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Exploring the Online Medical Knowledge Building in a University General Education Course

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Abstract: The purpose of this research is to explore using the online platform Knowledge Forum to construct knowledge in a general medical course of college students. Applying the resulting coding scheme, three independent judges coded 4,673 messages posted into Knowledge Forum by 131 students (56 men and 75 women) attending the General Medical course at an university to develop the coding scheme. This article adopts the online interaction model for collaborative learning and uses six dimensions to code all students' discussions in general education courses and find a new dimension "technical".

Keywords: Knowledge Forum, discussion-based collaborative learning, computer-supported collaborative learning, knowledge-building

1. Introduction

1.1 Knowledge Building

Knowledge Building is a collaborative process of teamwork, and it provides valuable and practical ideas for the community and continuous improvement (Scardamalia and Bereiter 2006).

"Defined as the production and continual improvement of ideas of value to a community, through means that increase the likelihood that what the community accomplishes will be greater than the sum of individual contributions and part of broader cultural efforts" (Scardamalia & Bereiter, 2003, p. 1370). Knowledge-building activities helped to transform students into more collaborative, autonomous and creative learners (Hong & Lin, 2019).

Before establishing a learning-centered community, community awareness must be raised. Contains online discussion forums; read and understand your peers' ideas. This kind of awareness needs to contribute to one's ideas to solve the community's problems. As a member of the knowledge-building community, participants need to assume the responsibility of group awareness and have continuously improved the ideas held by the community（Scardamalia 2002）.

In the KB class, learners treat new learning content or information as problems that need to be explained (Bereiter & Scardamalia, 1993; Chan, Burtis, & Bereiter, 1997). As the facilitator of knowledge construction, teachers guide students to develop problems and drive students to explore problems. Learners collaborate to improve shared knowledge (So, Seah & Hwee Leng, 2010).

In the learning process of KB, students participate in production, communication, reflection, elaboration, improvement, and creativity to promote knowledge generation. To support continuous idea-centric collaboration, knowledge construction emphasizes community-based foundations. Students can be divided into groups for activities (Scardamalia 2002; Scardamalia &Bereiter 2003).

1.2 Knowledge Forum

To create a learning environment where learners can use the KB foundation, we use KF as an online platform for knowledge sharing and development. The design of KF can promote the development of

the KB community and allow learners to share knowledge on the platform (Bereiter and Scardamalia 2014; Scardamalia 2004; Scardamalia et al. 1994).

KF has promoted important online activities in the KB community: community awareness, the contribution of ideas, and building upon ideas. These activities are also the main characteristics of KF (Broadbent and Galeotti 2015; Scardamalia and Bereiter 2006).

This online learning environment allows students to have many-to-many communication. This non-synchronized online discussion platform allows learners to capture the words they discuss on specific topics of inquiry. Under the guidance of teachers, it allows them to ask questions, spar interactively, and constantly improve their ideas to strengthen their understanding of knowledge (So, Seah & Hwee Leng, 2010).

2. Method

2.1 Participants

The 75-female and 56-male undergraduates who participated were all enrolled in the same General Medical course in the National Taiwan Normal University in Taipei.

Before the main study commencing, all participants were asked to report on their use of Knowledge Forum, which all of them had used for collaborative learning as part of a previously required course.

2.2 Data collection

Online interaction transcripts throughout the whole school semester were archived. For the present study, 12 weeks' online interaction transcripts were gathered and coded for each course.

The participants' online interaction performance was examined through a content analysis of archived online interaction transcripts (i.e., threaded online discussion posts). In all, there were 4,673 discussion posts on Knowledge Forum. All were collected for analysis. Individuals' interactions on KF were coded and analyzed using the online learning interaction model developed by Ke and Xie (2009), which categorizes interactions into six dimensions: Social interaction(S), Information sharing(K1), Egocentric elaboration(K2), Allocentric elaboration(K3), Application(K4) and Regulation of learning(R). (Table 1).

All the discussion contents were exported from the KF system along with all meta-information. Three raters coded the online interaction transcripts. After reaching 100% agreement on scoring two sample weeks' transcripts, both raters double-blindly scored the rest of the transcripts. The inter-rater reliability (Cohen’s kappa) is .87, .69 and .68. The three raters also discussed the differences in their codes and reached an agreement at 100%. The final revised codes were used for analyses.

Table 1. *Descriptions and examples of the coding dimensions*

Dimensions	Sub-dimensions	Code	Descriptions and examples
Social interaction		S	Social interactions that do not involve knowledge construction. Common examples of social interactions are greetings, comments without elaboration (eg, "I like your post"), and sharing emotions/feelings.
Knowledge construction	Information sharing	K1	Adding facts without elaboration (eg, providing references or links), opinions (eg, "I agree with you") and asking questions.
	Egocentric elaboration	K2	Elaborating individuals' arguments/concepts/problems with details, or citing personal observation/ experience or books/knowledge they have learned previously.
	Allocentric elaboration	K3	Based on the information provided, individuals compare and synthesize information, including providing judgments (eg, "I agree with you because. . ."),

			summarizing (eg, "I like what you said previously, but I think. . .") and extend understanding (eg, "Based on the advantages you've mentioned, I wonder if there are any drawbacks").
	Application	K4	Applying the acquired knowledge to a future or hypothetical scenario, or providing application strategies.
Regulation of learning		R	Self-evaluation (eg, "I may not understand this correctly") or self-regulation of learning processes (eg, "I prefer to learn it visually").

3. Discussion and conclusions

3.1 Learning Interactions of Adult Students

131 participants' online interaction transcripts were included in the statistical analyses, broken down to 4,673 thematic units.

As shown in Table 2, 47.1% of the interaction thematic units were identified as Category K2 (knowledge construction—egocentric elaboration), 15.0% as Category K1 (knowledge construction—sharing information), 13.2% as Category S (social interaction), 13.2% as Category K3 (knowledge construction— allocentric elaboration), 8.5% as Category K4 (knowledge construction—application), 3.7% as Category T (Technical problem), and only 0.2% as Category R (Regulation of learning).

This detection indicates that students were more explained in online interactions for social purposes (S) or for individualistic knowledge construction (K1 and K2), and less for building knowledge with other students (K3, K4). There is a new category Technical problem (T) be created, students expressed some issue about some technical problem (e.g. KF setting, internet lag, computer technical problems).

Table 2. *Numbers and percentage of the coding dimensions*

Category	S	K1	K2	K3	K4	R	T
N	617	701	2200	616	398	10	174
%	13.2	15	47.1	13.2	8.5	0.2	3.7

3.2 The categories of Adult Students' Online interaction

3.2.1 Social interaction (S)

In this dimension, social interaction between peers, without knowledge construction. For example, greetings, conversations that share emotions.

For example, the students described that:

S63: That's too cool! Just like what happens in the movie.

S13: Thank you for your care this semester.

S53: Sister social worker, if she is beautiful, she should be very calm.

3.2.2 Knowledge construction—sharing information (K1)

In this dimension, students post facts without detailed explanation. (E.g., provide a link to a website) or share simple ideas (such as "I agree with this article") or ask questions.

For example, the students described that:

S31: I think this idea is excellent.

S56: I find the relevant information, Marie Curie.

3.2.3 Knowledge construction—egocentric elaboration (K2)

Students describe emotional arguments in detail in this dimension or cite their own experience/ knowledge/ learned books. For example, the students stated that:

S51: When seeing Chinese medicine, I used traditional decoctions more often when I was young, but when I grew up, I used more scientific Chinese medicine. I still prefer traditional decoctions psychologically because they feel relatively natural and mild, but sometimes I encounter more uncomfortable physical conditions. Scientific Chinese medicine produces effects relatively quickly, so Chinese scientific medicine is the leading choice after growing up.

S31: I think the content of gender stereotypes is not equal. Like what you said, you have different expectations for different genders and so on. But regardless of the content, do you feel that men and women have the same anticipation and psychological pressure? If you think about it this way, it is equal.

3.2.4 Knowledge construction—allocentric elaboration (K3)

Students compare or summarize information in this dimension, including providing judgment, summarizing, and expanding understanding. For example, the students depicted that:

S59: We have thought about the inequality of girls in today's society. For example, girls will be accused of being unscrupulous if exposed, or if they are violated, girls will be blamed for being too naked, etc. These are all unfair to girls, so we think that. It is necessary to inform education to improve and the cooperation of the media.

S87: I think this is highly unreasonable. So far, people in European countries are still reluctant to wear masks. The prevention measures for COVID-19 have not achieved the highest effective prevention and treatment. There are even anti-Chinese phenomena. From this, it can be seen that their self-determined sense of excellence, racial division and discrimination, awareness of health and education, and the decisions made by the government in response to the current situation are the focus of their failure in epidemic prevention. It is not to use the theory of natural selection to conceal the government's faults. In addition, the new policy introduced by the United Kingdom mentions that as long as you have cold symptoms, you should isolate yourself at home and do not go to the clinic or hospital to confirm the diagnosis. Allow patients to have enough medical resources to use. Even if you don't let patients think that they are patients, the new coronavirus is already infectious before symptoms appear. If this continues, the United Kingdom may fall.

3.2.5 Knowledge construction—application (K4)

Students apply the acquired knowledge to future situations or hypothetical situations in this dimension or provide practical application methods. For example, the students described that:

S41: First, make an apology. You can also deal with the emergency medicine box when responding. If it is severe, you can ask the seniors' opinions.

S34: Nowadays, many people think that Chinese medicine is bitter, so I don't want to take it.

3.2.6 Learning regulation—teamwork coordination (R)

In this dimension, Self-assessment, such as "I may not understand well," or self-adjustment of learning methods, such as "I prefer cooperative learning." For example, the students explained that:

S17: I can't judge whether the behavior of taking drugs like this is right or wrong. After all, these drugs were initially developed not for work needs. In some ways, taking drugs is relatively unprofessional behavior. Still, on the other hand, if drugs can assist work performance in achieving overall work safety and integrity, it seems that there is nothing wrong with it.

S34: I don't think I want to be sent to a nursing home in my old age because I have always followed my freedom. I don't want to feel too painful and still have to be restricted from liberty. That will only make me want to die even more, whether I'm sick or not. I hope to take good care of the last time I spend with my family before I die. If I know that I am about to lose consciousness or burden my loved ones too much in the future, I may choose to euthanize. Then learn to say goodbye to everything.

3.2.7 Technical problem (T)

In this dimension, technical problems encountered websites, networks, and other computer settings or another discussion. For example, the students explained that:

S08: This interface seems to be unable to answer itself

The video is a bit stuck, and it doesn't seem to move too much, so I haven't finished watching it yet. I don't know if it's related to my home network.

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