Student Participation and Grade Performance in an Undergraduate Online Environment

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Abstract

This study explored learning and teaching of online classes. Examining the relationship between undergraduate students’ participation and their final grades in five selected courses in an online learning environment and exploring differences between the demographics characteristics of age, race, and gender to students’ participation and grade performance were the important focus of the study. The population of this study was undergraduate students enrolled at Colorado State University-Global Campus (CSU-GC) in the years 2010 and 2011. This study took a quantitative approach. Statistical analyses used were Spearman Rho correlation, Kruskal-Wallis tests and Mann-Whitney U tests. Students who posted more messages on the discussion forums tended to have higher course grades. The more a student accessed the discussion board over the eight weeks of the course the higher the final grade. Age was positively correlated with total number of messages posted and total access. There was a positive correlation between age and grade. There were no significant differences among the three race groups, White, Black or African American, and Asian on total number of messages posted, total access, and on grade performance. There was a significant difference in the mean ranks of males and females on total number of messages posted. Female students had a little higher mean ranks than males on Total Access. There were no statistically differences in mean of males and females with respect to final grades. Significant differences were found among the five core courses on total number of messages posted and on total access. Yet, there was no significant difference between the five core courses on grade performance. This study would benefit online institutions, instructors, decision makers at all levels of higher education, and students.

Keywords: Online Learning, Online Student Participation, Grade Performance, Undergraduate
ملخص البحث

في هذه الدراسة تم استكشاف عملية التعليم والتعلم عبر فصول الإنترنت، وذلك عن طريق دراسة العلاقة بين مشاركة طلاب المرحلة الجامعية ودرجاتهم النهائية في خمس مقررات دراسية مختارة في بيئة التعلم عبر الإنترنت، وركزت هذه الدراسة على استكشاف الفروق بين الخصائص الديموغرافية والتي تشمل العمر، العرق، و الجنس و مشاركة الطلاب وأدائهم التحصيلي. شملت عينة هذه الدراسة طلاب المرحلة الجامعية المسجلين في جامعة ولاية كولورادو- الحرم الجامعي العالمي في عامي 2010 و 2011. اعتمدت هذه الدراسة المنهجي الکمي. و تم استخدام معايير ارتباط سبيرمان، اختبارات كروسكال واليس و اختبارات مان ويتني في عملية التحليل الاحصائي. يميل الطلاب الذين ينشرون المزيد من الرسائل في منتديات النقاش للحصول على درجات أعلى في هذه المقررات التعليمية. كلما زاد دخول الطالب على لوحة النقاش عبر الإنترنت على مدى الثمانية أسابيع للمقرر الدراسي كلما ارتفعت درجاتنه النهائية لهذا المقرر. وقد وجدت الدراسة أن هناك ارتباط إيجابي بين العمر و كلا من المجموع الكلي للعدد الرسائل المنشورة و مجموع عدد مرات الدخول على المقرر الدراسي عبر الإنترنت. كما ارتبط العمر إيجابياً بالأداء التحصيلي. لم تكن هناك اختلافات كبيرة بين الثلاثة المجموعات الديموغرافية، البيض، الأمريكيين من أصل أفريقي، و الآسيويين في العدد الإجمالي للرسائل المنشورة، عدد مرات الدخول على المقرر الدراسي عبر الإنترنت، أو في الأداء التعليمي. بينما كان هناك اختلاف في متوسط العدد الإجمالي للرسائل المنشورة بين صفوف الذكور والإناث. متوسط عدد مرات الدخول على المقرر الدراسي عبر الإنترنت في صفوف الإناث أعلى قليلاً من الذكور. ولم يكن هناك اختلافات كبيرة في متوسط الدرجات النهائية بين الذكور والإناث. وقد وجدت اختلافات كبيرة عبر الجنس مقررات الأساس في المجموعة الكلي للعدد الرسائل المنشورة و مجموع عدد مرات الدخول على المقرر الدراسي عبر الإنترنت. ومع ذلك لم تكن هناك أي اختلافات كبيرة في الأداء التعليمي بين الجنس مقررات الأساس. ستفيد هذه الدراسة المؤسسات التعليمية عبر الإنترنت، المعلمين، صناع القرار في جميع مستويات التعليم العالي، والطلبة.

كلمات البحث: التعليم عبر الإنترنت، مشاركة الطلاب عبر الإنترنت، أداء رائع، طلاب المرحلة الجامعية.
Introduction

e-Learning is the most recent evolution of distance learning that creates, fosters, delivers, and facilitates learning, anytime and anywhere, with the use of interactive network technologies. (Chai & Poh, 2009, p. 237)

Technology is evolving rapidly, becoming a more flexible and interactive part of the classroom. Specifically, there is more utilization of learning management systems (LMS) in institutions of higher education. As many researchers and learners believe the Internet is essential technology for distance learning, e-learning through technology can be seen as one of the valuable tools for teaching and learning. To deliver distance education through the Internet, ample attention and research to examine the factors that affect learning outcomes of students enrolled in courses are essential (Moore & Kearsley, 1996). Instructors and students play equally important roles in achieving the primary goal “to teach and to learn”, especially in this technology driven era. hooks (2003) asserted “educators who challenge themselves to teach beyond the classroom setting, to move into the world of sharing knowledge, learn a diversity of styles to convey information” (p. 43). “A challenge for. . .instructors of online management courses is to be able to achieve a level of student participation that supports a learning environment where students play a central role” (Bento, Brownstein, Kemery, & Zacur, 2005, p. 79). Thus, students should take hold of the opportunities and access offered via online courses by higher educational institutions in embracing their interests in pursuing education.

National studies suggest that the number of institutions offering distance education courses is increasing (National Center for Education Statistics [NCES], 2011). In 2007-2008, approximately 20% of the 4.3 million undergraduate students in the United States took at least one distance education course and approximately 4% of all undergraduates took an entire program through distance education (NCES, 2011). The Institute of Education Sciences (IES) from the NCES (2011) reported data on the academic year 2007-2008, from which 61% of 2-year and 4-year United States institutions offered online courses. Thirty-one percent of these institutions offered courses using synchronous Internet-based technologies, known as online courses. An estimated 12.2 million students were recorded in college-level, credit-granting distance or online education courses in the same year.
In relation, the increasing demand for online courses based on the growing population of online students can be seen in many higher education institutions such as Colorado State University-Global Campus (CSU-GC), a new institution offering online education. The students’ enrollment in the academic year 2010 saw an increase of 148 students, a 14.6% increase from previous year. These numbers were projected to increase to 2,620 online students or enrollments in the year 2011 (Takeda-Tinker, 2011). This has initiated interest in academia specifically in pedagogy as it applies to the online environment. It is critical for researchers to have a clear understanding of what online education offers students. Further, as many higher education institutions employ distance education as one of the instructional delivery methods, it is imperative to explore e-learning and how students engage in online courses. Bento and Schuster (2003) affirmed:

With the increasing popularity of student-centered. . .education, student participation in class discussions is being considered not just something “nice to have”, but an essential part of the teaching and learning process. As we move from traditional to virtual classrooms, the challenge of understanding and nurturing such participation becomes even greater. (p. 156)

In particular, there is widespread consensus that participation in online asynchronous discussions can improve student learning (Palmer, Holt, & Bray, 2008). As significant work has been done characterizing and theorizing the nature of student communications in online discussions, there is a need to investigate the impact of participation in online discussions on student course performance (Hara, Bonk, & Angeli, 2000; Palmer et al., 2008). With the assumption that student participation might influence final course grade, it is arguable that the nature of student participation has an impact on student learning (Coldwell, Craig, Paterson, & Mustard, 2008). It does not necessarily follow that students with higher grades have mastered the learning process and vice versa.

Such an investigation requires tracking students’ online class activities and examining correlations with final course grades. By tracking students’ online activities, Wang and Newlin (2002) found the activities provide early indicators of student performance in virtual classrooms. Moreover, their research shows that discussion forum activity had a direct relationship with final grades as the total number of forum postings read and written by students was predictive of their final grades (Wang & Newlin, 2002). In view of that, one of the main attributes in online learning that cultivates interaction is the discussion forum (Bento et al., 2005). Wang, Newlin, and Tucker (2001) conducted a discourse analysis (DA) of a 16-week web-based psychology course and discovered the
total number and frequency of students’ postings and comments in the forum discussions correlated with the final grades.

While researchers use a variety of variables to represent student performance such as demonstration of learning outcomes, grade point average (GPA), graduation rate, and employment placement, this study use final course grade to represent achievement. According to Pascarella and Terenzini (2005), final grade performance has been used frequently to describe academic success, or has attracted most attention compared to these other measures, and is the most readily available variable. Hence, final course grades are used as the dependent variable in this study.

Findings from a meta-analysis of 232 studies of the comparative distance education literature between 1985 and 2002 led by Bernard et al. (2004) ascertained that “many applications of distance education outperformed their classroom counterparts” (p. 379). Thus, as more students are enrolling in online courses and with many higher education institutions expanding their realm of influence to greater numbers of students, a better understanding of online learning environments becomes more relevant.

Purpose of the Study

The purpose of the current study was to examine the relationship between undergraduate students’ participation and their final grades in selected courses in an online learning environment and to explore demographic relationships to students’ participation. This study utilizes the learning management system of eight-week courses in Colorado State University-Global Campus (CSU-GC). Total number of discussion board posts and total log-ins to the LMS will measure participation, as these have been found in past studies to facilitate participation and interaction among students and instructors.

Research Questions

1. What is the association between student participation and grade performance?
   (a) Is there an association between total number of messages posted and grade performance?
   (b) Is there an association between *total access and grade performance?

   * Total access refers to the total number of times the forums/files (unique views of discussion threads) were visited over the eight-week of the course.

2. Is there an association between age and: (a) total number of messages posted; (b) total access;
3. Is there a difference between race and: (a) total number of messages posted; (b) total access; and (c) grade performance.

4. Is there a difference between gender and: (a) total number of messages posted; (b) total access; and (c) grade performance.

5. Is there a difference between courses and: (a) total number of messages posted; (b) total access; and (c) grade performance.

Methodological Approach

This study took a quantitative, non-experimental approach to the collection and analysis of data. A non-experimental approach allows the examination of relationships between independent variables (IV) and dependent variable (DV), in which the researcher does not manipulate or control the independent variable (Morgan, Gliner, & Leech, 2009).

The study employed an associational research design (association questions) and between-groups or within subjects design (difference questions). The nature of the research questions in this study requires employing correlational analysis such as Spearman correlations, a nonparametric equivalent of the Pearson correlation coefficient (when assumptions are markedly violated). The between-groups subjects design requires Kruskal-Wallis tests (assumption of equal variances is violated) and Mann-Whitney U Tests. Secondary data sets were utilized to conduct this research.

Population and Sampling

The population of this study was all undergraduate students enrolled at CSU-GC in the Fall 2010 and Spring 2011 semesters. Specifically, it was determined that the most appropriate population for this study would include all undergraduate students enrolled in one or more of the five required courses. These five courses were selected because they are the core courses and prerequisites for other coursework for all undergraduates at CSU-GC. The five courses are Effective Communication: Research and Writing (COM300); Dimensions of Ethical Leadership (HUM300); Principles and Practices of Effective Leadership (ORG405); Working in Modern Society (SOC300); and Technology and Tools for the Global Information Age (SOC305).

The sample consisted of 822 unique students enrolled in either one or more of the five courses. A total of 450 males (47.6%) and 496 females (52.4%) comprised the sample. Student racial
identities represented in this sample were: White, 76.4%; African American, 3.6%; Asian, 1.8%; two or more races 1.5%; Native American or Alaska Native, 0.7%; and Native Hawaiian or Other Pacific Islander, 0.4%.

Results

Research Question 1: Participation and Performance

Spearman rho statistic was computed to analyze if there was a statistically significant association between total number of messages posted and grade performance. Spearman rho statistic showed \( r_s(1,027) = .35, p = .001 \). The direction of the correlation was positive. In this case, the correlation is .30, so, using Cohen’s guidelines, the effect size is medium or typical (1988). A positive correlation means that the more a student accessed the discussion board over the eight weeks of the course the higher the final grade.

Both variables, total access (2.44) and grades (-1.54) were skewed which violated the assumption of normality. Thus, Spearman rho statistic showed \( r_s(1,027) = .35, p = .001 \). The direction of the correlation was positive; the correlation is .30. A positive correlation means that the more a student accessed the discussion board over the eight weeks of the course the higher the final grade. The coefficient of determination was \( r^2 = .09 \), which indicates that approximately 9% of the variance of students’ final grade can be predicted from total access or number of times the forums/files (unique views of discussion threads) were visited over the eight-week course.

Research Question 2: Age, Participation, and Performance

As the variables were not normally distributed and the assumption of linearity was markedly violated, Spearman rho statistic was computed to examine the inter correlations of the variables. Age was positively correlated with total number of messages posted, \( r_s(1,011) = .27, p = .001 \) and total access \( r_s(1,011) = .27, p = .001 \); these are small effect sizes according to Cohen (1988) guidelines. As age increases the total number of messages posted and total access will increase. Thus, the directions of these correlations were positive.

The positive correlation between age and grade was \( r_s(1,011) = .15, p = .001 \), indicating that increasing the age by 1%, the grade will increase by .15%. The strongest positive correlation, which has a much larger than typical effect size or correlations, was between the total number of messages posted and total access, \( r_s(1,011) = .78, p < .001 \). Students who had relatively higher number of messages posted were very likely to have higher access in the discussion board.
Research Question 3: Race, Participation, and Performance

The nonparametric Kruskal-Wallis (K-W) analysis of variance test was computed for this RQ. There were no significant differences among the three race groups on total number of messages posted, $X^2 (2, 842) = 2.09, p = .351$; on total access, $X^2 (2, 842) = 1.57, p = .455$; and on grade performance, $X^2 (2, 842) = 3.50, p = .174$.

The mean rank of students who identified as White (424.70, $n = 786$) had higher messages posted than students who are Black or African American (371.85, $n = 37$). Also, the White students (423.99, $n = 786$) had higher total access than of students who identified as Black or African American (373.04, $n = 37$). Asian students had higher total number of messages posted (385.61, $n = 19$) and total access (413.00, $n = 19$) than Black or African American, (371.85, $n = 37$) and (373.04, $n = 37$) respectively. However, the Black or African American students had higher grade performance (389.23, $n = 37$) than Asian students (336.58, $n = 19$). For grade performance, White students had higher mean rank (425.07, $n = 786$) than that of Asian students (336.58, $n = 19$). Overall, the White students had higher mean ranks on total number of messages posted, total access, and grade performance compared to Black or African American and Asian students. Because the overall test was not significant, pairwise comparisons among the three race groups were not completed.

Research Question 4: Gender, Participation, and Performance

Mann-Whitney (M-W) $U$ tests were performed to compare gender because the dependent variables were non-normally distributed, skewed, and other assumptions of the $t$ test were violated. The result indicated a significant difference in the mean ranks of males (437.84) and females (505.85) on total number of messages posted, $U = 95552, p = .001, r = .12$, which according to Cohen (1988) is a small effect size. Also, the 496 female students had a little higher mean ranks (493.37) than the 450 males (451.59) on Total Access, $U = 101742.5, p = .019, r = -.076$, indicating there was evidence of a significant difference between males and females on total access, with a very small or smaller than typical effect size. In brief, females posted more messages and access more than males throughout the eight weeks of the courses. However, male and female students did not differ on grade performance. Mean ranks were 485.37 and 462.73, respectively, $U = 106257, p = .180, r = -.044$.

Research Question 5: Courses, Participation, and Performances

The highest mean rank on total number of messages posted was COM300, 559.37, indicating...
this course had the highest number of posted messages. The lowest mean rank was SOC305, 435.09, meaning students posted fewer messages in this course. Likewise, SOC305 had a mean rank of 224.30 in total access, indicating this course had the least number of accesses of course content throughout the eight-weeks of course. However, the highest mean rank total access was SOC300 (403.42). This course had the highest number of students viewed the files. Even though there was no significant difference found between courses and grade performance, ORG405 had the highest mean rank, 572.09, indicating students enrolled in this course had the most higher number of scores compared to other courses. However, students who took COM300 (496.56) had less number of scores compared to other four courses.

A nonparametric analysis, Kruskal-Wallis (K-W) test was run to examine if there were differences between the five courses on total number of messages posted, total access, and grade performance. This test revealed that statistically significant differences were found among the five courses on total number of messages posted, \(X^2 (2, 1029) = 96.76, p = .001;\) and on total access, \(X^2 (2, 1029) = 104.23, p = .001.\) However, there was no significant difference on grade performance, \(X^2 (2, 1029) = 4.05, p = .399.\)

Post hoc Mann-Whitney \(U\) tests compared the five courses on total number of messages posted and total access. The SOC300 (401.02) had significantly higher mean rank than HUM300 (265.33) on the total number of messages posted, \(U = 23027, p = .01, r = -.36.\) Likewise, there was a significant difference in the mean ranks of SOC300 (397.15) and HUM300 (267.13) on total access, \(U = 23784, p = .01, r = -.34.\) However, there were no significant differences found on total number of message posted between COM300 (179.27) and ORG405 (158.22), \(U = 5271.5, p = .230, r = -.06;\) HUM300 (240.04) and SOC305 (243.72), \(U = 12407, p = .85, r = -.01;\) HUM300 (226.26) and ORG405 (265.30), \(U = 6619.5, p = .08, r = -.08;\) and SOC305 (46.68) and ORG405 (53.95), \(U = 971, p = .22, r = -.12.\)

There was a significant difference in the mean ranks on total access between SOC300 (144.28) and SOC305 (76.94), \(U = 2786.5, p = .01, r = -.39,\) which is a medium effect size. COM300 (242.05) and SOC300 (278.43) also had a significant difference in the mean ranks on total access, \(U = 26474.5, p = .007, r = -.12,\) which is small or smaller than typical effect size. Similarly, COM300 (195.42) and SOC305 (149.03) had a significant difference in the mean ranks on total number of messages posted, \(U = 7112, p = .002, r = -.16,\) which is considered a small or smaller than typical effect size. However, there were no significant differences found on total access between HUM300
(240.04) and SOC305 (243.72), $U = 12407, p = .17, r = -.06$; HUM300 (232.17) and ORG405 (199.96), $U = 6857.5, p = .15, r = -.07$; and SOC305 (50.16) and ORG405 (48.49), $U = 1100.5, p = .77, r = -.03$. Thus, it is obvious that HUM300 and SOC305; HUM300 and ORG405; and SOC305 and ORG405 had no significant differences in the mean ranks on either total number of messages posted or total access.
Summary and Discussion of Findings

Participation and Performance

The findings were divided into two sub-sections based on the two student participation indicators, total number of messages posted and total access that were examined as associated with final grade performance. The results showed there were significant relationships between total numbers of messages posted and grade performance with a medium or typical effect size or correlation. This finding was in line with a study by Coldwell, Craig, Paterson, & Mustard (2008) which suggested students who participated more frequently in discussion forums were earned significantly higher grades. However, this result was in contrast with a study by Davies and Graff (2005) who found students who interacted more actively in the ‘blackboard’ access did not achieve higher grades. Davies and Graff (2005) did associate students who interact the least in online discussions earned failing course grades. Findings by Weisskirch and Milburn (2003) were consistent with Davies and Graff’s outcomes and revealed that tutor directed postings were associated with higher course grades when compared to postings made from peer to peer. Weisskirch and Milburn’s study showed that the amount of interaction in discussion board is not necessarily a factor in achieving a higher grade; however, whether postings were made based on a voluntarily or compulsory basis is important.

In agreement with the current study Webb, Jones, Barker, and van Schaik (2004) and Wang and Newlin (2002) discovered significant correlations between the accesses and postings with grades. In brief, students who had higher numbers of postings and higher total access numbers earned higher final grades in their study. This association was found statistically significant with a medium or typical effect size.

Age, Participation, and Performance

The findings of this study showed positive correlations between age and participation with a medium or typical effect size, and a significant correlation between age and grade performance with a small effect size. Older students have a tendency to achieve higher grades when compared to younger students. Alstete and Beutell (2004) and Carbanaro, Dawber, and Arav (2003) supported the notion that age has a positive relationship with grade. They found that older students initiated discussion board threads and outperformed their younger counterparts as they gained more experience in the online environment. They emphasized age and experience factors to enhance performance in online learning. Hoskins and van Hoof (2005) reported the number of messages posted and total access in bulletin boards increased with students’ ages; and online bulletin board usage by students influenced
achievement. These results were in contrast to findings by Palmer, Holt, and Bray (2008) who found that age was not significantly correlated with levels of participation. Other studies also showed students’ age generally has not been associated with learning outcomes in online learning education (Anstine & Skidmore, 2005; Arbaugh, 2005; Hwang & Arbaugh, 2006; Webb, Gill, & Poe, 2005).

In the current study, correlation results indicated students’ ages and participation variables are positively and significantly related to final grades in online courses. This suggests as students ages increase, they are more likely to use the discussion forums and they are more likely to achieve better grades in online learning courses.

**Race, Participation, and Performance**

Because demographic data were available, analyses were conducted to determine if there was a significant association between race, participation, and grade. The findings showed a significant difference between students of different races on grade performance with the most significant difference on mean grade performance between White and Asian students. White students outperformed Asian students in grades and participation in discussion boards. These findings are consistent with Palmer et al. (2008) who report Western students received better academic results than Asian students in OLL courses. Palmer et al. (2008) postulate possible reasons for these findings such as Asian students may face language barriers in accessing online content and may be less confident in using web-based learning applications. Similarly, according to Lanham and Zhou (2003), students of Western cultures accepted online learning opportunities more readily when compared to Asian students.

When comparing White students with African American students and African American students with Asians in grade performance, no significant differences were found. These results are mixed in agreement with Angiello (2002) who reported White students have a 16% higher success rate compared to other races in online courses. White students were more likely to earn higher course grades compared to Asian and African American students in online learning environments. While the current study supports Angiello’s (2002) findings regarding comparisons of White students to Asian students, it is contrast to the findings that White students outperform African American students. Regarding online participation, the current study also found that White, African American, and Asian students equally participated and accessed the discussion forums.

**Gender, Participation, and Performance**

Gender was analyzed in relationship to participation and final course grade. Although females
were more likely to have higher numbers of messages posted and total access when compared to males, there was no significant difference in final course grade performance. This finding is in contrast to Hoskins and van Hooff (2005) and Fink (2007) who found males to be more actively engaged in OLL discussions in comparison to females, and concluded both age and gender play a key role in the degree of participation on bulletin boards, but in the opposite direction than the current study’s findings. The current study’s findings are consistent with Price (2006) and Coldwell et al. (2008) reported female students were more actively engaged in OLL discussions and outperformed their male counterparts in online courses. Similarly, Arbaugh (2000) investigated the participation patterns by gender and identified that women had consistently higher participation patterns than men.

Similarly, Young and McSporran (2001) found that females averaged consistently more posting messages and viewing files in bulletin boards than males. Their study also revealed that women outperformed men in assignment grades but not in the final exam; men scored better on average than women in final exam.

There were gender differences in online learning in terms of participation and contribution on course bulletin board; also women read and posted more messages than males (Gunn, McSporran, Macleod, & French, 2003). Several studies showed that women perform better than men in technology-assisted courses and have positive attitudes toward online undergraduate level (Silberg & Lennon, 2006; Simmering, Posey, & Piccoli, 2009). Conversely, Yukselturk and Bulut (2007) indicated that gender did not reveal any significant differences to achievements in online discussions.

The current study showed a significant difference in mean ranks of males and females on messages posted and total access with females having slightly higher mean ranks in both categories when compared to males. Male and female students with respect to final grades. When situating the current study findings within the context of the larger body of literature on gender differences, it becomes apparent that while differences do exist between the genders concerning performance in OLL environments, there is no definitive evidence that one gender consistently outperforms the other gender.

**Courses, Participation, and Performance**

Five courses were reviewed to determine if there is a significant difference on total number of messages posted, total access, and final grades. Descriptive statistics over the two semesters showed that Dimensions of Ethical Leadership (HUM300) had the highest enrollments of students (40.8%)
and in contrast, Principles and Practices of Effective Leadership (ORG405) had the least number of enrolled students (3.7%). There were statistically significant differences between the five courses on total number of messages posted and total access. Students were actively engaged in posting messages and accessing files in the discussion boards at different frequencies depending on the courses in which they were enrolled. This result suggests that some courses offered materials and topics suited to discussion and encouraged students to be fully engaged while other courses did not.

While students in the courses participated in and accessed discussion boards differently based on the course in which they were enrolled, grade performance was not significantly different among the courses. Analysing the five courses and grade performance showed no differences indicating student performance is similar in these courses.

Research concerning courses taken and the relationship quality of postings and time spent in online discussion environments was not located by this researcher. Data analysis from this study indicates subject matter may be a determining factor in student online participation. In short, educational content, resources available, and interest in topics of courses offered will likely have an impact on student participation in online learning through discussion board. Students enrolled in SOC300 had the highest mean ranks in both total number of messages posted and total access. Students enrolled in SOC305 had least mean ranks of total access. However, the mean rank for the grade (531.80) was the second highest after ORG405 (572.09).

The key research findings from this study have been summarized in Table 1.

### Table 1 Key Research Findings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation and Grade</td>
<td>High numbers of participation in online discussion forums were positively correlated to higher final course grades in all five courses.</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>As students’ age increases, they have a high tendency of earning higher grades compared to the younger students. Older students also posted comments on discussion boards more frequently.</td>
</tr>
<tr>
<td>Race</td>
<td>White students outperformed Black or African American and Asian students in participation and final grade. There were no significant differences between White and Black or African American students or between Black or African American and Asian students in final grade.</td>
</tr>
</tbody>
</table>
Female students have statistically significant higher numbers of messages posted and total access than male students. There were no statistically differences for both male and female students with respect to final grades.

While there were statistically significant differences between the five courses on total number of messages posted and total access, there were no significant differences between the five courses on students’ final grade.

Areas for Future Research

Areas of research for CSU-GC or other online institutions

a. Research is needed looking specifically at other variables, which were out of the scope of this study and for which data were not available to the researcher: (a) time spent in online discussion board forums, (b) number of messages read by students, (c) number of follow-up messages sent by students, and (d) number of new/initial discussion postings. Such analyses could more thoroughly explain student behaviors.

b. Other courses in addition to the five required core courses examined can be analyzed. Consideration of elective courses and those courses required by specific major areas of study may reveal participation patterns not found in required general studies courses.

A study that focuses on least active students in online learning (Webb, Jones, Barker, & van Schaik, 2004) may reveal motivations for inactivity that could inform improved practices for effective use of online discussion boards.

c. A study of learner-instructor interaction may reveal a significant impact on students’ final course grades indicating that student-instructor interaction is more valuable that student-student and student-content interaction. Knowing what type of interaction has the most impact on student grades could help inform better practice.

e. A qualitative study could be conducted to examine the instructors’ viewpoints and explore teaching behaviors of instructors. Students’ perceptions of the online learning environment and quality of contributions can be taken into consideration as well. Understanding perceptions of those who are involved in the process may inform changes to policies and practices that impact online discussion quality and quantity and improve student learning.
Change Context of Populations and Environment

The context of interaction through learning management system goes beyond undergraduate education in university-level settings. To further understand other contexts and to increase the number of rigorous studies, future studies might consider exploring the same or similar variables across graduate level courses, community colleges, private academic institutions, K-12 students, and non-profit organizations to determine patterns of participation and how they are similar or different when accounting for level of education and training. Research using LMS data from different student populations across United States and throughout the world should be considered.

Longitudinal and Experimental Research

A longitudinal study examining the changes and progress of student performance in courses taken over time would add to the understanding of delivery and performance by accounting for student development in both academic and technological use. Such a study could examine differences in individuals regarding performance in required general studies courses, required major area courses, and elective courses, potentially revealing the impact of interest in course content on participation.
References


Takeda-Tinker, B. (September, 2011). CSU-GC Projection. Presented to CSU Governor Board Meeting, Fort Collins, Colorado, USA.


