

Characterizing patterns of interaction in knowledge building discourse

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Abstract: This paper reports the analysis of the online discourse of 44 sixth-grade students on an online platform in a Hong Kong primary school in the academic year of 2005-2006. A framework of two-step categorization is adopted to identify the patterns in a sustained knowledge building discourse, which integrates a category of four basic types of notes and SOLO taxonomy assessing the structural complexity in students' written discourse. This paper puts emphasis on the effect of argumentation in knowledge building processes, and provides insight on patterns of interaction in elementary students' online threaded discussions.

Keywords: knowledge building, content analysis, patterns of interaction

Introduction

In recent years, modern information and communication technologies promote the transformation of the traditional teaching and learning approaches. Computer-Supported Collaborative Learning (CSCL) has emerged as one of the promising pedagogical approaches to scaffold students to learn together efficiently. Research about online discussion environment has shed light on how computer technologies facilitate students' knowledge building (Guzdial & Turns, 2000; Scardamalia & Bereiter, 2003). The study puts forward a two-step procedure of categorization which aimed at analyzing knowledge building activities. After coding the nature of notes of complete episodes, the data analysis then focuses more closely on the argumentation in a sustained knowledge building discourse thread compared to a less productive one. The implication for this study is to facilitate argumentation processes in a collaborative knowledge building environment.

1. Theoretical and methodological background

1.1 Knowledge Building

According to Scardamalia & Bereiter (2006), knowledge building is an instructional approach that can facilitate the knowledge advancement in a community and learning appears as a by-product of knowledge building process. Compared to the goal of traditional education which mainly focuses on personal knowledge, knowledge building theory highlights the collaborative learning and advancement of collective knowledge (Lamon, Reeve, & Scardamalia, 2001). Knowledge building discourse can immediately reflect the activities taken place in the communication systems. And it has a crucial significance in assessing students' performance in online discussion environment.

1.2 Argumentation in knowledge building discourse

In CSCL, students resort to online discussion environment in order to do collaboration with others and positively contribute to the process of learning. Based on the theoretical and empirical considerations, argumentative interactions between students can effectively promote the communicative process. While the importance of argumentation has been highlighted in the interactions in online learning environment, it is not taken as an indicator for assessing the quality of knowledge building. In the article of Scardamalia & Bereiter (2006), knowledge building discourse is described as a commitment to progress, to seek common understanding other than simple agreement, to expand the basic facts. The authors regard the argumentation and debates in students' discussion as superficial mode which is inaccessible to progressive knowledge building.

1.3 Content Analysis

Content analysis is originally used in social science to study the content of communication. It enables researchers to mine the useful information by putting a large amount of texts into fewer categories based on certain coding schemes systematically. In CSCL, the method of content analysis is often adopted to analyze the qualitative data in a quantifiable way that could advance the understanding the verbal utterances (Chi, 1997; Schrire, 2006). In this study, content analysis is used to get insight into the argumentation in knowledge building discourse, that is, what differentiate a sustained inquiry and a less sustained one.

2. Method

2.1 Background

The data analyzed in this study were generated by 44 sixth-grade students on an online platform in a Hong Kong primary school in the academic year of 2005-2006. They formed a total of seven groups inquired on different topics under the seed question of "Can technology solve the problem of _____?". The problem can be, "Global Warming", "Energy Crisis", and "Species Extinction". A total of 568 notes were produced on the online platform. In the analysis, threads consist of five or more notes are regarded as a sustained inquiry which can reflect the continual improvement of ideas in the knowledge building discourse. Although the number of notes in a thread may not be result in more productive knowledge building activities, it is still interesting to measure the quality of online discussion using the thread length as a gauge (Law, Lu, Leng, Yuen, & Lai, 2008).

2.2 The Online Platform

The participants in this study used the online platform, Knowledge Forum®, to inquire collaboratively. Knowledge Forum® (KF) is an asynchronous online platform with special pedagogical designs for knowledge building (Bereiter & Scardamalia, 2003). It provides a networked space for students to create ideas in a common way, or share the conceptual artifacts to contribute to community knowledge. In particular, KF provides graphical display to visualize the students' interactions, and the customized scaffolds in the form of word cues to help students better identify the nature of their note contents.

2.3 Design

2.3.1 Coding the Nature of a Note

In this study, online discussions include four basic types of coding based on the nature of notes, which are argument, statement, information, and question. The unit of Analysis here is basically a note. The discourse on CSCL environment is regarded as a spiral process, that each state of code could trigger a series of events.

- **Argument**

Argument is defined as “a claim with one or more reason(s)”. The following is an example of arguments with explicit claims:

“Ground heat energy is not too useful because it isn't safe and the machines are hard to build. The cost and risk is very high.”

- **Statement**

Statement is “a claim without reason”. Examples of statement are as follows:

“I agree.”

“I think the Aluminum used should be mixed with other harder metal.”

- **Information**

In this study, information can be students' personal knowledge, experience or any information taken from external resources. The following note is an example of information:

“UV (Ultra Violet) is a light wave which has more energy than the visible light. Its wave length is shorter so that every time it contains more energy. This energy can change the nature of the bacteria so the bacteria die.”

- **Question**

Here question is defined as “an expression in an interrogative form”. For notes having two questions or more, each question will be coded separately. The followings are examples of questions:

“What is the chemical substance in fossil fuel?”

“How UV works to improve water quality?”

2.3.2 Coding with SOLO (Structure of Observed Learning Outcomes) Taxonomy

The SOLO taxonomy is for assessing the quality of a non-question note (argument, statement, or information). Biggs & Collis (1982) suggested four categories to assess the structural complexity of content in discourse of different depth, which are *unistructural*, *multistructural*, *relational* and *extended abstract*.

While “argument”, “statement” and “information” are coded based on the nature of the note, SOLO taxonomy is used to reflect the depth of notes. Using the two-step procedure categorization, the coding of the data could be referred to hereafter as Au, Ar, Am, Aea, Su, Sm, Iu, Im, Ir for short (no Sr, Sea, Iea were found in this study). According to “question”, four types are identified in the literature of knowledge building: *explanation-oriented* (Qe), *fact-oriented question* (Qf), *verification* (Qv) and *process management* (Qp).

2.3.3 Coding procedure

The coding procedure is illustrated in Figure 1.

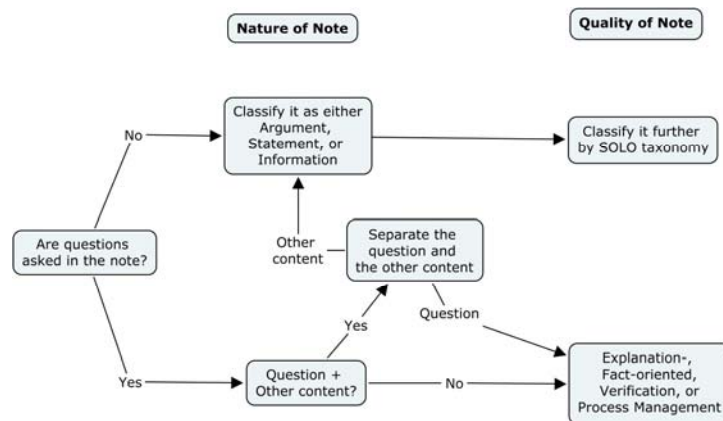


Figure 1. Flowchart for the coding process

2.4 Data analysis

In this study, coding is conducted with more than one kind of unit, which also enable to taking different aspects to view the process of knowledge building. One coder does the whole rating, and the other coder does 20%, then compare. The inter-rater reliability is 90% when coding the nature of notes, and 85% when coding argument, statement and information with SOLO taxonomy. The percentage of agreement for coding questions is 81%.

3. Result

There are 363 discussion threads found in this study, in which 179 belong to extended threads. It is observed in Figure 2 that there are sharp contrasts between sustained inquiries and the rest threads in knowledge building discourse for different levels of argumentation. The number of argumentative notes decreases by more than half in the less sustained discussion threads, while the differences are not so obvious in “statement” and “information”.

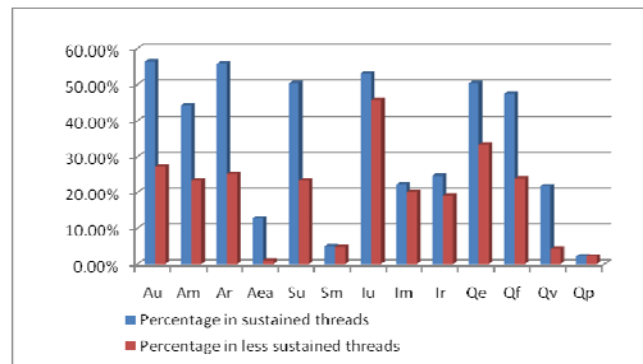


Figure 2. The comparison of interactions in sustained threads and less sustained threads

The study also finds out the emergent patterns for the argumentative notes in sustained discussion threads. It is shown in Figure 3 that the presence of Ar is mostly triggered by Au, about 32%, while Am and Su also contribute to higher level argumentation (18% for each). The pattern seemed to be the same referring the 2nd nearest note before Ar (42% for Au, 16% for Am and 17% for Su).

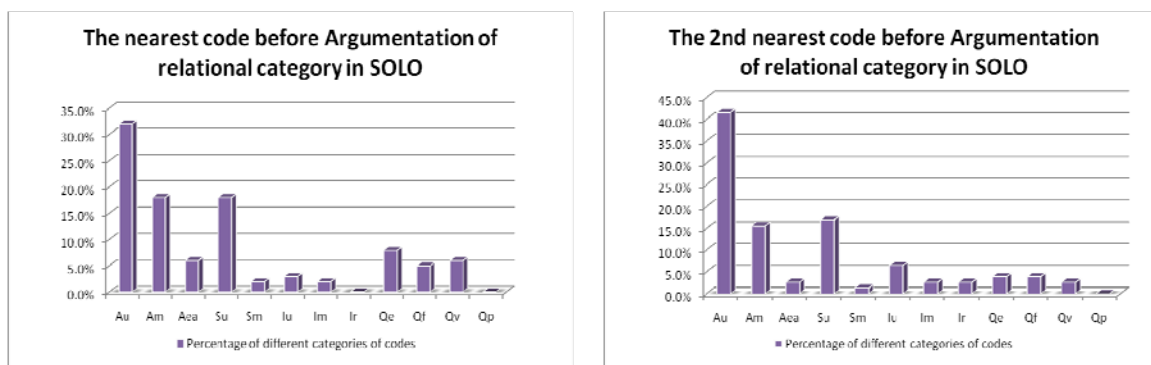


Figure 3. Patterns of interaction in sustained knowledge building discourse (Figure 2a. Bar chart of percentage of the nearest code before Ar, Figure 2b. Bar chart of percentage of 2nd nearest code before Ar)

4. Conclusion

Summarizing the findings reported in the last section, it appears that argumentation takes an important role in knowledge building discourse. The sustained discussion threads often contain higher level argumentative notes. In addition, there is a much higher chance for the higher level argumentation to take place if *unistructural* and *relational* argumentation, *unistructural* information occur in the first few notes in a discussion thread.

However, the results here only reflect the patterns of collective behaviors in online discussion forum which display a limited picture of knowledge building process. The scheme can be modified to examine the online discourse from multiple perspectives of participation, cognition, and interaction. Also students use scaffolds on KF to help identify the nature of their notes so that they can form “thinking types” gradually. It would be interesting to compare how the KF scaffolds really work using the coding scheme developed in this study.

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