

Anchoring for Self-Efficacy and Success: An Anchored Asynchronous Online Discussion Case

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ABSTRACT

In recent years, we have observed a rising interest in studying the effects of Web 2.0 technologies on student learning. We learned that human behavior can be influenced by personal and environmental factors as in Bandura's concept of "reciprocal causation." For business statistics students, we implemented online discussions to extend student involvement beyond the walls of the classroom, increase their effort, and enhance their success. We chose business statistics because many students struggle in this course. In the past, in our efforts to aid with this issue, when we used standard online discussions, we observed that students had difficulty navigating through those discussions. They participated strictly out of compliance and several of their comments were repeats of each other. To this end, we implemented anchored discussions to assist with the navigation issue. We examined the effects of the two forms of online discussions based on the students' feedback in essays they were asked to write at the end of the course. Using a qualitative data analysis, students' self-efficacy emerged as an important theme. We found that anchored asynchronous online discussions (AAODs) are more likely to help increase students' self-efficacy than standard online discussions (AODs). Moreover, AAOD students obtained statistically significant higher exam scores than students using AODs.

Keywords: Asynchronous learning, Case study, Qualitative research & analysis, Web 2.0, Course management system (CMS)

1. INTRODUCTION

People with a high degree of efficacy are more likely to put forth greater effort towards meeting their goal (Kirk, 2012). For students, that goal is to successfully complete challenging courses. Statistics is a required component of business and information systems curricula. Undergraduate business students tend to find business statistics to be one of their most difficult courses. It has not been uncommon to find students in the College of Business and Economics repeating this course for the third or fourth time because of D, F or Withdrawal grades. This motivated us to study the problem.

Previously, most research has focused on developing predictive models of attributes of success (Rochelle & Dotterweich, 2007) or assessment of prerequisites (Islam et al., 2005). While the above-noted research focused on preparation for success, the research has not addressed the

goal of helping students who are not well prepared to be successful in (i.e., at least pass) business statistics classes.

Students who are apprehensive about learning statistics and those who have trouble doing computations tend to have a high level of anxiety (Bawden & Robinson 2009; Pace & Barchard 2006). This apprehension comes from a tacit assumption that students must understand every word spoken by their instructors and to their unsatisfactory experience with classroom activities (Vandergrift, 2003). Classroom activities are generally teacher-centered giving the role to the instructor as the source of all understandings. Students are treated as passive listeners and dependent on the teacher for their learning. In their struggle to stay current with the course, some give up or lose interest. Others develop a negative perception of the course. We heard some comments about the course such as "it is not interesting" and "I only need it to graduate."

However, instructors can help students avoid some of the in-class frustrations and prepare them when they are outside

of the classroom. To supplement face-to-face (F2F) classroom meetings, online discussions can be used to help increase student involvement and effort, and facilitate their knowledge building (Lord & Lomicka, 2008). By extending the means of interaction from the walls of the classroom to the online environment, instructors stand to enhance the student experience and in fact can benefit from the notion that people typically are not single-method learners (Masie, 2002).

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. Bandura (1986, 1997) found that people are more likely to engage in a certain activity when they believe that they are capable of succeeding in performing the activity. Their belief is related to their self-confidence. An increase in their confidence will more likely help them complete a task successfully, whereas low self-efficacy beliefs tend to hinder educational attainment and progress. To this end, we employed two forms of asynchronous online discussions with the initial aim of improving and promoting student engagement and success in the course.

2. ASYNCHRONOUS ONLINE DISCUSSIONS

2.1. Standard online discussions

Figure 1 shows a screenshot of an interface for an asynchronous online discussion (AOD) from a Moodle-based online discussion system. The Moodle-based system has a similar mechanism for making posts as Blackboard®. Both systems have very long threads of comments and replies. In Figure 1, the students' names are covered to protect their identity and privacy. We have observed and

received feedback from students about the difficulty of navigating through these long threads.

Students found themselves consuming a significant amount of time by having to go over the replies and often through many repeats such as "I agree," and "Thank you very much." It has been found that this kind of interaction increases information overload and decreases the quality of the interaction (MacLean, 2004). Accordingly, the expected usefulness of this type of online discussion forum may not possibly be as valuable as theory predicts. We also found that many of the comments made by the students were very similar to other comments made in prior posts. The newer comments did not extend the discussion and were made out of compliance since participation was a required part of the course.

2.2. Anchored asynchronous online discussions

In this paper, we examine the effectiveness of two forms of asynchronous online discussion systems in terms of the above mentioned goals. The first asynchronous online discussion system contains an anchoring feature that allows for the selection of any part of a text to become the topic and focus of that online discussion thread, whereas the second asynchronous online discussion system does not have this feature available. As a focus, the selected text becomes a point of reference between the selected text (i.e., from an article, case, or practice problem) and the comment space. Accordingly, we describe anchoring as a process of creating reference points between parts of a document and comments in the discussion (comment) space that tends to prevent drifting from the context, thereby creating a focus.

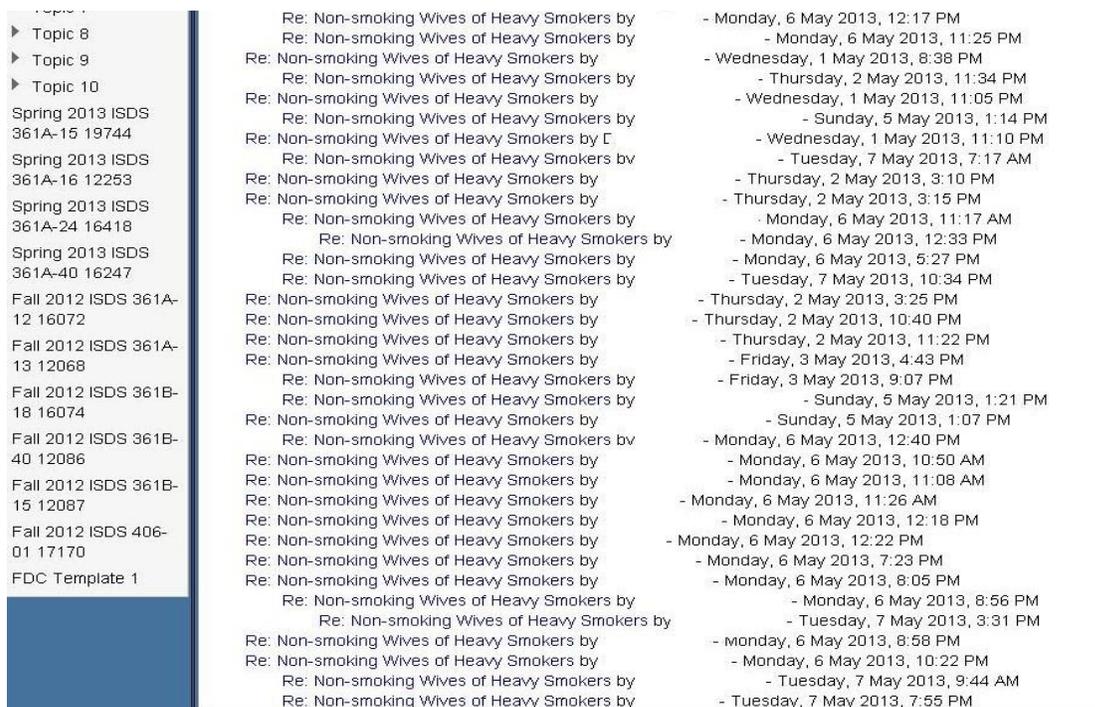


Figure 1. A screenshot of a thread from a standard asynchronous online discussion using a Moodle system

Anchoring in online discussions allows for the selection of any piece of a document (word, sentence, paragraph, or page) to be the focus of the discussion thread (Alrushiedat & Olfman, 2013a & 2013b; Eryilmaz et al., 2013a). An anchored asynchronous online discussion (AAOD) tool offers students a simple and effortless interface to participate in discussions. A simple human-computer interface (HCI) can potentially reduce frustration and anxiety, and increase motivation. Guzdial and Turns (2000) found that anchoring in online discussions motivated students and gave them a focus (Guzdial & Turns, 2000). This simple interface can help learners in to participate in discussions without wasting time trying to figure out how to proceed through the system (Casini et al., 2003).

Figure 2 illustrates a screenshot of an AAOD. The interface 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 piece of text in the right screen. When a thread is selected a red frame appears on both sides of the screen to indicate the correspondence between the text from the article and a thread from the discussion space. When a piece of text is opened for discussion, the anchor is formed, which directs the focus of the discussion thread to the marked piece of text. This linkage between the discussion thread and the article makes it harder for students to drift away from the idea being discussed.

Furthermore, it was found that use of anchoring in online discussions has an effect on reducing the cognitive (mental) load of the students, which provided the students with more mental capacity for processing thoughts and tasks (Eryilmaz et al., 2009; Eryilmaz et al., 2013b). AAODs may have also assisted in reducing information overload because of the ease of interface and increased enjoyment from using a Web 2.0 technology.

It has been suggested that anchoring discussions in lectures makes a good approach to extending classroom digital media (Abowd et al., 1999). Furthermore, Brush et al. (2002) concluded that “anchored online discussions allowed the less vocal students to contribute equally and made in-class discussions more interesting” (p. 9). Anchoring technology was found to be useful for collaborative discussions (Alrushiedat & Olfman, 2013a & 2013b; Van der Pol et al., 2006; Van der Pol, 2007). Asynchronous online discussions are utilized for this purpose to potentially increase students’ efforts given that effort has been found to predict success (McKenzie & Staaf, 1974). Since an AAOD enables the marking of text and the discussion of this text makes ideas more explicit and focused around the text, this discussion system may invite own perspectives, further elaboration and sharing of perspectives.

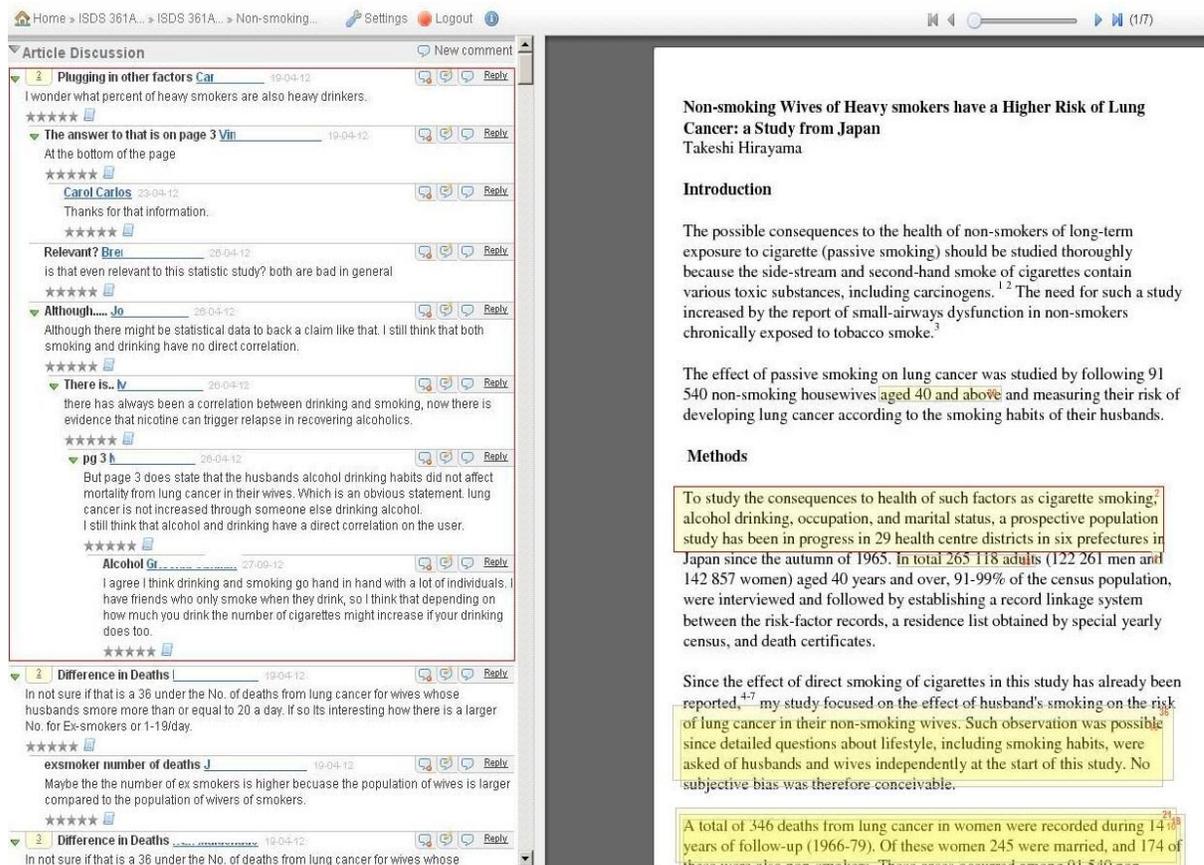


Figure 2. A screenshot of an anchored asynchronous online discussion system

3. CASE STUDY

Case research methodology builds on real-life experience to allow researchers to examine frequent changes in IT, and also gives a holistic view of the complex nature of interactions with regards to people and technology, a research that helps improve understanding (Dube & Pare, 2003). Case study research embodies both qualitative and quantitative data as it “brings richness and flexibility to the overall research process, making case research particularly well designed for the study of a complex phenomenon” (Dube & Pare, 2003, p. 598) such as self-efficacy. As noted, we conducted two studies. Each study enabled us to improve our understanding of the dynamics surrounding the online discussion process. The first study helped inform the second study.

We conducted our first study as a case study. A case study design was chosen, because of the lack of tight controls available and the need to examine the effectiveness of online discussions (ODs) in a natural educational setting. In this setting, students were not bound by time and place in order to participate. Students had 24/7 access to the ODs. The students’ participation in the ODs was natural and normal. However, we applied some controls to increase the validity of the study. We randomly assigned students to the discussions and we notified them of their assigned ODs. We obtained IRB approval and adhered to the protocol.

The subjects for this study were students enrolled in an Introduction to Business Statistics class (SB) and a Statistics and Management Science class (SMS). A total of 86 students participated, 42 used AAODs and 44 used AODs. In the AAOD group, there were 21 females and 21 males. In the AOD group, there were 20 females and 24 males. Although the average was not recorded in this study, it was recorded in a prior pilot study. In the pilot study, the average ages of students in the two groups were 22.44 years and 22.61 years for the AAOD and the AOD respectively. At the end of the semester, each student was asked to write an essay about his/her experience with using the online discussions. The response rates were 94% for the AAOD students and 86% for the AOD students.

The case study enabled us to compare the two discussions with respect to how they influenced students’ self-efficacy, and then we compared performance based on the students’ final exams.

3.1 Self-efficacy

The concept of self-efficacy can be described as being similar to self-esteem, but with one difference that self-efficacy is more specific to situations, whereas self-esteem encompasses a wide range of activities (Ormrod 1999, 2003). People with high self-efficacy tend to exert more effort towards a chosen activity than those with low self-efficacy. They are more likely to be more persistent and complete the activity successfully when they have a previous and successful experience with a similar activity (Bandura 1986, 1997). Students become more confident when their challenges are minimized. They generally feel more comfortable when they have a better understanding of what they need and how to do tasks. In addition, students’ self-

efficacy beliefs are improved when they get assuring feedback from their peers, more so than from their teacher (Ormrod 1999, 2003). This is because they often give consideration to other students’ successes and failures when they are evaluating their own likelihood of succeeding. For example, a student observing one of his/her peers solve a problem correctly carries more weight with that student than when observing the teacher solving the problem.

We adopt the notion that self-efficacy is a belief students have about their capability to manage and complete a given task required to accomplish a goal (Bandura, 1997). Students can gain self-efficacy from their vicarious experience through their observations of their own peers. Students get to model their peers, which can help them explain the thinking process and provide guidance to help them perform their tasks (Margolis & McCabe, 2006). Margolis and McCabe (2006) found that instructors can help struggling students develop an optimistic “can do” outlook.

The students were asked to email their “experience with the discussion system” essays to the instructor on or before the last day of the semester. The essays were categorized into 18 files and each file consists of group of essays was included in a separate source file. Each source file was saved with a rich text format (.rtf) extension; the readable format for Qualrus. Qualrus is a software program for analysis of qualitative data. Usually qualitative data analysis is composed of three simultaneous activities (Miles and Huberman, 1994):

1. Data reduction (open coding), which is defined the process of recognizing and classifying categories in the qualitative data. Aided by Qualrus, this process yielded over 250 codes, which resulted in the following eight categories: 1) perception of learning, 2) social learning, 3) peer learning, 4) improved self-efficacy, 5) collaboration, 6) contribution, 7) intention to use again, and 8) suggested changes.
2. Data display (axial coding) to help establish lists, links, or views between the categories to gain a deeper understanding of possible relationships (Robson, 2002).
3. Conclusion drawing/verification (selective coding) from beginning to end to identify potential patterns and themes. Selective coding focused on the core themes and the conceptualization of the story (Robson, 2002). Improved self-efficacy emerged as an important theme.

3.1.1 Self-efficacy analysis and findings: Many students reported that using the online discussions increased their confidence and helped improve their understanding of the subject matter. Since the construct of interest in this paper is self-efficacy, we interpreted students’ statements about their confidence to refer to self-efficacy. For example, one student using the AAOD wrote,

“The first set of practice problems that we were given were very complicating [sic]. We did not go over the material in class in depth and when I posted this [message], I received immediate feedback from others saying that they did the problem the same as me and got the right answer. This gave me confidence in that I knew the material and confirmation from my classmates that I was at the

same level of understanding of the material as they were.” [Monse, SB, AAOD]

Another student from ASB wrote,

“The second reason to get involved with the discussions is for yourself [myself]. I feel that everyone should have some level of self pride and confidence. For example in my "first" post I gave it is [sic] best shot to express myself. I had some pride in myself and did my best to contribute the best I could on a somewhat foreign subject. I am by no means a[n] expert or a master of PERT or CPM, but I will do my best to add to the discussion the best I can. I feel a[n] important part of the learning process is just giving it your best shot no matter what. This is because at times I feel we can learn more from our failures then our success[es]. In my personal experiences I have learned more about a subject and myself from my failures than I ever have my success[es].” [Kirk1, SMS, AOD]

A different student noted,

“Another great reason why I participated to [sic] the online discussions was the fact that I could speak up without being shy. Allowing each student to participate in their own way, not only helped my

learning, but also made learning fun.” [Ernest, SMS, AOD]

Another student from the same class, but from the AAOD group wrote,

“The last influential post(s) came from me. In this particular problem, I feel that I created somewhere for all of [sic] to start because I was the first one to post. I posted about 5 times before any other people had seen the problem. I had a lot of positive responses and really feel like I got the group off on the right foot. This was influential to me because I gained additional confidence in my ability. I also think I influenced others because of the positive responses I had.” [Mark1, SMS, AAOD]

Figure 3 shows an example of a part of a thread that the above student cited as an influential thread that helped increase self-efficacy. In Figure 3, Monse is a student that posted a possible partial solution to a question, Charlotte replied with an answer, and Monse replied back with a confirmation that he obtained the same answer as Charlotte. Tahub is a third student who had observed the interaction between Monse and Charlotte, had appeared to have gotten the same answer as both, and replied with a confirmation (agreement).

Question #4 [Monse](#) 01-04-10
Most of these questions I don't think we went over in class. Like finding out what n is. Though I think I got #4 right.

$n=64$ $m=\$1000$ $e=\$60$ $\text{std.dev.}=\$240$

I first divided the standard deviation by the square root of the population. I then divided e by the solution of the first part.

The solution I got, I looked up on the table and multiplied that number twice and then subtracted it from 1 to get the answer.

[Reply](#)
Did you get.... [Charlotte](#) 02-04-10
For #4 did you get 0.0456? That is what I got!! And you're right, the professor didn't go over these problems yet.

[Reply](#)
Prob. #4 [Monse](#) 02-04-10
Yeah that is what I got. I think it's right but not 100% sure. I tried looking in the book to find out how to do the others but it is really confusing in the book.

[Reply](#)
Exactly....I tried [Charlotte](#) 03-04-10
Hahah. Well, I guess tying is all we can do. I'm sure he'll show us how to do these problems on Monday.

Good luck!

[Reply](#)
[Tahub](#) 08-04-10
I got the same number too. Hopefully we are doing this correctly.

Figure 3. Example of a part of an “influential” AAOD thread

Figure 4 illustrates a star view for the belief “Increased my confidence”. For example “Felt good about helping others” or “felt comfortable” about posting in the online discussions are two codes that have “a part of” type of link

with “increased my confidence.” Collaboration has an “associated with” type of relationship with increased confidence. While increased confidence has an “associated with” type of relationship with “improved understanding”,

“solving correctly”, and the “perceived usefulness of the OD”. Increased confidence is also part of the reason for the student’s willingness to use the OD again (see Figure 4). There is ample evidence to suggest that more often the AAOD students talked more about confidence (self-efficacy). For example, one student wrote,

“For Problem Set #1 online discussion I had posted: “I was a little confused on how to solve this problem. I used the equation to solve for n for sampling distribution when you take Z^2 times Standard Deviation², then divide it by e^2 . To solve for Z i[I] [I] divided .95 by 2, then got .475 then looked at the Z table and go [sic]1.96. I then put this into the equation $(1.96^2 \times 5^2)/2^2$, then got 24.01, which rounds to 25 water specimens. I am not sure if i[sic] did this right, what do you think?” This post allowed me to show exactly how I solved the problem and ask other classmates if they solved the problem the same way. This benefited my lea[r]ning outcome

because knowing that I was helping other students and fully understand the concept boosted my confidence and influenced me to become engaged in the discussion.” [Danielle, SB, AAOD]

Another student noted, potential to improve confidence and performance as noted by one student,

“The last thing I would change about the discussion board is that I would like it to be available throughout the semester. The discussion board would have been much more effective if we started it in the beginning of the semester instead of near the end. In this case would see all the benefits of the discussion board throughout all the concepts in the semester. I think that the students would score higher on the first exam and continue there [their] confidence throughout the semester. Also, working on the discussion board the entire would allow us to get to know the students in our group.” [Andrew, SMS, AAOD]

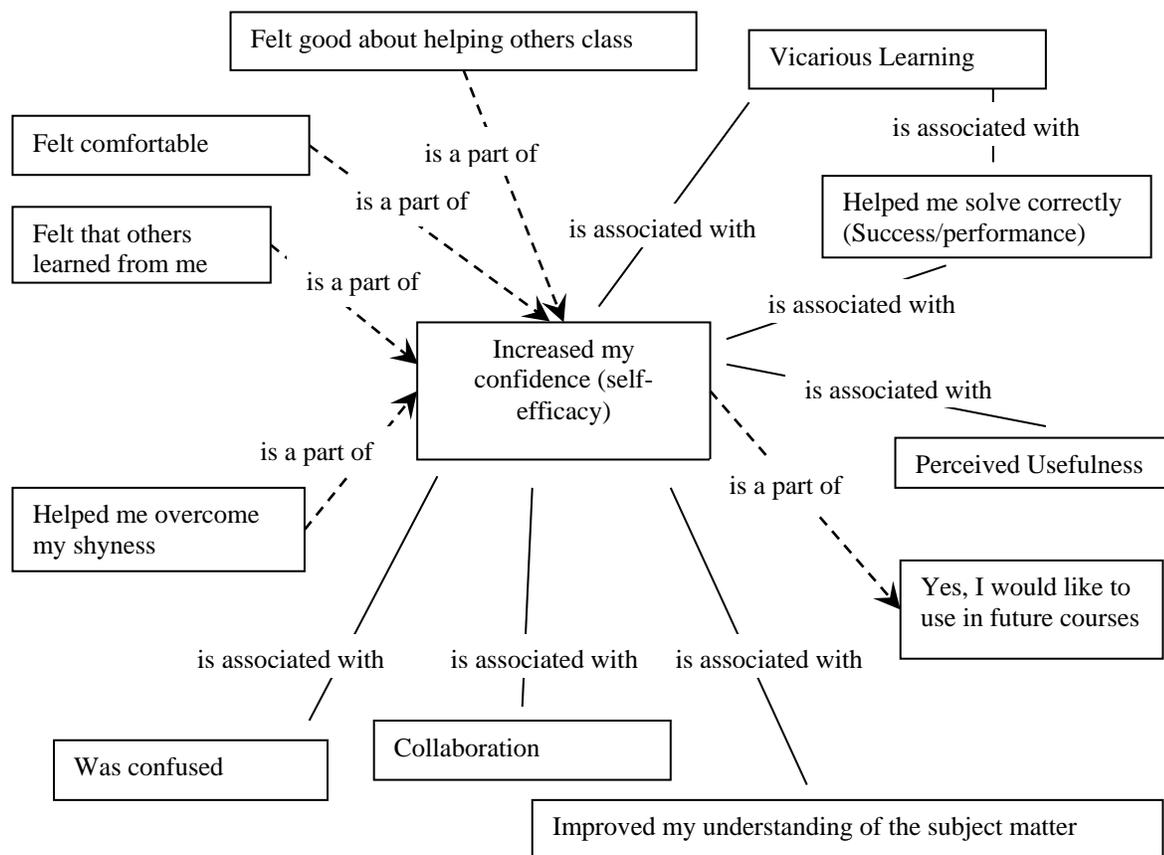


Figure 4. A star view of the “increased my confidence” (self-efficacy) belief

Group	Sample Size	Mean	Stand. Dev.	t
AOD	79	20.75	5.00	2.91*
AAOD	79	22.91	4.33	
* p = .002				

Table 1. Exam performance

3.2 Performance

The last comment by Andrew, associating his confidence with his performance in learning was a lesson that we learned from Case Study 1. In appreciation of the knowledge gained from this case study, we decided to measure the extent of student learning success in terms of students’ exam performance because we do not know whether anchored discussions can be used to aid students in their success in terms of exam performance. Therefore, we hypothesize:

H1: Students using AAODs will perform better on their exam than students using AODs.

We employed the two forms of online discussions (AOD vs. AAOD), but this time, Blackboard® was not available as the university has replaced it by a Moodle course management system (CMS). However, when we examined these discussion forums, we found that there was very little difference between Blackboard’s and Moodles’ online discussions as both systems offered similar looking threads and posting mechanisms.

Two groups of students from four business statistics sections participated in this study. One group used the standard online discussion tool while the second group used the anchored online discussion. Students in all sections were given two cases to discuss. The first case dealt with non-smoking housewives that end up suffering from lung cancer and the second case consisted of a multiple regression article that dealt with commercials and football. Both groups thought that the articles/cases were interesting. For example, one student from SMS wrote,

I think this is interesting and could be beneficial to many students. I replied to the thread twice-once asking whether or not it would be worth the effort to input the information. Instead, you can just compare alternatives by looking at the various graduation requirements and pathways-this would be a lot easier.” [Jake, SMS, AOD]

A student from SB wrote,

“It was interesting seeing what other students thought of my comments and to receive direct input from them. When I actually took the time to write down what was on my mind it gave me a clearer understanding of the subject matter.” [Quang, SB, AAOD]

While another student from the same section wrote, “It is very interesting to know what the other classmates are thinking. I definitely believe that

participating in the online discussion helped me become more open minded. I also accepted new and different ideas and beliefs as well.” [Christine, SB, AAOD]

Both groups participated in separated discussions in a 10-day time frame given to each case. The instructor acted as a facilitator and provided equal guidance and support for the two groups so that neither group was advantaged over the other. The AOD consisted of 79 students and the AAOD group also had 79 students. The difference in the discussion tools was the anchoring, which, other things remaining equal, would enable us to attribute the difference in exam performance to the difference in the tools. At the conclusion of the discussions, both groups were given an exam that consisted of 30 questions. The exam covered statistical concepts that were included in both articles discussed by students in their respective groups.

3.2.1 Performance findings: The findings of this study are summarized in Table 1. The AOD group had an average exam score of 20.75 and a standard deviation of 5.00, while the AAOD group obtained an average of 22.91 with a standard deviation of 4.33. A t-test found that the AAOD students obtained a statistically significant higher exam score (p=.002, one tail) than AOD students. The effect size was medium with Cohen’s d = .463 (0.2 “small effect” < Cohen’s d < 0.5 “large effect”). Therefore we can accept H1.

4. DISCUSSION

Bandura (1986, 1997) described the concept of “reciprocal causation” in terms of interactions of three interdependent major determinants: 1) environment, 2) person, and 3) behavior. Figure 5 shows the relationship between the determinants of reciprocal causation: each determinant has influence on the other two. In the online discussions, personal factors had influence on the behavior of the student and on the environment, such factors may include cognitive and affective capabilities. For example, one student wrote,

“Overall, taking part in the online discussions can do nothing but help your grade and I do not understand why anyone would not want to take part in them. My grade benefited with the help of the online discussions and I will be recommending the use of the discussion boards to my other professors.” [Evan, SB, AOD]

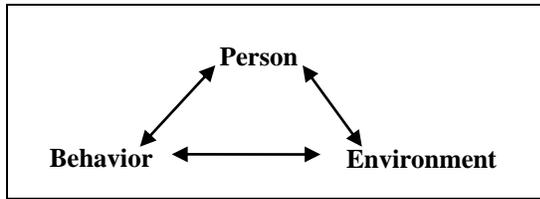


Figure 5. The relationship between the determinants of “reciprocal causation” (Bandura, 1986, 1997)

The environment (i.e., AOD or AAOD) also has influence on the person and the behavior. The influences are not necessarily equal and may vary. Because of the variations in the influences among many of the factors, we can reasonably conclude that outcomes are also likely to vary with regards to self-efficacy, learning and performance. Differences in learning can be explained in terms of the learning conception that may have occurred. For example, there is a difference between vicarious learning (learning by observing) and the application of what has been learned (Ormrod 1999, 2003; Bandura, 1986).

The Theory of Reasoned Action (TRA) (Ajzen 1991; Fishbein & Ajzen 1975) was proposed to study an individual’s attitudes and behaviors. In TRA, a person’s behavioral intention is dependent on and guided by his or her attitude about the behavior. Behavioral intention is viewed as a measure of the relative strength of intention to perform the behavior. Attitudes are the individual’s positive or negative feelings about performing the intended behavior (Fishbein & Ajzen, 1975) such as participating in the ODs.

TRA had served as a general model adapted to explain social behavior. Other studies explored additional factors impacting attitude such as self-interest, reciprocity, value of information, and relevancy of task in the context of impacting intentions to share information (Kolekofski & Heminger, 2003). The Theory of Planned Behavior (TPB) (Ajzen, 1985) was developed as an extension of TRA. TPB added perceived behavioral control as an important factor that was originated from the self-efficacy concept, which was central to Social Cognitive Theory (Bandura, 1997). TPB holds that attitude towards behavior, subjective norm, and perceived behavioral controls are positively correlated with the intention to perform the behavior. Ongoing research suggests that understanding human behavior and intentions is indeed complex.

5. CONCLUSION

From the two studies presented, we see that anchoring in asynchronous online discussions helped create better quality and more focused discussions. The findings of this research reveal that the undergraduate business students appeared to favor AAOD over AOD for improving their confidence (self-efficacy). Kirk (2012) found that a strong sense of efficacy will result in a high degree of effort (preparation) to achieve success (Kirk, 2012). To the extent that effort is reflected in higher exam scores and assuming that AAODs have similar influences across the same courses in a specific institution taught by the same instructor, we demonstrated

that students who used AAODs did score higher on an exam about the material that they discussed. Students using AAODs may have become more comfortable, motivated, and gained better insights about how to solve exam questions. Anchoring in online discussion has shown the potential to increase sharing perspectives and enable modeling of others from their vicarious experience. The anchoring tool offered a better capability to facilitate a student’s ability to build his or her own understanding and internalize new knowledge. The effect of anchoring on reducing the cognitive load (Eryilmaz et al., 2013b) may also have played a role in helping a student’s exam performance.

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 all students received the same instruction and amount of attention to minimize the instructor’s preconceptions and biases.

A future study could be more revealing if it was designed to specifically measure other learning outcomes in terms of cognitive and affective learning. Cognitive learning deals with the recall or recognition of the development of intellectual abilities (Bloom et al., 1956). Affective learning deals with attitude, emotions, values, and behaviors (Rovai et al., 2009). Specific measures of both types of learning (cognitive and affective) would provide improved understanding and a more holistic view of the dynamics of learning that lead to the improved performance.

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