Facilitating Collaboration and Peer Learning
Through Anchored Asynchronous Online Discussion

Completed Research Paper

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ABSTRACT
In this document we examine the collaboration and peer learning processes as articulated by students in essays that they wrote about their experience with using asynchronous online discussions for business statistics courses. The online discussions were implemented to help students succeed and overcome challenges and high failure rates in these courses due to D, F, or W grades. We implemented two forms of online discussions to help students improve their learning through the social interaction and collaboration with their peers. We conducted the study as a qualitative case study. The data from the students’ essays were analyzed using open, axial, and selective coding methods. The findings revealed that anchored asynchronous online discussions can help students overcome difficulties in demanding courses such as statistics. The implications for this study are notable for theory and practice. Anchoring in the online discussion can facilitate collaboration and learning from peers. This research contributes to the field of information systems by employing research that makes a difference.

Keywords
Collaboration, peer learning, anchored asynchronous online discussions, connectivism.

INTRODUCTION
In an online environment, students gain reasonable understanding and familiarity that allows them to transform their ideas into narratives to effectively communicate with each other (Muirhead, 2002). As a result, the product that emerges when a group of learners work together to understand a subject matter produces collaboration and learning (Bruffee, 1999). Harris (1999) identified four key benefits to asynchronous online collaborative learning: (1) provides access to “differing opinions, perspectives, experiences, and thinking process” (p. 55); (2) facilitates learning “anywhere and anytime” (p. 55); (3) creates a shared understanding of meaning; (4) can create learning communities. People collaborate with others to enrich “one’s capacity to develop and apply ideas” (Wiske, Franz, and Breit, 2005, p. 99). Furthermore, Muirhead and Juwah (2004) noted, “Peer-to-peer learning is an interactive and dynamic process that involves learners in discourse, assessment, critique and value judgment as to the quality and standard of the work of their classmates” (p. 7). Student-to-student interaction in an instructional activity can enhance students’ skills in knowledge building as well as social cognition, which is seen as central to collaborative learning (Anderson, 2002).

Online interaction among students fosters peer collaboration and learning (Muirhead and Juwah, 2004). Moreover, several recent studies have established the value of social learning among peers (i.e., Garrett, Thoms, Alrushiedat, and Ryan, 2009; Zhang, 2007). Student peers make up the social structure in the blended environment. Encouraging peer learning is central to the role of the instructor. It is important for students to identify themselves as members of a learning community (Zhang, 2007; Garrett et al., 2009). Richlin (2006) suggested that good learning is collaborative and social, not competitive and isolated. Researchers (i.e., Davies and Barak, 2013; Alrushiedat and Olfman 2012a; Chickering and Ehrmann, 1996) have found that the students themselves are the best and most capable resources available to instructors. Davies and Barak (2013) suggested that through social online interaction, student peers can articulate complex ideas in the language and phrases that they are most comfortable using. To this end, we sought to implement a virtual learning environment utilizing asynchronous online discussions. However, in order to have more efficient and effective online discussions, we examined two asynchronous online discussion environments with anchoring in one without anchoring in the other.

In general, asynchronous online discussions provide an opportunity for today’s students to aid them in their social learning as they tend to be more social (Oblinger and Oblinger 2007). We wanted to make use of the social motivations of today’s
student to assist them in their learning. The credible effect of these online discussions lends support to the two roles of
students that they can play as both “benefit-promisers” and “benefit-seekers” (Rank, 1976). As “benefit-promisers” students
need to exert additional efforts to post messages and replies while engaging in the discussions. As “benefit-seekers” they
can benefit from the added interaction with their peers when they seek further clarifications of ideas and concepts and/or
answers to their questions. Dennen (2008) suggested that “the discussion is an artifact of learning” (p. 209) and that online
discussions require students to read (articles, others posts), write (own thoughts and ideas), and engage (by asking questions
and posting replies).

Asynchronous online discussions (AODs) are both highly interactive and social (Gunwardena, Lowe, and Anderson, 1997;
Gunwardena and Zittle, 1997). Richardson and Swan (2003) found that the students’ overall perception of social presence
served as a predictor of their perceived learning in the course. Guzdial and Turns (2000) suggested that adding a discussion
forum is one of “the simplest ways to start integrating information technology into the class” (p. 438), since it does not
require a change in the curriculum. Disanctes et al. (2003) added that asynchronous online discussions are “pre-established,”
“private” (access is not public), and can be “used to supplement other learning venues…such as face-to-face (F2F) meetings”
(p. 567). Wu and Hiltz (2004) found that AODs produced meaningful effects in terms of students’ perceived learning for
distance education. Furthermore, Eryilmaz, Alrushiedat, Kasemvillas, Mary, and van der Pol (2009) found that anchored
asynchronous online discussions tend to provide students with additional spare capacity for the processing of mental tasks as
an effect from reducing the mental load. Van der Pol (2007) found that anchored online discussions can support
collaborative discussions. These conceptions are contained in the cognitive domain of learning. Alrushiedat and Olfman
(2012b) found that students using anchored asynchronous online discussions (AAODs) were definitely satisfied with their
learning experience. However, the above studies did not fully describe the characteristics of collaboration and “how”
collaboration affected peer learning in the AAODs.

The rest of the paper is laid out as follows: First, we describe anchored asynchronous online discussion, discuss the
framework of connectivism as it relates to the research, and paraphrase and describe the study methodology. Next we specify
the data analysis and findings of the study. Finally, we draw conclusions, discuss limitations, and draw future research ideas.

ANCHORED ASYNCHRONOUS ONLINE DISCUSSIONS

Alrushiedat and Olfman (2012a) describe anchoring in online discussions as a process of creating reference points between
the document space and the comments space to prevent drifting away from the idea being discussed, thereby lending a focus
to the discussion. Participants can select any part of a document (word, sentence, paragraph, or page) by clicking and
dragging the mouse over that part, which in turn makes this part more explicit. Anchored discussions differ from other forms
of online discussions because the comments are positioned within the same screen and alongside the text. Figure 1 illustrates
the interface of an anchored discussion in which the document being discussed is on the right side of the screen and the
comments are posted on the left side of the screen in a discussion thread. The comments and associated replies made by the
participants form a discussion thread. Each discussion thread on the left side of the screen starts with a new comment and a
number (reference) that relates it to a highlighted part of a document on the right side of screen. When a thread is selected
(by clicking on its number) a red frame appears on both sides of the screen to indicate the correspondence between that part
of the document and the selected thread.

Anchored asynchronous online discussion (AAOD) was chosen because it provided students with an easy interface to do
collaboration, which is what learning theory (Anderson and Elloumi, 2004; Murphy, 2004; Garrison, 2003) says can improve
learning and potentially increase motivation. The simple interface can help learners focus their efforts in their interactions
without wasting time on trying to figure out how to proceed throughout the system (Casini et al., 2003). The ease of interface
held the promise of facilitating the collaboration among peers to produce improvements in the learning experience of the
students. Furthermore, we selected AAOD due to our belief that it can make a positive difference in terms of collaboration,
discussion quality, effort outside of the classroom, and learning from peers. In the students’ peer-to-peer interaction, they
create connections and links among various sources of information (i.e., other students, selected segments, comments and
replies, lecture notes and the textbook). Connectivism offers a framework for providing a deeper understanding of the
students’ interaction and collaboration towards peer learning.
Siemens (2006) defined connectivism as the integration of principles when connecting information sources. The intent of the connectivist learner is to obtain current and updated knowledge (Siemens, 2006). Ally (2004) suggests that meaningful learning requires a deeper processing of the associations. Kop and Hill (2008) added that connectivism has an important role for the development of new pedagogies where the control shifts to the learner. Connectivism is exemplified by nine principles (Siemens 2006):

1. Learning and knowledge require diversity of opinions to present the whole, and to permit selection of a best approach.
2. Learning is a network formation process of connecting specialized nodes or information sources.
4. Knowledge may reside in non-human appliances, and learning is facilitated by technology.
5. The capacity to know more is more critical than what is currently known.
6. Learning and knowing are constant, on-going processes (not end states or products).
7. The ability to see connections, recognize patterns and make sense between fields, ideas, and concepts is the core skill for individuals today.
8. All connectivist learning activities aim to be current (producing accurate, up-to-date knowledge).
9. Decision-making is learning. Choosing what to learn and the meaning of incoming information is influenced by a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

The learner has to continue to learn new information in order to maintain currency. Ally (2004) suggested that due to the abundance of information, environmental changes, and advances in technology, the learner is losing control. But the online discussions may provide the means for the learner to maintain better connection and control of his/her learning.

RESEARCH METHODOLOGY
In our effort at examining the students’ activities and in determining the value of anchoring in online discussions, we decided on a qualitative case study design. The students were not bound by time and place constraints in order to collaborate. They had 24/7 access to the online discussions. We espoused the “researcher-as-instrument” archetype. As instruments for this...
research, we made every effort and exercised caution throughout this study to prevent any inferences of biases in any collected data in order to ensure accuracy in the analysis, reliability, and validity of the findings. As a result of the awareness for such biases, steps were taken to minimize potential threats to the findings. In this effort, the data were collected, saved, and analyzed based on the data itself. Awareness of the responsibility to obey the rules made reporting the findings as they are a critical matter, whether they match or contradict the researcher preconceptions. The view of the researchers is that any finding is a potential contribution.

To compare differences between AAODs and standard non-anchored asynchronous online discussions (AODs) for collaboration and learning from peers, we applied some controls to increase the validity of the study. We gave the same attention and instruction to both groups (anchored and non-anchored). We assigned students to the groups randomly. The same instructions were given to each group. Only the same initial message was posted at the start of the discussions and without any further participation from the instructor.

Subjects

The subjects for this study were students enrolled in the following three business classes:

1) One section of Introduction to Business Statistics. Students in this course were 3rd year (juniors) undergraduates, majoring in business.
2) One section of Statistics and Management Science. Students in this course were 4th year (seniors) undergraduates, majoring in business.
3) One section of Statistics for Business Decisions. In this course, the students were graduates enrolled in a Masters of Business Administration (MBA) program.

All of the subjects were enrolled students in one of the classes listed above. A total of 108 students participated in the online discussions, 86 subjects were undergraduate students and 22 were graduate students. A total of 52 subjects used AAODs and 56 subjects used AODs. Each student was required to write an essay about online discussions. AAOD students turned in 49 essays with a 94% response rate. AOD students also turned in 49 essays (88% response rate). Thus, a total of 98 essays were received for an overall response rate of 91% (see Table 1).

<table>
<thead>
<tr>
<th>Class Level</th>
<th>Class</th>
<th>AAODs</th>
<th>AODs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td># of Discussion Participants (n1)</td>
<td># of Essays</td>
</tr>
<tr>
<td>Undergrad.</td>
<td>A</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>19</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Subtotal</td>
<td>42</td>
<td>40</td>
</tr>
<tr>
<td>Grad.</td>
<td>C</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>52</td>
<td>49</td>
</tr>
</tbody>
</table>

Table 1. Subjects

Subjects were randomly assigned to the treatment (AAOD). We used Excel’s RANDBETWEEN function to select one subject at a time to randomly assign subjects for each class. The Excel random selection is used because it is practical and mimics the manual selection of balls (one ball for each student to be selected from a box) as closely as possible. The numbers generated by this method are called pseudo-random numbers, because the numbers are not truly random, but are obtained through a mathematical formula. This approach meets the statistical properties for randomness, because “each selection has an equally likely chance of occurring and there is no apparent correlation between the numbers generated by the mathematical formula” (Lawrence and Pasternack, 2005, p. 557). The random assignment was used to ensure that the only differences found would be related to the discussion tool and that there would not be any alternative explanation for the different effects.

DATA ANALYSIS AND FINDINGS

The students were asked to email their answers to their instructor on or before the last day of the semester, which allowed them approximately one week. Most of the students completed and emailed their essays prior to the last day of the semester.
The data was grouped and categorized into 18 source files. Each source file corresponded to the question number from the essay (3 questions) for each one of the two groups (AOD and AAOD) in each class (3 classes), which resulted in a total of 18 source files (3 questions x 2 groups x 3 classes = 18). Each source file was saved with a rich text format (.rtf) extension; the readable format for Qualrus. Qualrus is a qualitative analysis software program that enabled the uploading, coding, and analysis of the qualitative data.

Qualitative data analysis is composed of three simultaneous activities (Miles and Huberman, 1994): 1) data reduction (i.e., coding), 2) data display (i.e., lists, or views), and 3) conclusion drawing from beginning to end. The data analysis consisted of three coding steps. The first step was the open coding process which resulted in the following eight categories: 1) perception of learning, 2) social learning, 3) peer learning, 4) improved confidence, 5) collaboration, 6) contribution, 7) intention to use again, and 8) suggested changes. The second step was axial coding that established links between the categories, thereby helping understand the possible relationships between the various codes. Third, selective coding narrowed and focused the process on the core themes, in which collaboration and peer learning emerged as important and relevant themes.

Collaboration and Peer Learning

Murphy (2004) described collaboration as purposeful process that sets at the end of an interaction-collaboration continuum. To a various degree of collaboration, the process starts with social presence, and flows through articulation of individual perspectives, accommodating perspectives of others, co-constructing shared perspectives, building shared goals, and producing shared artifacts respectively (Murphy, 2004). Some students found the collaboration to be helpful to their learning. One student noted that collaboration helped her when working together with other group members towards the goal of finding a solution to a problem as noted,

“I think that part of the discussions was the most helpful because I like how everyone works together so we can help each other and ourselves learn. I like the teamwork when everyone is collaborating together and try[ing] to solve the problems or answer questions that other students may have posted that they were uncertain on[about].” [Krysti, Class A, AAOD]

Krysti also wrote:

“This is also a chance for us to work together as a team and attack the problems part by part and get a solution that we can be confident about. I contributed to these threads because everyone started working together to solve the equations. I found these threads the most influential to my learning because they helped us learn the material and it allowed everyone to collaborate and work together to figure things out.” [Krysti, Class A, AAOD]

A different student noted,

“The second thread was also great because the first poster presented everything that we had discussed in earlier threads into one cohesive post including objective function and constraints. The next poster brought in that collaborative element again by asking if any participators could solve for the answers with WinQSB. I think it's great that participators who had the software were able to come up with the answers and share them with everyone else. I posted in this thread because since there was confusion about the answer, I had to clear things up. I think it makes it a lot easier for participators to be able to “catch up” just in case they [may] not have understood the material up to that point.” [Fernando, Class B, AAOD]

In the following post, this student did not explicitly state collaboration, but it was more implicitly present in the students’ argument about whether water should be included as a constraint in a linear programming case thereby showing consensus among group members as described,

“Objective: One of the most important steps to decide on how to proceed. If we cannot agree during the phase of deciding the objective, we will not have a clear direction to go. Most often it is either maximize or minimize. I contributed to this thread. We were determining the variables and along the way there was a disagreement. Some students did not believe water was a variable for a beverage company, while some students agreed that water is a variable. I believed water was a variable, regardless whether water is unlimited or not. If it costs, then it should be a variable, since our objective was to maximize profit: P = R - C. However in the end, we came to terms that since water has an unlimited supply, it should not be a constraint.” [Nghia, Class B, AAOD]

As another student also noted,
“I would love to use online discussions in the future, I think that they are very helpful and they keep all the students involved. We are all working towards a common goal, so anytime that something that we have control over, like something online, we can take charge and write whatever our thoughts are. Some changes I would like to see in the online discussions are to have more discussions and have everyone participate. Instead of splitting up the class, it should be all in one so then there is more participation and more people with different ideas. I think it is important to have people who have different thought processes and different views on things.” [Stephanie, Class A, AAOD]

A different student from an AOD group articulated,

“Online discussions that helps a tremendous amount it helps and makes students do some work, but in an entertaining and digital age. Everyone goes online now-a-days, they insist on instant messenger, online forums or the new thing now. The freedom given to us to start discussions, dispute others opinions or agree, and the opportunity to teach is quite an experience.” [Ninyus, Class B, AOD]

Figure 2 provides a view for collaboration in the online discussions. For example, social interaction (interaction in a social setting) is “a part of” collaboration. Sharing, which encompasses sharing opinions, perspectives, experiences, and information has also a “part of” type of relationship with collaboration. In addition, the team concept is “associated with” collaboration. While collaboration is “associated with” peer learning, learning in general, social learning, increased confidence (self-efficacy), and improved understanding.
This study reveals that collaboration supports learning as has been the case for other researchers (i.e., Murphy, 2004; Eastman and Swift, 2002; Garrison, Anderson, and Archer, 2001). In this study much more evidence revealed greater details of collaboration among AAOD group members, as being present in numerous cases, such as when one student noted,

“In the second thread, winning traditions, I also contributed a lot. I contributed because there was stuff to talk about and I believe that I had a valid opinion. In this thread, I agreed with everyone else that it was completely coincidence which was very obvious. I also added more to the thread by saying things like why it was possible for this to happen, which was because there are so many teams and so many possible factors that can be connected together to make an assumption like that.” [Kevin, Class A, AAOD]

Another student also noted,

“The facts and hypotheses are... n1 = 200 xbar1 = 490 s1 = 25 n2 = 175 xbar2 = 480 s2 = 35 risk/alpha =... are... n1 = 200 xbar1 = 490 s1 = 25 n2 = 175 xbar2 = 480 s2 = 35 risk/alpha = .05 Ho: uBoston = uSeattle Ha: uBoston >< uSeattle. Reply: Calculation Mikem 01-07-10 It looks like the calculation for z comes out to be 3.143 z = 490 -... It looks like the calculation for z comes out to be 3.143 z = 490 - 480/sq. root of (25^2/200 + 35^2/175) = 10/3.1820 = 3.143 Mike and I commented on this portion of the assignment, which I found helpful because it was good to practice what we had learned in class. It was also nice being able to work together to complete the problem instead of only one of us doing it alone.” [Sheri, Class C, AAOD]

A communication channel for peers

Some students referred to the online discussions as a way to providing a communication channel to with peers. For example as one student stated,

“The online discussion was a very good way to communicate with the classmates. Typically, it is hard to get to know everybody or even have a small conversation with people in the same class, because some people are shy, or people already formed their own cliques. And once the cliques are already formed, it is definitely hard for some to join in a conversation with them. So in my opinion, the online discussion is a form of an “ice breaker” to begin a wide network connection. Online discussion is a great way of networking with others.” [Christine, Class A, AAOD]

A different student expressed his thoughts in terms improving communication skills. For example, this student wrote,

“Contributing to the online discussion can also improve my interpretation and communication skills. Since any ideas about the discussion topic in my mind have to be interpreted in written language.... I also have to make sure I use appropriate language that shows respect during communication.”

“I like the fact that you are able to interact with other classmates on your own time. In my opinion it is easier to communicate this way because students who don’t participate in class feel more comfortable participating in online discussions. This makes more room for a variety of conversations. I also feel that online discussion boards often create bonds between students that probably wouldn’t have happened without the use of the discussion board.” [Vanessa, Class B, AAOD].

Community of peers, team work, social interaction, and support

A few students referred to the discussion as providing a sense of community. One student noted,

“I contribute to the online discussion because it’s a way to get to know other students in the class outside the classroom and helps create a community spirit.” [Rafael, Class C, AAOD]

Another student felt that she was a member of a team member. For example, she noted,

“This is also a chance for us to work together as a team and attack the problems part by part and get a solution that we can be confident about. I contributed to these threads because everyone started working together to solve the equations.” [Krysti, Class A, AAOD]

Peer support and help

One student expressed his reason as a way to support his peers as he noted,
“Online discussions provide a sort of support group of peers. It is nice to know that if I have a question someone else may have the same question and another person may have the answer.” [Christopher, Class A, AOD]

While another student expressed it in terms of providing help to other students, as he stated,

“I contributed to the discussion to help other people understand the material. There were a few times when the material was misunderstood by other students, so I felt the need to shed light on the right way to do it, and why. I feel that this input was helpful to fellow classmates.” [Ezell, Class A, AAOD].

CONCLUSION

Blanchard and Markus (2004) noted, “Exchanging informational and emotional support is the impetus for community formation. But members must trust the support they receive, and trust requires belief in the support-givers’ identities” (p. 76). Sharing of ideas and perspectives was much more prevalent in the AAODs, students may have also had a higher sense of belonging to a virtual community of collaborators. The students cited the team (community) concept as a primary reason for participating and collaborating. Swan (2002) found that dynamic learner-learner interaction had positive influence on the student’s learning success.

The findings of this research reveal that the undergraduate students (Classes A and B) and graduate students (Class C) were more likely to favor AAOD over AOD for collaboration and learning from their peers. Other findings showed that for satisfaction, AAODs fared better than AOD. Anchoring in the online discussion has shown the potential to increase sharing of ideas and perspectives, improve collaboration, and support learning from peers. Most students reported benefits from both online discussion types. Some students who had previously used an AOD recommended that the selection feature of the AAOD be integrated with the university’s system (AOD). From the perspective of connectivism, online discussions may facilitate learning among peers when they stay connected with each other. Staying connected with peers from the class and away from the classroom contributes to the survival of the class community and its continuance towards further collaboration and potential increase in knowledge and learning from peers. Through a higher sense of community, the anchoring tool demonstrated its capability to maintain connectivity, which in turn makes it a more useful mechanism for facilitating learning from peers.

A limitation of this study is that the first author was the instructor for the classes. As noted above, we took steps to ensure that students were treated the same way for both online discussion forms. The researcher’s perceptions and preconceptions embody the biases within the researcher. Any outcome was to be considered as a contribution. A future study could be more revealing if it was designed as an experiment that would specifically measure learning outcomes in terms of cognitive and affective learning, overall perception of learning, and performance and with regards to a larger sample size for the same course.

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