EXAMINING STUDENT DISCUSSION FORUM PARTICIPATION:

A CRITICAL ANALYSIS OF INTERACTION IN A FULLY ONLINE CLASSROOM

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Ryan and Kevin, I hope I was able to set a good example for you and increase your love of learning. Angie, thank you for standing by me and shouldering more of the family responsibilities. I love you all.
ABSTRACT

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Student participation in online classroom discussion fora is becoming an increasingly important subject to examine and analyze because of the potential implications participation can have on student performance and persistence. The objective of this study was to determine if a student’s participation level in online course discussion fora at a fully online institution serving more than 110,000 students was, associated with the grade earned in the course and the likelihood that the student would reenroll for additional courses within a three-month time frame. An analysis also was performed on data collected from a survey administered to a sample of students; the survey asked for their perceptions of their own participation as it related to the online courses they recently completed. This study was unique compared to other studies addressing student participation in the online classroom because the sample of data analyzed consisted of more than 91,000 unique students, 433 unique courses, more than 16,000 course sections, and more than seven million discussion forum posts consisting of more than 1.2 billion words. However, the results of this study were not unique and mirrored other studies’ results in that, students who had higher participation rates in the classroom, as measured by the size and number of discussion forum posts, tended to earn higher grades and enroll...
in additional courses. Results from the survey showed that students more strongly agreed that they participated in the discussion fora on a regular basis than spending time doing things such as helping other students or having fun in other classroom conversations.
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Chapter One

Introduction of the Study

Student participation in the classroom, regardless if it is a face-to-face or online environment, has been an ongoing issue in higher education. In the face-to-face classroom, student participation is difficult to quantify. Each year the Indiana University Center for Postsecondary Research administers the National Survey of Student Engagement (NSSE) to assess the extent to which students engage in educational practices associated with high levels of learning and development (National Survey of Student Engagement, 2014). Yet, the amount of emphasis that NSSE puts on finding out about classroom interaction is minimal.

In the online classroom, institutions have large amounts of data collected through the learning management system (LMS) to help determine the amount of interaction students have with other students and faculty members. While student-faculty and student-student interactions within the bricks-and-mortar classroom take place during a scheduled time, the opposite is true for those participating in asynchronous courses at an online institution.

Online learning in higher education has grown significantly during the past decade. The number of students attending online institutions has increased at rates in excess of those of overall higher education (Allen & Seaman, 2013). According to a report published by the Babson Survey Research Group (2014), the number of students taking at least one online course increased to a new high of 7.1 million in 2013. At the same time, technological advancements in online learning classrooms have continued in order to meet the needs of the influx of online learners. One of the constants within the
LMS, however, is the presence of discussion fora, which serve as the primary form of student-faculty and student-student interactions. It is in these discussion fora where student participation in the online classroom occurs.

The online classroom, which is being researched in this study, differs from the Massive Open Online Courses (MOOCs) that have become popular over the past several years. MOOCs are online courses that enroll thousands of students at a time with little to no cost involved. However, due to no cost being involved, the student really has no motivation to complete the course as would be the case if the student were actually spending money. In fact, “the average MOOC course is found to enroll around 43K students, 6.5% of whom complete the course” (Jordan, 2014). Therefore, the low completion rates were the major factor for not including MOOCs for comparison in this study.

**Statement of the Problem**

In fully online courses, faculty cannot rely on face-to-face interactions to gauge student participation. At fully online institutions, the LMS is used to facilitate the student-to-faculty and student-to-student interactions via discussion fora. Discussion forum postings are usually requirements for the students and faculty during each course as a means to discuss specific course topics. The quantity and quality of the information being collected through discussion forum postings is extremely beneficial to the institution and is used to determine the level of participation for each student. In the era of “Big Data,” fully online institutions have the luxury of having access to an abundance of data from their LMS as well as other electronically stored data germane to students and courses. With so much data being collected each month via discussion fora, the
question often arises if course outcomes and retention can be correlated to student participation, as measured by the amount and size of forum posts. This study addressed the relationship between discussion forum postings in an online classroom and student performance and retention.

**Significance of the Study**

Research has been conducted that links student participation to success in the online classroom. Morris et al. (2005) found that students who were unsuccessful, that is, earning a grade of D, F, or Incomplete—were far less participatory than successful students. In a similar study, students earning a final grade of D or F used the institution’s online course management system an average of 39% less than those students earning a grade of C or higher (Fritz, 2011).

The frequency and general nature of forum posts can be easily influenced by curricular policy. The findings from this study can help guide curriculum development to increase student success and retention based on particular combinations of forum posts or overall participation in the online classroom—as measured by the total number of forum posts created relative to the number of forum posts required for a given course.

**Study Site Selection**

American Public University System (APUS), which comprises American Military University and American Public University, is a fully online institution founded in 1991 by a retired Marine Corps officer who envisioned an innovative way to offer quality and affordable education to US armed forces (American Public University System, 2015). APUS was selected as the institution for this study by virtue of its being one of the largest fully online institutions in the United States. Total student enrollments at APUS have
increased by more than 250% between 2007 and 2014, from approximately 30,000 to more than 110,000. During any given month APUS has, on average, 30,000 total students in the LMS taking classes, the majority of who are undergraduate degree-seeking students. As a result, APUS amasses an enormous amount of qualitative data from discussion fora each month from both students and faculty as discussion forum entries are a requirement for both during each week of each course.

**Conceptual Model**

Vincent Tinto (1975) developed his model of retention based on Emile Durkheim’s sociological theory of suicide. Durkheim’s theory suggests that insufficient social integration, which he identifies as the intensity of the collective life that circulates within a social aggregate, enhances individualism and encourages suicide (Maimon & Kuhl, 2008). Although this study is not researching suicide, aspects of the same theory can apply in succeeding and persisting in one’s college education. Tinto’s model, adapted in Figure 1, depicts his model in that the student’s social involvement in the educational life of the college provides a mechanism through which academic and social involvement arise and student effort is engaged (Tinto, 1997).
The ideas around academic and social integration within Tinto’s model served as the basis for this study. The fundamental premise of Tinto’s model is that a student’s likelihood to dropout can be predicted by their degree of academic and social integration at their institution (Draper, 2008). Examples of measures related to academic and social integration include the student’s grades, personal development, self-esteem, study patterns, enjoyment of course subjects, number of friends, and enjoyment level of being at the institution (Draper, 2008). At an online institution like the one used for this study, it is difficult, if not impossible, to obtain a lot of the aforementioned measures since the students are not located on a physical campus. For this study, metrics pertaining to the academic system and student attributes—including classroom discussion participation; course outcomes; prior schooling, as measured by transfer credits; the student’s race; and military experience—were data points extracted from the study site’s database. Even as
social integration encompasses conversations and interactions both inside and outside the classroom and through other electronic means, it was limited in this study to aggregating the interactions that the student had with other students and faculty members as part of the online classroom discussion fora. This study did not go into as much detail as Tinto’s model intended, which was a direct result of not having access to much of the data that may be collected more easily at traditional bricks-and-mortar institutions, but many of the areas within his model are addressed.

**Research Questions and Hypotheses**

The purpose of this study was to understand better how the level of participation of students in the online classroom is related to the overall student outcomes, as measured by the grade earned, of the class and whether the level of participation had an impact on the student’s decision to enroll for additional courses. Beyond the exploration of participation as it relates to success and retention, the student’s own perceptions of his or her participation were measured using a survey instrument. Specifically, the research questions addressed were:

- **RQ1:** Can we predict a student's academic performance in an online course, as measured by grade?
- **RQ2:** Can we predict a student's probability of re-registering in online courses?
- **RQ3:** Using a validated survey instrument, what are the perceptions of participation of students attending a fully online institution?

In addition to the discussion forum posting data that were collected, a robust repository of demographic data, data related to a student’s courses, and data related to a
student’s previous college experience (i.e., transfer credits) were used in the analyses as well.

I addressed multiple hypotheses in this study. First, I hypothesized that students who were more participatory in the online classroom would have higher grades and retention rates. The other hypothesis in this study related to whether students perceived themselves as being engaged in their education. Of particular interest was the extent to which students felt they were engaging in conversations in the classroom through discussion forum postings. Also of interest was the perception of regularity with which the students participated in discussion fora. My hypothesis was that students responding to the survey were going to indicate that they were not as engaged as they should be, as measured by their responses to the survey items. The reasoning behind this hypothesis is related to the type of student who attends online institutions—that is, the adult learner who may or may not have a job and/or family and participates in the class activities just enough to earn his or her degree.
Chapter Two

Literature Review

Introduction

Student participation in an online, asynchronous classroom is an ongoing issue for institutions that offer online courses and programs to students worldwide. Not only do the students and faculty members not meet each other face to face; in an asynchronous environment, they are likely to login to the online classroom at different times to complete tasks and assignments such as posting entries in the discussion fora. These discussion fora have become the central element in every learning management system (LMS) that extends teaching beyond the traditional campus classroom (Levine, 2007). Existing research indicates that student participation in the traditional face-to-face classroom has a positive effect on student success (Handelsman, Briggs, Sullivan & Towler, 2005; Morris, Finnegan, & Wu, 2005; Picciano, 2002). There is also research on participation in the online classroom, but it is less prevalent. This study researched student participation in the online classroom and how it, along with other attributes related to a student’s academic and social integration, is associated with student success and retention at a fully online institution. Furthermore, a sample of students from the institution was surveyed to gauge their perceptions on their participation within the online classroom.

The purpose of this literature review is to discuss findings from other researchers about the participation and outcomes of students in the online classroom. I reviewed on student participation, success and retention in the online environment, online pedagogical practices, student self-perceptions of participation, and the prevalence of military students
in online education. These areas of literature provided context for the research that was performed and showed which gaps currently exist in the area of online discussion forum participation.

**Student Participation, Success, and Retention in the Online Environment**

Online discussion fora are a way to get every student involved in conversations relating to the topics within their courses. Some students may be more likely to participate online than in the face-to-face classroom merely for the fact that they feel more comfortable and safer participating online. Other students may just need time to do additional reflection on the topic before posting their response. Regardless, studies have shown that in order to increase student participation in the online discussion fora, there need to be guidelines and/or activities in place to stimulate the participation.

Balaji and Chakrabarti (2010) urged institutions to make the role of the online instructor be one where he or she facilitates the discussions by influencing the interactions, which is essential for maintaining the interest and motivation levels of the students for participating in the discussion fora. Feedback from students in this study indicated that the instructions provided for completing activities, regular feedback from the instructor, and the increased communication among students helped encourage greater participation. In addition, Balaji and Chakrabarti stated that the online discussion fora expanded the opportunities for students to share their thinking with classmates and the instructor; they further indicated that the sense of community among the students increased the interactions in the online classroom. This sense of community, along with the facilitation of the conversations and the reflective thinking by the students, contributed to their interactions in the discussion fora. Finally, this study shows that the
use of multiple mediums of instruction enriched the context of the student communications and led to enhanced learning.

Bliss and Lawrence (2009) discussed the differences in how independent learners and interactive learners typically master concepts. The independent learners preferred to study alone while the interactive learners preferred one-to-one or one-to-many conversations. It was the interactive learners, though, who were most likely to engage in shared knowledge building in the online discussion fora. However, it was not just the type of learner that influenced a student’s participation, amount of discussion forum posts, and the extent of the discussion threading. The instructor’s presence, along with the presence of feedback from others and guidelines for creating quality posts, was also a major factor.

Alward (2012) stated that an active learning environment helps engage learners. In the online classroom, there are many ways to make the environment one in which there is a lot of activity to help encourage student participation. The studies discussed below have shown that instructor participation and facilitation, group projects, and study groups are just some examples of activities that can be introduced into the online learning environment.

Rovai (2003) stated that motivation to start course work on time, keep up with assignments, and actively participate in the course is needed given that online classes do not meet in the traditional sense. Rovai also stated that, in addition to learning from course materials and the online instructors, students taking courses in an online environment should be encouraged to learn from their classmates and form study groups with other online learners. This may help with the unfamiliar learning environment,
which may pose issues for nontraditional learners as significant coping skills may be required for them.

Reflection has been shown to be important with learning in the online environment as well. Picciano (1998) found that some students preferred to have reflection time so that they could develop their thoughts before participating in the course discussions, which is not always possible in the traditional classroom as the conversations can move from one topic to the next fairly quickly. One thing that Picciano expressed was that when an institution is designing the asynchronous learning model, it needs to allow enough time for student reflection. This asynchronous model then would allow for the student to have more of a voice in the discussions, which could change the faculty role to that of facilitator. Picciano gave examples of students who stated that they were hesitant to participate in the online discussions: given that written comments allow for more scrutiny from their classmates—they felt exposed. Other students stated that the asynchronous model was a totally different way of learning and sharing and that they felt it provided them more of a voice.

Dixson (2010) found that the path to student engagement is not about the type of activity or assignment that the student is working on; rather, it is the multiple ways of creating meaningful communication between students and their instructor. In short, it is all about the connections. Dixson supported this by suggesting that instructors should consider assignments in which students interact with each other and the content of the course. She also stated that active learning assignments, particularly discussion fora, may help to develop a student’s social presence in the classroom. However, the communication needs to occur with instructors so that they are able to create their own
social presence as well. Dixson’s study shows that when students readily identified multiple ways of interacting with one another and with instructors, the student engagement levels were higher across many types of courses. This was supported by her finding that when students were doing such things as working on group projects together, doing peer review of one another’s papers, or interacting within a discussion forum on a particular topic, they were likely to feel more engaged in the course overall.

Course grades are probably the most recognized form of measuring success for college students, and there are many factors influencing a student’s final grade in a course. One of these factors at the institution in this study was the level to which the student participates in the classroom. Primarily, the results of past studies have indicated that there is a correlation between course outcomes and the level of participation by a student. Morris et al. (2005) stated that course completers were more engaged in learning activities than those students who withdrew from the course and that a linear combination of student activities was significantly related to the student’s achievement. Specifically, 31% of the variability in achievement was accounted for by measures relating to the student’s engagement. At a more granular level, however, the results of a regression analysis in the study of Handelsman et al. (2005) revealed that engagement was a significant factor in predicting midterm and final examination grades. Chan, Lambert, and Guidry (2010) also found a positive relationship between participation and course outcomes. Their research, however, examined and quantified participation through course-related technology as well as those who engaged in other ways.

Specific components of engagement—such as participation in classroom discussions—were shown to have a positive association with success as well. Course
completers in the study by Morris et al. (2005) were found to have a greater number of
original and follow-up discussion forum posts along with higher numbers of other
discussions and content pages viewed. In addition, the course completers also had
significantly higher participation than those who withdrew from or did not complete the
course, where participation was measured by the frequency and duration of the student’s
visits to the classroom. Morris’ et al. (2005) concluded that active participation and the
time spent on task in the online classroom are important to complete the course
successfully.

There were studies, however, that found participation not to be significant when it
came to course outcomes. The preliminary analyses of course grades in Beaudoin’s
(2002) study indicated that the mean course grade was better for high-visibility learners
than for no-visibility learners—with visibility in that context pertaining to participation.
He compared the no-visibility student’s learning to an iceberg in that most of the mass is
hidden beneath the surface, which means that the factors that help explain the variability
with no-visibility learners have yet to be found. Beaudoin (2002) went on to state that it
was premature to declare that a certain level of interaction in online discourse is an
essential ingredient to student success.

Student persistence—or its reverse, student drop out—has been a major area of
concern in online learning (Hershkovitz & Nachmias, 2011). Persistence has been, and
continues to be, a highly researched area within higher education; however, the amount
of research on retention as it relates to the student’s participation level in the online
classroom is not nearly as prevalent. In 2003 Rovai stated that there is no certain formula
that ensures persistence; moreover, persistence cannot be attributed to one specific
student, course, or school characteristic. Rovai went on to state that discipline and self-direction were identified as traits that students need to be successful in online courses, especially considering that classes do not meet in the traditional sense.

Studies by individual institutions as well as anecdotal evidence suggest that course completion rates and program retention rates are generally lower in distance education courses than those in the face-to-face environment (Carr, 2000). In her research, Carr stated that a student who was taking an online course had dropped mid-semester due to the instructor being a first-time teacher in the online environment, which may have been the reason that the course and laboratories were not set up properly. Hershkovitz and Nachmias (2011) reiterated this sentiment in a study, stating that “online quitters” tend to access the online classroom only at the beginning of the semester. Another student in Carr’s study stated that “the biggest challenge in taking these courses is the fact that you don’t have direct contact on a regular basis with your instructor.” Carr concluded that it is essential to establish some form of personal contact with the students and to let them know ahead of time what is expected of them in order to succeed in an online course.

**Online Pedagogical Practices and Benefits**

Since classroom participation and engagement have been shown to be positively associated with student success and retention (Morris et al., 2005; Handelsman et al., 2005; Chan et al., 2010; Beaudoin, 2002), there need to be ways in which faculty effectively can get students to participate fully in the online classroom throughout higher education. The pedagogical practices of faculty teaching online courses can be seen as being both more difficult, and conversely, much easier. For example, getting faculty to
engage in monitoring and facilitating classroom activities can be a very time-consuming process if multiple courses are being taught and especially if the faculty members are adjuncts and have other jobs and responsibilities. Other issues could arise for faculty if they are not technically savvy or they prefer the lecture-centric classroom. On the other hand, teaching in the online environment can be much easier for faculty, especially in an asynchronous environment, because interaction in the classroom can occur at any time throughout the day. There are no scheduled class times and limits on how much time can be spent in the classroom. As Klemm (2002) wrote, “Convenience actually stimulates dialogue and constructive activity.” Teaching online allows faculty members to respond to everyone at once, if needed. “Responding to a group rather than to each individual student, the teacher has less work and is more likely to be fully engaged in what the students are doing” (Klemm, 2002). Saltmarsh and Sutherland-Smith (2010) found that participants in their study generally commented that the flexibility of the online classroom enabled students to learn in ways that suit their personal circumstances, lifestyles, and preferences and allowed them to engage regardless of distance, time, and work or family demands.

In order to teach effectively online, the topics of discussion need to stay focused and not get off topic, which means that good questions need to be designed and guidelines must be provided to the students when preparing their responses (Riedinger & Rosenberg, 2006). Klemm’s (2002) article stated that one faculty member required every student to post a creative idea on the week’s academic content into a shared document along with an answer, which would stimulate participation and further conversation among the class. The communications that occur in the online classroom ensure that
students do not have any excuse for not participating, and they also give faculty and staff a way to determine the participation levels of each of the students.

The utilization of multimedia in online pedagogy is a good approach to increasing student participation. Rosenthal (2010) stated that instead of having students read a textbook about the theory of a topic, videos were used to show how the topic was used in practice, thereby making the instruction more authentic. Pirosca and Mohanu (2009) found that multimedia usage in the online environment resulted in a greater equality of participation. In other words, the information flowed less through a hierarchy and more through a transactional exchange and network relationship.

There are many pedagogical approaches to teaching effectively in the online environment. Faculty subjectivities and the willingness to innovate and explore new pedagogic possibilities suggest that staff development germane to online teaching and learning be addressed with new approaches (Saltmarsh & Sutherland-Smith, 2010). Saltmarsh and Sutherland-Smith (2010) go onto state that instructors need to reflect upon their subjectivities, which have been shaped by current pedagogical practices, and to engage the challenges of online teaching and learning as opportunities to renegotiate teaching practices.

**Student Self-Perceptions of Participation**

Having knowledge of how a student perceives themselves during their education is important to understand from an institutional perspective. That is, knowing how a student describes his or her study habits, organization, listening/reading skills, level of effort, and the level of camaraderie with fellow students are just a few examples that can be used by the institution to correlate to outcomes and potentially result in ways that the it
can better help the student to be successful. Research has been performed on students’ self-perceptions, with results being mixed as to whether there was a correlation to classroom performance. Although Picciano (2002) concluded that there was a strong, positive relationship between student perceptions of their participation in a course and the perceptions of the quality and quantity of their learning, the results of his study were mixed. Picciano found that student perceptions of their participation did not have a statistically significant relationship with a student’s performance on examinations, but it did have a statistically significant relationship to their performance on written assignments.

In another study, Fritz (2011) hypothesized that using a tool every day could give faculty and students more realistic and timely feedback about their own effectiveness or participation in the classroom. Fritz’s conclusion was that students and faculty could see within the LMS that stronger students tend to be more active than weaker students. He also concluded that the stronger students could serve as motivation to a student to look more critically at his or her own study habits, how they go about seeking help from someone, and perhaps how they set their larger career goals based on their own activity and academic performance. The use of the course management system then could influence an instructor’s course design and create additional data points for student interaction and self-awareness.

Butts, Heidorn and Mosier (2013) found that there were no significant differences in a student’s perceptions of participation in an online classroom versus a face-to-face classroom within an undergraduate course. Butts, Heidorn and Moser (2013) recognize that online instruction is a student-centered educational method and that it is possible that
there is only an illusion of a teacher in a student’s online classroom as opposed to a teacher in the physical classroom. In contrast, Alward (2012) found that those students who had a heightened sense of satisfaction had prior experiences of being completely engaged in their coursework. In addition, collaboration with friends and other students helped this feeling of participation.

**Summary**

The prevalence of research on discussion fora in the online environment, as a measure of student success and retention, is minimal. However, for the research that does exist, most have shown that there is an association between participation and student success and retention (Beaudoin, 2002; Carr, 2000; Chan et al., 2010; Handelsman et al., 2005; Hershkovitz & Nachmias, 2011; Morris et al., 2005). The research and analysis that was performed for this study will add to the existing literature in multiple ways. First, this study categorized the discussion forum posts into more granular groupings for analysis. This allowed for a more targeted analysis based on the type of discussion forum post the student submitted. Second, the sample size used in this study was much larger than any other study that exists in the literature. This sample size allows consideration of the use of the Big Data that is being seen in the industry. Finally, this study contained a robust database preparation component. This component related to the complex data federation process and how other researchers who have access to multiple data sources can collect, prepare, analyze, and disseminate data at their institutions.
Chapter Three

Database Development

Introduction

The development of the database used in this study was both time- and resource-intensive. The vast amounts of data collected and the analyses performed on the data proved to be extremely challenging but useful and informative for institutions collecting similar data. Numerous software products were used during the development of the database, which included those needed to perform SQL querying, data mining, visual analysis, and statistical analysis.

Population and Sample

The institution selected for this study was American Public University System (APUS). APUS has monthly course starts, which give students more flexibility in how they progress their education. This model allows for interruptions in one’s education such as military deployments or other personal matters. A student maintains an active status at APUS for twelve months after their last recorded activity in the APUS student information system (SIS) or learning management system (LMS). This specific enrollment policy makes it difficult to track student retention given that a student can take multiple breaks for months at a time.

The base population of students for this study comprises those who were in an undergraduate, degree-seeking program and who took a course that started on or after January 1, 2013 and ended prior to October 15, 2014. This timeframe was selected in order to give students enough time to enroll in additional courses so that retention could be quantified and analyzed. Only students who took a course that was a core or major
requirement for their degree program were selected for this study. One reason for this course selection is that there are currently ongoing course improvement initiatives for the general education courses and it was determined that these initiatives could have a confounding impact on the LMS data that was being collected for the research. Another reason this course selection was used is because APUS has a high number of transfer students; therefore, a lot of the students already have completed their general education courses elsewhere and are taking the program-specific courses upon their arrival at APUS.

No sampling occurred as the entire student and classroom datasets were easily attainable for use. Sufficient infrastructural resources were available for processing the entire population of data.

**Data Collection, Preparation, and Instrumentation**

The data collection and preparation efforts for this study complex; multiple sources of data were used that had to be transformed for accurate data analysis to occur. Although APUS is a fully online institution with a fairly robust data collection infrastructure, the data used in this study were stored neither in one place nor at the same level. That is, the data needed for this study were stored at the course, student, registration, and discussion forum levels, and these all had to be transformed so that the analysis could be performed on one dataset. There was a lengthy and complex task of denormalizing the data, which resulted in redundant data items throughout the dataset. Although this denormalization increased the size of the dataset, it made things more manageable and easier from an analysis perspective, which included an increase in the speed in which the software performed the analyses.
Due to the complexity of the data collection process, the Statistical Package for the Social Sciences (SPSS) Modeler (SPSS Modeler, Version 16.0) software was used to create a model that allowed numerous processes to be combined into one package. One of the biggest advantages in using a software package like SPSS Modeler was having all of the activities within the data collection effort centrally stored. This made for a more manageable and cleaner data collection and preparation effort, which was conducive for an iterative process such as the one created for this study.

Figure 2 contains a layout of the completed data collection model used in this study. The model consisted of several series of connected nodes. Each individual node performed an independent function, but it could be connected to one or more additional nodes, which then functioned as a model. The model for this study was broken into three sections. The first section, as indicated by the red outline, extracted the courses that were taught to the population of students described in the previous section. Another section, as indicated by the blue outline, then extracted the data from the LMS, which included specific information about each forum posting by the students. Finally, the last section of the model, as indicated by the orange outline, displays the process by which the student- and course-level information was extracted from the SIS and subsequently merged with the data extracted and processed data from the LMS. Each section of the model is described in detail below.
Figure 2: Overall Data Collection Model
**Student information system course section data collection.** The data collection started first by extracting the unique course offerings from the SIS for the population of students mentioned in the previous section of this chapter. Figure 3 contains the section of the model used in this step of the data collection process, which I will refer to as the “SIS data” throughout the rest of this chapter. The data in the SIS was stored in a relational SQL Server database and an SQL script was written to extract the course numbers, course start and end dates, and unique course section identifiers for each course taught to the undergraduate, degree-seeking students in the population during the selected timeframe for this study. Given that APUS offers multiple sections of the same courses each month, there are times when small class sizes occur, sometimes resulting in no course completions. This happens when the students in these courses either drop or withdraw before the course ends. Only courses with at least one student completion were extracted from the SIS and included in the population.

*Figure 3: Student Information System Data Collection*

Once the data for the courses included in the study were extracted, the data were sorted and prepared to be merged with the data extracted from the LMS. In this case, the
data preparation included converting the format of the unique course section identifier. This identifier was stored as a numeric variable in the SIS and as a string variable in the LMS. The course section identifier from the SIS was then converted to a string value. Once the variable conversion was completed, the dataset was sorted in ascending order by the unique course section identifier so that the SIS and LMS could be merged successfully later in the data collection process.

One last step in the process of data collection was the selection of distinct course section identifiers, which were used to merge with the student- and course-level data extracted from the SIS in a later step within this model. This step also included the removal of two unique course sections resulting from issues in the LMS data, which were identified by the custodian of the LMS database. The reason the two course sections were removed from the dataset was because the sections contained students who had graduated and been removed from LMS database. Additional details were requested from the custodian of the LMS database regarding these deletions, but no details were received. Given that the extent of the course sections affected was so minimal relative to the entire dataset created for analysis, the impact on the analysis was also minimal. Once these two course sections were removed, the final course section-level dataset was complete. This dataset contained a total of 433 unique courses and 16,270 unique course sections, resulting in an average of more than 37 sections per course.
LMS data collection. The next step of the data collection process entailed extracting the forum posting data from the LMS. I will refer to this as the “LMS data” throughout the rest of this chapter. This extraction process is shown in Figure 4 above. In addition to the actual content of each forum posting, word counts were calculated for each posting that were used in the analysis. This process will be discussed later in this chapter.

The LMS data is stored in a MySQL database and was extracted using a custom view developed by the custodian of the LMS database. The first step of this data extraction process was the creation of a MySQL script that used the custom view to extract data from the LMS for courses that started on or after January 1, 2013 and ended prior to October 15, 2014, the same parameters used to extract the course section data from the SIS database. In order to extract only the undergraduate courses, a parameter was created to check the course number stored in the LMS to ensure that the course level
was at the undergraduate level (i.e., 100-, 200-, 300- or 400-level courses). The variables extracted from the LMS consisted of the course number, unique course section identifier, course start and end dates, course faculty identifier, unique discussion forum identifier, discussion forum title, unique discussion forum topic identifier, discussion forum topic title, unique discussion forum thread identifier, discussion forum thread title, main discussion forum thread identifier, and a variable indicating to which discussion forum thread each record was a response. During the testing of this extraction process, the need arose for a custom variable in order to construct and analyze the final dataset properly. This variable indicated the student or faculty member who created the primary discussion forum posting. This variable was used to create additional variables that were integral to this study. Further discussion on the hierarchy of the forum postings will be presented in a subsequent section within this chapter.

The next step in the LMS data extraction process was to sort the dataset by the unique course section identifier in ascending order and remove some variables that were found not to have any benefit to the dataset. Removing the variables at this stage in the process improved processing times given that the variables removed contained large amounts of text. The sorted dataset was then merged with the SIS data, resulting in a dataset that contained only the LMS data for the courses selected for this study. The dataset merge process took every record in the LMS dataset for all the courses and course sections and matched them against the data from the SIS dataset. The resulting dataset now contained more than 7.3 million records, each of which represented a unique discussion forum posting. The dataset also contained the original 433 unique courses and 16,270 unique course sections.
The final step in the LMS data extraction process in Figure 3 was to extract the actual content of each discussion forum posting and derive a variable containing the number of words for each posting. This step was performed separately from the previous step because the extraction of the discussion forum posting content was much more resource intensive than the rest of the LMS data. In fact, the forum content had to be extracted by course start month and then combined into one dataset. Figure 5 shows the process by which each of the month’s data were appended to one dataset. The final
dataset containing all of the word-count information was then merged back to the overall LMS dataset.

**Discussion forum posting word counts.** The process by which the word counts were created for each forum posting was resource intensive based on the fact that numerous methods were formulated and tested. The reason so many methods were tried was because most of the forum postings had numerous HTML tags saved within the field on the database. This could have resulted from the students and faculty developing their postings outside of the LMS in a word processing software package and then copying and pasting the content into the LMS. As a result, when the content was saved to the MySQL database, the accompanying formatting in the form of HTML was saved as well.

In order to avoid having inflated word counts due to the HTML tags, a process had to be developed to remove all HTML content from the forum postings. The first method entailed a MySQL script that used a function to remove all HTML characters. However, this approach was unsuccessful because there were insufficient processing resources available. Another issue with this method was that not all extraneous characters were removed. The next method involved the LMS database custodian developing a custom script on the database server, which removed the HTML tag information. This script was also unsuccessful; not all of the extraneous characters were removed. The final solution was to remove the HTML tags using a script written in Python, which occurred outside of the IBM SPSS Modeler data collection model. Python is programming language used as a scripting language to connect existing components (Python.org, 2014). In this case, Python was used to remove the extraneous HTML tags.
from within each forum post and create output files that could be integrated back into the main data processing model.

The script used Python-specific functions, which resulted in the removal of all HTML tags and extraneous characters. A custom database query script was embedded within the Python script that extracted each unique discussion forum posting identifier along with the content of the posting. Based on the resource issues experienced in the previous attempts within MySQL to remove the HTML tags, the database query extracted the content by month in order to limit the size of each resulting file. The Python script then had to be executed 20 times, once for each month of data included in this study. The resulting 20 files were saved in comma-delimited format and routed back into the main data processing model, where they were appended (Figure 5) and merged back to the main dataset. The resulting file contained the original records but with the additional variable containing the word count of each forum posting. The total number of words for the 7.3 million forum postings was 1.3 billion, for an average of 178 words per forum posting. Further discussion on the number of words per forum posting is contained in Chapter 4.

**Creation of final dataset for analysis.** All of the database processing that occurred up to this point resulted in a file containing one record per discussion forum posting for (a) the core and major course requirements; (b) students in an undergraduate degree-seeking program; (c) courses started on or after January 1, 2013 and ending before October 15, 2014. Discussion forum postings by the faculty teaching the courses were also included for the purposes of creating additional variables used in the data analysis of this study.
In order to construct the final dataset for the main data analysis, the course-level data from the SIS, which I will refer to as the “course data” throughout the rest of this chapter had to be merged to the LMS data. Figure 6 below contains this portion of the overall data collection model. The course data included demographic data (e.g., race, gender, military classification, age, etc.), course registration data (e.g., grade, course registration date, course pay type, etc.), and student degree program data (e.g., program name, program start date, program deadline date, etc.). In addition, information also was extracted from the SIS to determine if the student registered for courses after the start date of the course for which the discussion forum posting data was extracted. These subsequent registrations were used to determine retention, as stated in the second research question.
In order to extract the course data only for the records in the overall dataset, a process had to be constructed similar to that which occurred between the SIS data and LMS data above, whereby the unique course section identifier in the course data had to be converted to a string variable and then sorted in ascending order by this new variable. Once the file was sorted, it then was merged with the LMS data. The reason it was not merged directly to the LMS data was to avoid having to rerun the resource-intensive steps throughout the overall data collection process if errors were found within the model. This iterative process was a major advantage of using SPSS Modeler, as mentioned.
above. SPSS data files were saved throughout the model process once each step was completed. A consistency check was then performed on the course data and the LMS data to ensure that the number of students, courses, and course sections were the same.

Once the consistency check was completed, several new variables were constructed on the LMS data that indicated if a discussion forum posting fit one of three categories: primary, secondary, or tertiary. I defined and created these categories so that the different types of discussion forum entries could be quantified and used in the data analysis. Primary forum postings were determined by the creation of a new thread within the classroom. A thread was defined as an individual topic created by a participant in the class, whether a faculty member or student. Therefore, if a new thread was created then the student who created the thread would be credited with a primary thread entry. A secondary thread was then defined as any direct response to a primary thread. All other thread entries for a given topic were then categorized as tertiary thread entries.

Additional variables then were derived that equaled the number of the different types of thread entries and the word counts associated with them. These aggregations were performed at the unique student-course section level, given that the purpose of the research was to address the overall course outcomes and not the outcomes of the individual assignments with which the discussion forum postings were associated. After the new variables were constructed in the model, the dataset then was sorted by the unique identifier of the person to whom the discussion forum posting belonged and the unique course section identifier. The course data then was sorted by the same variables and they were merged, resulting in the dataset that would be used in the final analysis for this study.
The final dataset is shown in Figure 6 and was exported in SPSS Statistics format for the data analysis. The file consisted of one record per student and faculty member at the course section level. The reason the file was at this specific level was that a student can take the same course more than once depending on the outcome. For example, if a student takes a course and withdraws before the course ends, he or she is then eligible to take the same course at a later time. It was important to include both records for the course in this final dataset as retention was being addressed as part of the second research question. The total counts in the final dataset included 433 unique courses, 16,270 unique course sections, 91,061 unique students, 7.3 million discussion forum postings, and a total word count of 1.3 billion.

Survey instrument and administration. Data from an institution’s SIS and LMS obviously can quantify student participation, but collecting qualitative data from students about their perceptions of their classroom participation can help enrich these perspectives. Although the majority of the analysis performed for this research study used the SIS and LMS, supplemental data was collected directly from students currently attending APUS through the administration of a survey. The survey used for this study was developed by Dr. Marcia Dixson at Indiana University-Purdue University Fort Wayne and is titled Online Student Engagement Survey (OSES). Dr. Dixson gave permission to use her survey; a copy of the survey instrument, along with the approval email, are included in Appendices A and B, respectively. The survey consisted of four subscales comprising 19 total questions addressing a student’s skills, emotional attributes, class participation, and class performance. Each of the question responses is measured on a five-point ordinal scale ranging from 0 (not at all characteristic of me) to 4 (very
characteristic of me). Dixson (2010) created the OSES out of the need for an instrument to measure online student engagement.

In order to avoid sending the survey to students who were no longer actively taking classes at APUS, a sample of students was taken from the overall population of this study who had completed a course that started on or after June 1, 2014 and before October 15, 2014. A simple random sample was then performed that selected 50% of this population of course completers for a total of 10,792 students. Once the sample of students was selected, several variables were extracted from the SIS for use in the survey administration. These variables included the student’s degree program unique identifier, name, and e-mail address. At the same time, the student’s unique identifier and email address were rendered anonymous using a function within the modeling software. This process was performed to ensure that there were no violations of the Family Educational Rights and Privacy Act (FERPA) as a result of uploading the data into Survey Gizmo (http://www.surveygizmo.com), the online survey software used to administer the survey. Once that process was completed, the final survey list was exported to Excel for cleaning and formatting, per the survey software’s specifications.

The list of variables was reduced to just now-anonymous student identifier and email address prior to uploading the survey send list into the survey software. After uploading the send list, a unique link to the survey was generated for each record within the list. These links subsequently were exported back out of the survey software and merged back to the original survey send list with each unique survey link. The final list used for the survey was complete at this point and ready for administration. In order to prevent potential FERPA concerns that could arise by uploading student-identifying
information to third-party survey software, the decision was made to send the survey to the students via APUS’s Exchange server.

The survey was sent using a mail-merge process from within Word. An email message was constructed within Word, and the mail-merge fields representing the student’s name, email address, and unique link to the survey were inserted into this message. A copy of this message is included in Appendix C. The mail merge was then tested numerous times before sending to the students. Once sent, the responses to the survey would be saved within the survey software, from which they were retrieved once the survey was closed. The survey was sent on a Monday afternoon, which has been shown to be one of the best times to achieve the best response rates (Quinn, 2009). The survey administration was closed exactly two weeks after the initial administration occurred. The survey response data were then exported from the survey software for analysis. Findings and recommendations resulting from the survey data analysis are presented in Chapters 4 and 5.

Data Analysis

The data analysis for this study occurred in stages using different software products. Once the final file from the data modeling process was completed the file was exported as a SPSS Statistics file. In turn, this file was integrated into a visual analytics tool called Tableau (Tableau Desktop Professional, Version 8.3.0). The reason for using Tableau was to perform the preliminary data exploration, which included a series of basic frequencies, cross-tabulations and descriptive statistics. Tableau can ingest numerous types of files for analysis, but SPSS Statistics files are not currently one of the supported files in their native format. To move beyond this limitation, an open database
connectivity (ODBC) driver was installed that would enable essentially any software that connects to external data sources to access an SPSS Statistics file. A local data source name (DSN) was then created for the SPSS Statistics file that utilized the newly installed ODBC driver. The DSN was then used by Tableau to connect to the SPSS Statistics file for the preliminary analysis. The SPSS Statistics file could have been exported from the data modeling software in a more basic file type such as a comma-delimited file, but after trying this approach, the file did not export as cleanly for use by Tableau.

Once the data were imported into Tableau the preliminary data analysis was performed, which included exploring the variables in the dataset by looking at frequencies, descriptive statistics, and cross-tabulations. These different analyses were then visualized for ease of interpretation. Throughout the preliminary analysis, several more variables were derived within Tableau that were subsequently analyzed and appended to the dataset. Once the preliminary analysis was completed, the dataset was exported from Tableau directly into an Excel file, which then was imported into SPSS Statistics for the statistical analyses. Excel was used because SPSS Statistics cannot import directly from data stored in Tableau’s proprietary format.

Once the data were imported into SPSS Statistics, dummy and standardized variables were derived for use as the independent variables in the linear and logistic regression models that would be performed to address the research. These independent variables included the standardization of the discussion forum post counts at the primary, secondary, and tertiary levels. Also standardized was the variable containing the number of transfer credits applied to the student’s academic program. Finally, dummy variables were created to represent the student’s military status and race in binary format. The
dummy variables were validated by running a series of frequencies and cross-tabulations to ensure the values and counts in the original variables matched those in the newly derived dummy variables. The resulting dataset then was filtered to include only student course-level records that did not have a failing grade that were determined to be unearned. That is, if the student left the course without formally withdrawing before the midpoint or did not complete at least half of the course assignments then the grade was classified as unearned. Only failing grades were able to be categorized as unearned.

After all the variables were created and the dataset was filtered, the analyses needed to answer the research questions were performed. Specifically, a multiple linear regression was performed to determine if a student’s grade could be predicted using the variables that were created to measure the discussion forum postings by an individual student. A multiple linear regression was chosen because a model is being fit to the data to predict values of the dependent variable from one or more independent variables (Field, 2009). In this analysis, grade points were used as the dependent variable—that is, as the variable to be predicted—using the available independent variables that will be discussed in the ensuing chapters.

In order to address the second research question regarding whether a prediction about a student’s proclivity to enroll in subsequent courses at APUS could be made, a logistic regression was performed. Basically, the logistic regression is the same as a multiple linear regression except that the dependent variable is categorical (Field, 2009). In this study the dependent variable represented whether the student decided to enroll for additional courses at APUS based on several other categorical and continuous variables.
Finally, the third research question relating to the students’ perceptions of their participation in the online course environment was addressed by performing descriptive statistics analysis and a comparison of means for the survey question responses. Specifically, the participation subscale items, as constructed by Dr. Dixson in her survey, were the focus of this analysis and were compared across the entire sample as well as across the military classification variable.

**Limitations and Assumptions**

I extracted the data used in this study to determine participation from the LMS discussion fora, which are requirements for all online courses at the site used in this study. Participation can also occur outside of the LMS, but that data is more difficult, if not impossible, to compile for data analysis. That is so because conversational exchanges between students and faculty can occur using other types of communications such as telephone, email, and video chat, just to name a few. These types of communications were not included in this research study. Another limitation of this study was the absence of text analytics on the discussion forum postings. The quality of the interactions between students and faculty could play an important role in the student’s course grade and his or her decision to register for additional courses, but the quality of the forum postings was not examined in this study. An additional limitation related to the discussion forum postings was that they were not cleaned before the analysis occurred. That is, all discussion forum postings that had any amount of words in them were used. For example, postings such as “great job” or “I agree”, along with other postings that were unrelated to the course content were not removed for this study.
In addition to only core and major course requirements being used in the study, only undergraduate students were selected for analysis. At the institution where this study took place, there were several ongoing projects addressing the first-year experience of students, which mainly will include the general education and other high-enrollment courses. Hence, the decision was made not to use the general education courses in this study.

**Summary**

An educational study exploring this size a dataset demands much attention to the data preparation process. Data scientists say that 80% of the data-mining work is performed during the data collection and preparation phases (Dietrich, 2013). This study is no exception. The data collection and preparation strategies were extremely robust for this study. Numerous data sources were utilized requiring the use of an advanced data modeling software for ease and efficiency with regard to joining the datasets and computing new variables for the analyses. Although the data collection and preparation phases were complex, the data analyses remained very basic as simple descriptive statistics and regression models were used. The findings, conclusions, and implications from the data analysis for each of the research questions are detailed in the subsequent chapters.
Chapter Four

Data Analysis Overview and Population Descriptive Characteristics

Organization of Data Analysis

I will discuss the data analysis performed for this study in this chapter and present it in the following sections. The first section contains an overview of the variables that were derived after the data was extracted from the databases along with an overview of the statistical analyses that were performed. The second section includes a thorough analysis of the descriptive characteristics of the populations of students in the datasets. These analyses are important to perform in order to gain an understanding of the population being analyzed. The ensuing chapters discuss, in detail, the analyses that were performed in order to address the first two research questions regarding student participation in the classroom and how they are associated with success and retention, if at all, and the results of the survey administered to capture students’ perceptions about their participation in the online learning environment.

Derived variables. The data collection for this study included the extraction of data from the student information system (SIS) and learning management system (LMS). Derived variables often can be the strongest predictors in a model (Elder, Miner, & Nisbet, 2009). Therefore, in order to analyze the data thoroughly, several variables were derived for this study using other variables extracted from the SIS and LMS. In fact, derived variables were used in each of the statistical analyses performed in this study.

Although there were many more derived variables created for the study, only those variables described below were used in the final analyses. These variables represent metrics that could be included in Tinto’s retention model. The discussion
forum posting variables represent both academic and social integration in that they show the amount of interaction a student has with the faculty member and other students in the online classroom. The student’s race and military status represent some background information of the student and the transfer credits applied to the student’s program represent the student’s previous education.

**Primary Forum Posts.** This variable was constructed to indicate the number of discussion forum threads that each student created within the course. That is, if a student started a discussion forum post topic, then it was classified as a primary thread.

**Secondary Forum Posts.** Similar to primary threads, this variable was derived to account for the number of direct replies a student had to another primary thread, regardless of who created the primary thread.

**Tertiary Forum Posts.** The tertiary thread variable was constructed as a means by which all other threads could be aggregated. Essentially, this variable was created to track all other discussion forum posting replies a student had that were not categorized as primary or secondary, which potentially could indicate a higher level of participation. An example of a tertiary post would include a response by a student to a different student’s secondary post.

**Participation.** This variable was constructed to indicate the level of participation that each student attained in each of the courses for which he or she had participated in the dataset for analysis. The level of participation was based on the number of discussion forum postings each student had for the entire course. For the purposes of this study, the levels of participation were calculated based on the site institution’s requirement for students to create three forum postings per week—one primary and two secondary.
Although both eight- and 16-week courses were included in this dataset, the data showed that the number of forum postings was approximately the same through the length of the course. So, to construct the participation variable, the decision was made to use the same number of forum postings over the timeframe for each course type (i.e. 8- and 16-week).

There were five levels of participation created. These levels ranged from Very Low to Very High and were based on the ranges (a) less than 13 total forum postings (Very Low); (b) 13 to 22 forum postings (Low); (c) 23 to 25 forum postings (Expected); (d) 26 to 35 forum postings (High); (e) 36 or more forum postings (Very High).

Reenrolled. This variable was derived to indicate if the student registered for another course and was constructed to represent retention for this study. To be flagged as reenrolled, a student had to register for another course within three months of starting the course for which the record in the dataset indicated. This three-month timeframe was used because of the site institution’s model of the student being able to take one course at a time. Enrolling within a shorter timeframe can speak to student momentum resulting in higher retention rates.

Student Race. The original variable storing the student’s race information was recoded into a new variable that stored whether the student was a minority or a non-minority. If a student indicated their race to be White, then they were classified as non-minority. All other categories were then collapsed into the minority category, as some of the race categories contained smaller numbers in the population. The rationale for using these two categories was due to the site institution having more than 55% of its student population being white. The race groups that comprised the minority group in the sample
were smaller in number and the decision was made to combine them so as to not identify any single race directly if the results of the analysis reflected negatively on them.

**Transfer Credits Applied.** The application of transfer credits to a student’s program has been identified as being a significant indicator of retention at APUS in previous research (Boston, 2010). That being said, it was important to include this same data, as it could prove to be an important indicator in this study. This variable contained the total number of transfer credits that were evaluated, accepted, and applied to the student’s academic program.

**Military Status.** Military personnel are a big part of the online learner population as indicated by the numbers the *Military Times* collected on schools at which tuition assistance dollars are spent (*Military Times*, 2014). Based on these numbers, it was important to account for this population of student in the analysis. This variable was constructed using data self-reported by the student during the application process. If a student stated that he or she was in the active-duty military, then he or she was flagged as being military while all other students were flagged as non-military.

All of the variables discussed above correspond to Tinto’s model in that they are directly related to the background of the student, previous schooling, and integration into the social and academic environments at the institution.

**Data analyses performed.** The first set of analyses performed was a series of crosstabs. Specifically, crosstabs were created for each of the variables that were used for the research questions pertaining to success and retention. These variables included the student’s participation level, as measured by the total number of forum posts, military status, number of transfer credits applied, and race. Each of these variables was crossed
with the participation level variable and target variables for course grade points and whether the student reenrolled for additional courses within three months. These crosstabs were created to give context to the study and compare the dependent variables used in the analyses for the research questions pertaining to success and retention.

The analysis to address the first research question (RQ1: Can we predict a student's academic performance in an online course, as measured by grade?) used a linear regression with a variable representing the number of grade points the student earned for the course completion as the dependent variable. A regression line reflects the best guess as to what value of the dependent variable would be predicted by a value of one or more independent variables (Salkind, 2011). The grade points variable was based on the 0-4 point scale whereby 0 represents a grade of F and 4 represents a grade of A. The grade points variable was standardized as it was not normally distributed. This variable is discussed in the subsequent chapter.

The analysis to address the second research question (Can we predict a student's probability of re-registering in online courses?) used a logistic regression with a variable representing whether the student reenrolled for another course within three months of starting the course represented in the dataset for the student. The logistic regression was chosen as the prediction is trying to be made as to whether an event, in this case reenrollment, occurred or not based on other continuous or categorical variables (Field, 2009). The variable representing the reenrollment was a binary variable with values of 0 (did not reenroll) and 1 (reenrolled).

The final analysis was performed to address the third research question (Using a validated survey instrument, what are the perceptions of participation of students
attending a fully online institution?). The survey that was used already had four distinct sets of subscale items developed by the author of the survey and the difference in mean scores among the participation subscale items was performed.

**Presentation of Descriptive Characteristics of the Student Population**

Descriptions and frequencies of the variables being used in this study are displayed and discussed in the tables below. Specifically, the course grade points and reenrollment decisions of the students in this study are broken out by participation levels, military classification, transfer credits applied, and race. The variables representing course grade points, transfer credits applied, and primary, secondary and tertiary forum posts were standardized in preparation for the analyses.

**Analysis variables.** Table 1 contains a list of the variables that were used in the regression analyses. Based on Tinto’s model of retention—or, more specifically, the portion that addresses the Academic System—variables relating to classroom interaction among students and faculty—as measured by the number of discussion forum posts, along with the student’s race, military status, and number of transfer credits the student had applied to his or her academic program—were used as the predictors in this analysis.

**Table 1: Variables Included in Analyses**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Role in Regression Equation</th>
<th>Scale of Measurement</th>
<th>Range of Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Grade Points</td>
<td>Outcome</td>
<td>Continuous</td>
<td>-3.160–0.845</td>
</tr>
<tr>
<td>Reenrollment</td>
<td>Outcome</td>
<td>Categorical</td>
<td>0 (No)–1 (Yes)</td>
</tr>
<tr>
<td>Student Race</td>
<td>Predictor</td>
<td>Categorical</td>
<td>0 (Minority)–1 (Nonminority)</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td>Predictor</td>
<td>Continuous</td>
<td>-1.301–2.534</td>
</tr>
<tr>
<td>Primary Forum Posts</td>
<td>Predictor</td>
<td>Continuous</td>
<td>-2.108–11.639</td>
</tr>
<tr>
<td>Secondary Forum Posts</td>
<td>Predictor</td>
<td>Continuous</td>
<td>-1.491–40.408</td>
</tr>
<tr>
<td>Tertiary Forum Posts</td>
<td>Predictor</td>
<td>Continuous</td>
<td>-0.597–47.359</td>
</tr>
<tr>
<td>Military Status</td>
<td>Predictor</td>
<td>Categorical</td>
<td>0 (Nonmilitary)–1 (Military)</td>
</tr>
</tbody>
</table>
Descriptive statistics were generated for the variables that were used in the model as well. Table 2 contains these descriptive statistics and although this table is not needed to interpret the results of the analyses, it is useful to see the means and standard deviations of the variables included in the regression.

Table 2: Descriptive Statistics of Variables Included in Analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Grade Points</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Reenrollment</td>
<td>0.801</td>
<td>0.399</td>
</tr>
<tr>
<td>Primary Forum Posts</td>
<td>0.358</td>
<td>0.751</td>
</tr>
<tr>
<td>Secondary Forum Posts</td>
<td>0.296</td>
<td>0.772</td>
</tr>
<tr>
<td>Tertiary Forum Posts</td>
<td>0.122</td>
<td>1.066</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td>0.111</td>
<td>0.976</td>
</tr>
<tr>
<td>Student Race (Minority/Nonminority)</td>
<td>0.601</td>
<td>0.490</td>
</tr>
<tr>
<td>Military Status</td>
<td>0.470</td>
<td>0.499</td>
</tr>
</tbody>
</table>

Participation level frequencies. In Table 3, an overall view of the participation levels was generated. More than 50% of the students taking courses in the sample had participation levels at the expected level or higher, with the majority (43.6%) having High or Very High participation levels. Conversely, about the same percentage (45.7%) had participation levels lower than expected.

Table 3: Percentage of Overall Participation Level

<table>
<thead>
<tr>
<th>Participation Level</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>13.6%</td>
</tr>
<tr>
<td>Low</td>
<td>32.1%</td>
</tr>
<tr>
<td>Expected</td>
<td>11.1%</td>
</tr>
<tr>
<td>High</td>
<td>32.6%</td>
</tr>
<tr>
<td>Very High</td>
<td>10.6%</td>
</tr>
</tbody>
</table>
In Table 4, the level of participation by the students was generated and compared between the other predictor variables used in the regression analyses. The breakdown of participation level among the different categories of the military status variable showed that veteran students have a slightly higher percentage (12.0%) that is Very Highly participatory in the classroom with civilian students following close behind (11.1%). Although, when looking at students who were at the expected participation level or higher, higher percentages of military (56.9%) and veteran (55.8%) students come out as participating more compared to the civilians and those students that are affiliated with the military—50.5% and 51.2%, respectively. Civilian students had the lowest participation level among the populations, with 18% having Very Low participation in the classroom discussion fora.

The participation levels were crossed with the transfer credits applied by the students, and 21.7% of those students who did not have any transfer credits applied to their program have Very Low participation levels. In all, more than 55% of the students who did not have any transfer credits had lower-than-expected participation levels. The percentage of Very Low participation levels decreased as the number of transfer credits increased. Conversely, the percentage of high participation levels increased as the number of transfer credits applied increased, ranging from 25.7% for students with no transfer credits applied to just under 37% for those students who had 64 or more transfer credits applied to their program. The percentage of students who had Expected and Very High participation levels were roughly the same, with only about a two-to-three percentage point difference across the transfer credit range. Finally, minority students had a higher percentage of participation below the expected level with almost 50%
compared to 43% for nonminority students. At the opposite end of the participation spectrum, nonminority students had almost 46% with high or very high participation levels, compared to almost 40% for minority students.

*Table 4: Participation Level Frequencies by Predictor Variables*

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Very Low</th>
<th>Low</th>
<th>Expected</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Military Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military</td>
<td>10.5%</td>
<td>32.6%</td>
<td>12.3%</td>
<td>34.7%</td>
<td>9.9%</td>
</tr>
<tr>
<td>Civilian</td>
<td>18.0%</td>
<td>31.5%</td>
<td>9.9%</td>
<td>29.5%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Military Affiliated</td>
<td>15.0%</td>
<td>33.9%</td>
<td>11.0%</td>
<td>31.2%</td>
<td>9.0%</td>
</tr>
<tr>
<td>Veteran</td>
<td>13.3%</td>
<td>31.0%</td>
<td>10.3%</td>
<td>33.5%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>21.7%</td>
<td>33.7%</td>
<td>10.1%</td>
<td>25.7%</td>
<td>8.7%</td>
</tr>
<tr>
<td>0.01–18.00</td>
<td>14.0%</td>
<td>34.0%</td>
<td>11.2%</td>
<td>30.6%</td>
<td>10.2%</td>
</tr>
<tr>
<td>18.01–30.00</td>
<td>13.4%</td>
<td>32.9%</td>
<td>11.4%</td>
<td>32.0%</td>
<td>10.3%</td>
</tr>
<tr>
<td>30.01–39.00</td>
<td>12.4%</td>
<td>32.2%</td>
<td>11.7%</td>
<td>33.7%</td>
<td>10.0%</td>
</tr>
<tr>
<td>39.01–46.00</td>
<td>12.0%</td>
<td>31.3%</td>
<td>11.7%</td>
<td>34.3%</td>
<td>10.7%</td>
</tr>
<tr>
<td>46.01–55.00</td>
<td>10.8%</td>
<td>30.9%</td>
<td>10.9%</td>
<td>35.4%</td>
<td>12.0%</td>
</tr>
<tr>
<td>55.01–64.00</td>
<td>10.3%</td>
<td>30.2%</td>
<td>11.2%</td>
<td>36.7%</td>
<td>11.6%</td>
</tr>
<tr>
<td>64.01+</td>
<td>9.1%</td>
<td>30.7%</td>
<td>11.3%</td>
<td>36.9%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Student Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority</td>
<td>15.7%</td>
<td>33.3%</td>
<td>11.1%</td>
<td>30.6%</td>
<td>9.3%</td>
</tr>
<tr>
<td>Nonminority</td>
<td>12.2%</td>
<td>31.2%</td>
<td>11.1%</td>
<td>33.9%</td>
<td>11.6%</td>
</tr>
</tbody>
</table>

**Course grade point frequencies.** As seen in Table 5, a higher percentage of students with Very Low participation levels (18.4%) failed courses as represented by 0.00 grade points earned, which was at least 15 percentage points higher than the next closest participation level that earned 0.00 grade points. Those students with a Low participation level had the next highest percentage of failed courses with 3.4% earning no grade points. Conversely, more than 90% of the students with High (92.3%) or Very High (94.9%)
Students in the military have lower percentages of courses resulting in course grade points earned of one or less at 4.1%. Civilians, veterans, and those affiliated with the military had 9.5%, 6.2%, and 5.8%, respectively, earning one or fewer grade points. Civilians had a lower percentage (56.9%) of courses resulting in 3.01 or more grade points.

<table>
<thead>
<tr>
<th>Course Grade Points</th>
<th>0.00</th>
<th>1.00</th>
<th>2.00</th>
<th>3.00</th>
<th>4.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>18.4%</td>
<td>9.9%</td>
<td>23.3%</td>
<td>28.7%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Low</td>
<td>3.4%</td>
<td>4.2%</td>
<td>13.0%</td>
<td>27.1%</td>
<td>52.4%</td>
</tr>
<tr>
<td>Expected</td>
<td>1.0%</td>
<td>2.1%</td>
<td>8.1%</td>
<td>23.2%</td>
<td>65.7%</td>
</tr>
<tr>
<td>High</td>
<td>0.7%</td>
<td>1.3%</td>
<td>5.7%</td>
<td>19.0%</td>
<td>73.3%</td>
</tr>
<tr>
<td>Very High</td>
<td>0.4%</td>
<td>0.8%</td>
<td>3.9%</td>
<td>13.5%</td>
<td>81.4%</td>
</tr>
<tr>
<td>Military Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Military</td>
<td>1.8%</td>
<td>2.3%</td>
<td>8.6%</td>
<td>22.9%</td>
<td>64.4%</td>
</tr>
<tr>
<td>Civilian</td>
<td>5.1%</td>
<td>4.4%</td>
<td>11.5%</td>
<td>22.2%</td>
<td>56.9%</td>
</tr>
<tr>
<td>Military Affiliated</td>
<td>3.4%</td>
<td>2.8%</td>
<td>10.0%</td>
<td>23.5%</td>
<td>60.3%</td>
</tr>
<tr>
<td>Veteran</td>
<td>2.9%</td>
<td>2.9%</td>
<td>9.2%</td>
<td>20.8%</td>
<td>64.3%</td>
</tr>
<tr>
<td>Transfer Credits</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>6.7%</td>
<td>5.6%</td>
<td>13.9%</td>
<td>25.0%</td>
<td>48.8%</td>
</tr>
<tr>
<td>0.01 - 18.00</td>
<td>3.5%</td>
<td>3.9%</td>
<td>12.0%</td>
<td>25.5%</td>
<td>55.1%</td>
</tr>
<tr>
<td>18.01 - 30.00</td>
<td>2.9%</td>
<td>3.1%</td>
<td>10.2%</td>
<td>24.5%</td>
<td>59.3%</td>
</tr>
<tr>
<td>30.01 - 39.00</td>
<td>2.6%</td>
<td>2.6%</td>
<td>9.5%</td>
<td>23.2%</td>
<td>62.1%</td>
</tr>
<tr>
<td>39.01 - 46.00</td>
<td>2.0%</td>
<td>2.4%</td>
<td>8.7%</td>
<td>22.6%</td>
<td>64.4%</td>
</tr>
<tr>
<td>46.01 - 55.00</td>
<td>1.9%</td>
<td>2.2%</td>
<td>7.9%</td>
<td>20.4%</td>
<td>67.6%</td>
</tr>
<tr>
<td>55.01 - 64.00</td>
<td>1.7%</td>
<td>1.7%</td>
<td>6.8%</td>
<td>19.0%</td>
<td>70.8%</td>
</tr>
<tr>
<td>64.01+</td>
<td>1.5%</td>
<td>1.5%</td>
<td>6.2%</td>
<td>17.4%</td>
<td>73.4%</td>
</tr>
<tr>
<td>Student Race</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minority</td>
<td>4.2%</td>
<td>4.0%</td>
<td>11.8%</td>
<td>24.8%</td>
<td>55.1%</td>
</tr>
<tr>
<td>Non-Minority</td>
<td>2.3%</td>
<td>2.4%</td>
<td>8.3%</td>
<td>20.8%</td>
<td>66.3%</td>
</tr>
</tbody>
</table>

Students in the military have lower percentages of courses resulting in course grade points earned of one or less at 4.1%. Civilians, veterans, and those affiliated with the military had 9.5%, 6.2%, and 5.8%, respectively, earning one or fewer grade points. Civilians had a lower percentage (56.9%) of courses resulting in 3.01 or more grade points.
points earned than the other categories. Military and veteran students had the highest percentage of courses resulting in 3.01 grade points or more at 64 % each compared to just 56.9% of civilians.

As the number of transfer credits applied to the student’s academic program rose, so did the percentage of students who earned 3.01 grade points or more for their courses. Only 48.8% of students who did not have any transfer credits applied to their program earned 3.01 or more grade points compared to 73.4% for those students with 64 or more transfer credits applied. The opposite is true for those students who did not earn any grade points with 6.7% of those with no transfer credits applied and only 1.5% with 64 or more transfer credits failing their courses. Finally, a higher percentage of nonminority students earned 3.01 grade points or more than minority students with 66.3% and 55.1%, respectively. A higher percentage of minority students (8.2%) earned one or fewer grade points than nonminority students (4.7%).

**Reenrollment frequencies.** In Table 6 below, retention rates, as measured by reenrollment within three months, are quite high across all of the predictor variables. This is most likely the result of the site institution allowing students to enroll in classes in an ongoing basis throughout the year. A slightly higher percentage of students who had Low, Expected, or High levels of participation reenrolled within three months–81.1%, 81.6% and 82.1% respectively–compared to students with Very High participation levels–with 80.8% reenrolling. As expected, the lowest percentage of students reenrolling within three months belonged to those with Very Low levels of participation (71.3%), however, this percentage seems high for students with Very Low participation levels. Another interesting finding was the fact that the smallest percentage of those
reenrolling occurred with military students (78.2%) compared to civilian (79.7%),
military affiliated (83.2%), and veterans (86.2%). As expected, a small percentage of
those with no transfer credits applied (71.1%) to their program reenrolled. Students
transferring in 55 or more credits had the highest percentages of reenrollment at 84.3%
and 84.1%, respectively. Finally, almost the same percentage of minority and
nonminority students reenrolled for additional courses within three months, with 79.1%
and 80.8%, respectively.

Table 6: Frequencies of Reenrollment within Three Months by Predictor Variables

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Reenrolled</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Participation</td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>71.3%</td>
</tr>
<tr>
<td>Low</td>
<td>81.1%</td>
</tr>
<tr>
<td>Expected</td>
<td>81.6%</td>
</tr>
<tr>
<td>High</td>
<td>82.1%</td>
</tr>
<tr>
<td>Very High</td>
<td>80.8%</td>
</tr>
<tr>
<td>Military Classification</td>
<td></td>
</tr>
<tr>
<td>Military</td>
<td>78.2%</td>
</tr>
<tr>
<td>Civilian</td>
<td>79.7%</td>
</tr>
<tr>
<td>Military Affiliated</td>
<td>83.2%</td>
</tr>
<tr>
<td>Veteran</td>
<td>86.2%</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td></td>
</tr>
<tr>
<td>0.00</td>
<td>71.1%</td>
</tr>
<tr>
<td>0.01–18.00</td>
<td>79.8%</td>
</tr>
<tr>
<td>18.01–30.00</td>
<td>81.3%</td>
</tr>
<tr>
<td>30.01–39.00</td>
<td>82.3%</td>
</tr>
<tr>
<td>39.01–46.00</td>
<td>82.5%</td>
</tr>
<tr>
<td>46.01–55.00</td>
<td>82.7%</td>
</tr>
<tr>
<td>55.01–64.00</td>
<td>84.3%</td>
</tr>
<tr>
<td>64.01+</td>
<td>84.1%</td>
</tr>
<tr>
<td>Student Race</td>
<td></td>
</tr>
<tr>
<td>Minority</td>
<td>79.1%</td>
</tr>
<tr>
<td>Nonminority</td>
<td>80.8%</td>
</tr>
</tbody>
</table>
Summary

Although the majority of the differences in percentages among the combinations of variables discussed in this chapter are not substantive, it is important that they be included for context of the analyses discussed in the ensuing chapters and for an overall understanding of the variables used in this study. The majority of the differences that were substantive were related to the participation levels of the students in the online discussion forums and the number of transfer credits applied to the student’s program.
Chapter Five

Classroom Discussion Forum Participation as a Predictor of Course Outcomes

Introduction

The first research question asked what level of association, if any, the student’s level of participation in the classroom discussion fora had on the grade he or she received for the course. Before the main analysis was performed for this research question, a difference in means of the grade points earned was generated among the five participation levels of the students. The participation levels were determined based on the number of forum post entries a student had during the duration of a given course. This means comparison was performed to see if the differences in the mean grade points earned were significantly different between the different participation levels. The regression analysis was then performed to see if the grade points earned in a class by a student can be predicted using the predictor variables described in Table 5 below.

Findings

Table 7 contains the mean grade points for students within the five different discussion forum participation levels. The mean grade points (1.987) earned by students in the Very Low participation level was more than 1.5 grade points below the mean of the participation level with the highest mean grade points (3.577), which happened to be the Very High group. In addition, the Very Low participation level was almost a full grade point below the next lowest participation level of Low, with mean grade points of 1.987 and 2.976, respectively. The mean grade point spread among the groups with the three highest mean grade points (Expected, High, and Very High) only differed by .290 grade
points. The difference in mean grade points between each participation level was significant at the 0.01 level.

*Table 7: Mean Grade Points by Participation Level*

<table>
<thead>
<tr>
<th>Participation Level</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low</td>
<td>18648</td>
<td>1.987</td>
</tr>
<tr>
<td>Low</td>
<td>76115</td>
<td>2.976</td>
</tr>
<tr>
<td>Expected</td>
<td>26834</td>
<td>3.287</td>
</tr>
<tr>
<td>High</td>
<td>78821</td>
<td>3.427</td>
</tr>
<tr>
<td>Very High</td>
<td>25454</td>
<td>3.577</td>
</tr>
<tr>
<td>Total</td>
<td>225872</td>
<td>3.156</td>
</tr>
</tbody>
</table>

The next table that was generated in the regression model was the correlations matrix. This matrix, as shown in Table 8, shows the Pearson’s correlation coefficients, which were generated to test for multicollinearity among the predictor variables used in the model. The correlation matrix is useful for getting an idea of the relationships among the predictor variables and the outcome variable as well as to get a preliminary look for multicollinearity, which will not exist with a lack of substantial correlations (r > .9) among the predictors (Field, 2009).

The strongest correlation with the outcome variable occurs between only two predictor variables. Table 7 shows the entire set of correlations and indicates that primary forum posts (r = 0.249, p < 0.001) and secondary forum posts (r = 0.379, p < 0.001) have the highest correlation with the outcome variable course grade points. Based on these correlations, the number of secondary forum posts correlates best with the outcome variable of course grade points, which means that the number of secondary forum posts will best predict course grade points (Field, 2009). The correlations between the predictor variables indicate that the predictors are measuring distinct constructs. That is, the highest correlation between the different combinations of primary forum posts,
secondary forum posts, and tertiary forum posts exists between primary and secondary \((r = 0.516, p < 0.001)\) and is well below the threshold of 0.9, indicating that multicollinearity does not exist among the predictor variables in this model.

**Table 8: Regression Model Variables–Correlations**

<table>
<thead>
<tr>
<th>Pearson Correlation</th>
<th>Course Grade Points</th>
<th>Primary Forum Posts</th>
<th>Secondary Forum Posts</th>
<th>Tertiary Forum Posts</th>
<th>Transfer Credits Applied</th>
<th>Student Race</th>
<th>Military Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Grade Points</td>
<td>1.000</td>
<td>0.249</td>
<td>0.379</td>
<td>0.168</td>
<td>0.195</td>
<td>0.127</td>
<td>0.081</td>
</tr>
<tr>
<td>Primary Forum Posts</td>
<td>0.249</td>
<td>1.000</td>
<td>0.516</td>
<td>0.149</td>
<td>0.020</td>
<td>0.020</td>
<td>0.031</td>
</tr>
<tr>
<td>Secondary Forum Posts</td>
<td>0.379</td>
<td>0.516</td>
<td>1.000</td>
<td>0.268</td>
<td>0.090</td>
<td>0.047</td>
<td>0.037</td>
</tr>
<tr>
<td>Tertiary Forum Posts</td>
<td>0.168</td>
<td>0.149</td>
<td>0.268</td>
<td>1.000</td>
<td>0.056</td>
<td>0.050</td>
<td>-0.063</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td>0.195</td>
<td>0.020</td>
<td>0.090</td>
<td>0.056</td>
<td>1.000</td>
<td>0.053</td>
<td>0.139</td>
</tr>
<tr>
<td>Student Race</td>
<td>0.127</td>
<td>0.020</td>
<td>0.047</td>
<td>0.050</td>
<td>0.053</td>
<td>1.000</td>
<td>-0.032</td>
</tr>
<tr>
<td>Military Status</td>
<td>0.081</td>
<td>0.031</td>
<td>0.037</td>
<td>-0.063</td>
<td>0.139</td>
<td>-0.032</td>
<td>1.000</td>
</tr>
</tbody>
</table>

The next section of output from the regression model was the model summary. This summary indicates whether the model is successful in predicting course grade points. The output of the model summary is contained within Table 9 below. This particular model used the Enter method, which means that all the predictor variables were entered into the model simultaneously. The model summary contains numerous statistics about the regression that was performed. The first statistic is represented in the column labeled R. This statistic contains the value of the multiple correlation coefficients between the predictor variables and the outcome (Field, 2009). The value in the column labeled \(R^2\) represents the amount of variation in course grade points accounted for by the predictor variables. In this case, the \(R^2\) value is .191, which means that 19.1% of the variation of course grade points are accounted for by the predictor variables. This indicates that more than 80% of the remaining variation is accounted for by other
variables. The Adjusted $R^2$, in turn, is the same as the $R^2$ value. This is primarily due to the relatively large sample size combined with a relatively small set of predictors (Meyers, Gamst, & Guarino, 2012).

Table 9: Model Summary for Grade Points Regression Analysis

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>.437a</td>
<td>.191</td>
<td>.191</td>
<td>.899</td>
</tr>
</tbody>
</table>

*. The significance is at the 0.05 level.

The next set of output from the regression model, shown in Table 10 below, contains the results from an analysis of variance (ANOVA). Basically, this table shows the test of significance of the model. This model used six predictor variables resulting in the regression effect having 6 degrees of freedom. The regression effect for this model is deemed to be significant, which indicates that predicting the course grade points can be accomplished better than can be done by chance (Meyers et al., 2012). This significance is determined by the $F$-ratio. Simply stated, the $F$ value is the test statistic needed to evaluate the hypothesis that there are overall differences between groups (Salkind, 2011). This model is statistically significant at ($F = 8876.799$; $df = 225860$; $p < 0.001$), suggesting this regression model predicts course grade points better than if the mean value of course grade points were used and that this regression model predicts course grade points significantly well (Field, 2009).

Table 10: Regression Model ANOVA

<table>
<thead>
<tr>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>$F$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>43099.498</td>
<td>6</td>
<td>7183.250</td>
<td>8876.799</td>
</tr>
<tr>
<td>Residual</td>
<td>182764.726</td>
<td>225854</td>
<td>0.809</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>225864.224</td>
<td>225860</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*. The significance is at the 0.001 level.
Finally, the last set of output from the regression analysis represented in Table 1 describes the parameters of the model. The value of $B$ is also calculated for all of the predictor variables in the regression model. These $B$ values can be interpreted to mean that if the value of the primary forum posts goes up by 1, then the value of the course grade points will go up by 0.103. If the number of secondary forum posts goes up by 1, then the course grade points will go up by 0.389, which is the highest of all of the predictor variables. All the predictor variables are statistically significant from 0 because the p-values are all less than 0.001. The resulting equation for this particular regression model is:

$$Y = 2.804 + 0.103(\text{Primary Forum Posts}) + 0.389(\text{Secondary Forum Posts}) + 0.062(\text{Tertiary Forum Posts}) + 0.154(\text{Transfer Credits Applied}) + 0.209(\text{Student Race}) + 0.108(\text{Military Status})$$

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
</tr>
<tr>
<td>(Constant)</td>
<td>-0.353</td>
<td>0.004</td>
<td>-97.395</td>
</tr>
<tr>
<td>Primary Forum Posts</td>
<td>0.103</td>
<td>0.003</td>
<td>0.078</td>
</tr>
<tr>
<td>Secondary Forum Posts</td>
<td>0.389</td>
<td>0.003</td>
<td>0.301</td>
</tr>
<tr>
<td>Tertiary Forum Posts</td>
<td>0.062</td>
<td>0.002</td>
<td>0.066</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td>0.154</td>
<td>0.002</td>
<td>0.150</td>
</tr>
<tr>
<td>Student Race</td>
<td>0.209</td>
<td>0.004</td>
<td>0.102</td>
</tr>
<tr>
<td>Military Status</td>
<td>0.108</td>
<td>0.004</td>
<td>0.054</td>
</tr>
</tbody>
</table>

The remaining two columns in Table 11 address the Collinearity Statistics of Tolerance and Variance Inflation Factor (VIF). The VIF indicates if a predictor variable has a strong linear relationship with the other predictors (Field, 2009). As a rule of thumb, a VIF with a value greater than 10 may merit further investigation as there could be multicollinearity (Regression with SPSS, 2015). The Tolerance is merely the
reciprocal of VIF (1/VIF), which would mean that a value below 0.1 would indicate further investigation is needed. As indicated by the VIF values, which are all less than 1.5, no multicollinearity exists between any of the predictor variables in this model.

**Summary**

The overall result of the model that was created to predict course outcomes based on variables related to classroom discussion fora and student characteristics show that students in this study who had high levels of participation tended to have had higher grades than those students who were not as participatory.

Overall, after controlling for race, transfer credits applied, military status, both primary and secondary discussion forum posts were shown to be positively associated with the grade points earned with a larger effect for secondary posts than primary posts. The regression model accounted for 19.1% of the variance. While it failed to account for over 80% of total variance, the $R^2$ value of the model should not be discounted accordingly, especially when considering that only a small number of predictor variables relating Tinto’s retention model were used. The model itself was deemed to be significant and better predicts the course outcomes than if the outcomes were derived by chance.
Chapter Six

Classroom Discussion Forum Participation as a Predictor of Reenrollment

Introduction

The second research question in this study addressed what level of association, if any, the student’s level of participation in the classroom discussion fora had on the likelihood that the student would reenroll for additional courses within three months. The three-month period began upon the start of the course in which the students were enrolled for this study. Course reenrollment within three months is represented by a binary variable and had a value of 1 for those students who did reenroll and 0 for those who did not reenroll in the three-month period. Those who did not reenroll in the subsequent three months could have enrolled for another course at a later time. The institution used for this study allows students to take courses in any month they choose with minor limitations on the number of months in between each course. However, for the purposes of this research question, the students who did not reenroll within the three-month period were categorized as not having reenrolled. Given that the outcome variable was binary, a logistic regression was performed using the same predictor variables specified in Table 5 in the previous chapter.

Findings

Table 12 shows the estimates for the coefficients for the predictors included in the model. Specifically, the Wald statistic is of particular importance as it determines whether the B coefficient for the given predictor variable is significantly different from zero (Field, 2009). As indicated in Table 12, all the predictor variables (p = 0.000), except for the student’s race (p = 0.624), are determined to be statistically different from
zero. It is assumed then that these predictor variables are making a significant contribution to the prediction of the student reenrolling. After controlling for the number of different types of forum posts, student race, and military status, those students who had transfer credits applied to their program were more likely to reenroll for additional courses within three months (odds-ratio = 1.310). Conversely, military students were less likely than nonmilitary students to reenroll (odds-ratio = .694), after controlling for the same aforementioned variables.

Table 12: Coefficients for Reenrollment Regression Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
<th>95% C.I. for EXP(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Forum Posts</td>
<td>0.118</td>
<td>0.008</td>
<td>221.089</td>
<td>1.000</td>
<td>0.000</td>
<td>1.125</td>
<td>1.108 – 1.143</td>
</tr>
<tr>
<td>Secondary Forum Posts</td>
<td>0.122</td>
<td>0.008</td>
<td>207.633</td>
<td>1.000</td>
<td>0.000</td>
<td>1.130</td>
<td>1.111 – 1.149</td>
</tr>
<tr>
<td>Tertiary Forum Posts</td>
<td>-0.021</td>
<td>0.005</td>
<td>15.442</td>
<td>1.000</td>
<td>0.000</td>
<td>0.979</td>
<td>0.969 – 0.990</td>
</tr>
<tr>
<td>Transfer Credits Applied</td>
<td>0.270</td>
<td>0.005</td>
<td>2430.877</td>
<td>1.000</td>
<td>0.000</td>
<td>1.310</td>
<td>1.296 – 1.324</td>
</tr>
<tr>
<td>Student Race</td>
<td>0.005</td>
<td>0.011</td>
<td>0.240</td>
<td>1.000</td>
<td>0.624</td>
<td>1.005</td>
<td>0.985 – 1.026</td>
</tr>
<tr>
<td>Military Status</td>
<td>-0.365</td>
<td>0.011</td>
<td>1186.885</td>
<td>1.000</td>
<td>0.000</td>
<td>0.694</td>
<td>0.680 – 0.709</td>
</tr>
<tr>
<td>Constant</td>
<td>1.531</td>
<td>0.010</td>
<td>24848.661</td>
<td>1.000</td>
<td>0.000</td>
<td>4.623</td>
<td></td>
</tr>
</tbody>
</table>

* The significance was at the 0.05 level.

The main finding in this analysis is that the number of primary forum posts (odds-ratio = 1.125) and the number of secondary forum posts (odds-ratio = 1.130) were the only other variables that had a positive impact on a student’s proclivity to reenroll. Surprisingly, the number of tertiary forum posts (odds-ratio = 0.979) that a student had was determined to have a negative impact on the predictive model.

Summary

Much like the analysis of student outcomes in Chapter 5, the number of primary and secondary discussion forum postings did have a positive association with the student’s proclivity to reenroll for additional classes within a three-month timeframe. In addition, the amount of transfer credits applied to the student’s program was associated
with the reenrollment tendencies of the students as well. So the amount of interaction in the classroom and the amount of previous college experience are significant when it comes to students continuing their education at the institution.
Chapter Seven

Student Self-Perceptions of Online Classroom Participation

Introduction

The final research question in this study addressed a student’s perceptions of his or her participation within the online classroom and how it compared to the actual participation data collected from the student information system (SIS) and learning management system (LMS). These perceptions were measured using Marcia Dixson’s Online Student Engagement Survey (see Appendix B). In addition to questions germane to participation, there were also questions in the survey that addressed the student’s skills as they relate to studying, keeping up on readings, reviewing notes, organizational practices, emotional involvement as determined by the amount of effort put forth, making the course materials relevant to the student’s life, making the courses interesting, the student’s desire to learn, and whether the student thought he or she got good grades and did well on tests and quizzes. The survey was sent to a random sample of 50% of students who completed a course that started on or after June 1, 2014. This random sampling resulted in 10,792 students being selected. Responses were received from 1,117 students, of which only 1,092 actually completed the survey. This resulted in an overall response rate of 10.4% and a completion rate of 97.8%. Even though the number of survey completions was over 1,000, the low response rate proved to be another limitation within this study.

Findings

Table 13 contains the mean scores of each of the 19 items in the survey grouped by the subscale categories identified above. The overall means of the four categories
show that the participation of the student in the class is ranked lowest with a mean of 2.59 (0 = Strongly Disagree; 4 = Strongly Agree). The mean score of the student’s skills is 2.93 followed by the emotional attributes and performance measures at 3.22 and 3.45, respectively. Participation ranks lowest among the subscale categories, with the lowest scored item (2.09) being that which asks if the student gets to know other students in the class. Students also ranked having fun in the online communications with their instructors and fellow students low with a mean score of 2.29. Helping fellow students (2.48), engaging in online conversations (2.63), and participating in small-group discussions (2.72) also had relatively low mean scores. The highest mean score (3.34) was associated with the regularity with which the students participated in the discussion fora.

*Table 13: Mean Scores for Each Survey Item*

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Skills Subscale</strong></td>
<td></td>
</tr>
<tr>
<td>I make sure to study on</td>
<td>2.95</td>
</tr>
<tr>
<td>a regular basis</td>
<td></td>
</tr>
<tr>
<td>I stay up on the readings</td>
<td>2.90</td>
</tr>
<tr>
<td>I look over class notes</td>
<td>2.83</td>
</tr>
<tr>
<td>between getting online</td>
<td></td>
</tr>
<tr>
<td>to make sure I understand</td>
<td></td>
</tr>
<tr>
<td>the material</td>
<td></td>
</tr>
<tr>
<td>I am organized</td>
<td>3.21</td>
</tr>
<tr>
<td>I take good notes over</td>
<td>2.45</td>
</tr>
<tr>
<td>readings, PowerPoints,</td>
<td></td>
</tr>
<tr>
<td>and/or video lectures</td>
<td></td>
</tr>
<tr>
<td>I listen/read carefully</td>
<td>3.20</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Emotional Subscale</strong></td>
<td>3.22</td>
</tr>
<tr>
<td>I put forth effort</td>
<td>3.52</td>
</tr>
<tr>
<td>I find ways to make the</td>
<td></td>
</tr>
<tr>
<td>course material relevant</td>
<td>3.06</td>
</tr>
<tr>
<td>to my life</td>
<td></td>
</tr>
<tr>
<td>I apply course materials</td>
<td>3.06</td>
</tr>
<tr>
<td>to my life</td>
<td></td>
</tr>
<tr>
<td>I find ways to make the</td>
<td>3.08</td>
</tr>
<tr>
<td>course interesting to me</td>
<td></td>
</tr>
<tr>
<td>I really desire to learn</td>
<td>3.40</td>
</tr>
<tr>
<td>the material</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Participation Subscale</strong></td>
<td>2.59</td>
</tr>
<tr>
<td>I have fun in online</td>
<td>2.29</td>
</tr>
<tr>
<td>chats, discussions, or</td>
<td></td>
</tr>
<tr>
<td>via email with the</td>
<td></td>
</tr>
<tr>
<td>instructor</td>
<td></td>
</tr>
<tr>
<td>or other students</td>
<td></td>
</tr>
<tr>
<td>I participate actively</td>
<td>2.72</td>
</tr>
<tr>
<td>in small-group discussion</td>
<td></td>
</tr>
<tr>
<td>fora</td>
<td></td>
</tr>
<tr>
<td>I help fellow students</td>
<td>2.48</td>
</tr>
<tr>
<td>I engage in conversations</td>
<td>2.63</td>
</tr>
<tr>
<td>online (chat, discussions,</td>
<td></td>
</tr>
<tr>
<td>email)</td>
<td></td>
</tr>
<tr>
<td>I post in the discussion</td>
<td>3.34</td>
</tr>
<tr>
<td>forum regularly</td>
<td></td>
</tr>
</tbody>
</table>
I get to know other students in the class 2.09  
Performance Subscale 3.38  
I get good grades 3.45  
I do well on the tests/quizzes 3.30

A comparison of means was performed using an Analysis of Variance (ANOVA), which determines the significance, if any exists, among the means of the multiple groups being analyzed. In this instance, the means tested were among the participation groups for the item related to discussion forum participation in the Participation Subscale items from Table 13. The results of the ANOVA revealed that the difference between the groups of participation levels (i.e. Very Low to Very High) were all significant as determined by the $F$-statistic for each survey items. This indicated that at there was a difference among the means of the participation levels for the survey item selected. The Bonferroni Post-Hoc test was performed in order to determine where these differences in means existed.

Table 14 contains the statistically significant mean differences of the participation levels for the discussion forum participation survey item. Every combination of the variables had a statistically significant difference in the means at the 0.01 level. The largest differences in means occurred between those with Very Low or Low participation and those with Very High participation with a mean difference of -0.561 and -0.390 respectively. All these differences were negative, meaning that those with the higher level of participation had higher means than those with the lower participation levels.

However, there were significant mean differences among some of the survey questions for those students who had participation levels at the Expected level or higher. For example, there was a significant mean difference between the students with Very
High participation levels and those students who had the Expected (-0.269) or High levels (-0.209) of participation.

Table 14: Mean Comparison of Discussion Forum Survey Item to Participation Levels

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Mean Difference (I-J)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I post in the discussion forum regularly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Low</td>
<td>Low</td>
<td>-.171</td>
</tr>
<tr>
<td></td>
<td>Expected</td>
<td>-.292</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>-.351</td>
</tr>
<tr>
<td></td>
<td>Very High</td>
<td>-.561</td>
</tr>
<tr>
<td>Low</td>
<td>Expected</td>
<td>-.121</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>-.181</td>
</tr>
<tr>
<td></td>
<td>Very High</td>
<td>-.390</td>
</tr>
<tr>
<td>Expected</td>
<td>Very High</td>
<td>-.269</td>
</tr>
<tr>
<td>High</td>
<td>Very High</td>
<td>-.209</td>
</tr>
</tbody>
</table>

*. The mean difference is significant at the 0.05 level.

Summary

The average scores for the survey items regarding participation were very informative. Overall, students responding to the survey indicated that they posted in the discussion forum on a regular basis, which was expected, but the average score of 3.34 was lower than expected given that discussion forum postings are a requirement within each course. This may indicate that students were fulfilling the discussion forum requirements during one login to the classroom rather than over a period of several days as other students entered their postings. It may also indicate that the forum postings were not really ongoing discussions throughout each week of the course. Another support for this conclusion was that students were more neutral or uncertain as to whether they had fun in the online discussions or actually got to know the other students in their class. There were students, however, indicated that they did participate actively in small-group discussions, helped fellow students, and engaged in online conversations. This may indicate that those students who had higher levels of participation were seeking each other out, which led to the smaller-group interactions and helping each other. For the
students who were doing the minimum amount of work, it may be that they were more
engaged in their personal lives—working full-time, with families, or other responsibilities
or engagements. Students with these other responsibilities may not realize that engaging
more in his or her education may lead to higher success rates.
Chapter Eight

Discussion

Introduction

Numerous studies have shown that students who participate more in the classroom had better outcomes than those students who were not as participatory (Hamane, 2014; Handelsman, Briggs, Sullivan, & Towler, 2005; Morris, Finnegan, & Wu, 2005). This study was developed to address the growing concern about the levels of student participation in the online classroom as they relate to the student’s success and persistence. In addition, this study addressed the perceptions students have of their own participation in the online classroom based on data collected via a survey instrument developed specifically for students participating in online courses.

The sample used in this study consisted of data from the student information (SIS) and learning management systems (LMS) and data collected via a survey administered to a sample of students from the larger dataset. The sample was collected at the course section level and consisted of a total of 433 unique courses, 16,270 unique course sections, 91,061 unique students, and 7.3 million discussion forum postings consisting of 1.3 billion total words. This sample was one of the largest that has been used in the literature regarding classroom participation.

The data analysis performed in this study was done on a large population of student data as it pertained to their participation in the online classroom. Variables representing different levels of discussion forum postings (i.e., primary, secondary, and tertiary), the student’s race, the student’s military status, the number of transfer credits applied to the student’s program, and a sample of students’ perceptions about their
participation in the classroom were used in the analyses. I performed numerous statistical analyses summarizing participation as it related to course outcomes and the student’s proclivity to reenroll in additional courses.

**Findings**

The participation levels of the students within the discussion fora were compared against the other predictor variables. The high-level findings showed that as the number of transfer credits applied increased, so did the percentage of students who had high participation levels. Also, minority students had lower participation rates than non-minority students. As the number of transfer credits applied increased, so did the percentage of students who obtained a grade of 3.01 to 4.00. Also, a lower percentage of civilian students received grades of 3.01 to 4.00 than students in the other military status categories. Finally, more than 11% more nonminority students received grades of 3.01 to 4.00 than those in the minority category. The same trend as the previous comparison of transfer credits applied was seen as the number of transfer credits applied to the student’s program increased, so did the percentage of students who reenrolled within three months. There was also about a 9% difference between students with Very Low participation levels and Very High participation levels when it came to reenrolling, whereby the students who were more participatory reenrolled at higher percentages.

The mean grade points earned by students increased as the level of participation increased. Specifically, students with Very Low participation levels had an average grade of 1.987; students with Low participation levels had a 2.976; students with Expected participation levels had a 3.287; students with High participation levels had a 3.427; and students with a Very High participation level had a 3.577. The overall
average grade for all students was 3.156, and the difference in average grade between each of the participation levels was significant.

A linear regression was performed to address the first research question regarding whether classroom participation were associated with the grade points earned by the students. The regression analysis, which used predictor variables related to classroom participation, student background and previous college experience, had an $r^2$-square of .191. That is, the independent variables in the regression analysis accounted for 19.1% of the variance. Correlations among the independent variables were calculated; however, with such a large sample size every combination of variables was shown to be statistically significant.

The second research question regarding the student’s proclivity to reenroll in another course within three months was addressed by performing a logistic regression to determine the amount of association, if any, the predictor variables representing participation and other student information had on the reenrollment tendencies. The results showed that the number of primary and secondary discussion forum posts along with the number of transfer credits applied to a student’s program were more associated with the student’s proclivity to reenroll within three months.

The final research question addressed the students’ self-perceptions of their participation, as measured by a validated survey. The data that was collected from the survey was analyzed by calculating the means of each of the 19 items within the survey, which were collapsed into four subscales addressing the student’s skills measures, emotional attributes, participation measures, and performance measures. The highest mean score was seen within the performance measures, followed closely by the
emotional attributes, both with means above 3.2 on a 0–4 scale. The skills and participation subscales had the two lowest means, which came in at under 3.0. The mean differences among the survey item related to the student’s participation habits in the discussion forums were then calculated across the actual participation levels to test for significance. There was a high level of significance among the participation levels across this particular survey item.

This study has numerous implications for policy-makers, faculty, and staff members within higher education institutions relating to student participation in the online classroom. Assisting students to be more successful is not just the responsibility of faculty members or student advisers; rather, institutional leadership should endorse a holistic approach to student success and retention through the measurement of student participation. The institution studied was data-rich; nevertheless, the results of this study have implications for all types of institutions that currently have a LMS. The first section below discusses the implications this study has for any institution that has an LMS implemented on its campus. Specifically, how can institutions better utilize the LMS in order to generate meaningful data for decision-makers? The second section then discusses the implications for individual departments within an institution that has an LMS and how they can change policies and/or procedures using data collected from the LMS.

**Implications for Institutions with LMS**

In a 2011 survey by Educause, it was discovered that more than 90% of higher education institutions were using an LMS on their campus (Green, 2011). The amount of usage of the LMS by these institutions remains unclear, however. One thing is for
certain, though: If the LMS infrastructure is in place, then institutions need to assess the appropriateness of the data that is collected as a Key Performance Indicator for student participation. Participation is almost impossible to quantify in the traditional face-to-face environment. Yet with the implementation of an LMS, these institutions now have the opportunity to collect, analyze, and disseminate data on student participation. Even if institutions do not have as much, or any, supplemental data from a SIS like the institution in this study, they still will be able to quantify student participation and possibly adjust institutional policies in order to promote student success and retention. The end result should not be about the amount of data that is collected and analyzed, but how the data will be acted upon to make change within an institution. It comes down to action-richness, not data-richness.

Although the implications discussed below are quite disparate and veer away from addressing the research questions directly, they are important to understand since student success and retention should be addressed with a holistic approach within an institution. It is important to relate the work that is performed within each department back to the strategic goals of an institution.

**LMS utilization by face-to-face faculty.** Faculty members at fully online institutions have no choice when it comes to using the LMS for their courses. However, faculty who teach at traditional institutions, which may offer face-to-face and even hybrid courses, may have the choice of not utilizing the LMS at all. Some traditional institutions may use the LMS only for assignment submissions or as a repository for syllabi and/or course materials, whereas other institutions may use it for all of the above as well as for communicating with the students in their courses. It is the extent to which the faculty
currently uses the LMS and the potential for further integrating the LMS’s functionalities into the courses the faculty teach that will determine how data-rich institutions will become. Academic freedom certainly will play a role in the integration of the LMS, as some faculty members may not want within their courses even though it may be to their advantage to use the LMS as more students may be more likely to participate in discussions surrounding the course content. These student groups are discussed in the ensuing section.

**Student sub-groups impacted by LMS utilization.** Another implication for the traditional institutions is that there may be more students participating in discussions if the LMS were used more often. For example, some students may need time to reflect before they are ready to discuss a topic with their instructors and classmates. If discussions were to occur online over a period of a few days or more, these students may be more likely to participate more, which could lead to better outcomes. A student’s personality type can be a major factor in how they communicate in a class. Introverts prefer to work on their own rather than in groups and see reflection as very important (Burruss & Kaenzig, 1999). With the implementation and full integration of an LMS, student participation may increase as those students who need time to reflect or do not participate in large face-to-face groups may be more likely to participate in the classroom discussions.

**Infrastructure for providing data and analytics.** Human resource needs play a large part in fully implementing an LMS into the curriculum of an institution. For an institution to realize the benefits of an LMS fully, they will need to make sure that staff members with the necessary technical and analytical skills are involved and able to
extract and analyze the data collected within the LMS. Extracting the data from an LMS database is important and requires a certain amount of technical skills. Typically, the staff that is tasked with the maintenance of the LMS, which includes the database management, will be able to provide data to the analysts. The analysts will need to have a firm understanding of the role and function of the LMS along with the knowledge of how to interpret and disseminate the results of the analysis efficiently and effectively.

**Possibilities for multi-institutional collaboration.** Merely collecting, analyzing, and disseminating data on student participation may not be sufficient for particular institutions. Having a way to benchmark themselves against other institutions regarding measures of participation can be an important need. There are consortia of institutions that currently exist in which data is collected, analyzed, and shared as a means of benchmarking with one another. Collecting data through an LMS will create opportunities for institutions to share their data and collaborate with other institutions to establish best practices for collecting, analyzing, and effectively using the data to initiate change. Given the high number of institutions currently using an LMS on their campus, there will be no shortage of institutions willing to work as a collective.

**Implications for Individual Departments within an Institution**

**Implications for course content policy-makers.** Course content administrators within higher education institutions can use the findings from this study to change the content of the courses in order to promote increased discussion forum participation. The findings in this study will enable leadership within institutions to establish new or update existing policies and best practices germane to the online classroom and promoting student participation. Specifically, the number of primary and secondary forum postings
had higher coefficients than all of the predictor variables except for the number of transfer credits applied. This indicates to course content policy makers and course designers that the more individual students with which a student interacted, as indicated by the number of secondary forum posts, the higher their likelihood was of reenrolling in additional courses. These results identify ways in which to increase student participation without major disruptions to the student’s experience in the online classroom.

One of the obvious conclusions to make based on these findings is that institutions offering online courses need to find ways to encourage more of their students to increase their participation in classroom discussion fora. Specifically, institutions need to increase the number of unique individuals that a student replies to in their weekly discussion fora; this may expose students to a greater number of perspectives on the topics being discussed. Another conclusion is that it may be beneficial for fully online institutions to target transfer students to enroll at their institutions. It takes a different type of motivation to complete a degree online than at a traditional institution, and students with previous college experience may be more likely to succeed.

One way to increase participation would be to increase the minimum number of secondary thread entries that a student creates during their course. If those students who had greater amounts of secondary thread entries were shown to have higher success rates and reenroll more frequently, then changing the existing policies potentially could have a meaningful impact on student behavior and, ultimately, on outcomes and retention.

Another way to increase participation levels would be to increase the amount of the overall course grade for which the discussion forum postings account. If institutions were looking to increase participation, then another way to do so potentially would be to
increase the percentage of the grade for which discussion fora account. Students may be more likely to contribute more often to the weekly conversations if the discussion fora were a higher percentage of their grade.

Although faculty participation was not a part of this study and no data were collected to indicate that faculty at the institution studied were not engaged in the classroom, another way to increase student participation would be to increase the amount of faculty involvement or, at least, better equip the faculty to assess the levels of student participation throughout the course. A potential way for institutions to encourage higher levels of participation from their students is by providing real-time data on the student interactions, or lack thereof, to faculty. Having the ability to make informed decisions from the use of data is something that institutions should support and promote to their staff. Expanding the use of data to faculty members would be consistent with institutions that promote a data-driven decision-making philosophy.

Finally, although the data collected from the survey administration indicated that students stated they are posting to the discussion boards on a fairly regular basis (i.e., average score of 3.34 on a 4.0 scale), perhaps faculty members could encourage students to post more throughout the week to keep the students’ participation at high levels. An assumption being made from the results of the survey data is that students are posting to the discussion boards infrequently throughout each week of the course. That is, they may be logging into the classroom to create their primary thread entry for the week, responding to two other classmates at the same time, and then not participating in the discussions until the following week when the new assignments are due. Students should be encouraged or required to login more frequently to read and participate in other
discussions, thereby increasing participation levels. Perhaps having institutions implement higher frequencies of classroom logins for faculty and students would be worthwhile.

**Implications for admission and student advisers.** Whether student advising is a shared function of the admission and student services departments or handled within only one of these departments, the first course would be an ideal time to encourage participation in the classroom and inform students that higher levels of participation have been shown to have a positive impact on grades and retention. This encouragement should then remain consistent throughout the remainder of the student’s program. Although all institutions are unique in their advising practices, encouraging student participation from the onset of the student’s first course is vital. Establishing good habits from the start should help the students in being successful.

Educating the students about participation and getting them into the habit of participating in classroom discussions on a regular basis will be beneficial to both students and their institution. A way to help offset the amount of work that would be involved from the admission and student services departments would be to identify highly participatory and successful students and prompt them to try and engage those students who are not as involved. This peer-level approach, to what essentially can be referred to as mentoring, is something that has been shown to be effective and potentially less intimidating than mentoring from a faculty member (Inzer & Crawford, 2005).

Another area of concern identified in this study that institutions will need to address is the differences in participation, success, and retention of nonmilitary students. That is, civilian students were shown to have lower participation levels in their courses
than their military counterparts. Open-enrollment institutions may want to consider how they might attract a higher-quality civilian student population by modifying admission practices. Another option would be to create special programs developed to help students succeed who are identified as being less prepared for college. Either option could have major impacts on the admission office as well as other departments within the institution, but the outcomes could be beneficial as the quality of student attending the institutions would be higher.

Updates to existing policies and best practices in admissions and student services could be coordinated to incorporate the emphasis on the amount of participation a student should have throughout his or her courses. Implementing the types of changes mentioned above in the admission and student services departments will require access to real-time data relating to the students’ participation and preparedness levels for monitoring purposes.

**Implications for institutional researchers.** It is not an easy task to keep every department within the institution informed on how their areas are doing as it relates to the student’s experience. Essentially, the role of an institutional research office is to collect and disseminate data to key stakeholders throughout the institution on an as-needed basis for decision-making purposes. The reliance on the institutional research office for accurate and consistent data is likely to increase as institutions increase the amount of electronic data they collect. Therefore, if student participation is going to be addressed at institutions offering online courses, the institutional research offices will have to be highly engaged with other departments so that proper and thorough data analysis is performed. This will entail the continued analysis of student participation data and
keeping everyone across the institution informed on trends and behaviors as changes are made. This will result in a shift in the work that institutional research offices are currently doing; they are moving from a collect-and-disseminate model to a model of collecting, analyzing, informing and educating. If institutions aspire to be data-driven, they will need to rely more on engaging the institutional research office with regard to major, ongoing projects. The institutional research office also will need to focus its current responsibilities to perform thorough data analysis and collaborate more with key stakeholders from other departments.

**Implications for online learning.** There needs to be a better understanding of student participation as it pertains to fully online institutions. The National Survey of Student Engagement (NSSE) has been around since 2000 and tracks the amount of time and effort students put into their studies and how an institution deploys its resources and organizes the curriculum to promote student engagement (National Survey of Student Engagement, 2014). Unfortunately though, this survey is primarily meant for traditional brick-and-mortar institutions. For fully online institutions that have participated in the NSSE, there can be a lot of very informative data from its students. However, because online and in-classroom instruction is so different, some of the questions are irrelevant for students at the online institutions. Hence, the creation of a NSSE-like instrument for online schools would be a meaningful contribution to better understanding student participation and institutional contributions promoting student participation.

**Implications for military outreach.** Approximately 325,000 active-duty military personnel enrolled in college courses in 2011 (NASPA Research and Policy Institute, 2013). Military veterans also make up a large population of college-going
students, with more than one million veterans and their families taking advantage of the Post 9/11 GI Bill to attend college (National Conference of State Legislatures, 2014). Add to that the tens of thousands of personnel in the National Guard and Reserves and the entire military and military-related population is quite substantial. Based on the outcomes of this study, institutions that have a military-outreach program may want to increase their efforts, as doing so could have positive benefits for enrollments and the number of quality students that institutions enroll and educate.

Future Research

This study addressed an important topic and utilized an extremely large sample of students. Naturally, numerous gaps exist in this study along with other research performed on student participation in the online classroom. One of the biggest areas identified in this study to be addressed in future research was faculty participation in the online classroom discussion fora. Students cannot be expected to learn and succeed in their courses without input and guidance from their faculty members, especially at the undergraduate level. Therefore, it could be beneficial to explore the relationships between faculty and student participation in the discussion fora. In addition, there is a tremendous amount of data available pertaining to discussion forum postings by faculty members, and the potential outcomes from an analysis of faculty participation could have implications for the faculty recruiting and training departments.

A major limitation of this study was related to the actual content of the discussion forum postings by the students in the sample. Specifically, no analysis was performed during the data-preparation phase to remove forum posts that did not pertain to the actual content of the course assignment. For example, students may have personal
conversations with each other within a given topic or merely have short responses such as “good job” or “I agree,” which have no direct meaning to the topic being discussed. An area of future research, then, would be to perform text analytics on the content of the discussion forum postings to see what extent of the postings stay on topic vis-à-vis the weekly assignments.

The analysis on student retention was very superficial in this study, looking only at reenrollment patterns within three months of starting a course. To understand retention patterns better, this analysis will need to expand to include additional timeframes and other factors that may have an impact on the proclivity for a student to reenroll. The availability of data from the National Student Clearinghouse (NSC) allows institutions to get a better understanding of the extent to which students attend other institutions prior to and after attending their institution. The data from the NSC will enable institutions to understand better “swirling” patterns by students who attend their institution and the extent of classroom participation of students who leave their institutions.

One of the implications mentioned above was related to a NSSE-type survey for online institutions. Implementing such a survey will not be a simple task. Until such time that an online version of the NSSE is constructed, though, APUS will continue to use the NSSE as it exists currently. That being said, another area of future research would be to analyze the data collected via the NSSE more closely to see if students who responded to the survey stayed at the institution, chose to go elsewhere to continue their education, or did not continue their education at all.

The amount of data that is available from the LMS can be quite extensive. The objective of this study was to look just at the actual content of the discussion forum
postings as they related to success and retention. It may be beneficial to institutions to look at the frequency with which students post to the discussion boards to see if any patterns exist for those students who are more highly engaged. In addition, data also could be analyzed to see how quickly faculty members are responding to students in the discussion boards.

Although a lot of research already has been performed on the Community of Inquiry, a survey instrument that numerous online institutions use as their end-of-course survey, the data collected from this survey instrument could be integrated with the data from the LMS as another way to triangulate data better as it relates to student participation.

All of the data identified in the future analyses suggested above can be used in the ongoing student participation analyses recommended in this study. There is a lot of variance that has not been accounted for in the regression analysis performed in this study; having the additional data to include in the models would be worthwhile and possibly extremely informative.

Summary

It is no secret that students with higher participation levels in the online classroom earn higher grades than those who are not participating as much. This study was developed to look specifically at student participation levels in the online classroom, as measured by discussion forum postings, and other variables related to the student’s background and previous college experience. The goal was to determine any of these variables had any association with course outcomes and retention. In addition, data were
collected that addressed students’ perceptions about his or her own participation both inside and outside the classroom.

As mentioned, there are numerous implications that this study has for institutions that have an LMS on their campus. As the amount of data from the LMSs increases on campuses, implications for these institutions will continue to increase as well, perhaps encompassing accreditation, diversity and equity initiatives, and even NCAA regulations. In fact, the level of engagement in online postsecondary institutions will even have an impact on the K–12 sector of education. Institutions need to start investing now in order to be ready to handle the vast amounts of data that potentially will be collected on their campuses.

Data-driven institutions need to be able to establish data-analysis models that can measure participation related to success and retention that ultimately will inform decision makers at the institution. In addition, from a policy perspective, higher education institutions with online classrooms should consider increasing the number of secondary threads required each week during a course. Increasing the number of secondary threads not only will increase participation, but it will increase the number of students with which other students interact, which was an area that had low scores on the survey. The combination of these two changes may have a positive effect on course outcomes, given that higher grades were shown to be related to increased participation levels in this study.
Appendices

Appendix A

Permission from survey author to use survey:

From: Marcia Dixson <dixson@ipfw.edu>
Date: Sun, Aug 24, 2014 at 5:27 PM
Subject: Re: Online Student Engagement Survey (OSES)
To: Dave Becher <becherd@gse.upenn.edu>

Dave:

You are welcome to use the OSES - let me know how it goes :)

Marcia D. Dixson, PhD
Associate Professor and Chair
Department of Communication
IPFW
dixson@ipfw.edu
(260) 481-6558

Sent from my iPhone

On Aug 24, 2014, at 11:22 AM, "Dave Becher" <becherd@gse.upenn.edu> wrote:

Dear Dr. Dixson,

My name is Dave Becher and I'm a doctoral student in the Executive Doctorate in Higher Education Management program at the University of Pennsylvania. I'm reaching out to you today to ask for your permission to use your OSES for my dissertation. I am studying the level of student engagement at a fully online institution of higher education. Specifically, I will be surveying students who have taken courses at the institution and triangulating the results with quantitative data extracted from the institution's student information system and learning management system along with the results of my literature review.

If granted permission, I will give the appropriate credit throughout the dissertation, where applicable.

Please let me know if there are any other terms that must be followed.
Thanks in advance.

Dave Becher
University of Pennsylvania
Graduate School of Education
Exec Doc in Higher Education Management
Appendix B

Survey Administered in Study

Student Engagement Survey

Consent to Participate

Please review the information below to give your informed consent to participate in this study:

You have been invited to participate in a research study about online classroom engagement. This research study is being conducted by Dave Becher and has been approved by the Institutional Review Board (IRB) of the University of Pennsylvania and American Public University System. The information you provide will contribute to a better understanding of engagement in the online classroom. Please review the following:

- There are no known risks if you decide to participate in this research study.
- There are no costs to you for participating in this study.
- The questionnaire will take approximately 5 minutes to complete.
- The data collected may not benefit you directly, but the information learned in this study should provide more general benefits.
- This survey is being conducted online and no one will be able to identify you or your answers and no one will know whether or not you participated in the study.
- Individuals from the IRB may inspect these records. Should the data be published, no individual information will be disclosed.
- Your participation in this study is voluntary. Submission of your survey responses indicates your consent to participate in this study. Please be assured that your responses will be held in the strictest confidence and data collected in this study will be reported at the aggregate.

If you have any questions about this study, please contact me at: dbecher@apus.edu and/or becherd@gse.upenn.edu

Date of IRB Approval: October 9, 2014
IRB Number: 821082 (University of Pennsylvania)

1) Do you wish to continue with the survey?*
   ( ) I have read the information above, give my informed consent, and wish to participate in this survey.

   ( ) I do not wish to participate in this survey.
Classroom Engagement Questions

Thank you for your consent. The following questions will ask you to consider your overall engagement in your courses at American Public University System (AMU or APU). Please consider each question and respond as accurately as possible based on the extent to which the items are characteristic of you.

2) For each of the following items please select the level of agreement most appropriate for you as it pertains to your engagement in the online classroom.*

<table>
<thead>
<tr>
<th>Item</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tbody>
<tr>
<td>I put forth effort.</td>
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<td>I get good grades.</td>
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<td>I listen/read carefully.</td>
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<td>I stay up on the readings.</td>
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<td>I get to know other students in the class.</td>
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<td>I take good notes over readings, PowerPoints, and/or video lectures.</td>
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<td>I help fellow students.</td>
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<td>I do well on the tests/quizzes.</td>
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<td>I participate actively in small-group discussion fora.</td>
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<td>I look over class notes between getting online to make sure I understand the material.</td>
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<td>I find ways to make the course material relevant to my life.</td>
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<td>I really desire to learn the material.</td>
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<td>I engage in conversations online (chat, discussions, email).</td>
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<td>I find ways to make the course interesting to me.</td>
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<td>I apply course</td>
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<td>materials to my life.</td>
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<td>I make sure to study on a regular basis.</td>
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<td>I have fun in online chats, discussions, or via email with the instructor or other students.</td>
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<td>I am organized.</td>
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<tr>
<td>I post in the discussion forum regularly.</td>
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**Technology**

3) *When you are taking a course, do you use any type of reminder system or application to remind you to log in to your classroom for any reason (e.g., assignment submission, forum participation, etc.)*?

( ) Yes

( ) No

4) *Which reminder system or application do you use? (Please check all that apply.)*

[ ] Astrid

[ ] Any.Do
[ ] Todoist
[ ] Toodledo
[ ] Wunderlist
[ ] Remember the Milk
[ ] Workflowy
[ ] Other: __________________________________________

Thank You!

Thank you for your time.

If you have any questions about my research, please contact me at dbecher@apus.edu or becherd@gse.upenn.edu
Appendix C

Sample Survey Request Email to Student

Hi «First_Name»,

My name is Dave Becher, and I am the Associate Vice President of Institutional Research at American Public University System (APUS), which comprises American Military University (AMU) and American Public University (APU). I am currently pursuing my doctorate in Higher Education Management at the University of Pennsylvania and for my dissertation I am researching classroom engagement in an online environment. As part of this research process, I am asking for your help by completing a short survey on your level of engagement within your classes at AMU/APU.

The Institutional Review Boards at the University of Pennsylvania and APUS have approved this study and its procedures. The study involves no foreseeable risks or harm to you as well as no academic benefits to you.

The results of the survey will not only help with my dissertation, but it could also help me as an Institutional Researcher at APUS in proposing potential improvements to the online classroom environment. The results will be kept confidential and will be reported in the aggregate. All data that is collected will be stored in a secure location and destroyed in three years.

Completing this survey is completely voluntary and should take no longer than five minutes. The submission of the completed survey implies consent for participation in this study.

If you have any questions or concerns, I encourage you to contact me via email at becherd@gse.upenn.edu or dbecher@apus.edu or by phone at 304-724-3762.

Please click here to complete the survey.

Thank you in advance for your participation.

Dave Becher

| Student, Executive Doctorate, Higher Education Management | University of Pennsylvania |

| Associate Vice President, Institutional Research | American Public University System |
References


