A Case Study of Students' Participation and Knowledge Construction in Two Online Discussion Settings

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ABSTRACT

Online discussions have become important educational activities through which collaborative learning and knowledge construction in online courses can be facilitated. This study is an empirical case study in which a group of graduate students' participation and knowledge construction in two online discussion settings is explored and compared. We examine participants' interactions by dividing their online discussion posts into four types and investigate their knowledge construction by coding and analyzing the discourse. Results reveal that the participants tended to create more words and contents in the audio or video posts than those in the text posts. Besides, although most of knowledge construction behaviors took place in the early

phases, the participants involved in the process of knowledge construction more frequently when the discussions occurred in the VoiceThread platform.

Keywords: Participation, knowledge construction, online discussion board, VoiceThread.

1. INTRODUCTION

Online learning is undergoing rapid growth at the college level in the United States and now represents a significant proportion of all learning for college students [1]. From a sociocultural perspective, knowledge is socially constructed by collaborative behaviors toward shared objectives or by discourses and challenges produced by differences in persons' perspectives [2]. Social interaction is an essential aspect of ensuring successful learning experiences [3]. Therefore, it is of great necessity to ensure and enhance interaction and collaboration among learners in the online learning environment.

The online discussion board is often considered as effective instructional technologies to engage learners in collaborative learning and knowledge construction [4][5]. Students can access course materials through multimedia technologies without the constraint of time and geographical location [6]. As most online discussion boards for educational use are text-based, writing skills are highly required. Students who are weak in keyboard operations or online writing experience may have difficulty in expressing themselves when communicating with one another [7]. Researchers and instructors attempted to employ alternative audio and video tools into online courses to help facilitate learning and interaction among students. Participants in these studies generally demonstrated a high level of engagement and positive attitudes towards the integration of audible or visible features in online discussion activities [7] [8] [9].

2. LITERATURE REVIEW

2.1 Online Discussion Tools

In the online environment, learning through discussions is an effective strategy for students [10]. Online discussions can take place with the assistance of different discussion tools, such as

synchronous web conferencing technologies, asynchronous text-based discussion boards, and asynchronous audio/video-based discussion methods [6] [9] [11]. The synchronous communication technologies are dependent on time, and students and instructors are required to present simultaneously in the online classroom for interaction opportunities [12]. The asynchronous online discussion technologies are generally free of time and physical constraints. The asynchronous and text-based features are favored by a certain number of online learners since they are provided a learner-centered environment and time to raise questions, reflect, and respond to others' postings [13] [14].

While the text-based online discussion board has been broadly utilized for online instructions, studies found that learning by interaction and collaboration in the discussion board can be time-consuming and complex due to the lack of non-verbal social clues [9] [15]. Besides, researchers argued that text-based discussions do not always promote effective, thought-provoking communication opportunities [16] [17]. Misunderstanding can occur as actions might go unobserved for some time, and online discussions require a longer time frame to complete [7] [10].

With increased media options for online discussions, audio-based and video-based tools could be alternative choices for online collaborative learning which can encourage discussion engagement and can lead to increased interaction and knowledge construction. One significant advantage is that both audio and video can reveal the nuance of spoken language that can be missing in text-based discussion [18]. Besides, as a certain of students find it difficult to express themselves or explain complex concepts using text-based medium [7], elaboration in oral format can make it easy for listeners to understand and therefore can reduce the possibility of misunderstanding.

2.2 Knowledge Construction in Online Settings

In online learning settings, knowledge construction is often considered as a critical aspect of learning outcome [19]. The assumption of knowledge construction in online settings is that students engage in specific discourse activities and that the nature of the engagement and content of the discourse is connected to the knowledge thereby constructed [20]. The processes of knowledge construction and reconstruction are complex and are influenced by some interconnected factors, such as students' learning styles, the design of the discussion task or activity, and the facilitation roles and techniques [21] [22].

Educational activities that promote knowledge construction allow students to share, discuss, and produce diverse ideas while interacting with others [23]. Advances in instructional technology have led to an increase in educational activities using online discussion tools to achieve deeper knowledge construction through collaborative learning [24] [25] [26]. When using the discussion tools, Students can construct knowledge by actively participating in discussions and expressing thoughts and concepts with their peers. They can create, share information, develop critical reflection, negotiate meaning, test synthesis, and build consensus. [26] [27]. The exchange of ideas and negotiation of meaning not only affects the individual's cognition but the group's 'distributed cognition' as participants deliver, negotiate and transform their ideas and create new knowledge as well [28]. In this manner, students not only acquire experiences and explanations from others, but also build up a strong social connection and an online learning community which will be beneficial for sustainable learning and knowledge advancement [23].

3. RESEARCH QUESTIONS

In this study, we plan to investigate the use of two asynchronous discussion tools for supporting online discussions among a group of graduate students, and to examine the differences in the interaction patterns and knowledge construction among graduate students in the discussion activities in an online course. We seek to answer two research questions:

1) How did the graduate students participate and construct knowledge in online course discussion activities in two online discussion settings?

2) What differences can be found in the graduate students' knowledge construction in the two online discussion settings?

4. METHODS

4.1 Participants and Contexts

This study took place in a graduate online course at a northeastern university in the United States. The online course consisted of five learning modules and lasted for several weeks. Each student was required to participate in two discussion activities in each learning module. Other course-

related activities such as paper writing and artifact presentation were also designed by the course instructor and assigned to the students. Before engaging in each module discussions, students needed to read provided reading materials and prepare initial questions based on the instructions and materials in the first part of each learning module.

Ten graduate students selected the online course and accepted to participate in this study at the beginning of the semester. However, as the course moved on, two of them quitted the online course and the study for personal reasons. Based on this condition, we only collected and analyzed data from the eight students. Each learning module has two discussion activities which initiated chronologically. Two module discussions were conducted in the text-based asynchronous online discussion board and another two discussions occurred in an audio/video-based online discussion platform called VoiceThread. VoiceThread (VT) is a cloud-based communication platform applied in classroom settings to include face-to-face or online [29]. Students and instructors can upload PowerPoints, images, videos, documents, or any other media files to the VT platform to develop a slide-based presentation. The discussant has the option to add audio or video comments to each slide and share the presentation with others. Others then can give responses through audio or video to each presentation slide [30]. In this study, we edited instructions for each module discussion and guiding questions in slides and uploaded to the VT platform. The students were suggested to use audio/video recording features to create posts and add on others' posts in the discussion thread. Each student was required to create at least one post and to respond to one classmate with one comment as the least course discussion requirement.

4.2 Data Collection and Analysis

The primary data sources were the posts and the comments generated by participants in the online discussion board and the VT platform. To explore students' participation and interaction patterns in the discussion activities, Hewitt's [31] four types of threaded discussion posts were employed. The classification can provide insights into how participants interact with others in the course discussion activities. The four online post types include: (1) Standalone posts (post which introduces new ideas and does not build on other's posts), (2) add-on posts (quote or build on the ideas of one other post), (3) multiple reference posts (make reference to two or more previous posts with no attempts at convergence), and (4) convergent posts (post that discusses some of the ideas stated in two or more others' posts) [31].

For the investigation on participants' knowledge construction, the discourse in both settings was transcribed and coded by two independent raters who were specialized in online discourse coding and analysis using the Interaction Analysis Model (IAM) [26]. This model consists of five phases which learners must go through (not necessarily sequentially) as knowledge is being collaboratively constructed [32]. The five phases are: (1) Phase 1 – Sharing and comparing of information, (2) Phase 2 – Discovery and exploration of dissonance or inconsistency, (3) Phase 3 – Negotiation of meaning or knowledge co-construction, (4) Phase 4 – Testing and modification, (5) Phase 5 – Phrasing or agreement and applications of newly constructed meaning. The inter-rater reliability was .86 and disagreements were settled by negotiation between the raters. Pieces of the discussion discourse which can demonstrate participants' knowledge construction behaviors will be presented in the following section.

5. RESULTS

5.1 Participation in Online Discussions

The students' posting behaviors in the discussion activities can be reflected by the total or the average number of posts [33]. Participants in this study generated a total number of 45 posts in the text-based online discussion board (ODB) and 44 posts in the VT platform. Figure 1 presents the average number of words in one post in the two discussion settings, which to some extent reflects the quality of the posts and students' willingness to share personal ideas and experience with others.
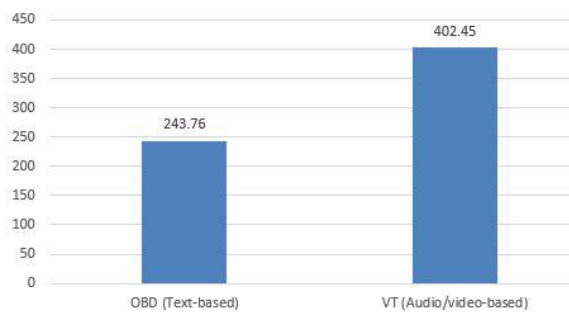

Figure 1. The average number of words per post.

As the result shows, the participants tended to create and add comments with more words and contents in the audio or video posts in the VT platform. One possible explanation for this phenomenon is that elaboration and demonstration by speaking take less time and cognitive loads than typing long paragraphs of words. One student stated:

Sometimes it is easier to speak your thoughts rather than thinking about how to put it on the text. When you are writing or typing, you tend to be conscious about the formality of your discussion discourse, which can stifle your thoughts.

Besides, the participants claimed their positive attitudes towards the use of the VT platform for online collaborative discussions. As one of the participants wrote in one of the posts:

Using an asynchronous multimedia tool like VoiceThread is fantastic since it gives me the ability to listen to a comment posted by a classmate, think it over and then create a response.

Additionally, to investigate participants' participation in the two discussion settings, Hewitt's [31] four online post types were employed. It can be seen from Figure 2 that while there was a considerable amount of interaction between participants, only a few students provide feedback to multiple classmates in one post and produce a more sophisticated type of posts that tied together ideas from different sources. This result agrees with the findings of Hewitt, who found that most students hardly made attempts to synthesize or summarize ideas from different notes during their conferencing sessions [31].
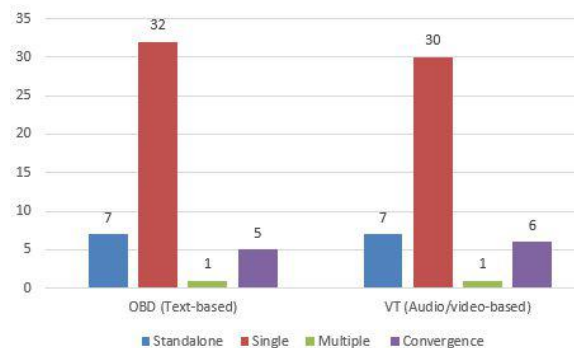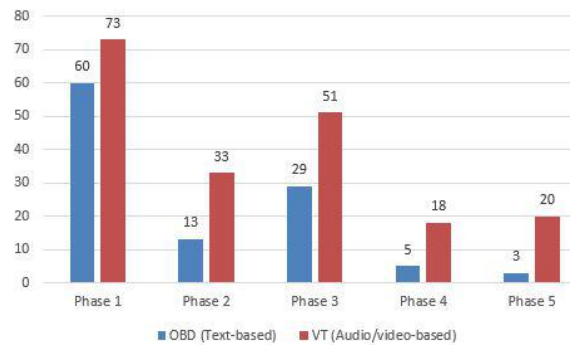

**Figure 2. Counts of post types in two discussion settings**

5.2 Knowledge Construction in Online Discussions

Through analyzing the transcripts of the online discussion discourse, knowledge construction among the participants was explored. Figure 3 indicates that more knowledge construction

behaviors took place when the participants were discussing in the VT platform. One possible reason for this phenomenon can be attributed to the advantage of audio and video features for more interpersonal interaction and opinion expression. Besides, Figure 4 shows that 85% knowledge construction behaviors the participants conducted involve in the first three phases across all the four discussion activities, including opinion sharing (Phase 1), disagreement identification (Phase 2) and meaning negotiation (Phase 3). New knowledge had been constructed in the exchanges of ideas and concepts with others, although only account for a limited percentage of the discussion posts.

Figure 3. Counts of Phases of Knowledge Construction in two Discussion Settings
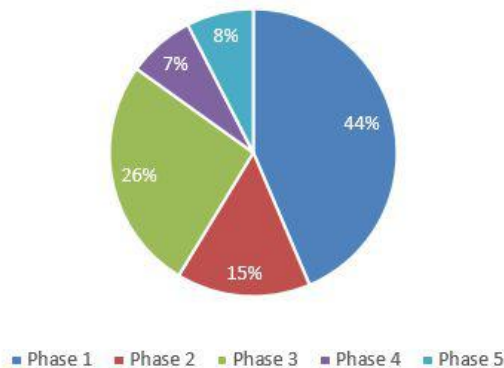
Figure 4. Distribution of the five phases of IAM in all the discussion posts

To better illustrate the results and present the process of knowledge construction in the discussions, we here provide some sample excerpts of discussion posts among participants (pseudonyms used to protect identity):

Post #1 by Terry (Standalone Post)

Siemens (The author of the reading) further asserts that knowledge can be owned and manipulated by technology. [Ph1] --again, I do not think this is so outrageous to a millennial growing up today who often sees computers "do things" with information. [Ph2] But until we reach true artificial intelligence, aren't these programs just doing what we tell them to do? Can they really "know" anything? More importantly: when they can learn, is not that learning still occurring within that one unit, that one individual machine? The knowledge is being processed, not processing itself. [Ph3]

Post #2 by Jenny (Add-on Post)

Hi, Terry. You make several great points here, but I have to say that you shifted my thoughts when you said," But until we reach true artificial intelligence, aren't these programs just doing what we tell them to do? Can they really "know" anything?" Siemens' words are easy to believe when we live in a world where technology has a role in almost everything we do. However, in reading your post, I realized I hadn't thought about it as much as I should have. [Ph5]

The first post above was created by a participant discussing an idea from the reading and presenting personal opinions. This post serves as an initial post for a discussion thread in the text-based online discussion board. The second post was an add-on post to the first one provided by another participant. As mentioned in the previous section of this study, the IAM [26] was employed for coding. The first post involves three phases of knowledge construction (sharing information, the discovery of dissonance, and negotiation with others). This post plays a critical role in collaborative knowledge construction as the second post writer claimed a great impact on her personal views (show agreement of other's idea).

6. DISCUSSION

The purpose of this study is to explore the utilization of two different discussion tools, Online Discussion Board (ODB) and VoiceThread (VT), in supporting a group of students' collaborative learning and knowledge construction in the course discussion activities. By examining students' participation and knowledge construction behaviors in online course discussion activities, we generally figure out the following findings: First, the participants generated almost the same number of posts in the two discussion settings. However, the larger average number of words in the audio/video post in the VT platform may indicate that speaking is more comfortable and less cognitive-loaded than writing and typing in the formal text format. The use of tonal cues such as inflections and expressions could potentially help students understand better and therefore reduce the risk of misunderstanding as well [18]. Second, the participants showed their preferences to communicate and interact with one another in both settings, as can be illustrated by the significant number of add-on posts. Feelings of group cohesion rather than perceptions of "self" help facilitate effective communication and knowledge construction [34]. Third, although the participants only created a limited number of multiple reference posts and convergent posts, and they rarely reach to the final phase of knowledge construction (summarizing agreements of newly constructed knowledge), it does not necessarily mean that these participants have a low level of summarizing and integrating capabilities. We suppose that if more conclusive discussion activities can be designed and encouraged, this situation will probably be changed.

This study has some limitations. First, this study only contains a small-scale dataset generated by a few students. The online course where the online discussion activities in this study took place was a graduate-level selective online course. Ten students chose this course and two of them quitted in the middle of the course and this study. Only eight students approved to participate in this study. Therefore, the total number of posts created by this group of students was not as many as the number of posts in the same course in previous semesters. Second, during the process of this study, there were some technical and copyright issues related to the application of the VT platform, it took much time to mediate and solve these problems with technical staff at the university. We had to change our original plans and designs in accord with the unexpected situation. Third, a few pieces of discussion discourse in the audio format were unable to be transcribed and coded due to the quality of participants' recording files. We did our best to recover these pieces and marked the irreversible parts as inaudible. Fortunately, there were only

very few missing words which can be negligible to the findings. Finally, it is highly suggested that more details of the interactions among the participants and the in-depth analysis of the discourse should be conducted in the future study.

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