Students' conceptions of and approaches to knowledge building: A phenomenographic method

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Abstract: This study explored primary school students' conceptions of and approaches to knowledge building using a phenomenographic method. A total of 48 students participated in present study. Five qualitative conceptions of knowledge building, namely "building up knowledge," "sharing ideas," "obtaining ideas," "discussing ideas" and "improving ideas," and five approaches to knowledge building, namely "seeking for the related information," "contributing what I know, " "receiving more ideas," "discussing ideas for better understanding" "getting feedback for making ideas refined" were revealed. These different and hierarchically related categories show the perspectives as experienced by the students. The results indicated that the students with fragmented conceptions tended to use surface approaches while those with cohesive conceptions tended to adopt deep approaches.

Keywords: Conceptions of learning, approaches to learning, knowledge building

1. Introduction

Within the computer-supported collaborative learning (CSCL) literature, knowledge building has received much attention in recent decades. It describes how students can be engaged with online discourse to develop new knowledge within a community through the use of discussion forums, mainly the Knowledge Forum (Chan, 2011). Scardamalia & Bereiter (2010) distinguish between knowledge building and learning; they see learning as "a personal matter, but knowledge building is done for the benefit of the community." (p.2). Knowledge building highlights the creation and modification of ideas as public knowledge that lives 'in the world', and can be further improved by other people. Based on the extensive research conducted on the knowledge building pedagogy, Scardamalia (2002) has distilled twelve principles or social-cognitive and technological contributing factors that are essential for fostering a knowledge building culture in a classroom. These principles, include (a) real ideas, authentic problems, (b) improve ideas, (c) idea diversity, (d) rise above, (e) epistemic agency, (f) community knowledge, collective responsibility, (g) democratizing knowledge, (h) symmetric knowledge advancement, (i) pervasive knowledge building, (j) constructive uses of authoritative sources, (k) knowledge building discourse, and (l) embedded and transformative assessment. Essentially, these principles engage students in addressing problems of understanding they are personally confronted with, articulating their initial understanding as ideas and subsequently treating the ideas as improvable cognitive artifacts. The students assume the responsibilities as a community to respectfully examine the diverse ideas proposed through collaborative discourse that aims to improve their collective understanding. The ideas are therefore discussed and compared to authoritative sources and sometimes empirical testing, and are assessed and sometimes transformed as higher level cognitive artifacts. These principles not only guide teachers and researchers to design their lesson activities and teaching strategies, but also to evaluate the extent of knowledge advancement within the community (Hong & Scardamalia, 2014).

Recently, a growing body of research has investigated students' conceptions of and approaches to learning in educational research, such as conceptions of and approaches to learning through peer assessment (Yang & Tsai, 2010), conceptions of and approaches to learning through online discussion (Ellis, Goodyear, Prosser, & O'Hara, 2006), conceptions of learning management (Lin & Tsai, 2011), and conceptions of and approaches to online argumentation (Tsai & Tsai, 2013). Conceptions of learning are related to what the students think about the learning process and its purposes (Benson & Lor, 1999) while approaches to learning are concerned with how students approach their learning (Yang & Tsai, 2010). In this line of research, phenomenographic method was utilized to explore individual variations in the perceptions of the phenomenon experienced by the students. The phenomenographic method is a qualitative method, and is used to document individual experiences and classify the variations into hierarchically related categories (Åkerlind, 2005; Richardson, 1999). For example, in the pioneering study of Säljö (1979), five qualitatively different, hierarchically related conceptions were revealed, including "increase of knowledge," "memorizing," "acquiring facts or procedures that can be retained and/or utilized in practice," "abstraction of meaning," and "an interpretative process aimed at the understanding of reality." Hence, following this research method, the hierarchically related conceptions and approaches were found, and also revealed students' different views of learning that have implications for improving how teachers design and practice their instruction.

Moreover, many researchers have categorized conceptions of learning as fragmented and cohesive conceptions (Ellis et al., 2006). Fragmented conceptions refer to a limited understanding of the learning resources and environment where students fail to take advantage of it while cohesive conceptions refer to a comprehensive understanding of the learning resources and environment that students can leverage to enhance their learning. Ellis et al. (2006) revealed that students with cohesive conceptions tend to have better learning outcomes than those with fragmented conceptions. Likewise, approaches to learning can be classified into surface and deep approaches (Yang & Tsai, 2010). Surface approaches reveal that students engage in the learning activity for reproduction. Deep approaches reveal that students engage in the learning activity for real understanding. Unsurprisingly, Ellis, Goodyear, Brillant and Prosser (2008) indicated that students with deep approaches tend to outperform than those with surface approaches.

By using dichotomous views (i.e. fragmented versus cohesive conceptions, and surface versus deep approaches), many studies found the positive relationships between students' conceptions of and approaches to learning (Lee, Johanson, & Tsai, 2008). For example, Yang and Tsai (2010) revealed that the college students who held fragmented conceptions of learning through peer assessment tended to adopt surface approaches while those who held cohesive conceptions tended to use deep approaches. The results of these studies implied that students' conceptions of and approaches to learning may be important for their learning. In the present study, we are interested in investigating how students developed their conceptions of and approaches to knowledge building after engaging in knowledge building as a community in a social study class. Therefore, the present study aimed to examine students' conceptions of and approaches to knowledge building. The research questions are showed as below:

- Using the phenomenographic method, what are the students' conceptions of knowledge building?
- Using the phenomenographic method, what are the students' approaches to knowledge building?
- What are the relationships between students' conceptions of and approaches to knowledge building?

2. Method

2.1 Participants

The participants of this study consisted of 48 primary school students ranging in age from 9 to 11 years (consisted of 23 primary three and 25 primary four students; 19 females and 29 males). All of the students had experienced knowledge building activities in social studies classes for one year (a 35-minute period weekly). The curriculum plan of the primary three and four social studies is to enhance civic-mindedness among students through an understanding of Singapore's past and present. In

the knowledge building activities, students were encouraged to interact and discuss the issues with their peers online by using the Knowledge Forum ™.

2.2 Data collection and analysis

To understand the students' conceptions of and approaches to knowledge building, the interview questions were constructed based on Tsai (2009), Yang and Tsai (2010), and shown as below.

- What were the knowledge building activities about? Please share with me your experiences last year.
- Based on your experience, what do you think is the meaning of knowledge building activities?
- When your friends, who did not attend the knowledge building activities, ask you about the knowledge building activities, what will you tell them?
- What do you think about the purpose of knowledge building activities?
- Given a choice, would you still want to take part in knowledge building activities? Why?

- What have you done during knowledge building activities?
- What strategies did you use and why did you adopt those strategies in the knowledge building activities?
- What were some of the things you learnt from the knowledge building activities?
- How do you know when you have learned something through knowledge building activities?

The first five questions explored the students' conceptions of knowledge building, while the rest investigated the students' approaches to knowledge building. Moreover, the phenomenographic method (Richardson, 1999) and the most dominant category (Koballa, Gaber, Coleeman & Kemp, 2000; Tsai & Kao, 2008) were utilized to analyze the students' interview responses, which were applied as a major data source to examine their conceptions of and approaches to knowledge building.

Firstly, this study utilized the phenomenographic method to identify qualitatively different categories for describing students' conceptions of and approaches to knowledge building. That is, the authors read the whole interview responses, chose the significant sentences, and then marked the main ideas which were able to represent the students' conceptions of and approaches to knowledge building. The authors also compared the significant sentences and the marked ideas to find out the similarities and differences between the students' responses. The hierarchically related categories of students' conceptions of and approaches to knowledge building were then constructed in this study.

Similar to previous studies (Koballa et al., 2000; Tsai & Kao, 2008), this study also found that the students had mix views of conceptions and approaches; hence, following the most dominant category, the authors identified each student's highest frequency idea as the most significant conception and approach to represent his/her views of knowledge building. For instance, Tsai and Tsai (2014) revealed four categories of college students' conceptions of online argumentation, involving expressing ideas, discussing ideas, negotiating ideas, and reflecting on and extending ideas. If a student had many utterances around "discussing ideas" but a few utterances about "negotiating ideas," these utterances would be grouped into the category of "discussing ideas."

After the classification of interview responses, 20 out of all students were randomly chosen and their interview responses were classified by another author using the same coding criteria. The percentage of agreement was applied to measure the reliability of the two researchers' coding. The percentage of agreement with regard to the conceptions and approaches were 80% and 85%, respectively. For the remaining data that were not subjected to inter-rating, the researchers reviewed and discussed the interview responses together, and then determined final classifications.

3. Findings

3.1 Conceptions of knowledge building

Five different conceptions of knowledge building were identified by using the phenomenographic method. The categories range from A (highly fragmented conception) to E (highly cohesive conception) showing the hierarchically different conceptions of knowledge building as experienced by the students.

A. *Knowledge building as a way of building up knowledge.* Students conceptualized knowledge building as gaining and accumulating more knowledge from Internet. The purpose of knowledge building was to find more information about the theme under study.

B. *Knowledge building as a way of sharing ideas.* Students characterized knowledge building as a way of sharing ideas and information on Knowledge Forum. The purpose of knowledge building was to express and share their views.

C. *Knowledge building as a way of obtaining ideas.* Understanding classmates' ideas about the theme inquired was viewed as the main features of knowledge building. The purpose of knowledge building was to know others' perspectives.

D. *Knowledge building as a way of discussing ideas.* Trying to integrate and discuss the peers' ideas was viewed as the major features of knowledge building. Hence, students classified in this category not only shared information, but also the higher-level cognitive processes needed in knowledge building activities.

E. *Knowledge building as a way of improving ideas.* Knowledge building was characterized in terms of improving ideas. The purpose of knowledge building was the improvements of ideas or obtaining more complete understanding of a theme.

3.2 Approaches to knowledge building

Five qualitatively different approaches to knowledge building were identified by using the phenomenographic method. The categories from A, which is related to a highly surface approach, to E, which is related to a highly deep approach, reveal hierarchically different approaches to knowledge building as experienced by the students.

A. *Engaging in knowledge building to seek for the related information*. This approach to knowledge building highlighted seeking for the related information about the theme from the Internet. The students tended to emphasize information finding is a necessary process in knowledge building activities.

B. *Engaging in knowledge building to contribute what I know.* This approach to knowledge building stressed providing more ideas. The students seemed to expect that they could tell more ideas they known.

C. *Engaging in knowledge building to receive more ideas*. This approach highlighted providing their opinions to receive more ideas. The students seemed to expect that they could get more feedback from peers.

D. *Engaging in knowledge building to discuss ideas for better understanding*. This approach to knowledge building stressed discussing with peers to increase their understanding about a theme.

E. *Engaging in knowledge building to get feedback for making ideas refined.* This approach to knowledge building emphasized discussing with peers to re-think or reflect on their ideas in a more cohesive way. The students seemed to expect that they could refine their ideas.

3.3 The distribution of students' conceptions of and approaches to knowledge building

The distribution of variation in conceptions of and approaches to knowledge building are shown in Table 1. As to student' conceptions, 68.7% (n = 33) of interview responses were classified as fragmented, and 31.3% (n = 15) as cohesive. As to students' approaches, 72.9% (n = 35) of interview responses were classified as surface, and 27.1% (n = 13) as deep. It implies that most students were viewing knowledge building in a fragmented way and used a surface approach.

Table 1: The distribution of students' conceptions of and approaches to knowledge building.

Type	Category	Counts

Conceptions of knowledge building		
Fragmented	A	16 (33.3%)
	B	7 (14.6%)
	C	10 (20.8%)
Cohesive	D	9 (18.8%)
	E	6 (12.5%)
Approaches to knowledge building		
Surface	A	18 (37.5%)
	B	7 (14.6%)
	C	10 (20.8%)
Deep	D	8 (16.7%)
	E	5 (10.4%)

3.4 The relations between students' conceptions of and approaches to knowledge building

To explore the relations between conceptions of and approaches to knowledge building, the Pearson chi-square test was conducted in this study. As shown in Table 2, the results showed that there was a significant relations between students' conceptions of and approaches to knowledge building (χ^2 (1, n = 48) = 21.86, $p < 0.001$). It implies that students with fragmented conceptions tend to use surface approaches, while those with cohesive conceptions tended to use deep approaches.

Table 2: The relations between students' conceptions of and approaches to knowledge building.

Approaches/Conceptions	Fragmented	Cohesive
Surface	29	5
Deep	2	12

χ^2 (1, n = 48) = 21.86, $p < 0.001$

4. Discussion and conclusions

This study investigated students' conceptions of and approaches to knowledge building by using the phenomenographic method. Five qualitative conceptions of knowledge building, namely "building up knowledge," "sharing ideas," "obtaining ideas," "discussing ideas" and "improving ideas," and five approaches to knowledge building, namely "seeking for the related information," "contributing what I know," "receiving more ideas," "discussing ideas for better understanding" "getting feedback for making ideas refined" were revealed. These different and hierarchically related categories show the perspectives as experienced by the students.

Our findings showed that in accordance with the fragmented and cohesive conceptions, more than half of the students held fragmented conceptions (i.e. building up knowledge, sharing ideas and obtaining ideas). Similarly, according to the surface and deep approaches, more than half of the students held surface approaches (seeking for the related information, contributing what I know, and receiving more ideas). Moreover, this study also found that students' conceptions are related to their approaches; that is, students with fragmented conceptions tended to use surface approaches while students with cohesive conceptions tended to adopt deep approaches. The results are consistent with the studies of Bliuc, Ellis, Goodyear and Piggott (2011), and Yang and Tsai (2010). The findings extended current research of conception of learning and points out that the deep and surface continuum is applicable to conception of knowledge building and there is a need to pay attention to the less desirable conceptions that have been formed.

Many researchers have investigated the relationships among students' experiences of learning and the learning outcomes, including the relationships among conceptions of online argumentation, and the quality of online argumentation (Tsai & Tsai, 2014), and the relationships among conceptions of learning via peer assessment, approaches to learning via peer assessment and learning outcomes (Yang & Tsai, 2010). Those studies provided some insights into students' learning processes from students' views. Therefore, future studies are encouraged to examine the relationships between students' perceptions of knowledge building and their knowledge building processes.

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