CREST+ Model: Writing Effective Online Discussion Questions

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Abstract

Research on online classes strongly identifies participation as a positive variable. Research on online teaching also reveals the time intensive practices involved with providing individualized attention and feedback. An online instructor must negotiate the balance between being responsive and managing time effectively. To that end, writing sound discussion questions, based on a model, is one way to invite and increase participation and maximize the time element. The CREST+ model, a model for writing effective online discussion questions, covers the cognitive nature of the question, the reading basis, any experiential possibility, style and type of question, and finally ways to structure a good question. This model encourages students to participate in online forum discussions, provides a template for new online faculty to use in creating effective discussion questions, and promotes a higher level processing of the material.

Keywords: Asynchronous discussions, constructivist learning, discussion forums, facilitated discourse, models, online community, online education, student engagement, instructor immediacy

Introduction

An ordinary function of any class, online or otherwise, is to teach and engage the students. Research on online education consistently finds that high and consistent interaction levels between students and the professor, and high interaction levels between the students themselves, is often seen as a positive variable (Hammond, 2005; Johnson, Aragon, Shaik, & Palmas-Rivas, 2000; Berge & Collins, 1996; Tu, 2000; Muirhead, 2001; Blignaut & Trollip, 2003; Vonderwell, 2003). The most common form of participation is student engagement in discussion forums established by the instructor. As Berge and Collins (1999) have observed, interaction does not just occur but must be intentionally incorporated into the design of the class, and research reminds us that facilitated discourse is critical to creating a community of inquiry (Anderson, 2004; Easton, 2003; Bullen, 1998).

Most online instructors, aware of how important student participation is to online learning, will realize that s/he must produce solid educational discussion questions that also engage; as Hunkins (1989) stated,

"Questions and thought coexist" (p. 17). These good questions must also be sound in terms of learning theory, be big enough to engage online classes with possibly 30 or more learners, and long enough to last a module. Dillon (1983) claims that creating educative questions "requires thought; to formulate it requires labor; and to pose it, tact" (p. 8).

An online instructor should also be aware of the research that demonstrates that teaching online takes more time and more effort, especially due to the need to provide individualized attention (Cavanaugh, 2005; Stern, 2004). McLain (2005) found that online students attempted to contact their instructors twenty-four hours per day, seven days per week, at least every fourteen hours.

In response to the need to balance interactivity with time economy, this research compresses the literature on writing good discussion questions into the CREST+ model that any online instructor can apply. Education has created numerous models for ensuring sound pedagogy, and teaching online is no different. The SQUAD model provides a way to measure cognitive group engagement and the letters of SQUAD stand for suggestion/question/unclassified/answer/delivery (Oriogun, Ravenscroft & Cook, 2005). IMPROVE, a model used for mathematical e-learning environments, stresses metacognitive development and stands for introduce, metaquestioning, practice, review, obtain mastery, verify and enrich (Kramarski & Gutman, 2006; Kramarski & Mizrachi, 2004). IRE (initiate, reply and evaluate) was used to examine online discourse patterns (An & Levin, 2003). Finally, a rubric for assessing interactivity was designed by Roblyer and Ekhami (2000).

The CREST+ model aids the instructor in creating the actual discussion questions and is based on the existing literature, presentations by the authors, and their professional experiences as online educators. The CREST+ model covers the cognitive nature of the question [C], the reading basis [R], any experiential [E] possibility, style and type of question [ST] , and finally ways to structure a good question [+]. An appendix is provided showing a sample topic and how it would be structured by using many of the CREST+ steps. A single topic is used for consistency and for demonstration purposes. An asterisk (*) by any technique in this article indicates that a sample question can be found in the appendix.

C: Cognitive Nature

A question can reflect many theoretical aspects of learning. Questions can be based on andragogy, constructivism, Bloom's Taxonomy, learning styles, or building community.

Andragogy, developed by Knowles, looks particularly at how adults learn and then provides markers in order to teach to adults effectively. Knowles' theory has six key points. Adults want to know why they are learning something, they want to be responsible for their own decisions and have self-direction, they have something to bring to the course content vis a vis their life experiences, they are ready to learn, they prefer a problem based approach, and they are motivated to learn that which will help them in their lives (Atherton, 2005).

Whether traditional or online, a course should rely on andragogical principles in course creation and construction. Since adults prefer the problem-based approach, the students can be asked to share in discussion forums what they already know about a concept, and carefully designed questions can provide a problem-based approach.

Constructivism* states that the learner is intimately involved in creating (constructing) meaning out of the course content (Atherton, 2005). Bruner and Piaget are key early theorists within cognitive constructivism and they both argued that it is the learner's work to create new meaning and build new cognitive structures (Huitt, 2003; McConnell, 2002).

Cognitive constructivism has transferred well to the online environment. There are articles on participation, assessment, reflection, effective discussion questions and knowledge creation (Salmon, 2003; Gulati, 2004). Moore dissects online interactions into three types: student to professor, student to student, and student to content (Moore, 1989).

Salmon offers a five step model for online learning. The steps provide increasing complexity and learning as the student moves from access to online socialization, to information exchange, to knowledge construction to development, whereby the students use what they have learned. As the student moves up the levels the amount of interactivity should increase as should the learning. Carefully designed questions can help the student move up the cognitive ladder while creating and designing meaning for themselves (Ally, 2004).

Bloom's (1956) Taxonomy of Learning ranks inquiry types into six hierarchical levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. "These levels build upon each other as the learner gains knowledge and expertise therefore leading the student to complex understandings and knowledge" (Christopher, Thomas, & Tallent-Runnels, 2004). Using complex, higher order questions will not only force the student to flex intellectual muscles when responding, but will also lead the student to more understanding and less recitation (Foote, 2001; Lord & Baviskar, 2007). Depending on the learning objective, using Bloom's Taxonomy will provide a starting place for the instructor in designing an appropriate level of question.

Learning styles are highly individualistic. Some students learn by doing (tactile/kinesthetic learners), some by seeing (visual learners), some by reading (processing text learners) and some by listening (auditory learners). It seems reasonable that effective discussion questions would represent these types of learning patterns. Research has found that among online learners, independent learning was preferred (Diaz & Cartnall, 1999) so providing forum questions that are designed specifically to address learning styles allows the student to select a learning activity that best addresses how they learn. In the Diaz and Cartnall (1999) study, self-direction and independence were facilitated in the online course by offering students flexible options to shape their learning environment. While not every question can be designed for every learning style, varying the types of questions can aid in student response and participation (Ally, 2004).

An online course that develops a sense of community, based on respect and engagement, will lead to students who are more likely to participate (Conrad, 2002; Roberson & Klotz, 2002; Garrison, Anderson, & Archer, 2000). High participation and student engagement leads to cognitive presence, the extent to which learners are able to construct meaning through sustained communication and engage in critical thinking. (Kanuka & Garrison, 2004; Garrison, 2002).

A discussion forum specifically designed to increase community would be one asking students to share something they already know about the subject at hand. This might be a simple "where is the first place you turn to when seeking information on a subject" forum. Students will post a variety of answers. A competent instructor can find the patterns in the answers, provide a table, and then ask the students to discuss the implications of their own responses and tie this to the course content.

In review, the first step of the CREST+ model involves the instructor deciding on the best type of forum question to design, based on the cognitive needs of the class, the desired learning outcomes, and the instructor's sense of what the students will respond to, all supported by respected learning theories. It is possible to combine these approaches but a beginning online instructor may wish to try one at a time.

R: Readings Base

After the instructor has determined the theoretical purpose for the discussion question, the next step is to consider the reading base for the question. All approaches can be collapsed into two types, either literature based or not. The following discussion considers textbook readings, literature based readings, and non-literature based questions.

Stansberry's (2006) research, which sought to determine whether literature-based or non-literature-based discussions elicited a higher quality of student discourse, ended as "inconclusive" (p. 34). More research is needed to further investigate the effectiveness of each base, but it might be worthwhile to include various readings bases in discussion question formation.

Textbook Based

The most convenient type of literature based forum question would be derived from assigned readings in the textbook, as everyone will have the book and presumably have read the assigned chapters. A textbook discussion shares a common vocabulary and experience. Research by An and Levin (2003) found that this type of readings based discussion was often used as an opening for a main discussion to follow, or provide a platform for more sophisticated analysis after everyone was on the 'same page'.

Discussions centering on textbook readings have long provided fodder for traditional classroom discussion and there is no reason to discontinue that practice. However, there is the matter of continuity. For an in-person class, an instructor may have a definite goal in mind and can begin with seemingly simple questions, with the plan to build on the responses until the students arrive at the big idea. The problem with this approach online is that the instructor cannot predict how and when the responses, both simple and complex, will be posted. The instructor can plan to monitor the forum regularly but even, within 24 hours, a forum can take a definite turn. One way to manage this is to use more than one forum and create roadblocks so that students must perform some part of a simpler forum, before heading to a more complex discussion that may involve reflection, critical inquiry, or analysis. This may be construed as artificial, but even those students who believe they already know the answer, can learn from fellow classmates why others may not be arriving at the same answer.

*Literature-Based**

Literature-based questions that are not derived from the textbook form a second type of forum discussion questions with a literature foundation. Here the students are instructed to find existing, discipline-specific literature to prove or disprove, agree or disagree, or expand upon the concept under discussion. This method can promote lively dialogue as students are likely to find research that attacks the concept under analysis from all directions. Students can share citations, findings, and links that can take the discussion far in terms of discipline specific research. Another aspect of this type of activity is to have the students share their actual finding process, thereby strengthening information literacy and seeking skills. Finally, this type of question acts as a current events filter, through which students must find and share current research, thereby learning what their particular field or discipline is engaged in researching (Neal & Akin, 2007).

Non-Literature Based

A non-literature based question is a question designed to present a concept or theory without relying on texts or readings. The Socratic method, a dialectic method of inquiry where two speakers reason together, can be an effective teaching method, but may be very difficult to employ in an asynchronous class. The online instructor cannot easily mimic dialogue so other techniques, such as scaffolding and peer generated questions may be used (Choi, Land, & Turgeon, 2005).

An instructor can create an online survey and direct the students to take the survey, then have all the results shared. The class can manipulate the results to illustrate what is being learned. The students can be directed to podcasts, audio files, streaming videos, graphics, simulations, interactive scavenger hunts, webquests, reusable learning objects, and scenarios created by the teacher (Jones, 2003; Roblyer & Ekhami, 2000; Ally, 2004; Akin & Neal, 2006). Not only does this multimedia approach free the discussion from the literature, it also can be used to satisfy a variety of learning styles. Another aspect could be to base the discussion question on having the students perform the concept, either in real time or virtually, and then have students share the results of their activity and discuss their experience with the class. Speaking anecdotally, students often enjoy these types of questions as they are highly participatory, novel, and engaging.

E: Experiential Element*

According to both andragogy and constructivism, students bring a lifetime of experiences to the classroom, and they create their own meanings based on their prior experiences (Salmon, 2003). Adult learners want to build on their personal catalog of experiences and observations, and they want a

pragmatic exercise in which to do so. Authentic activities, such as collaborative, complex real world tasks, benefit the learner and support both constructivism and andragogy (Herrington, Oliver, & Reeves, 2003). Research by Choi, Land, and Turgeon (2005) found that peer generated questions served an important role in helping learners construct new knowledge. To ignore the needs of the learners to contribute and build connections is to have empty discussion forums.

An astute online instructor will provide discussion forums based on the experiences of the students enrolled in the class. These are questions designed around a concept or theory being taught but aimed directly at the personal story of the student. Students should feel free to post about their qualifications to respond to the question, and their conclusions based on their qualifications and their experiences. This type of student sharing is a powerful learning tool and captures some of the affective elements of story telling, only in asynchronous time.

As students open up to each other and share, the sense of community is heightened, the participation is increased, and the instructor's main role is simply to listen, and when possible, link the story to the theory.

S and T: Style and Type of Question

Style of question

Varying the style in which a question is written offers students a chance to work with different students in the class, play a variety of roles within the discussion, and complete an assortment of learning activities. Examples of different question styles follow.

Collaborative learning tends to encourage knowledge building and deeper understanding by sharing ideas and building on responses (Salter, 2000; Piezon, 2005). One method of collaborative learning, called pairing, is to divide the students into pairs. Have them discuss the forum topic between themselves, then post their answer as a pair. By having pairs discuss then post, the learning can take place on several levels and the students will work to produce a good response, knowing they are a pair of responders. This method can reduce the number of posts in a large online class by half, increase the sociability and community aspect of an online class, and provide students a chance to engage in a small, yet in-depth discussion.

Pair swapping is simply a variant of pairing (McGonigal, 2005). After the pair has posted their response, one member is moved to another pair with an alphabetical shift being probably the most effective way to manage this. Each pair becomes new and pollinated with the thinking processes of the original set of students. If an instructor commits to this discussion method, at some point, every member of the class has been paired with most, if not all of the students.

Pair evaluating is letting the pair reflect on what they learned in trying to respond to the original question. If students have regularly been exposed to each other in debates and question analysis, they come away with multiple perspectives of thinking and they will have increased their store of cognitive responses.

Grouping is another useful method. Group the pairs into sides of a debate with assigned roles, or have the groups pollinate with what each pair learned, then share results. Groups can be assigned to brainstorm an issue, and then participate in sharing the ideas that were raised. Research suggests that group sizes should be small in online classes (Reonieri, 2006).

Assigning student roles in the discussion is helpful to extending participation length. Students can serve as moderator to their group, they can serve as partial question designer, they can play an assigned part in a case study discussion or a role playing exercise, or they can actually assign the parts and act as stage manager for their group. Often some students step up and act as gate keepers, watching the discussion, making sure all aspects have been covered and often producing outline sheets of what has been covered. These types of students are often online discussion forum gifts and the best way to encourage this is to publicly thank them on the forum.

Muilenberg and Berge (2002) outline several possible question styles. According to the authors, questions could include those that focus on the central topic of the unit, require students to evaluate presented ideas, relate to current events, quote contrasting views, present scenarios, involve case studies, address controversial issues, mandate role play, or require students to complete online activities and summarize their experience for the class.

*Post building**.** Throughout a single learning unit, discussion questions can be built on questions used earlier in the unit (Muilenberg & Berge, 2002). Post building can encourage students to further develop their thoughts about a topic if the questions are designed to build on the previous questions and require students to use various higher-order thinking skills.

Affect style. Affect can be communicated through social presence and teacher immediacy. In face-to-face courses, affect can be communicated through nonverbal cues that teachers send to students. It can be expressed online through the use of communication techniques such as emoticons, humor, and self-disclosure (Rourke, Anderson, Garrison, & Archer, 2001; Swan, 2002). Incorporating social presence in online communication may create a more lively discussion environment (Picciano, 2002). A welcoming affect style can be extended to instructors' discussion question writing as well.

Type of Question

In order to address different learning preferences and employ the variety of students' life experiences within the course's context, it is useful to vary the type of discussion questions presented to the class. According to research by Smith and Winking-Diaz (2004), varied instructional strategies will extend concepts to allow for sufficient time for discussion, argument, reflection, and re-evaluation. Suggestions for question types follow.

Metacognitive questions. In an experiment by Mevarech and Kramarski (2003), teachers trained mathematics students to ask metacognitive questions, which encourage students to construct their own meaning through self-questioning. In the authors' experiment, the students who were exposed to metacognitive questions outperformed the students who were not introduced to them. Their IMPROVE model includes facilitating metacognition through four types of questions: comprehension of the problem, making connections between former and current problems, using strategies to solve the current problem, and reflecting on the process.

Follow-up questions. Follow-up questions “ensure a depth of understanding or synthesis and evaluation of the topics discussed” (Christopher, Thomas, & Tallent-Runnels, 2004). Related to this tactic, del Valle, Öncü, Koksal, Fatma, Kim, Paul, & Duffy (2004) suggest using a broad approach to questioning students in order to encourage self-examination of their thoughts. They suggest asking students to consider different perspectives, provide clarification of their thoughts, identify outcomes, and answer the “so what” within the discussion.

Student-created questions. Pelz (2004) suggests assigning students the task of writing discussion questions in order to lead discussion, claiming it enables students to take control of their own learning. Pelz self-reports excellent results with this practice, saying “they ask thought-provoking questions which address the salient issues presented in the textbook” and other research has found that peer-generated questions to be powerful learning tools (Choi, Land, & Turgeon, 2005).

*Evaluation and reflection questions**.* The “one-minute assessment” (Hanna et al, 2000, p. 46) allows students to reflect on the course so far, the current lesson, or any other segment of the course. In response to this type of question, students can share their concerns, their opinions about the most important part of the sessions, what they found confusing, and so on. Instructors may choose to allow students to post anonymously in order to encourage student candor.

Built-in discussion evaluation is a good way to design reflection into the forum. Students can be asked, mid-point into the forum, to reflect on what they have learned so far. Students can peer evaluate, on a cognitive level, what patterns emerged from the class as a whole. Finally, the instructor can build in the one minute assessment, asking students to take one minute to evaluate the forum, the discussion, and

the actual questions posed.

Other question types. Brookfield and Preskill (2005) propose several types of questions. These include questions that ask for more evidence, questions that ask for clarification, open questions, linking or extension questions, hypothetical questions, cause and effect questions, and summary and synthesis questions.

+: Structuring the Question*

Once good questions are installed into the learning unit, the instructor will need to provide a working structure to the discussion forum and the actual question. There should be clear instructions, definite dates, and depending on the question, a 'why are we doing this' explanation. The instructor should have already provided discussion forum protocols in the course syllabus but additional reminders within the actual discussion forum will aid the student in responding appropriately.

Iteration. Sometimes a question may be misunderstood by the students or, for whatever reason, the discussion may not develop naturally. The instructor should reconsider the cognitive purpose for the question and restructure it. Perhaps the initial question, a collaborative compare-and-contrast based on a difficult textbook reading, expected too much of the students who found the reading difficult. A change to an experiential question will allow the students to build and develop the necessary foundation, then return, renewed to the purpose of the initial inquiry. This iterative approach gives the instructor agility in responding to the situation and sensitivity in responding to the students.

Instructions. Facilitator guidelines were found to increase the number and type of student facilitator postings and this enabled students to discuss the course material in greater detail (Gilbert & Dabbagh, 2005). In their research, Gilbert and Dabbagh added specific protocols for posting messages and moved their online course from low structure to high structure. Their findings showed that these instructor-provided guidelines helped increase student participation. These instructions provided students with a certain level of comfort in knowing what was expected, how it should look, and how posts should be managed.

Dates. Set opening and closing dates for the forum. Without a set ending date, discussions can seem never-ending, student enthusiasm will wane, and the purpose will be lost (Ali & Salter, 2004; Akin & Neal, 2006). Having a set opening and closing date helps the instructors better manage their time and helps students stay focused. It is helpful to students to actually put the module dates in parentheses right after the forum question so they can see at a glance the time period they have to construct a response.

Provide clear directions for participating in the forum. If a multi-part question is posed to the class, it is helpful to remind students to only respond to a part of the question, until everyone has had a chance to respond. Nothing can harm participation more than having a student post a several page response, to every aspect of the question, before anyone else has had a chance at it. Students have shared that when this happens, they feel forced into a 'what she said' response mode and that will not increase participation. If an instructor plans to use a bi-level question, (respond, wait a few day, then reflect) make sure this is clearly written into the instructions, so that students can be prepared. With set beginning and ending dates, and clear instructions on participation, the forum becomes an orderly place to share ideas and build connections.

Conclusion

Using the CREST+ model will aid the online teacher in creating discussion questions that are useful, educational, and effective. Once the instructor decides on the cognitive value of the question, the next step is to decide if the question will be literature based or not. After the cognitive and literature base has been established, the instructor will decide whether to develop an experience based question. Next, the instructor will design the style and type of the question. Finally, the instructor will establish the parameters for the overt structure of the question within the discussion forum.

Not every forum question will have every characteristic. It may be that, for one particular question, the life experiences of the students is simply not a factor. It is balance and variety, married with educational

theory and objectives that will determine the effectiveness of the question, the liveliness of the participation, and the utility of the online discussions.

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Appendix

For consistency, the topics of link resolvers and federated search engines have been used in the following sample discussion questions. Federated search engines allow people to search multiple Web-based databases from one screen and with one search. Link resolvers connect searchers from a citation in a Web-based bibliographic database to links to the corresponding complete document.

Example 1. Basic Constructivist Question.

How do you think federated searching and link resolvers will impact the work of information professionals and how will it impact searching?

Example 2. Literature-Based Question.

In the article you read on link resolvers and federated searching, the author provides advantages and disadvantages for both. Do you agree or disagree with his assessment of the good and the bad points of these new library technologies?

Example 3. Experiential Question.

In the article you read on link resolvers and federated searching, the author provides various advantages and disadvantages for both. Relying on your experience of searching these types of technologies, do you agree or disagree with his assessment of the good and the bad points of these new library technologies? Why or why not? Can you think of any other advantages and disadvantages that he did not address in this article?

Example 4. Post building.

Question 1: Identify what is, in your opinion, the most significant advantage to using link resolvers. Explain why you think it is an advantage.

Question 2: Now, compare the advantage you identified with some of the advantages your classmates identified. Reflect on whether your opinion about the most significant advantage has changed.
Question 3: Do not post until you have read the article on link resolvers. Focus on the author's arguments against link resolvers. Show how his arguments contrast the advantages you or a classmate identified.

Example 5. An evaluative/reflective question.

You have shared some engaging thoughts so far on the advantages and disadvantages of link resolvers. Now, take one minute to think about what we have discussed so far about them, and share your thoughts with the class. For example, what concerns you about this technology? What confuses you about it? Is it an exciting technology for libraries, and why or why not? You may post anonymously.

Example 6. Final question with instructions.

You have shared some engaging thoughts so far on the advantages and disadvantages of link resolvers. Now, take one minute to think about what we have discussed so far about them, and share your thoughts with the class. For example, what concerns you about this technology? What confuses you about it? Is it an exciting technology for libraries, and why or why not? Please respond to only one part of the question until everyone has had a chance to post.

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