

Community Knowledge Advancement and Individual Learning

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Abstract: This paper reports on a preliminary attempt to examine the relationship between community knowledge advancement and advances in understanding made by individual learners based on Popper's (1971) Darwinian theory of knowledge and the view that theoretical, more abstract knowledge is at a higher level than specialized instances of that knowledge. The study is carried out using online discourse data collected over a period of about two weeks in the context of an international knowledge-building program.

Introduction

Knowledge building (KB) as proposed by Scardamalia and Bereiter (1999, 2003) is both a theory about how human knowledge is created through intentional collaborative efforts of communities to extend the frontiers of knowledge and a theory that even young children can engage in KB and that learning in schools can take place through the process of knowledge building. This pedagogical approach directly addresses the need for education in the knowledge society to prepare learners to contribute to knowledge creation. There has been accumulated literature from different parts of the world that show students, including young elementary school children, can engage in KB (Messina, Reeve, & Scardamalia, 2003; Zhang, Scardamalia, Lamon, Messina, & Reeve, 2007).

Unlike learning organized in traditional classrooms, the KB process is necessarily an intentional community effort, and is not possible simply as an individual enterprise. In the KB literature, priority has been given to the description of knowledge advancement for the community and individual advancement through the process is less discussed. On the other hand, schools as social institutions are vested with the responsibility to ensure that individual learners achieve some baseline levels of knowledge and competence. How do individual and collective advances in knowledge and understanding relate to each other? What is the interplay between individual learner's changes in knowledge and understanding, and the knowledge advancement made by the entire class of students as they engage in learning activities designed on the basis of KB pedagogical principles? These are the questions explored in this paper. The context of this study is an international knowledge-building project centered on the theme of the sustainability of caves involving online asynchronous work on KF as well as face-to-face activities, including two field trips to limestone caves and experimental work on water samples collected from the caves. The study traces the knowledge advancement of the community as a whole, as well as those of 14 individual learners during the process.

Theoretical background

What counts as knowledge advancement? This paper takes, as its point of departure, Popper's (1971) view of knowledge growth as a process of *natural selection*. According to this view, knowledge always starts from problems, practical or theoretical ones, and grows through a process of conjectures and refutations as it proceeds from old problems to new problems. The knowledge at any point in time may be partial or inadequate for the problem at hand, and it grows by being corrected or modified. Popper argues that the process is one of *the natural selection of hypothesis* (authors' emphasis) – only those hypotheses that are able to show their comparative advantage in relation to others can survive while those hypotheses proven to be “unfit” through the process of criticism and refutation are eliminated. Scientific knowledge grows through the elimination of mistaken beliefs and unfit theories by the process of scientific criticism. In this study, we identify the idea units found in the learners' online KB discourse, examine whether we can see changes in the “population” of such idea units over time, and whether such changes do indicate the emergence and survival of “fitter” ideas when compared to advances as documented in the subject discipline itself. In keeping with the Darwinian evolutionary conception, we adopt the term “meme” first coined by Richard Dawkins (1976) to refer to the idea units.

Another idea put forward by Popper (1971) in the same work is the distinction between applied and pure knowledge (as in ‘fundamental research’) in terms of the structure of knowledge. The former becoming more different and specialized as it grows while the latter grows towards increasing integration and unified theories. A large part of the knowledge as specified in school curricula also falls into the latter category – focusing on understanding that can answer how and why questions in the specific disciplinary area covered. Here, Biggs' SOLO taxonomy (Biggs & Collis, 1982) is used as an appropriate analysis scheme to discriminate levels of increasing integration and complexity in students' understanding and presentation of a subject.

Study context

In this study, since we are primarily examining the ideas expressed by learners on the online platform Knowledge Forum®, we will restrict our exploration of individual and collective knowledge advancement to the

realm of stateable knowledge. The context of this study is an event titled “Tomorrow’s Innovators 2009” (TI2009) organized as part of the Knowledge Building International Program (KBIP during which students were to tackle the problem of the sustainability of caves). Students’ work was categorized into four stages: project kick-off, pre-field trip asynchronous discussion, field trip and final day of intensive face-to-face and online work. For the part of this study concerned with the analysis of individual knowledge advancement, we focus on the online work of the 14 students from Hong Kong (7 were elementary school students from grades 5 and 6, and the remaining 7 were secondary school students from grades 8 and 9) as on average they have written more notes, all of which were written in English. We examine the knowledge advancement students made from two perspectives – the memes related to the subject matter content, in this case the sustainability of caves, and the levels of generalization as reflections by the structure of the notes using SOLO taxonomy.

Summary of findings and discussions

In this paper we examine the knowledge advancement of the community of learners taken as a whole, as well as a selection of individual learners as they engaged in knowledge building around the theme of sustainability of caves. We found that at the individual level, of the 14 Hong Kong students participating in the program, 11 showed some form of advancement. The most common is the increase in meme diversity (type I), and is found in the work of all of the 11 students who made some advancement. The other two forms are the emergence of higher-level memes (type II) and higher levels of structure and abstraction based on SOLO taxonomy (type III). Types II and III advancement do not appear to be hierarchically related. This way of examining knowledge advancement systematically at the individual level has not been reported in the work on knowledge building. It is very preliminary work and needs to be further explored, together with the collection of more information on student background characteristics in order to seek a better understanding of the conditions that would contribute to individual advances, including characteristics such as students’ motivation in engaging in collaborative inquiry activities. We hope that this work will also stimulate debates and discussions on the appropriateness of the indicators we have selected for assessing knowledge advancement, as well as viable alternatives.

We have also examined the population distribution of memes and the mean SOLO level of the all students’ notes written during the four stages of the TI2009 program. We find that the most “productive” period for the community in terms of increases in the diversity and levels of memes is stage 2, when the students were working asynchronously at their own time to look for information and discuss with each other their views. The three days of intensive face-to-face activity have contributed to students taking up the various memes circulating in the community and hence to the types I and II knowledge advances among individuals. However, there is no evidence that less “fit”, lower level memes have become less popular or that any of the higher level memes have emerged as more dominant in terms of the total population of memes expressed by the students. These findings point to the importance of providing students with longer periods of asynchronous work for individual and social construction of understanding. Unfortunately the face-to-face work of the TI2009 program was not followed by an online asynchronous collaboration. These findings also indicate that collective knowledge advancement is possibly more difficult to achieve than individual advances.

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