

## Anchoring for Self-Efficacy and Success

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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 to help students succeed. We chose business statistics primarily because many students have struggled in it. Students also had difficulty navigating through the standard online discussions. Moreover, their participation was mainly made out of compliance. We implemented anchored discussions to help with the navigation issue. We decided to examine the effects of the two forms of online discussions. We were not sure of the impact on students' self-efficacy and success. Our results from conducting the two studies show that anchored asynchronous online discussions are more likely to help increase students' self-efficacy. Moreover, students using the anchored discussions obtained statistically significant higher exam scores than students using standard discussions.*

### 1. Introduction

People with a high degree of efficacy are more likely to put forth greater effort towards meeting their goal [19]. For students, that goal is to successfully complete challenging courses. Undergraduate business students tend to find business statistics to be one of the most difficult courses. Although statistics is a required component of business curricula, it has not been uncommon to find students at the Mihaylo School of Business repeating business statistics courses for the third or fourth time because of D, F or Withdrawal grades. This motivated us to study the problem.

Most previous research has focused on developing predictive models of attributes of success [29] or assessing prerequisites [18]. While the

above-noted research focused on preparation for success, research has not addressed the goal of helping students who are not well prepared to be successful (i.e., at least pass) in a business statistics class.

Students who are apprehensive about learning statistics and those who have trouble doing computations tend to have a high level of anxiety [10, 28]. This fear comes from a tacit assumption that students have to understand every word, which is due to their unsatisfactory experiences with classroom activities [31]. Classroom activities are generally teacher-centered. The instructor becomes the source of understanding and the students are treated as passive listeners. Students depend heavily on the teacher for their learning. As a result, students struggle to keep up with the course. Many give up, lose interest, and develop a negative perception of the course. Some of the students' comments we have heard include "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) meetings, online discussions can be used to help increase student involvement, effort, and facilitate knowledge building [21]. By extending the means of interaction from the walls of the classroom to the online environment, instructors stand to enhance the student experience and can in fact capitalize on the notion that people typically are not single-method learners [24].

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 [13]. Bandura (1997, 1986) 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 [7, 8]. Their belief has to do with their self confidence where an increase in their confidence will more likely help them succeed in completing a particular task. Moreover, 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 students' self-efficacy. The second goal is to improve students' performance and success in the class.

We report two studies. The first enabled us to compare discussion boards with respect to how they influence students' self-efficacy, while in the second study, we compared students' exam performance.

## 2. Self-efficacy

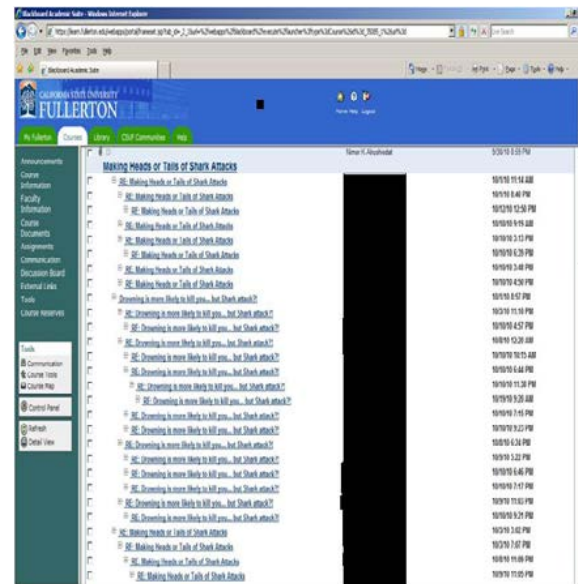
The concept of self-efficacy can be described as being similar to self-esteem, but with one difference that self-efficacy is more specific to situations, whereas self-esteem encompasses a wide range of activities [26, 27]. People with high self-efficacy tend to exert more effort towards a chosen activity 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 [7, 8, 9]. Students become more confident when their challenges are minimized. They generally feel more comfortable when they have a better understanding of what 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 [27]. 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.

## 3. Asynchronous online discussions

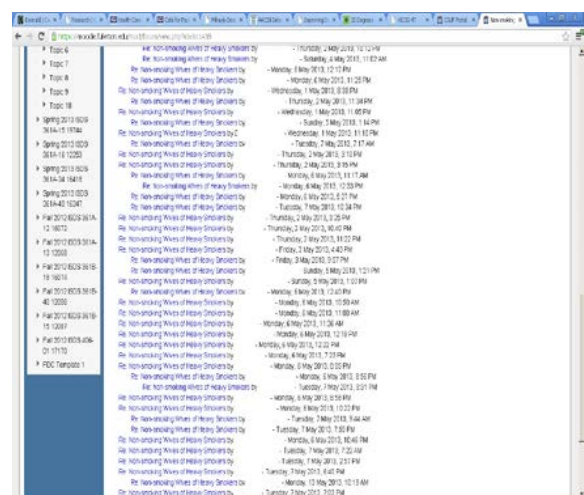
### 3.1. Standard online discussions

Figure 1 shows a screenshot of an interface for an asynchronous online discussion (AOD) forum from Blackboard®. A screenshot for an AOD from a Moodle-based online discussion system is displayed in Figure 2. Both discussion systems demonstrate a similar mechanism for making posts as both have long threads of comments. In these figures, 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 [22]. 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.



**Figure 1. A screenshot of a thread from a standard asynchronous online discussion using a Blackboard® system**



**Figure 2. A screenshot of a thread from a standard asynchronous online discussion using a Moodle system**

### 3.2. Anchored asynchronous online discussions

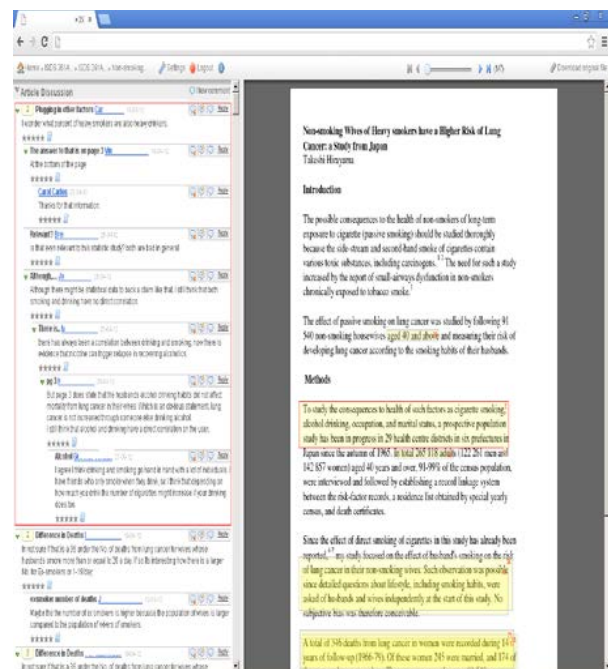
In this paper, we examine the effectiveness of two forms of asynchronous online discussion systems in terms of the above mentioned goals. The first asynchronous online discussion system contains an anchoring feature that allows for the selection of any part of a text to become the topic and focus of 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 problems) 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.

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. 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 [4, 5, 6]. 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. Anchoring was used in online discussions and found that it gives motivation and a focus [17]. 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 [12].

Figure 3 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 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 that marked piece of text, forming the basis of the discussion thread. 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 the online discussions has an effect on reducing the cognitive (mental) load of the students, which provided the students with a more mental capacity for

processing thoughts and tasks [15]. 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 [10]. It has been suggested that anchoring discussions in lectures makes a good approach to extending the classroom digital media [1]. 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” [11, p. 9]. Anchoring technology was found to be useful for collaborative discussions [4, 32]. Asynchronous online discussions are utilized for this purpose to potentially increase students’ efforts given that effort has been found to predict success [25].

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 3. A screenshot of an anchored asynchronous online discussion system (<http://www.annotatiesysteem.nl/>)**

### 4. 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 help improve understanding [14].

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” [14, 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 the 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 and a Statistics and Management Science class. A total of 86 students participated, 42 used AAODs and 44 used AODs. 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.

#### 4.1. Study 1: Self-efficacy

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 [7] since it is also known to us as confidence in the ability to execute a task. We use the terms of self-efficacy and confidence as synonyms. Students can get 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 [23]. Margolis and McCabe (2006) found that instructors can help struggling students develop an optimistic “can do” outlook [23].

The students were asked to email their essays to their instructor on or before the last day of the semester. The essays were grouped and categorized into 18 source files. 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. The 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 (self-efficacy), 5) collaboration, 6) contribution, 7) intention to use again, and 8) suggested changes. The second step was axial coding that helped us establish links between the categories to gain a deeper understanding of possible relationships. In the third step, we used selective coding to point the process at the core themes. Improved self-efficacy emerged as an important theme.

##### 4.1.1. Study 1 analysis and findings

Many students reported that using the online discussions increased their confidence and helped improve their understanding of the subject matter. For example, one student using the AAOD wrote,

*“The first set of practice problems that we were given were very complicating. 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, Class A, AAOD].

Another student from G1 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 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 expert or a master of PERT or CPM, but I will do my best to add to the discussion I best can. I feel a 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. In my personal experiences I have learned more about a subject and myself from my failures than I ever have my success.”* [Kirk, Class B, AOD].

A different student noted,

*Another great reason why I participated to 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, Class B, AOD].

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

*"The last influential post(s) came from me. In this particular problem, I feel that I created somewhere for all of 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."* [Markl, Class B, AAO].

Figure 4 shows an example of a part of a thread that the above student cited as an influential thread that helped increase this student's self-efficacy. In Figure 4, 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      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 4. Example of a part of an "influential" AAO thread.**

Figure 5 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 5).

There is ample evidence to suggest that the AAO was valuable in helping increase the students' 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 Deviation<sup>2</sup>, then divide it by  $e^2$ . To solve for Z  $i[I]$  divided .95 by 2, then got .475 then looked at the Z table and go 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  $i[I]$  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 leaning 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, Class A, AAO].*

Another student noted,

*"I think the answers I received to these posts helped to confirm for me that I was on the right track, and gave me confidence going forward that I was gaining an understanding of the subject. This validation was a big momentum builder for me in this course, which-like in sports-has proven to be an*

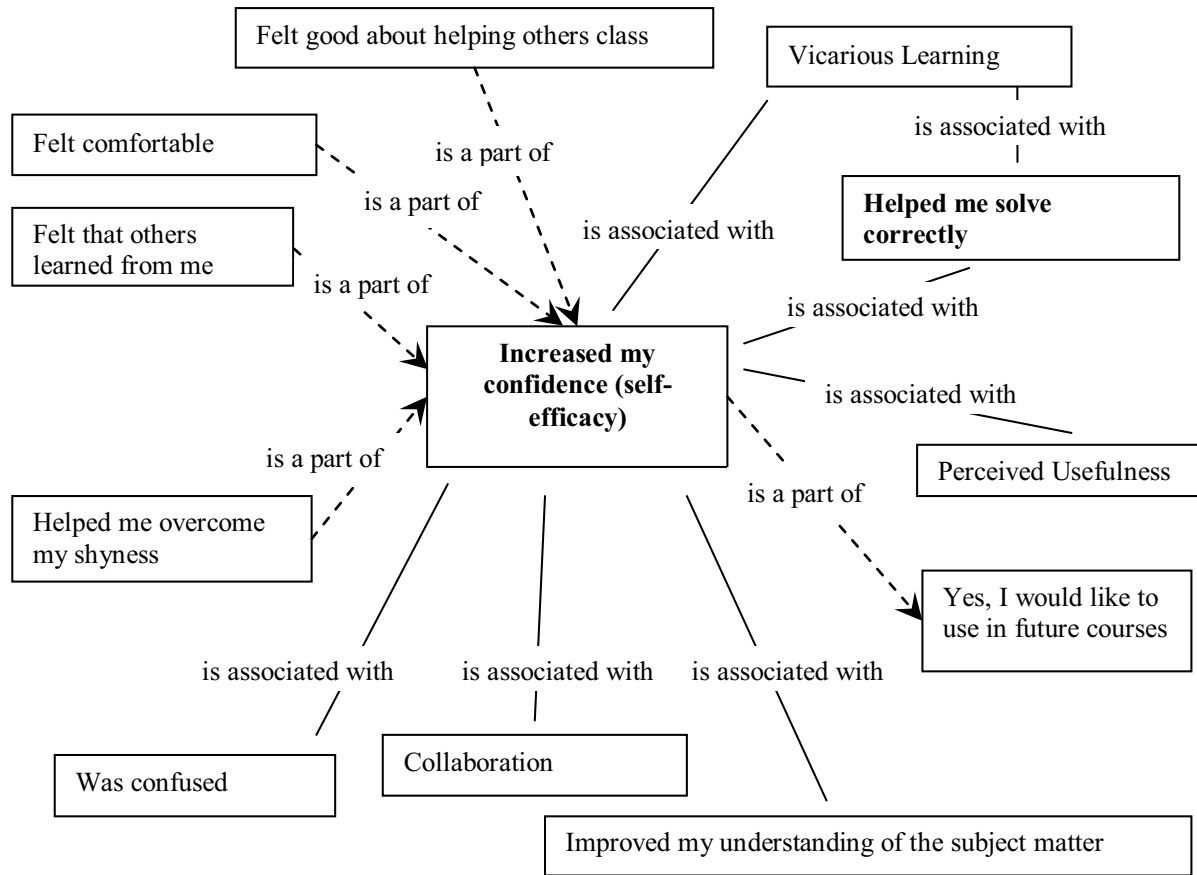


Figure 5. A star view of the “increased my confidence” (self-efficacy) belief

*important ingredient in my success in learning.”*  
[Mike, Class C, AAOD].

#### 4.2. Study 2: Performance

The last comment, by Mike, that associated his confidence with his success in learning was a lesson that we learned from Case Study 1. In appreciation of the knowledge gained from the prior study as a part of the curriculum to aid students in their learning of business statistics, we decided to extend the study further to help us measure the extent of student learning success in terms of students’ exam performance. As we do not know whether anchored discussions can be used to aid students in their success in terms of exam performance. Therefore, given the lessons learned from the above study (Case Study 1) about the association between self-efficacy and success, we hypothesize:

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

As in the prior case, we employed the two forms of online discussions (standard vs. anchored). But this time, Blackboard® was not available as the university has replaced it by a Moodle course management system (CMS). Luckily, when we examined these discussion forums, we found that there was very little difference between Blackboard’s and Moodles’ online discussions. As we have illustrated above in Figure 1 and Figure 2, both systems offered similar looking threads and posting mechanisms. Therefore, we were able to proceed with this part of the case study. We employed two asynchronous online discussions, a Moodle-based discussion tool as the AOD, and the anchored discussion one as the AAOD. We decided to conduct this case study in a similar fashion as we did earlier. Two groups of students from four business statistics sections participated in this study. The first group (G1) used the standard online discussion tool while the second group (G2) used the anchored online discussion. The two groups were given 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 articles/cases were interesting. For example, one student from G1 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, Class B, AODs]

A student from G2 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, Class A, AAOD]

While another student from G2 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, Class A, AAOD]

Both groups G1 and G2 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. G1 consisted of 79 students and G2 also had 79 students that participated in the online discussions. The difference in the discussion tools was the anchoring, which would enable us to attribute the difference in exam performance to that 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.

#### 4.2.1. Study 2 findings

The findings of this study are summarized in Table 1. G1 had an average exam score of 20.75 and a standard deviation of 5.00, while the G2 obtained a higher average of 22.91 with a standard deviation of 4.33. We find 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,” [30]. In this case, we

have obtained sufficient evidence in support of our research hypothesis (H1).

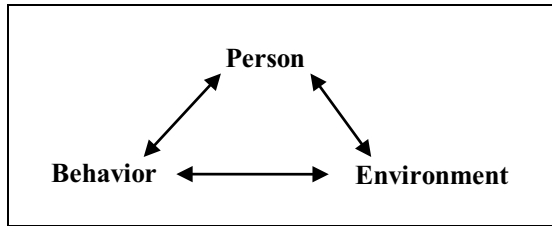
**Table 1. Exam performance**

Group	Sample Size	Mean	Stand. Dev.	t Stat
G1: AODs	79	20.75	5.00	2.91*
G2: AAODs	79	22.91	4.33	
* p =.002				

## 5. Discussion

Bandura (1997, 1986) described the concept of “reciprocal causation” in terms of interaction of three interdependent major determinants: 1) environment, 2) person, and 3) behavior [7, 8]. Figure 6 shows the relationship between the determinants of reciprocal causation: each determinant has influence on the other two. For example, in the online discussions, personal factors had influence on the behavior of the student and on the environment. The environment (i.e., AOD or AAOD) also has influence on the person and the behavior. Personal factors may include cognitive and affective capabilities. The extents of the influences are not necessarily equal and may vary. Because of the variations in the influences among many of the factors, a researcher can reasonably conclude that outcomes are most likely to vary, such as for self-efficacy, learning and performance.

The Theory of Reasoned Action (TRA) [2, 16] was proposed to study an individual’s attitude and behavior. 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. Attitude is the individual’s positive or negative feelings about performing the intended behavior [16], such as participating in the ODs.



**Figure 6. The relationship between the determinants of “reciprocal causation” (Bandura, 1997, 1986)**

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 [20]. The Theory of Planned Behavior (TPB) [3] 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 Bandura’s Social Cognitive Theory [8]. 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.

## 6. 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 were more likely 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 [19]. Students using AAODs may have become more comfortable, motivated, and gained better insights about how to solve exam questions. Anchoring in the 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 [15] may 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 both groups of students received the same instructions and amount of

attention. The researcher’s preconceptions embody the biases within the researcher. We held that any finding would make a potential contribution. A future study could be more revealing if it was designed to specifically measure other learning outcomes in terms of cognitive and affective learning.

## 7. Acknowledgement

We wish to thank Professor Jakko van der Pol from University of Amsterdam in The Netherlands for giving us permission to use his anchoring tool.

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