Anchored Asynchronous Online Discussions: Facilitating Participation and Engagement in a Blended Environment

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Abstract  
This research was conducted as a field experiment that explored the potential benefits of anchoring in asynchronous online discussions for business statistics classes. Many students tend to perform poorly in these classes, which are usually taught using traditional methods with emphasis on lecturing, knowledge reproduction, and treatment of students as dependent learners. Course activities are typically centered on the teacher as the source of all knowledge and understanding. Moreover, student interactions are often limited to face-to-face meetings in the classroom, where students have exerted little effort towards engaging themselves. Online discussions show promise for improving students’ learning in business statistics classes. We examined and compared the impact of anchored asynchronous online discussions (AAODs) and standard asynchronous online discussions (AODs) on students’ participation and engagement in a blended learning environment. The findings show that AAODs facilitated more and better quality participation and engagement for undergraduate students.

1. Introduction

In the traditional course environment, the emphasis has been on traditional teaching practices (TTP). The traditional course environment emphasizes [1]: 1) teaching, knowledge reproduction, and dependent learning; 2) classroom activities as teacher centered; 3) instructor’s role as that of the expert and source of understanding; 4) students as passive listeners; and 5) assessment based on retention of facts. Under TTP, teaching and learning appear segmented, separated, and disconnected (see Figure 1). Yet, the reality is that there is no teaching if there is no learning. Hence the focus should be more on learning rather than on teaching. Learning encompasses two ideas [2]: learning as acquisition and as participation. Acquisition mainly covers the products of learning (e.g., skills, knowledge, understanding, content, and values); participation deals with the active involvement of the participants [3].

Students have exhibited lack of interest, effort, enthusiasm, engagement, learning and performance in business statistics classes. It is not uncommon to find students retaking business statistics courses for the third or fourth time. As such, we started this study as a research in action to uncover ways to improve learning as we believe that teachers and students can co-construct pedagogical practices in a participatory manner.

Furthermore, students who are apprehensive about learning statistics and those who have trouble doing computations tend to have a higher level of anxiety [4]. While not just limited to learning statistics, Vandergrift noted, “Anxiety is a common reaction to a listening task, which springs from student fears that they will not gain control. This fear often springs from a tacit assumption that they must understand every word, as well as unsatisfactory experiences with a listen and answer the following questions’ approach to listening activities” [5, p. 426] that are often initiated by the instructor in class. The instructor can provide students with a resource to help them avoid some of the in-class frustrations and help them prepare when they are outside of the classroom by using asynchronous discussion forums to supplement F2F meetings.

1.1. Blended learning

Blended learning is a blend of classroom and online learning to include the conveniences of online
interaction without the loss of face-to-face contact \cite{22}. An online discussion board is one of the tools that can be implemented to facilitate discussions and interactions \cite{23}. Online discussions can promote learning and interaction at a distance and can, in fact, promote a sense of community among the learners \cite{23}. When students actively contribute ideas and discuss them together, they mutually benefit. Faculties generally desire to have a greater degree of student involvement, which in turn improves the learning of the student \cite{24}.

The combination of classroom and online learning modes stands to enhance the students’ experience, because people are typically not single-method learners \cite{25}. Undoubtedly, a blended environment can provide opportunities for added interaction and peer-to-peer learning.

1.2. Asynchronous online discussion forums

The interface shown in Figure 2 represents the Blackboard® instance at a state university in the western United States. The threaded discussion shows a very long thread with many replies from students whose names are covered to protect their identity and privacy.

![Figure 2. Example of a thread from a standard asynchronous online discussion forum](image)

We have observed and received direct feedback from students about the difficulty of navigating through threads such as the one shown in Figure 2. Students find themselves consuming a significant amount of time by having to go over the replies and often finding many repeats such as “I agree,” and “Thank you very much.” MacLean found this kind of interaction increases information overload and decreases the quality on the interaction \cite{6}. In this regard, the expected usefulness of online discussion forums has been subverted. A more effective interface for asynchronous online discussions is clearly needed. A virtual learning environment (VLE) can provide the environmental setting via the web for online discussion forums.

A VLE is an online software application that provides an online space for various aspects of delivering learning material to students. Dillenbourg specified the following characteristics for a VLE \cite{7}: 1) designed space for information, 2) educational interactions, 3) explicit representation of an information/social space (i.e., text), 4) students co-construct the virtual space (i.e., through interactions), 5) not restricted to distance education but may supplement classroom activities, and 6) multiple pedagogical resources (i.e., content and communication methods).

Isaksen and Treffinger recommended a creative problem solving (CPS) approach in an effort to finding an acceptable solution to the challenges facing students that deal with the content of the course and the quality of the interaction \cite{8}. The CPS approach consists of three components \cite{8}: 1) understanding the problem, 2) generating ideas, and 3) planning for action. For example, from our personal experience with teaching business statistics courses for more than seven years we have looked at the problem from different viewpoints (i.e., our own observations, students’ feedback, and other faculty members’ feedback and observations).

A promising solution has been proposed by Van der Pol for the use of anchored discussions as a versatile tool with many possible uses that concern the text-based discussion of online materials \cite{9}. A study showed that anchored asynchronous online discussions (AAODs) produced \cite{10}: (1) more meaningful discussions; (2) “less room for miscommunication” (p. 17); and (3) the discussions were “more straightforward and to the point” \cite{10, p. 17}. It was found that anchored forums had longer threads than unanchored forums \cite{11}.

But, it is unclear whether these findings would improve the quality of participation, engagement, and collaboration, or translate into improved learning outcomes in a blended environment. In this study we explore the use of anchoring to answer the following research question: Does the use of anchoring improve students’ participation and engagement in online discussions?

1.3. Anchored asynchronous online discussions

Anchoring is a process of creating reference points between parts of a document and comments in the discussion space to help prevent drifting within the
context. In the online discussions, anchoring allows for the selection of any part of a document such as a word, a sentence, a paragraph, or a page to become the focus of a discussion thread. The advantage is that it highlights a visual marking of some selected text. It makes an explicit link that helps to bring more attention to this text. The comments are situated within or alongside the documents thereby forming a tight link on the same screen [26]. The anchored (annotated) interface (see Figure 3) shows the discussion article on the right side of the screen and the discussion on the left side of the screen. Each discussion thread has a number that links it to a highlighted part of the text on the right hand side of the screen. When a thread is selected (by clicking on its number) a red frame appears on both sides of the screen to show the correspondence between the selected text and the comment. This linkage between the discussion thread and the article tends to make it harder for students to drift away from the idea and constructing a focus. When an idea becomes explicit, it permits clarity into the discussion [27]. It becomes more inviting for others to introduce their perspectives or elaborate further as they discuss their understandings of the idea. This type of linkage develops into a bias towards the anchor [28]. Moreover, an AAOD was chosen because it provides students with an easy interface to do collaboration, which is what learning theory (i.e., constructivism) [14, 29, 30] says can improve learning and potentially increase motivation. Motivation can increase the effort of the students since effort predicts success [31].

2. Theoretical foundations

Chickering and Ehrmann suggested seven principles of good practice in teaching that [12]: 1) stimulate student-teacher contact, 2) stimulate cooperation among students, 3) stimulate active learning, 4) offer fast feedback to students, 5) highlight the time invested in the assignment, 6) transmit high expectations, and 7) respect different talents, abilities, and ways of learning. The principles correlate directly to this study as “new communication and information technologies have become major resources for teaching and learning in higher education. If the power of the new technologies is to be fully realized, they should be employed in ways consistent with the seven principles. Such technologies are tools with multiple capabilities; it is misleading to make assertions like “Microcomputers will empower students” because that is only one way in which computers might be used” [12, p.1].

Good teaching practices encourage [16]: 1) student-faculty contact as the most important factor in student motivation and involvement to help students get through the hard times, 2) cooperation among students whereby learning is enhanced when it is more like a team effort than a solo race, “good learning is collaborative and social, not competitive and isolated” [16, p. 1], and 3) active learning. Learning is not a spectator sport. Students “must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives” [16, p. 2]. The seven principles of good practice in undergraduate education are now widely accepted among post-secondary institutions as a set of standards by the American Association of Higher Education [29].

However, a procedural framework is needed to support the learning process and provide a structure by which instructions are guided. The instructional design that is learner-centered is supported by the constructivist paradigm according to instructional design theory (IDT), which consists of [13]:

1. Design-oriented: focuses on the means to obtain goals for learning or development.
2. Method of instruction to support and facilitate learning.
3. Methods can be broken into smaller parts or features according to tasks or criteria.
4. Probabilistic: methods do not guarantee desired learning outcomes, but rather “only increase the probability that desired results will occur” [13, p. 11].

IDT requires two components [13]: 1) methods to facilitate learning and development, and 2) situation or context. In IDT, the desired outcomes are: a) level of effectiveness: for example, solving 8 out of 10
problems based on using the correct mathematical equation, b) level of efficiency: equals the level of effectiveness divide by time or cost of instruction, for example, the time it takes students to solve the 8 out of 10 problems, and c) level of appeal: is the extent of enjoyment from participation. The instructional conditions of IDT include: a) the nature of what is to be learned (e.g., understanding), b) the nature of the learner (e.g., motivation), c) the nature of the learning environment (e.g., blended environment), and d) the nature of developmental constraints (e.g., time and cost). The responsibility of the instructor is to recognize the main idea, to facilitate interaction among students, and to have them reflect upon and share their conception with regards to that idea [14].

The seven principles of good practice and IDT are highly regarded frameworks that offer complementing perspectives for learners and instruction design, particularly with regards to applicability and support of designing a constructivist learning environment, which can be effectively structured to benefit learners.

2.1 Constructivism

Constructivism is a psychological theory of knowledge that was attributed to Jean Piaget and Lev Vygotsky [17]. The foci of the constructivism paradigm are cognitive development and deep understanding [18]. Cognitive development is important to this study because of its concern with the construction of meaningful learning. Garrison noted, “The learner takes the responsibility to construct meaning actively, not in isolation, but through dialogue with oneself as well as with others” [14, p. 201]. Understanding is defined as the degree of comprehension and the ability to explain and make meaning. If a learner has the understanding, then the learner can apply it in either familiar or new situations [16].

Constructivism suggests that learning is the process of making adjustments to our understanding of the world as we reflect on our own experiences [19]. Social constructivism postulates that in a group setting, knowledge is socially constructed by the participants [20]. This holds true for the online discussion environment because students and the instructor form a virtual group setting as an extension of the physical classroom setting, whereas students alone only participate in dialogues. Learning in a social context is consistent with constructivism. The creation of these environments allows students to discover and construct knowledge for themselves [21]. Constructivism can be well-supported through a blended course environment.

Finding effective teaching and learning mechanisms are key reasons to examine anchoring in asynchronous online discussions.

3. Research hypotheses

We are interested in increasing the effort of the students given their high failure rate in statistics courses. We sought to explore the use of anchoring in asynchronous online discussions to aid our efforts towards designing more effective practices to support learning processes. As learning also encompasses participation [2], it deals with the active involvement of the participants [3]. The online environment serves as a social venue for students’ interactions. Learning within a social context approach in the blended environment is consistent with the constructivist paradigm. We wanted to see whether AAODs can be more effective at increasing the effort of the students than AODs. Effort is expressed in terms of participation. Participation refers to the number of times a student posts a comment (message) to a discussion. Therefore, we hypothesize:

H1: Students using AAODs will have a significantly higher overall participation rate than students using AODs.

Discussion is an interactive process. The outcome of interactivity is engagement [32]. When students put more time into the course and when provided with the right means, they are more likely to succeed. But, achievement is a function of the students’ intellectual ability and the time spent in the course. We also hypothesize:

H2: Students using AAODs will have better engagement than students using AODs.

4. Research methodology

A field experiment was conducted to compare the two types of asynchronous online discussions, which were different in terms of anchoring. This design was chosen because of the lack of tight controls available and of the need to examine differences between the two online discussions (ODs) in a natural educational setting. In this setting, students are not bound by time and place in order to participate. They have 24/7 access to the ODs. They were not aware that they were involved in an experiment, which made their participation natural and normal. In carrying out this research, we highlight the following three challenges [33]:

1) Random assignment that is generally hard to do outside of the lab in the real world. But, in this context, it was feasible for us to randomly assign students to treatments.
2) The possibility of the control group getting influenced by the researcher, which may result in questionable validity. We gave both groups (treatment and control) the same attention and instruction. We maintained awareness of all of the communications to ensure no favoritism. We adhered to the research guidelines and followed procedures thoroughly. We also obtained IRB approval.

3) Control due to interactions between the subjects of different treatment groups. We told the students that the class would have two groups of students for the online discussions, and that the groups were assigned randomly. We sent an email to each student to let him/her know about his/her group assignment.

4.1. Subjects

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

1) One section of Introduction to Business Statistics, Class A. Students in this course were 3rd year (juniors) undergraduates, majoring in business.

2) One section of Statistics and Management Science, Class B. Students in this course were 4th year (seniors) undergraduates, majoring in business.

Table 1 gives a list of the student subjects. A total of 86 subjects participated. A total of 42 subjects used AAODs and 44 subjects used AODs. Additionally, each student was asked to write an essay about his/her experience for using online discussions. We had a 94% response rate for AAOD students and an 86% response rate for AOD students.

<table>
<thead>
<tr>
<th>Class</th>
<th>AAODs</th>
<th>AODs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>B</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
<td>44</td>
</tr>
</tbody>
</table>

The subjects were randomly assigned to the treatment (AAOD). We used Excel’s RANDBETWEEN function to randomly assign subjects because it mimics the manual selection of balls from an urn, which meets the statistical properties for randomness. Each selection has an equally likely chance of occurring. This lends further support to ensure that if differences were found they would be related to the discussion tool.

4.2. Procedure

The instructor was cognizant of the responsibility as a facilitator [14]. It is one of higher education’s objectives to aid students in becoming more “self-regulated” [34]. The same conditions were applied to both discussion groups. The instructor posted the same initial message, which consisted of one sentence (e.g., “Discuss this article” or “How can this be possible?”).

<table>
<thead>
<tr>
<th>Class</th>
<th>Discussion Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Article: “Winning Tradition”</td>
</tr>
<tr>
<td></td>
<td>Article: “Shark Attacks”</td>
</tr>
<tr>
<td></td>
<td>Article: Develop. In Bus.</td>
</tr>
<tr>
<td></td>
<td>Problem Solving: Practice Problems #1</td>
</tr>
<tr>
<td></td>
<td>Problem Solving: Practice Problems #2</td>
</tr>
<tr>
<td>B</td>
<td>Case: Linear Program. #1</td>
</tr>
<tr>
<td></td>
<td>Case: Linear Program. #2</td>
</tr>
<tr>
<td></td>
<td>Article: Develop. In Bus.</td>
</tr>
<tr>
<td></td>
<td>Article: Pert/CPM</td>
</tr>
</tbody>
</table>

The students participated in discussing the articles and some attempted to find solutions to problems selected from the subject matter. The treatment group used the AAODs while the control group used AODs. For each group in a class, the content and discussion articles were exactly the same. Table 2 lists the discussion items for all classes. For example, in Class A, both groups had the following articles: 1) “Winning Traditions,” 2) “Making Heads or Tails of Shark Attacks,” 3) two sets of problem solving practices, and 4) a multiple regression article that dealt with watching television.

At times, students attempted to relate relevant concepts to the course. At other times, they tried to identify the type, method, and approach for solving assigned practice problems. The discussions promoted active participation and knowledge construction as a constructivist learning environment.

4.3. Data collection

Students completed their posts prior to the last day of the semester. We obtained data from the log counts of the messages posted by student participants. No personal data were obtained from the student subjects.

5. Data analysis and findings

We looked at the interactions of the students and we examined the data in terms of participation and engagement.
5.1. Participation

The number of messages for each class and group were obtained from the log counts. Figure 4 shows a column chart of the participation for both online discussion groups in Class A. The AAOD group had a total of 347 messages while the AOD group had a total of 235 messages.

![Figure 4. Class A participation](image)

Figure 4. Class A participation

Figure 5 shows a column chart of the participation for both online discussion groups in Class B. The AAOD group had a total of 409 messages, while the AOD group had a total of 281 messages. Both figures (Figure 4 and Figure 5) show that the participation rates were higher for students using AAODs.

![Figure 5. Class B participation](image)

Table 3 shows the descriptive statistics for the number of messages posted per student for each discussion item. The participation rates per student were higher for students using AAODs, in some of the cases, they were statistically significantly higher (i.e., for Class A: the Shark Attacks discussion article had \( t=3.06 \) and \( p=.002 \), Practice Problems #1 had \( t=1.73 \) and \( p=.045 \); for Class B: the Linear Programming #2 case had \( t=4.58 \) and \( p<.001 \), the Development in Business article had \( t=3.57 \) and \( p=.001 \), and the PERT/CPM discussion had \( t=3.17 \) and \( p=.020 \)).

<table>
<thead>
<tr>
<th>Class</th>
<th>Discussion Item</th>
<th>AAODs</th>
<th></th>
<th></th>
<th>AODS</th>
<th></th>
<th>t</th>
<th>p (one tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Median</td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Median</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Winning Tradition</td>
<td>2.1</td>
<td>1.41</td>
<td>2</td>
<td>1.74</td>
<td>1.39</td>
<td>1</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>Shark Attacks</td>
<td>3.1</td>
<td>1.39</td>
<td>3</td>
<td>1.83</td>
<td>1.5</td>
<td>1</td>
<td>3.06</td>
</tr>
<tr>
<td></td>
<td>Develop. In Bus.</td>
<td>3.4</td>
<td>1.67</td>
<td>4</td>
<td>2.43</td>
<td>2.39</td>
<td>1</td>
<td>1.64</td>
</tr>
<tr>
<td></td>
<td>Practice Problems #1</td>
<td>3.2</td>
<td>2.37</td>
<td>3</td>
<td>2.13</td>
<td>1.87</td>
<td>2</td>
<td>1.73</td>
</tr>
<tr>
<td></td>
<td>Practice Problems #2</td>
<td>3.2</td>
<td>2.49</td>
<td>3</td>
<td>2.09</td>
<td>2.09</td>
<td>1</td>
<td>1.67</td>
</tr>
<tr>
<td>B</td>
<td>Linear Program. #1</td>
<td>5.8</td>
<td>2.78</td>
<td>5.5</td>
<td>4.29</td>
<td>3.05</td>
<td>4</td>
<td>1.59</td>
</tr>
<tr>
<td></td>
<td>Linear Program. #2</td>
<td>5.1</td>
<td>2.19</td>
<td>5</td>
<td>2</td>
<td>2.05</td>
<td>2</td>
<td>4.58</td>
</tr>
<tr>
<td></td>
<td>Develop. In Bus.</td>
<td>5.5</td>
<td>2.2</td>
<td>5</td>
<td>2.81</td>
<td>2.46</td>
<td>3</td>
<td>3.57</td>
</tr>
<tr>
<td></td>
<td>PERT/CPM</td>
<td>6.3</td>
<td>2.57</td>
<td>5</td>
<td>4.05</td>
<td>1.94</td>
<td>4</td>
<td>3.17</td>
</tr>
</tbody>
</table>
Although some of the other discussion items for Classes A and B did not have statistically significant higher participation rates, they were very close to being significant (i.e., for Class A: the Development in Business article had \( t=1.64 \) and \( p=.053 \), Practice Problems #2 had \( t=1.67 \) and \( p=.051 \); for Class B, the Linear Programming #1 case had \( t=1.59 \) and \( p=.06 \)). These patterns were also reflected in the higher median score for AAODs for the items already noted.

Table 4 shows the overall participation for each class across all discussions. Students in both classes (A and B) have significantly higher participation rates using AAODs than students using AODs. For both class levels, the majority of items for AODs had medians equal to 1 or zero, indicating that about half of the students in each of those AODs had very little participation. In fact, for the both classes the AODs were dominated by a small number of students whereas participation in the AAODs covered more students. The median in this case can be considered as a natural and robust measure of participation quality because the median is resistant to extreme values unlike the mean. For example, if a student participant makes a large number of posts (extreme case), the mean would be affected by this extreme case and show a higher number, whereas the median would not be affected. The median is a useful measure in this case. AAODs facilitated better quality participation for students for both classes. It is also noteworthy to state that none of the AAODs had any participation median equal to zero, thus indicating broader participation within the AAOD groups.

### Table 4. Overall Participation per class and group

<table>
<thead>
<tr>
<th>Class</th>
<th>AAODs</th>
<th>AODs</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n1</td>
<td>Mean</td>
<td>Std. Dev.</td>
<td>Median</td>
</tr>
<tr>
<td>A</td>
<td>23</td>
<td>15.09</td>
<td>5.94</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>18</td>
<td>22.72</td>
<td>8.08</td>
<td>21.5</td>
</tr>
</tbody>
</table>

5.2. Interaction and engagement

Good learning is collaborative and social instead of isolated and competitive [12]. Interaction can be described as a shared and collaborative communication that assumes understanding as an outcome of participation and reaction to the actions and thoughts of other students [35]. The geometry (depth and breadth) of the discussion can provide insights into the quality of the interaction. In this study, the depth refers to the hierarchical structure (the maximum number of levels) in a thread, whereas breadth refers to maximum number of messages in a level in a thread. A deeper thread is most likely to include more viewpoints and perspectives than a shallower one. For example, when a student posts a reply to a message, the student maintains the context of that message [6]. However, a larger number of replies to a message at the same level increases the breadth, but does not necessarily mean more viewpoints and perspectives. Many of the posts at the same level may not be different from each other. Hence, when comparing discussions, it would be desired to see more depth than breadth. Each AAOD forum contained several threads, while each AOD forum typically contained one long thread. There was a statistically significant higher number of threads for AAODs than for AODs (AAOD mean=10.50, AAOD standard deviation = 6.52; AOD mean=1.17, AOD standard deviation=0.38, \( t=6.06, p<.001 \)). The higher number of threads for AAODs indicates that more viewpoints and perspectives are present for AAODs than for AODs. Neither of the two types of ODs showed a consistently higher depth level than the other. But, this was not the case when comparing breadth levels, which were consistently higher for AODs, particularly at a lower level of hierarchy. For both classes, the highest breadth occurred mostly at depth level 1, which indicates that most of these students were influenced by the initial message (posted by the instructor), and that they were merely posting replies out of compliance.

The interaction among student participants can be visible through the use of interaction maps. An interaction map is “a visual representation of the frequency of individual participation, discussion threads development and whether discussions are one-way or two-way” [35, p. 122].

In interaction maps, the unit of analysis is the complete message posted [35]. Interaction maps are created to specifically show the direction of the posted messages (replies) and whether the posts were on or off-task [35]. The interaction maps show on-task as a measure of focus on the subject matter (on-topic or off-topic) [36].
Figure 6 shows an example of an influential thread for an AOD. The on-topic focus (on) was present for most of the messages. Most of the messages had further elaboration (+). Four of the messages simply stated agreement (ag)/disagreement (disag) without any further elaborations (Eun at Level 2, Jes at Level 3, Adam at Level 4, and Darren at Level 6). Most of the interaction took place at levels 1 and 2; this shows a lack of attempt to integrate with peers at the same level, as many of the messages may simply be reiterations of the same message from peers [6].

A large number of the messages (13 out of 29) were posted as replies (at Level 1) to the initial message (at Level 0). This pattern was evident across all AODs. In this thread, 13 students out of 23 from Class A participated in the AOD (nearly 57%). There were a total of 29 messages posted, in which 17 of the 29 messages were made by 4 of the students (Jes, Tia, Eun, and Tracy). This pattern of a few students dominating the discussion thread was evident throughout the AODs (see Table 5). The average number of posts per student is 2.23.

Figure 7 shows an example of an influential thread for an AAOOD from Class A. This thread differs from the previous thread in that most of the messages are not clustered at the lower levels. More posts from students were made at both the lower and the higher levels (i.e., MartM at levels 2, 4, and 5, Ezell at levels 1 and 3, Nqqua at levels 1 and 4), all of the messages were on-topic (on), and the agree/disagree messages were supported with further elaborations. In this thread, there were a total of 23 messages. Fifteen students out of 23 (Class A, AAOOD group) participated in this thread (65%). In this thread, only 5 (Level 1) of the 23 messages were replies to the initial message (Level 0).

In Figure 7, the highest number of replies to the initial thread is equal to 6. This thread was not dominated by a few students; it was distributed among the student participants. The average number of posts is equal to 1.53. It is worth noting that there were other threads for this discussion item, whereas the thread in Figure 6 was the only thread for that discussion item. Six students made two posts each (LopezM, Nqqua, Ezell, Romdan, PhamT, and Tahub), and the rest of the student participants made 1 post each. The maximum number of posts is equal to 3 (i.e., for MartM). Seven students made a total of 15 posts (65%) versus 58% made by 4 students in the previous thread. A higher count of posts at higher levels may indicate better integration, quality, and interactivity [6]. Since the outcome of interactivity is engagement [32], this thread would also indicate better engagement. Table 5 shows that the highest breadth levels were concentrated at the lower depth level that indicates less integration of ideas.

Table 5. Highest breadth at depth level

<table>
<thead>
<tr>
<th>Measure</th>
<th>AAOD Mean</th>
<th>Std. Dev.</th>
<th>AOD Mean</th>
<th>Std. Dev.</th>
<th>P (One-tail)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breadth</td>
<td>6.44</td>
<td>2.70</td>
<td>23.11</td>
<td>7.56</td>
<td>0.000</td>
</tr>
<tr>
<td>Depth</td>
<td>2.22</td>
<td>0.67</td>
<td>1.33</td>
<td>0.50</td>
<td>0.003</td>
</tr>
</tbody>
</table>
6. Conclusion

Anchoring in an online discussion has shown the potential to increase sharing of ideas and perspectives, enhance participation, and improve engagement to support learning. These findings provide considerable and useful insights about use of anchoring in asynchronous ODs to increase participation, collaboration and sharing and exchanging of ideas and perspectives, and peer learning for undergraduate students. Table 6 provides a summary of the results. The principles of good practices correlate directly to our findings about AAODs stimulating cooperation among students and providing a mechanism for motivating active learning.

Table 6. Summary of results

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Supported</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Yes</td>
<td>Students using AAODs had significantly higher overall participation rate (p = 0.0076 and 0.0003 for classes A and B, respectively).</td>
</tr>
<tr>
<td>H2</td>
<td>Yes</td>
<td>Students had better engagement and interactivity through AAODs (significant levels for highest breadth level at the low levels, p &lt;0.0001 and &lt;0.003 for classes A and B, respectively).</td>
</tr>
</tbody>
</table>

Students may have preferred using one discussion over another could be due to the anchoring feature as perhaps aiding constructivist learning compared to not having this feature available. AAOD may have also assisted in reducing information overload because of the ease of the interface and enjoyment in using a Web 2.0 technology [37]. The AAOD facilitated involvement and contributions not only because of interest in the subject matter, but also for “social reasons, such as to make friends, impress others, or out of social responsibility” [38, p. 668]. Moreover, differences in the cognitive styles for processing information may have played a role as a personality aspect that influenced attitudes, feelings, approaches, and social interaction [29]. AAODs were favored means to support the students’ participation, engagement, collaboration, and problem solving.

A future study could be more revealing if it is designed as an experiment that specifically measures the effects of anchoring in ODs on participation and enjoyment based on factors such as: 1) required versus optional, 2) with incentive versus without incentive (i.e., extra credit), and 3) student’s motivations and change over time (i.e., trend). This type of experiment can be performed with a larger sample size for the same course. The extent of the relationship between participation and enjoyment under the above conditions and their effect on performance can be examined in a study that would provide further insights about ways to increase performance in the context of using online discussions.

This study focused on business courses that deal with quantitative business analysis. The value from using asynchronous online discussions may vary depending on the subject and context. The subjects were undergraduate students, mainly at the junior and senior levels majoring in one of the business fields (e.g., marketing, accounting, and management). In this regard, we may be limited in our ability to generalize the findings to other students or courses.

7. Acknowledgement

We would like to thank Professor Jakko van der Pol from Utrecht University-The Netherlands for given us permission to use his anchoring tool.

8. References


