Student Moderators in Asynchronous Online Discussion: Scaffolding Their Questions

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Abstract: Asynchronous computer-mediated conferencing (CMC) courses rely on sustained threaded discourse to encourage student learning. One successful approach for engaging students is through the use of peer moderators, whose goals are to focus and sustain the discussion, challenge students, and synthesize and summarize shared accomplishments. Peer moderators typically begin by posing thought-provoking questions to their peers, and it is known that different types of questions are differentially effective for generating higher-order discussion. However, prior literature suggests that students use very few question types, and tend to use types that have been linked to low levels of learning. In this research, we scaffold the questioning process, and then investigate the use and impacts of question type on resultant higher-order thinking. We find that the scaffolding led to a rich variety of question types, and that the evidence suggests new research directions for both Application and Course Link questions.

1 Introduction

Asynchronous computer-mediated communication (CMC) is now a dominant form of online education. Such courses often consist of various forums in which instructors and students dialogue through threads (Hewitt 2005). There are many benefits of threaded asynchronous CMC compared to synchronous CMC and face-to-face courses, including time-independent access, heightened levels of interactivity, and platforms supporting constructivist tenets (Morse 2003; Gold 2001; Cavana 2009).

Such benefits, of course, are afforded to students only when they engage in the environment and, unfortunately, such engagement does not "just happen". For example, Hew and Cheung (2008) collect several references to courses where large numbers of students do not post at all or post one or two messages per week. See Zingaro (2012) for more on how engagement is fostered in online courses, and Della Noce, Scheffel, and Lowry (2014) for the ways that students do and do not engage with their instructor's questions.

The use of peer moderators has been suggested as a means of increasing student interaction, making students feel more comfortable, and bridging the teacher-student divide in online settings. For example, Seo (2007) compared peer-moderated and non-moderated discussions, yielding two important findings. First, quantity of participation was greater in moderated discussions. Second, moderated discussions contained more posts that enriched the conversation (rather than simply restated what had already been said). While students do sometimes naturally assume moderator roles (Ioannou, Demetriou, & Mama 2014), the majority of peer-moderation research is conducted in courses where such roles are explicitly designed into the course by the instructor.

Student moderation involves a passel of inter-related techniques which, together, are appreciated by peers. For example, Hew and Cheung (2008) found that moderators engaged in seven practices that were associated with lengthy discussions. These practices included sharing personal experiences, establishing ground rules, and showing appreciation for other students' ideas. The most frequent practice, however, was the use of questioning.

There is evidence that many different types of questions are possible in an asynchronous environment, and that these types can impact the discussion that follows. Bradley, Thom, Hayes, and Hay (2008) studied the impact of six different types of instructor-posed questions on response word count, completeness of the responses, and evidence of

higher-order thinking. They found that each of these dependent variables was influenced by question type. For example, "Limited Focal" questions — those that ask students to take a stand given several possible options — received responses of the highest word count and response completeness. Application questions — those that ask students to apply course content to a real-life scenario — received replies from the smallest proportion of students, and the responses that were received were brief and incomplete. The most productive questions in terms of higher-order thinking were those that required students to make a link to the reading at hand or the course in general, and "Brainstorm" questions that asked for any and all perspectives.

It is important to note that these questions were generated by instructors in a controlled study where the question types were distributed evenly across the semester. In a more recent study of student moderator questioning patterns (Zingaro 2012), it was found that student moderators rely primarily on two question forms: Brainstorm and multi-part "Shotgun" questions. This is important as these are **not** the only types of questions known to generate higher-order discussion.

Zingaro (2012) recommended that students be scaffolded in their understanding of different types of questions, hypothesizing that this would increase the variety of question types used. In addition, Zingaro (2012) was not able to capture student response patterns to all question types, because some types of questions were not asked by student moderators at all. We make progress on both of those research fronts here.

Specifically, we pose the following research questions:

- To what extent do students use alternate question forms when they are provided information on how to ask questions?

- As is the case for instructor-posed questions, does the question type of student-posed questions influence the level of higher-order thinking evidenced by the answers and subsequent discussion?

2   Methods

The course studied here is a fully online graduate education course that took place in Winter 2016 at a large Canadian research university. The course used an asynchronous online learning environment where each week of discussion was conducted through a forum (Makos, Lee, & Zingaro 2015). The topic of the course was computer science education research, and included the study of learning theories and modes of inquiry (e.g. sociocultural theory), underrepresented groups (e.g. gender imbalance), student misconceptions (e.g. of recursion), predictors of success and failure, innovative teaching (e.g. media computation), assessment, and educational technology.

22 students took the course. Each week, one or two students served as moderators, focusing the discussion around the week's course readings. The moderators collaborated to develop guiding questions, facilitated discussion, and summarized the week's highlights at the end of the week (Griffith 2009). In week 1, the instructor asked the students to read and discuss the paper by Zingaro (2012) that focuses on how to ask questions, including categories from the literature known to be good forms of questions. Students were encouraged to use a variety of question types, not just the ones that seem to be used most naturally (Zingaro 2012).

Students were given 20% course credit for their moderation work and 30% for their participation in weekly discussions. The instructor was the moderator for the first two weeks, after which the students moderated each week.

codename	shorthand	description
direct link	DL	Refers to a specific aspect of an article (e.g. a quotation) and asks students for interpretation or analysis. The direct link to the article can be found in the question itself or be a requirement in the response.
course link	CL	Asks students to integrate specific course knowledge with the topic of the article.
brainstorm	BS	Asks students to generate any and all relevant ideas or solutions to an issue.
limited focal	LF	Presents an issue with several (e.g. two to four) alternatives and asks students to take a position and justify it.
open focal	OF	Asks for student opinion on an issue without providing a list of alternatives.
application	AP	Presents a scenario and asks students to respond using information from a reading.
shotgun	SG	Presents multiple questions that may contain two or more content areas.

Table 1: Types of questions

codename	Bloom Level	description
No score	N/A	Student attempted submission but cannot be coded as a result of being too off-topic or incorrect.
Reading citation	1	Student only cited the reading using mostly direct quotations when justifying their answer.
Content clarification	2	Student stated personal interpretation of article content, such as paraphrasing ideas in own words.
Prior knowledge	2	Student used prior knowledge or referred to new outside resources when justifying their answer.
Real world example	3	Student applied a personal experience or scenario to justify answer.
Abstract example	3	Student applied an analogy, metaphor or philosophical interpretation to justify answer.
Making inferences	4, 5, 6	Student's answer reflected analysis, synthesis or evaluation, made broader connections to society or culture and created new ideas in justifying answer.

Table 2: Cognitive response categories

We adopt both the coding scheme for question types and the Bloom-based coding scheme for responses from Zingaro (2012); see (Tab. 1) and (Tab. 2). The questions were coded using negotiated coding (Garrison, Cleveland-Innes, & Koole 2006). For the responses, two coders coded a total of 215 notes (22% of the total notes in the course). Interrater reliability was conducted using 37 notes to determine consistency between coders. Of the 37 notes selected for interrater reliability testing, 31 matched between the coders. The interrater reliability was calculated and found to be strong with Cohen's Kappa of 0.837.

For each question, we calculated the percentage of response notes that fell in the low (no score, reading citation, content clarification), medium (prior knowledge, real-world example, abstract example), and high (making inferences) levels of Bloom's taxonomy.

3 Results

3.1 Moderator Questions

(Tab. 3) indicates the number of instructor (first two weeks) and student (remaining nine weeks) questions. In sharp contrast to the results of Zingaro (2012), here we see students relying on all question forms to some extent.

	BS	DL	LF	OF	SG	AP	CL
instructor	2	1	0	1	0	0	0
student	2	5	1	3	10	2	2

Table 3: Question types produced by instructor and students

3.2 Cognitive Level of Responses

(Fig. 1) presents the analysis of the proportion of low-, medium-, and high-cognitive responses to each question type.

Focusing on the high levels of Bloom's taxonomy, we see that LF questions yielded the lowest proportion of inference (just 37.5%). This replicates the similar finding in Zingaro (2012), suggesting that response choices for these questions are too constraining in terms of opportunities to synthesize and evaluate. By contrast, AP questions yielded the highest level of inference at 66.6%, and this type of question was completely absent from Zingaro (2012). Perhaps most surprisingly, CL questions, expected to generate high levels of cognition (Bradley et al. 2008), yielded the second-lowest level of inference. In fact, both CL and DL questions were associated with large proportions of low-level responses.
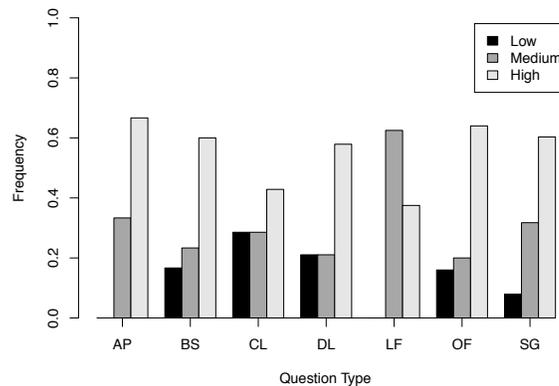

Figure 1: Frequencies of responses by question type

4 Discussion and Conclusion

Threaded discussions are fundamental for collaboration in online learning spaces. Yet, as we have argued in the introduction, meaningful discussion does not "just happen". In this work, we report on research from our continuing efforts to support high levels of cognition in threaded discussions. We present further evidence that the type of question asked by student moderators does influence the ensuing type of discussion.

Why are Application (AP) questions associated with such high levels of cognition? One hypothesis is that such questions are relevant to many students, as each student can apply the course readings to their own areas of expertise. Such expertise might free students to make connections between what they know well and what they are learning in the course (synthesis), and to compare and contrast their prior understandings with the current readings (analysis).

Disappointingly, Course Link (CL) questions were not, as hypothesized, associated with high levels of cognition. This is an area of future work, but one hypothesis is that these questions are considerably more difficult than others. By definition, they require a synthesis of past weeks' material; students may be struggling with the current week's material, leaving fewer cognitive resources and little time to grasp the full generality of what has been learned previously. That said, the contradictory findings with respect to CL questions (Bradley et al. 2008) are puzzling and warrant further research. Differences in the ways that student moderators and teachers ask these questions, as well as particulars of the differing course material, are possible starting points for this research.

As in earlier work (Ertmer, Sadaf, & Ertmer 2011; Zingaro 2012), Shotgun (SG) questions were disproportionately used by the student moderators. Such questions often combined a Brainstorm (BS) question with Limited Focal (LF) or Open Focal (OF) questions. Their prominence across several studies now suggests that a more fine-grained analysis scheme that disaggregates the SG questions into their components is warranted. One possibility is to tag each response to an SG question with the piece of the SG question to which it responds; this would allow a more detailed study of the ways in which each piece of the question guides and constrains the discussion.

We conclude that providing students with and encouraging the use of a typology of question types does broaden the types of questions that are asked by student moderators, and that some of the "new" question types are associated with high levels of cognition. We encourage practitioners to share a question typology with students: it is a low-cost tool that helps students both ask interesting questions and provide cognitively-rich responses.

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