertinent to the theme. Once the research questions are generated, students should generate ideas or an hypothesis as a starting point of their research. This will help students to link what they know with what they are going to investigate. Teachers can then group the students according to their research interests. At this stage, it is also advisable for teachers to guide the students in formulating some

research plans. The following paragraphs document a real example from a local classroom.

When teaching students about animal adaptation, a primary six teacher presented the main question "How do animals adapt to their environment?" to her students. She began her lesson by bringing live crabs into the science laboratory. Students were asked to make careful observations of the crabs' body parts and later to dissect the crabs. She scaffolded students in making observations and hypotheses on how different body parts help the crab in adapting to its environment. Students then entered their ideas in the form of individual or group Notes. Figure 3 shows the result of the lesson in a "Rise-above" (summary) Note that summarizes different students' contributions into one single Note. Through such learning episodes, students began to generate interest in studying the various body parts of animals. The teacher also encouraged students to identify further inquiries by creating scaffolds such as "I need to understand" and "New Information".

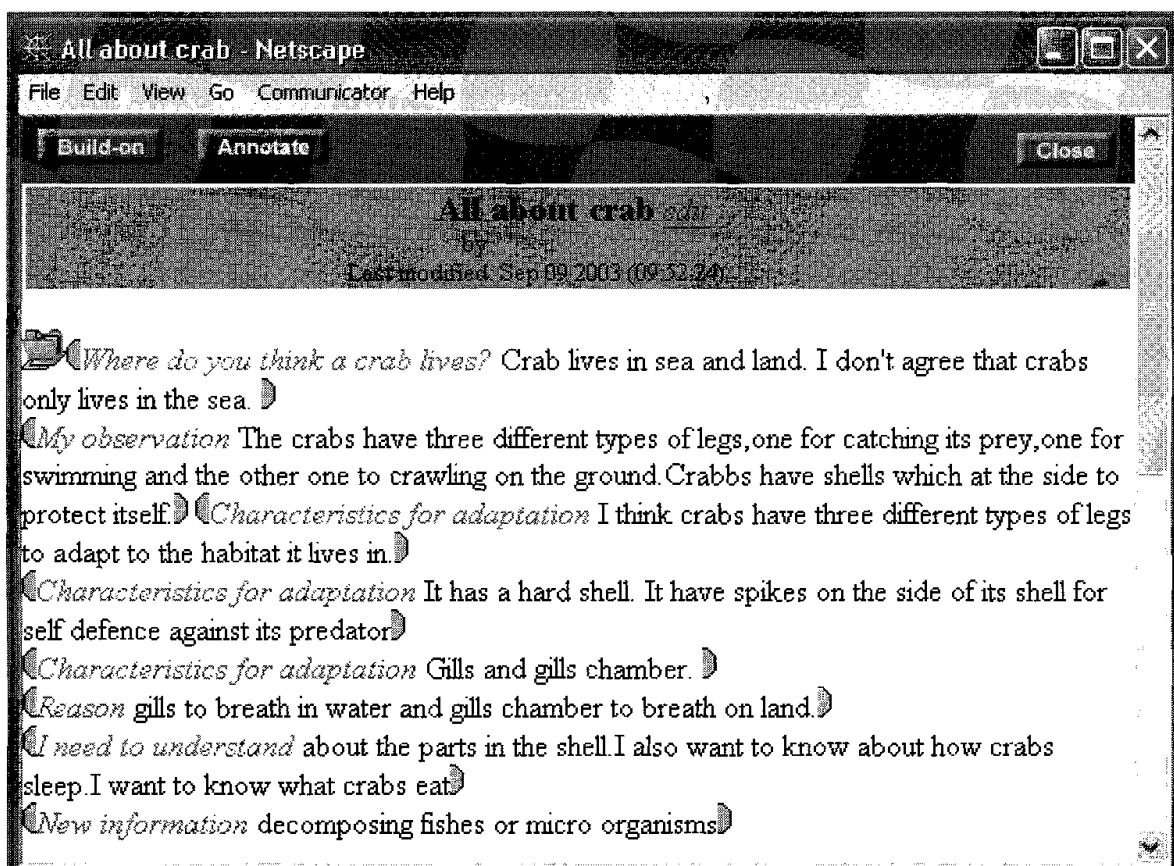


Fig. 3. Sample of pupils' notes of discussion of animal adaptation.

In the subsequent lessons, the teacher allowed her students to choose the animals they wish to study and formed groups based on their research interests. The students were able to generate Notes that explain how different animals adapt to their environments. They went well beyond the information given in the textbook both in terms of breadth and depth.

### ***The Knowledge Building Phase***

During this phase, there is usually a myriad of activities that go on concurrently. Students may be busy doing research work such as searching the Internet for information, designing experiments or other forms of empirical studies. They may also be recording their findings, reading Notes posted by other students, challenging or elaborating fellow classmates' ideas using the build-on function, refining their own understandings and identifying emerging issues. These activities contribute to the advancement of knowledge within the class.

The diverse activities and ideas can be quite a challenge to the teachers. When the students are actively posting Notes, it is almost impossible for teachers to keep track of what is going on both in the database and the classroom. Teaching strategies for dealing with this problem include benchmark lessons and cross-talk (Caswell and Lamon, 1998). Benchmark lessons are designed to address emerging issues that students cannot resolve at their level. Teachers can provide explanations to difficult concepts or model problem-solving processes for the students. As the research questions generated by the students may be beyond the teacher's knowledge, experts can also be invited to help the students. Cross-talk is basically time set apart for various research groups to report on their findings. It provides opportunities for the teachers and the whole class to monitor the community's progress as a whole. It also provides opportunities for the peers to challenge the reporting groups' findings and thus allow the reporting groups to further their research.

### ***The Consolidation Phase***

The closure of knowledge building activities can be at times rather artificial. This is because a true KBC is one that is marked by continual improvement of ideas. There is usually a deepening and progressive discourse. It is therefore not uncommon that many interesting questions remain unanswered in

the discussion. During this phase, students select and combine Notes that represent their understanding. They may create different pages to place their Notes and link the pages. This helps the students in organizing their knowledge in the form of hypermedia. At this stage, it is beneficial for the students to use the recorded interactions for reflection on their research effort. They can identify strengths and weaknesses of their research strategies, group processes and utilization of resources.

### **Challenges of Building a KBC**

Buiding a KBC is by no means an easy task. In this section, we discuss some of the potential obstacles that teachers might face based on research reports and our experience. One potential problem is sustaining the inquiry. We have experienced difficulties due to students' reluctance to participate in online discussion beyond the curriculum time. Reports from Canada seem to suggest that knowledge building activities that are supplemented by relevant field trips can help to sustain the inquiry (see Caswell and Lamon, 1998; Scardamalia, 2002). Field trips tend to generate active discussions when the students try to make connections between what they learn and what they experience. It is one strategy teachers might want to consider.

Another challenge to the teachers is to scaffold students' inquiry. It is not an easy task because the teachers have to provide just enough guidance as to help progress students' inquiry and yet not so much that might make the task too easy and un-motivating for the students. Expertise in scaffolding students' learning can only be mastered through repeated practice. The advantage that Knowledge Forum offers is that the interactions between teachers and students are recorded. These records provide good materials for teachers to reflect on and improve their practice.

Time constraints and student's language skills are two other factors that might affect building a KBC (Chai *et al.*, 2003). Teachers have to be mentally prepared for the time investment necessary for the mastery of this approach. They may need to struggle between fostering deep inquiry and completing the prescribed curriculum. One approach is to do it as an enrichment activity if curriculum restructuring is not feasible. Another problem is student's language skills. Lower primary pupils need more guidance and support in expressing their thoughts and typing their Notes. For students at Secondary level, it might be necessary to impose rules to

discourage the use of acronyms and emotive icons that are popular in the current instant messaging and text messaging culture.

## Conclusion

We believe KBC offers an alternative pedagogy for the cultivation of learners who can deal with ideas fluently. It is an ambitious pedagogy and it poses tremendous challenges for the teachers. We understand various obstacles that the teachers might encounter to implement such an approach in a structured curriculum. In summary, we acknowledge that there are real obstacles. However, we see the congruency of the KBC with the ability-driven education philosophy that the Ministry of Education is emphasizing. We therefore encourage teachers to embark on the task of adapting KBC for local contexts so as to push towards achieving the goals of *Thinking Schools, Learning Nation*.

## Implications for Classroom Teachers

1. KBC is an approach that aims to foster student-centred learning by encouraging collaborative efforts in generating, discussing, testing and refining ideas.
2. It can be facilitated by using a blended approach of having face-to-face discussions complemented by online discussions with the support of software such as Knowledge Forum.
3. Among many other factors, the success of KBC depends on the principles of:
  - a. focussing on knowledge understanding rather than creating assignment reports;
  - b. encouraging ownership of learning by using student-initiated ideas;
  - c. using collaborative learning to achieve mutual advancement and improvement of ideas; and
  - d. helping students to build knowledge through research activities that simulate experts in intellectual communities.
4. There are three major phases in forming a Knowledge Building Community in classrooms: Preparation, Knowledge Building and Consolidation.
5. In the Preparation phase, the teacher helps the students to identify appropriate authentic problems that are appropriate and worthwhile for

- the students to pursue. Students can be grouped according to their interests to investigate various sub-problems.
6. In the Knowledge Building phase, the teacher scaffolds the students in improving their ideas through meaningful collaborative work. Online discussion using software like Knowledge Forum can provide a way to integrate discussions within and outside of the classroom.
  7. The Consolidation phase brings closure to the research activities with students presenting their learning and findings.

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