

Encouraging Critical Thinking in Online Threaded Discussions

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Abstract

Critical thinking is a highly desirable goal of online higher education courses. This article presents qualitative data from a mixed-method study that explores how asynchronous discussions within online courses influence critical thinking among students. In this study, online discussions were related to higher levels of critical thinking, but qualitative data indicate that the way discussions are used and facilitated is vital for encouraging critical thinking. Online discussions typically have the purpose of creating a space and time for informal, open-ended thinking to occur. Critical thinking appears to be best encouraged among students when a more consistent emphasis is placed on the discussions, and when instructor facilitation is less frequent but more purposeful.

Introduction

Instilling critical thinking abilities in students is a highly touted goal of higher education. In every discipline there is a need for students to think critically and analytically. Critical thinking is more than just knowledge acquisition or a collection of processing skills, rather it is the development and continual use of analytical skills (Scriven & Paul, 2005). Critical thinking is seen as a necessary life skill whereby the process of improving thinking is, in essence, creating the habit of reflection and questioning in every aspect of life (King, 1995; Scriven & Paul, 2005). However, studies have long indicated that students are often not learning at critical and reflective levels in higher education (Ramsden, 1992; White, 1992). Higher education instructors often proclaim to want students to use higher order cognitive objectives such as critical thinking, but tend to focus student efforts on memorization or lower level cognitive tasks (McKeachie, Pintrich, Lin, & Smith, 1986). Although critical thinking is a goal of higher education, instructors may not often be using the most effective methods to encourage students to use critical thinking strategies.

Online courses in higher education are no different than on-campus courses in the goal of promoting critical thinking among students. Yet unfamiliar teaching methods and techniques in online environments can cause even more uncertainty about the best methods for encouraging critical thinking. Online threaded discussions have emerged as a promising method for encouraging critical thinking (Meyer, 2003). These discussions are seen as effective places for instructors to coach and develop deeper and more reflective learning because they put emphasis on the elements of an argument and the exchange of ideas (MacKnight, 2000). The nature of text-based communication makes it particularly useful for critical thinking by allowing for more reflective and less spontaneous discourse (Garrison & Anderson, 2003). And with online discussions, students can return to the permanent record created online as a means of continual reflection (Lea, 2001). Online courses typically use online discussions and grade for discussion participation (Anderson & Elloumi, 2004; Jarmon, 1999), so they are an integral part of online education. Yet, it appears that critical thinking is still not occurring to a great extent in online courses (Maurino, 2007). Similar to the situation with on-campus classes, online instructors may tend to focus students' efforts on content, knowledge retrieval, and lower level thinking.

Because critical thinking is such a valued goal in higher education, and because online teaching methods are still unfamiliar to many instructors, it is important to explore how to use methods such as online discussions to best promote higher thinking levels. This study explores how online discussions influence critical thinking among students. Recent research has focused on the potential for critical thinking development through online threaded discussions, but most studies have been focused on education and graduate courses and are based mainly on data from student perceptions (Maurino, 2007). This study contributes to this growing body of literature by providing data from students and instructors in a larger sample of courses, across disciplines, with a more typical online student population.

Methodology

This article presents findings from the qualitative phase of a larger study. The study overall used a mixed-method, two-phase design where the first stage developmentally and sequentially informed the second phase. The site for this study was an online institution created in 1999 comprised of sixteen community colleges. This institution offers over 300 educational and occupational online courses to nearly 5000 students each semester. In the first quantitative phase, surveys were used to explore assessment practices within typical online courses and how those assessment practices relate to students' use of learning strategies. Sixty courses were selected for the first quantitative phase of this study, stratified by academic program. Instructor surveys and researcher observations were used to determine the summative and formative assessment practices used in the courses. Student surveys using selected subscales from the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991) were used to determine how often students used five different learning strategies, including critical thinking. Results showed that written assignments, papers, and discussions were positively related to students' use of the critical thinking learning strategy, whereas finals/midterms and non-graded assessments were negatively related (Arend, 2007).

The second phase of this study is the topic of this article. The purpose of this phase was to use a qualitative grounded theory approach to explore in more depth and add more detail to the findings from the first phase. A major area of the qualitative study focused on critical thinking

and online discussions. Because critical thinking is an often-cited goal of higher education classes, and because online discussions are used in nearly every online course, the researcher wanted to explore how online discussions relate to higher levels of critical thinking. Was it simply the use of more discussions? Or are there also specific characteristics or techniques that seem to encourage students' use of critical thinking strategies? Interviews and observations were used to answer the question: how do online discussions influence the use of the critical thinking strategy among students?

Definitions

In this study critical thinking is defined as developing one's own way of thinking about course materials, following the learning strategy taxonomy developed by Pintrich, Smith, Garcia and McKeachie (1991). Online discussions are defined as asynchronous threaded discussions in which instructors pose questions and students respond to the questions and to each other over the course of a week or a few weeks. The online courses in this study are classes that are conducted completely online.

Sample

Nine courses were selected for the qualitative phase of this study using purposeful extreme case sampling (Creswell, 2002). The original 60 sampled courses were sorted in order of student mean scores on the MSLQ indicating students' self-reported use of the critical thinking learning strategy. Courses were reviewed to exclude those with low survey response rates or with unusually skewed subscale scores or student demographics. Eight courses were chosen across disciplines based on two variables. Courses were chosen if the instructor rated critical thinking as something students should usually or always be doing in the class (rated 6 or 7 on a 7-point scale). Courses were also chosen to select four courses with the highest critical thinking use means from student surveys, and four courses with the lowest means. An additional course was later added to supplement a gap in student responses. This created a sample where critical thinking was a strong goal of the course, according to the instructor, but where students reported either the highest or the lowest use of critical thinking. Comparisons between the two groups of courses were expected to yield information about how online discussions can influence different levels of critical thinking among students. Table 1 details the variables for these two groups of

courses, referred to as the higher critical thinking use group and the lower critical thinking use group.

The sampled courses purposely constituted a mix of academic programs across the two groups. Courses belonged to the Physical and Environmental Science, Languages and Literatures, Arts and Humanities, Computer Information Systems, Criminal Justice, Social and Behavioral Science, and Math programs. The only notable difference between the groups was related to an instructor’s teaching experience. Instructors in the higher critical thinking use group had nearly double the years of teaching experience in terms of both total years teaching and years teaching online. Specific student demographic characteristics were not collected for this phase of the study. It is known that 18 of the participants were female and 11 were male and that the participants were drawn from the original sample of 411 students who were mostly female (75%), White non-Hispanic (81%), U.S. citizens (96%), employed at least part-time (80%), between the ages of 18 and 69.

TABLE 1: Sampled Courses and Descriptive Variables

Course	Instructor critical thinking value ^b	Student critical thinking mean ^b	Credit hours	Course level	Total enrollment	Student interviews	Instructor interviews
Higher critical thinking use group							
1	6	5.63	3	100	19	5	1
2	6	5.52	4	100	19	4	1
3	6	5.32	3	100	17	0	1
4	7	5.17	5	200	25	5	1
5 ^a	4	5.51	3	200	25	2	0
Lower critical thinking use group							
6	7	3.83	3	200	18	1	1
7	6	3.75	3	100	24	6	1
8	7	3.73	4	100	10	2	1
9	7	3.56	3	100	30	4	1
Total						29	8

^aCourse 5 added later to supplement the higher critical thinking group sample

^bbased on a 7-point rating scale measuring frequency of learning strategy use (1 = never, 7 = always)

Participants and Instrumentation

Qualitative data were collected from three sources: courses, instructors, and students. The researcher reviewed each course in depth, including analysis of course assignment details, grading rubrics, discussion postings, and internal email messages. The researcher spent approximately two to three hours in each course and took extensive field notes. Field notes were divided into details of the course and reflective notes by the researcher. The notes focused on the nature of the interactions between instructors and students within the discussions and the course as a whole, and the nature and type of assignments including discussion question prompts and the extent of instructions.

Instructors were asked to participate in an email or phone interview one week after the course ended. Instructors were sent a customized list of questions about their goals and strategies for online discussions, and how they might be used to encourage critical thinking. Six of the eight instructors in the original sample participated in email interviews, engaging in back and forth email discussion with the researcher between two and three times. The other two instructors participated in phone interviews which were tape recorded, transcribed, and returned for member checking. The instructor from the course added later to the sample was eventually unable to participate due to time constraints.

All students from the sampled courses were also invited to participate in email or phone interviews. Student questions were designed to get a sense of how students responded to online discussions and how the discussions either encouraged or discouraged them to think about course material in new ways. Twenty-nine students participated in email interviews. One class had no students respond and the ninth course was sampled to supplement this gap. Student responses varied from short statements to multiple paragraphs. The researcher asked a few further personalized questions of each student and 21 responded back with further information and detail at least one additional time. Two courses, including course three which had no student interviews, had online discussion forums where the students were asked to anonymously share their views on the course and this information was added to the qualitative data. Student responses and researcher observations were summarized into a short report for each course for

member checking. Fifty-five percent of the students interviewed, including at least one student from each course except course three, reviewed the report and provided feedback.

Data Analysis

Data analysis was based on a version of the grounded theory tradition of qualitative research (Creswell, 1998). Grounded theory is intended to generate a theory or model that is grounded in data. It uses open coding and inductive reasoning to arrive at a possible theory before examining the theory against the data. In this study, a variation of grounded theory was used where the theory, or model, first emerged from quantitative data. Findings from the first quantitative phase of this study suggested a model whereby online discussions were related to higher uses of critical thinking among students. Grounded theory was used in this second phase first to support or dispute this finding and then to provide further description and help explain this relationship.

Qualitative data analysis followed the pattern of open, axial and selective coding detailed by Strauss and Corbin (1998). NVivo software was used to code data and allow themes to be identified, isolated and regrouped. In open coding, participant responses were coded, attempting to use the words of the participants as much as possible. Some categorizations were predetermined and other categorizations emerged on their own. Axial coding was next used to constantly compare categorizations and assumptions from themes relating to the model. The categorizations and researchers initial conclusions about these themes were constantly revised as a result. Data were analyzed simultaneously through two contexts. First, data were analyzed through the context of each individual course. General summaries and conclusions were made about the dynamics within each course so that data from a particular course could be understood in relation to its context. Data and quotes were always identified by participant and course so the context would not be lost. However, data were also analyzed across courses, trying to understand and capture some of the themes that went beyond the context of an individual course. In the final stage of selective coding, the researcher continually revised findings of the themes related to critical thinking strategy use and online discussions. Here, the researcher often went back to the raw data and coding results when questioning or revising the findings. Saturation was reached on many areas and those areas where saturation was not achieved are noted in the results section.

Qualitative researchers typically use the concepts of trustworthiness and credibility to judge the quality of qualitative research (Lincoln & Guba, 1985). In this study, issues of trustworthiness and credibility will be discussed under the general constructs of internal validity and external validity (Creswell, 1994). The accuracy of information collected, or its trustworthiness or internal validity, was supported through various means. Triangulation was achieved by combining the perspectives of both students and instructors with the observations and reflections of the researcher. Member checking, or allowing participants to review their own data, was achieved first because nearly all responses were sent in written format and could be reviewed by the participant. In follow up questioning the researcher often used participant's exact words and participants were able to see and elaborate on their previous comments in the email itself. Also, member checking occurred through the sharing of phone interview transcripts and when students were asked to review the researchers summary report conclusions about their course and provide feedback. This gave the researcher many points in time to compare personal conclusions with participant conclusions. In addition, clarification of researcher bias occurred through the use of analytical memos reflecting on the researcher's experiences, preferences, and assumptions at many stages throughout data collection and analysis. Finally, during selective coding and reporting, general conclusions were again compared to the raw data.

Credibility can be explained as external validity, the extent to which the study is generalizable. There are certainly limitations to the generalizability of any qualitative study; however efforts were taken to make the results meaningful to a broader audience of online instructors. The institution used was chosen to represent a fairly typical online experience for students rather than either a brand new program or a technology-intensive course. The community college students in this study more closely resemble the common online student. Also, multiple courses, across disciplines, were sampled to try to represent a variety of perspectives and practices and to reach saturation on some general issues about online discussions and critical thinking.

Results

The purpose of this qualitative study was to explore how online discussions influence the use of the critical thinking strategy among students. A finding first emerged from a quantitative phase of this study whereby written online discussions were related to higher levels of critical thinking strategy use (Arend, 2007). Qualitative data were used to first support or dispute this finding and then to provide detail and description to explain this relationship.

Critical thinking in online discussions

The online learning literature talks about discussions as the place where a learning community develops. In this study, the discussion forums were definitely a place where instructors and students shared personal information and got to know each other. Some instructors and students described this area as where “the class” took place. But beyond the social and community aspects, instructors across the board said the intent of discussions was to create an open forum for thinking about course concepts.

According to instructors, the purpose of their discussions was to provide an informal learning opportunity where students explore different concepts, apply course material to real life, or dig deeper into a concept or topic. In courses more aligned with humanities and social science disciplines, the focus was typically on exploring different views on a topic or concept. Many students commented on the value of seeing others views and sharing their own. “I learned a few things about my thinking process and I also learned to give credit to others opinions.” Some students and instructors talked about the value of learning to tolerate different opinions. Students in some of the higher critical thinking use courses talked about how the discussions were a place where they would challenge each other’s ideas and support their own viewpoints. They used words like, “defend,” “justify,” “debate,” and “argue.” Said one student, “Some of the discussions were really in-depth. You really had to think carefully about what you were going to discuss because anyone would be eager to challenge your thoughts and ideas.” One of the higher critical thinking use courses used peer review in the discussion area, which was greatly appreciated by students for the ability learn from other viewpoints.

In the courses more related to math and physical science disciplines, the focus was often on seeing multiple strategies for solving a problem. According to one student, “It helped me see how others looked at various problems and encouraged me to look closer at my methods.” The use of applied and real-life problems also helped students think of the material in new ways. Most students appreciated being asked to think about the connection between the abstract and the concrete. One instructor explains:

Students often tell me that they benefited from having to think about what they are using in their daily life that pertains to this class. Often students aren’t sure how our “in class” material is really being used. I think it takes some obvious critical thinking to see what you are doing and how you can apply it to this unit.

Most math and science courses followed this tactic; however a few, especially in the lower critical thinking use group, had some trouble keeping the discussions interesting and interactive. Students generally did not like when there was little interaction or when the responses were repetitive. They got bored reading postings that repeated each other and got frustrated when they found the discussions so limited it was awkward to find anything new to say. One student explains, “Once a solution was posted it felt like the students were strained to come up with creative additions without posting, ‘yeah, what he said’...a good discussion problem might include at least two different and distinct solutions.” This did not seem to be the norm for math and physical science courses, but it did occur.

Although there was some discrepancies, especially in the math and science courses in the lower critical thinking use group, most instructors used the discussions to encourage critical thinking and students felt this was a place where thinking about course materials in new ways was expected and did occur.

Informal nature of online discussions

Most instructors used the discussions specifically to ask students to develop and share their own ideas about course concepts. The most talked about benefit of the discussions was the open-ended nature where multiple viewpoints are expressed. One instructor described the discussions

as “a ‘free speech’ forum for opinions based on research and facts.” These discussion assignments were more informal in nature than most course assignments. Even though the discussions are typically graded, the focus was usually on the content of students’ postings, rather than on format or following a specific structure. The purpose is to think about course material in a more unrestricted fashion, as this instructor describes:

The students might think that the discussion topics are supposed to be academic/quasi-academic, but what they are really supposed to do is engage the students in the learning process with different parts of their thinking patterns than what takes place in just “book learning.”

The informal focus of online discussions is very much aligned with this study’s definition of critical thinking as developing one’s own ways of thinking about course materials. Students said the informal nature of the discussions means they are free to express themselves and focus on their concepts and thoughts rather than grammar or format. According to one student, “I think the discussion were the best because we could freely say what we thought without being graded on structure.” Another student added that with the anonymity of the discussions “you feel more free to express your true opinion.”

Time for reflection

Students in all courses talked at length about how they had to spend time preparing for the discussions. Many students shared examples about how they had to think about their responses ahead of time and spend time looking for references or ideas to support their postings. They described how this led to “outside the box” thinking. For example, one student in a higher critical thinking use course described this experience and how it helped her develop her own opinions on the course concepts.

I was researching my answers to [discussion] questions all week. The instructor posed questions at the beginning of the week, so I always posted a thought-out answer to that, and then as the week went on, I would comment on what other people had written. Because I was “required” to respond to their questions as well, I tended to think a bit

more about what they had said. Also, if someone posted a comment that I completely disagreed with, I went back to the text or Internet to find a credible source to give credit to my opinion. The questions [the instructor] posed, coupled with the requirements of interacting with other students, helped me to form my own opinion.

Students and instructors in this sample felt there was a deeper level of thought without the on-the-spot pressure of synchronous discussions. The time delay of asynchronous discussions allowed students to process and think more. As one instructor said, “The online environment requires more detailed and involved discussions than the face-to-face format.” Another instructor concurred, “All students are required to participate in every discussion, there are no interruptions as a student starts to ‘speak’ and the shyest student has time to formulate a response.”

However, this asynchronous nature of online discussions can also be challenging for students. Some students felt it was harder to express themselves in a written format or felt there was difficulty with having a delay in the conversation. Also, some students who were admittedly less social did not like being forced to participate and did only a minimal amount of posting. These comments formed a minority opinion from the students in this study, but do reflect a challenge with online discussions. Overall, the built in time for reflection in asynchronous discussions was felt to encourage more critical and reflective thought.

Differences in discussion emphasis

Online discussions in this study seemed to have the intent of creating a space and time for open, informal thinking and reflecting on course material. The qualitative data support the finding that online discussions are related to higher levels of critical thinking among students. However, there were some differences that stood out when looking at the courses with the highest levels of critical thinking and those with the lowest.

Table 2 presents the online discussion methods used in the nine sampled courses. The higher critical thinking use courses used between 10-28 discussions whereas the lower critical thinking use courses used only between 5-12. All of the courses in the higher critical thinking use group

and only half of the courses in the lower critical thinking use group made discussions worth 10% or more of the overall course grade. In addition, all of the courses in the higher critical thinking use group and only half the courses in the lower critical thinking use group had separate discussions areas to separate off-topic conversations, such as Q & A forums, coffee shops, and extra credit areas. Although the instructors in both groups claimed to use discussions for the purposes of encouraging student thinking, courses in the higher critical thinking use group placed more consistent emphasis on the explicit use of this method.

TABLE 2: Number of Discussions Used and Course Grade Percentages for Sampled Courses

Course	Number of discussion assignments	% of course grade	Course	Number of discussion assignments	% of course grade
Higher critical thinking use group			Lower critical thinking use group		
1	10	14%	6	9	0%
2	25	18%	7	12	16%
3	10	11%	8	5	33%
4	11	10%	9	7	7%
5	28	37%			

Differences in instructor facilitation

The most prominent differences between the course groups observed by the researcher had to do with instructor facilitation. The courses in both groups used provocative, real life, and controversial discussions question prompts. However, there was a noticeable difference in the ways the instructors managed the discussions. For one, courses in the higher critical thinking use group used more explicit instructions concerning how to participate in the discussions. But more notably, instructors in the higher critical thinking use group responded less frequently and more impartially to student postings.

Instructors in the lower critical thinking use group were very active in the discussions, sometimes responding to nearly every student posting. However, instructors in the higher critical thinking use group participated less often, responding to approximately every 2-10 student postings. This may appear to go against advice about online teaching that tells instructors to stay very present and involved in discussions. Yet the instructors in the higher critical thinking use

group were not any less present even if their comments were less frequent. Students did seem to know that the instructor was observing the discussions regardless of the amount of instructor postings. In fact, in one course from the higher critical thinking use group, the instructor did not post at all in one of the units and the discussion was observed to be just as long and contain the same apparent quality of responses as the other units where the instructor was more active.

This is not to say that instructors should simply respond less frequently in discussions. Especially where discussions revolve around solving problems, the lack of instructor presence can cause anxiety for students. One student had this experience in a lower critical thinking use course and commented, “Are the original posts valid? Are the replies valid? Who knows? An outspoken student in the course could have easily led the course astray since there was little real participation in serious discussion on the part of the instructor.” Rather, instructor postings in the higher critical thinking use group showed that the instructors were present and involved in the content of the discussions.

In the higher critical thinking use group discussions, the instructors’ responses were very purposeful. For one, instructors from the higher critical thinking use group appeared more impartial in their comments. Especially when the discussions centered on a controversial or personal topic, instructors in the higher critical thinking use group took a neutral stance. In the lower critical thinking use group it was common to see instructors provide comments that showed how they felt on an issue. For example, postings commonly seen were “I agree” or “good point.” Instructors showed their views even in these short posts. One observed response to a student post was “Very idealistic! Also very unrealistic!” Other postings were very general such as, “Anyone else?” In one course in the lower critical thinking use group, students were seen to be challenged by the instructor but in a way where they were directed towards the “right” answer in an open-ended discussion. Students were observed to change their thinking and reply with apologies such as one student who commented, “I’m sorry, I see what you mean now.”

In contrast, instructors from the higher critical thinking use group remained very neutral in their comments. Instead of sharing their own views, instructors would question or extend the discussion using a neutral tone. For example, one posting read, “Thanks for your contributions.

Now some in this debate would say [presents one side of argument]...while others defend [presents other side]...[provides a link to a related article]...your thoughts?” These instructors would also respond with very specific questions, pushing students to go further in their thinking. A comment seen in an arts and humanities course went as follows, “Nice start. Now how do you think [the concept under discussion] evolved from that point in history to where it is today?” One instructor from the higher critical thinking use group explained this strategy, “I try to affirm the value of simply participating, even though I happen to disagree. But even if I agree, I try to post a follow-up question that is meant to be provocative, or encourage students to search elsewhere on the net for answers.” Students appeared to appreciate this tactic. One student remarked, “I also liked how the instructor remained neutral throughout the class and posed questions to encourage discussion. I actually enjoyed when [the instructor] challenged me to think more about a statement I posted.”

Thus it appears that a comment such as “Good point, I agree” may signal an end to the conversation, whereas a comment such as “Interesting, how do you think others would react to your comments?” encourages the student to think a bit more about the topic and other perspectives and views. The qualitative data in this study indicate that effective facilitation to encourage critical thinking is more than just being active and visible in the discussions. Rather, students reported to do more critical thinking in the courses where the instructor played a more neutral and probing role.

Facilitation challenges

A possible downside of the more limited instructor postings is that some student comments indicated that they felt the instructor should be very involved in the discussions. Instructors seem to think that the discussions are mainly for the students to interact, but many students viewed discussions as an instructor-led space. Students may not be accustomed to discussing and learning from each other. Some students, especially in math and science courses, expressed a desire to learn from the instructor and saw discussions as frivolous. Said one student, “I trust what the instructor has to say, not other students.” Students may need some guidance getting used to open-ended, collaborative discussions. Instructors did acknowledge this and said it could take several weeks for students to get used to the tone and style of the discussions.

In addition, students felt that the instructor needs to monitor the discussions and keep the conversations from being dominated by just a few individuals. And discussions based on controversial topics have the potential to become very personal for students. One course in the higher critical thinking use group had very intense and lengthy discussions and some of the highest reported uses of critical thinking. This same course was also criticized by at least three students for getting too personal. One of these students was upset that one individual often dominated the discussions. The instructor did acknowledge this aspect of the course and talked about the fine line between monitoring the discussion for these potential problems but also not ruining the flow of ideas and opinions:

I try to keep the course as “open” to differing points of view as possible. However, sometimes an individual will take an opportunity to “preach” rather than discuss, on an issue. This sometimes provokes less favorable responses to the individual in question. But I try not to intervene too much, in part because I think this course is valuable for the “preaching” student, as well as the “non-preaching skeptic,” in learning how to tolerate each other, and communicate in ways that promote dialogue rather than “shouting.” I try to intervene when the discussion becomes inappropriate, becoming a matter of personal attacks rather than debate on an issue. At the end of the course, this has sometimes resulted in everyone having a good understanding of where they stand on certain issues, and enables them to better understand those with whom they disagree.

Overall, online discussions are a place where critical thinking can be encouraged. The intent of most discussions is to get students to think in new ways about the course material. The informal and asynchronous nature of online discussions means students have the time and space to reflect and think about their ideas and contributions. Courses that had higher reported use of critical thinking used more discussions and placed more emphasis on discussions in the course grade. These courses also had discussions led by instructors who participated less frequently but more purposefully, provoking students with neutral, probing questions.

Discussion

Implications

It has been observed that online discussions are positively related to the use of the critical thinking strategy among students (Arend, 2007). Instructors in this study who used more online discussions and made them a higher percentage of the course grade had students who reported higher levels of critical thinking. However, there is more to this picture than simply using more online discussions. Qualitative data indicate that there are some general facilitation characteristics that seem to promote critical thinking among students.

Instructors in this study said the intent of online discussions was typically to encourage students to think about course material in new ways. The discussions were typically used as an open space for students to think freely about course concepts. Students in this study spoke positively about the informal nature of the discussions and they valued sharing their thoughts and being able to see other students' viewpoints. These collaborative discussions engaged students in social constructivism activities of questioning each other, defending their ideas, and reexamining their assumptions (King, 1995; Vygotsky, 1978). This process involved examining and reflecting on their own, as well as others' viewpoints, therefore engaging in a process of continually restructuring meaning and understanding. If an online instructor wants students to be thinking critically in a course, he or she should use discussions as an open-ended, informal space for students to share multiple viewpoints and problem-solving strategies.

One especially valuable aspect of asynchronous online discussions is that time is already built into the structure for students to reflect and process information. In face-to-face classroom discussions, longer wait-times between instructor questions and student responses are related to more student engagement and better performance (Cotton, 2001). In online discussions, students have as much time as they need for reflection, producing what instructors and students both say are deeper and more reflective contributions (Bender, 2003; Boaz et al., 1999). When instructors resist responding to each student post, but rather respond selectively throughout a discussion, it may be a form of creating the beneficial longer wait-times within online discussions.

Instructor guidance in facilitating online discussions is a critical aspect in developing critical thinking. Instructors should encourage students and create a safe environment for discussion, but effective facilitation is more than simply responding frequently and positively to students. An instructor who does not continually push the discussion further, or who explicitly shares his or her thoughts on the topic under discussion, may be inadvertently shutting down the thinking process. When an instructor replies, “Good job, I agree” to a student’s comment, that student is likely to feel good about their response but have little motivation to think about it any further. But if the instructor’s reply was, “Interesting comment, I wonder how you would defend your position to the other students in this class who think quite the opposite?” the student is left thinking further about opposing views, perhaps wondering how the instructor feels about the topic, and thinking in more depth about their own position. While both instructor responses are positive, only the latter really asks the student to continue using critical thinking strategies and does not indicate an end to the dialogue.

The success of the technique seen in this study is consistent with the literature on inquiry methods of teaching, commonly known as the Socratic method, which is often suggested for online discussions (Bender, 2003; Garrison & Anderson, 2003). The inquiry method is based on an instructor’s role of questioning, rarely telling students what they ought to know, but rather encouraging dialogue and student-to-student interaction through probing and redirection (Cotton, 2001; Davis & Davis, 1998). Instructors who model to students how to ask good questions and develop habits of inquiry, improve students’ critical thinking skills (Angelo, 1995; King, 1995). When the purpose of a discussion is critical thinking, the instructor’s role is not so much to lead students to a correct answer as to carry on a dialogue that helps develop deeper understanding.

Some online instructors, especially those new to online education, may feel the need to respond to every student post within a discussion. In fact, the institution where this study took place previously had a policy that instructors should respond to at least 75% of student postings in online discussions. The findings from this study seem to contradict these practices and show that quality is much more important than quantity in instructor facilitation. Rather than frequent short posts, more thoughtful questions that force students to take the time to think through their answers appear to be more important for developing critical thinking.

Limitations and areas for future research

This study took an initial step in exploring how online discussions and critical thinking interact online and the study limitations should be noted. This study represents the practices of only a select number of courses at one institution at the community college level. Qualitative data was gathered to represent perspectives from a variety of courses across disciplines, but the samples within each course were small and came from those who volunteered to participate. Although the online environment is unique in that an entire course and all its interactions can be observed by an outside researcher, it is impossible to fully describe cognitive processes of students. Also, motivation is a potentially intervening factor in students' use of learning strategies such as critical thinking, but motivation was not specifically examined in this study.

This study explored critical thinking at its basic level, differentiated from other learning strategies by the general definition of developing new ways of thinking about course material. There is a newly emerging and very promising body of research into taxonomies of critical thinking and online discussions that are attempting to identify the various levels of systematic analysis and reflection and how to move students along a continuum towards more advanced levels (Collison, Elbaum, Haavind, & Tinker, 2000; DeLoach & Greenlaw, 2007; Garrison, Anderson, & Archer, 2001). This study supports the basis of these studies and adds to this body of literature by focusing attention on the delicate balance between quality and quantity in online discussion facilitation.

Facilitation skills are considered to be one of the most needed skills of online instructors in the coming years (Kyong-Jee & Bonk, 2006). The current research emphasis on critical thinking and online discussions is encouraging. However, recent studies show that critical thinking is still lacking at high levels in online courses and that more instructor effort is needed (Maurino, 2007). Research that offers implementable actions by online instructors is needed. Studies in this area that inquire further into issues of frequency, neutrality, and purpose of discussion facilitation would help online teaching and perhaps alleviate some common concerns about the need to respond to every student post. The field could also benefit from exploration into specific strategies for diagnosing students' current thinking levels and the most effective types of

questions for developing critical thinking. There may especially be need for these strategies in the math and physical science disciplines. Also, strategies that help students to better appreciate this probing facilitation style would be useful. Finally, the use of more qualitative data to better understand both student and instructor perspectives would help to advance this complex and emerging area of research.

Conclusion

Critical thinking is a necessary life skill of reflective and analytic thought. College students, even adult learners, are not initially ready for critical thinking and need to develop these analytical skills gradually throughout their college classes (King & Kitchener, 1994; MacKnight, 2000). Thus it should be the goal of most college courses, whether online or face-to-face, and regardless of discipline, to contribute to the development of critical thinking among students. Based on the findings of this study, it appears that online discussions should be utilized to encourage the use of critical thinking. When working towards the goal of critical thinking, instructors should take care to ensure that the online discussions create a space and time for informal, reflective thought, and that instructor facilitation is focused less on frequency and more on purpose, continually provoking students with selectively spaced, neutral, probing questions.

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