

Predictors of student success in online courses: Quantitative versus qualitative subject matter

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ABSTRACT

This study seeks to examine whether the predictors of success for students in an online quantitative course are different than those for an online qualitative course. Data were collected from students taking online courses offered by an AACSB accredited College of Business at a medium sized state university (total student population 7,000) in southern Louisiana. A quantitative course is defined as numerically based and involves mathematical calculations; while a qualitative course is conceptual in nature and does not include mathematical calculations. Examination of the significant variables present different predictors of student success, dependent upon the class surveyed. Students with higher ACT math scores and higher semester GPAs were more likely to be successful in a quantitative course. Whereas, students with a higher level of reading comprehension (as measured by a student's ACT reading score) are more likely to earn an A, B, or C in a qualitative class.

Keywords: online courses, quantitative, qualitative, finance, predictors

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INTRODUCTION

The success of online education is evident by the preponderance of offerings available, as well as, the demand for such programs. Allen and Seaman (2007) found that online university enrollments grew almost six times faster than the overall higher education population. There are many reasons why this form of distance education is attractive to students – convenience, personal and/or career enrichment, flexible scheduling, geography, more suitable learning environment, etc. However, there is much concern regarding the quality of instruction offered via this medium, as well as, the performance of enrolled students. Many studies (Gange and Shepard, 2001; Neuhauser, 2002; Reuter, 2009; and Russell, 1999) have found no difference in the success of students in a particular class, with the variable of interest being method of delivery – online instruction versus traditional face-to-face lectures. Various researchers (Gerlich, Mills, and Sollosy, 2009; Mandernach, Donnelly, and Dailey-Heber, 2006; Wojciechowski and Palmer, 2005; and Yukselturk and Bulut, 2007) have also tried to pinpoint what particular characteristics led to success in an online class. Some of these variables were demographic features, while other variables were related to learning style and motivation.

However, the type of information presented in the online class and subsequent student success has rarely been investigated (the exception being Mensch, 2010; and Thrasher, Coleman, and Atkinson, 2012). Most professors would agree that some topics are likely easier to convey in a classroom, than at a distance. It can also be argued that knowledge can be broken down into quantitative and qualitative information. A quantitative course would involve the calculation and measurement of quantity, while a qualitative class would focus on descriptions and concepts. Boster, et al (2006) state that technology is a powerful tool to teach math, even though students prefer a face-to-face presentation for a numerically oriented class, such as statistics (Johnson, et al, 2009). However, studies by Lam (2009) and Olson and Wisher (2002) explained that online methods were ideal for the instruction of “procedural and declarative knowledge.”

It is the purpose of this study to examine whether the predictors of success for students in an online quantitative course are different than those for an online qualitative course. Data were collected from students taking online courses offered by an AACSB accredited College of Business at a medium sized state university (total student population 7000) in southern Louisiana.

COURSES SURVEYED

The quantitative online course surveyed was Finance 302: Financial Management. The course was offered annually, during the summer terms, 2007-2012, to a total of 128 students. Traditional face-to-face presentations were also available. While three different professors were assigned this course, the textbook remained the same, as well as, assessment methods: quizzes, exams, and homework assignments. The material covered was identical, due to a departmental decision, which included:

- Construction and analysis of financial statements
- Effect of income taxes on financial decisions
- Time value of money
- Bonds and their valuation
- Risk and rates of return
- Stocks and their valuation
- Cost of capital
- Capital budgeting
- Cash flow estimation
- Working capital management

The course was delivered completely over the internet, first, via the Blackboard platform, and then, using Aplia for Finance, a comprehensive supplemental package written by the textbook authors. Answers to assignments and power point slides were made available to students. Faculty was available by email and discussion forums. The course was self-paced (students were welcome to work ahead), but assignments and quizzes had specific due dates. Exams were made available and had to be completed on the date specified in the syllabus. Exams were open book, but were long enough that it was impossible to look up every answer. Financial management is a core course required of all students seeking a baccalaureate degree from the College of Business. Students must earn a “C” or above in order to graduate. Financial management is considered by some students to be particularly challenging, even with traditional face-to-face presentations. Students taking financial management for a second (or more) time, may have earned a “D,” “F” or withdrawn from the course (receiving a “W” on their transcript) before being awarded a final grade. The prerequisites for this course include managerial or financial accounting; micro and macroeconomics; statistics; and completion of 54 hours of non-developmental coursework. Finance 302 is rarely taken by a student outside of the College of Business.

The qualitative course examined in this paper was Finance 341: Principles of Real Estate. This online course was delivered in the summers of 2011 and 2012. The same instructor offered the course to a total of 35 students using two different textbooks. However, instructional consistency was achieved in material covered:

- Nature and description of real estate
- Rights and interests in land
- Forms of ownership
- Methods of transferring title, title closing and escrow
- Recordation, abstracts, and title insurance
- Real estate contracts and contract law
- Lending practices, sources of financing, and types of financing

- Taxes and assessments
- Real estate leases
- Real estate appraisal
- The principal-broker relationship: employment and agency
- Land use control
- Investing in real estate

Topics covered were of a conceptual nature, with little or no calculations involved. The class was delivered totally online using Blackboard in 2011 and Moodle in 2012. Answers to assignments and power point slides were made available to students. Faculty was available by email and discussion forums. The course was self-paced (students were welcome to work ahead), but assignments and quizzes had specific due dates. Exams were made available and had to be completed on the date specified in the syllabus. Exams were open book, but were long enough that it was impossible to look up every answer. Finance 341 is an elective course; it is open to all students across campus, regardless of major. The only prerequisite for entry into Finance 341 is successful completion of 54 hours of non-developmental coursework.

Instructors in all online courses offered through this university must first complete the Quality Matters Program (2012), “a nationally recognized, faculty-centered, peer review process that is designed to certify the quality of online and blended courses.”

HYPOTHESIS

The following relationship is hypothesized: the predictors of success for students in an online quantitative course (FINC 302: Financial Management) are not different than the predictors of success for students in an online qualitative course (FINC 341: Principles of Real Estate). Success in the course is defined as having earned an A, B, or C, while failure is defined as D, F, or W; students receiving a D, F or W, will have to take the class again. The predictors of success are thought to be the following:

Gender

While more females than males enroll in online courses (Halsne and Gatta, 2002; and Zirkle, 2003), most previous research has reported little or no significant difference between males and females in regard to online course performance (Daymont and Blau, 2008; Dutton, Dutton and Perry, 2002; Gerlich, Mills and Sollosy, 2009; Wojciechowski and Palmer, 2005; Dille and Mezack, 1991; and Lim, 2001). However, some researchers have reported significant performance differences between genders (Barrett and Lally, 1999; and Taplin and Jegede, 2001).

Age

Reuter (2009) found that online students, as a whole, were older than students enrolled in traditional lecture classes, positing that older students have more responsibilities (jobs, families, etc.). But, Buhagar and Potter (2010) showed that online students were younger than their face-to-face counterparts, reasoning that younger students were more comfortable with web-related technology. In terms of performance, some studies found that age was not a predictor of online course success (Dutton, Dutton and Perry, 2002; and Yukselturk and Bulut, 2007). However, Wojciechowski and Palmer (2005) demonstrated a positive relationship between age and grades in an online course offering. Weaver (2005) found that those over 21 were more likely to earn an A, B, or C in an online course. Dille and Mezack (1991) observed a higher average age for successful students

Course load

Wojciechowski and Palmer (2005) investigated full versus part time student status and found that this had no relationship with the eventual grade earned in the online class. However, Weaver (2005) found that full time students were considered more successful than part time students in an online class.

Number of previous withdrawals from other courses

Wojciechowski and Palmer (2005) found a strong negative correlation between number of previous withdrawals and student grades in an online class.

How many times the course was attempted prior to current registration (may be online or face-to-face)

Examination of the literature revealed no published research regarding this variable. Some universities may limit the number of times a student can repeat a course, resulting in cost efficiency and improved success rates. While the university surveyed does not have such a policy, it is assumed that a positive relationship exists between this variable and the grade earned. It is expected that this variable is highly correlated with the number of previous withdrawals from other courses.

American College Testing (ACT) composite scores

Through their study, Wojciechowski and Palmer (2005) showed no relationship between ACT composite scores and grades earned in an online course, while Weaver (2005) found that students who earned ACT composite scores of at least 17 were more likely to earn an A, B, or C

in an online class. Freeman (1995) and Mortensen (1995) discovered no difference in achievement test scores for students enrolled in online versus face-to-face classes. However, a study by Gubernick and Eberling (1997) demonstrated that online students have higher achievement test scores (5-10%) than those enrolled in traditional lecture classes.

ACT English scores

Wojciechowski and Palmer (2005) attempted to link ACT English score and final grades in an online course; results showed that “the higher the ACT English test score for the general population, the higher the grade in the course. But, for those receiving a C or higher, this relationship no longer exists.”

ACT math scores

It stands to reason that students with higher ACT math scores will perform better in quantitatively oriented courses, regardless of the method of delivery. Allen and Sconing (2005) found that “a student with a benchmark ACT mathematics score of 22 [had] a 75% chance of earning a C or higher” in a quantitative course, such as college algebra.

ACT reading scores

Phipps and Merisotis (1999) showed a link between student literary level and their success, while Wojciechowski and Palmer (2005) found no significant relation between ACT reading scores and grades received in an online course. According to Mandernach, Donnelly and Dailey-Hebert (2006), “. . .students with poor reading comprehension are likely to struggle more in an online class than they might in a traditional classroom where the readings are supplemented more by demonstrations and audio descriptions. The presentation of instructional materials relies on written texts, and so do many of the interactions which are based primarily on threaded discussions.”

Student semester grade point average (GPA) prior to online class surveyed, and Student cumulative GPA prior to online class surveyed

A student’s grade point average (GPA) is a strong predictor of success in any class, but especially those delivered online. According to Hill (2010), “Students who have demonstrated that they can handle college –level work are more likely to be successful studying online.” Artino (2007) demonstrated that a student’s GPA was a significant predictor of success in an online class. This connection was also found by Wojciechowski and Palmer (2005), Cheung and Kan (2002) and Moore and Kearsley (1996). The research of Gerlick, Mills, and Sollosy (2009) showed that GPA, serving as a measure of student effort, is the only predictor of success

in an online course. However, Buhagar and Potter (2010) did not find a statistical difference in GPA between online versus face-to-face students.

MODEL SPECIFICATION AND EMPIRICAL RESULTS

For each class surveyed, the model is written as follows:

$$\text{GRADE}_i = f(\text{GENDER}_i, \text{AGE}_i, \text{CRSLD}_i, \text{\#WDS}_i, \text{\# ATTS}_i, \text{ACTCOMP}_i, \text{ACTENG}_i, \text{ACTMATH}_i, \text{ACTREAD}_i, \text{SEMGPA}_i, \text{CUMLGPA}_i)$$

where:

GRADE_i = grade earned by the i th student (A = 4; B = 3; C = 2; D, F or W = 0).

GENDER_i = dummy variable indicating gender of student i (GENDER = 1 if male; 0 if female).

AGE_i = student i 's age (in years) at time enrolled in online course.

CRSLD_i = student i 's total number of hours carried for the semester. For this study, all of the online courses are offered during the summer term. Students registered for nine or more hours during the summer term are considered full time, eight hours or less, part time.

\#WDS_i = total number of times student i has withdrawn from other classes.

\#ATTS_i = total number of times student i has attempted the class surveyed. The student may have enrolled in the class previously (whether online or face to face) and had to subsequently withdraw. A student may also have to re-enroll if he/she earned a D or F in the class. Some students may be looking to enhance their GPAs by re-taking a class and earning a better grade.

ACTCOMP_i = student i 's highest reported composite score on the American College Testing exam (ACT), 0-36. The ACT may be taken (and reported to the university) multiple times. The highest composite score, as well as, the highest English, math and reading scores, may have occurred on different test dates. Only the highest scores were included.

ACTENG_i = student i 's highest reported ACT English score, 0-36. If the ACT is taken multiple times, the highest English score may or may not occur in conjunction with the highest reported composite score.

ACTREAD_i = student i 's highest reported ACT reading score, 0-36. If the ACT is taken multiple times, the highest reading score may or may not occur in conjunction with the highest reported composite score.

ACTMATH_i = student i 's highest reported ACT math score, 0-36. If the ACT is taken multiple times, the highest math score may or may not occur in conjunction with the highest reported composite score.

SEMGPA_i = student i 's semester GPA prior to enrolling in course surveyed, 0.0-4.0.

CUMLGPA_i = student i 's cumulative GPA prior to enrolling in course surveyed, 0.0-4.0.

The data used in this study was recovered from the university's student database. Data were collected from students taking online courses offered by an Association to Advance Collegiate Schools of Business (AACSB) accredited College of Business at a medium sized state university (total student population 7,000) in southern Louisiana.

The descriptive statistics of the sample are presented in Table 1 (Appendix). The data has been segregated by each class surveyed. While the mean grade (GRADE) for the qualitative course (2.485 versus 1.3438) is higher, several of the means are strikingly similar (AGE, CRSLD, and ACTENG). Furthermore, it is not surprising that the mean number of attempts (#ATTS) for the quantitative class is higher (as well as exhibiting a higher standard deviation), since financial management is perceived as a relatively difficult class by students. Table 1 also provides descriptive statistics for all of the other variables included in the model.

The empirical results are used to predict the likelihood of a student achieving success in a quantitative or qualitative online course; these are presented in Table 2 (Appendix). Examination of the significant variables present different predictors of student success, dependent upon the class surveyed. As was expected, students with higher ACT math scores (ACTMATH) were more likely to be successful (earn an A, B, or C) in a quantitative course. Also, the student's GPA earned in the semester prior to enrolling (and completing) the quantitative course is also deemed a significant predictor; a positive relation was also observed. Small sample size notwithstanding, the only variable of significance for the qualitative course was ACTREAD. Thus, observers can surmise that those with a higher degree of reading comprehension (as measured by a student's ACT reading score) are more likely to achieve success (earn an A, B, or C) in a class that is conceptual in nature. None of the variables were significant across both models. For the data set surveyed, we can conclude that the predictors of success in quantitative and qualitative courses are not the same.

CONCLUSION

The performance of students enrolled in online classes has been a hotly debated topic. Many studies have tried to pinpoint what particular characteristics led to success in an online class. Some of these variables were demographic features, while other variables were related to learning style and motivation. However, the type of information presented in the online class and subsequent student success has rarely been investigated. Most professors would agree that some topics are likely easier to convey in a classroom, than at a distance. It can also be argued that knowledge can be broken down into quantitative and qualitative information. This study seeks to examine whether the predictors of success for students in an online quantitative course are different than those for an online qualitative course. Students with higher ACT math scores and higher semester GPAs were more likely to be successful in a quantitative course. Whereas, students with a higher level of reading comprehension (as measured by a student's ACT reading score) are more likely to achieve success in a qualitative class. None of the variables were

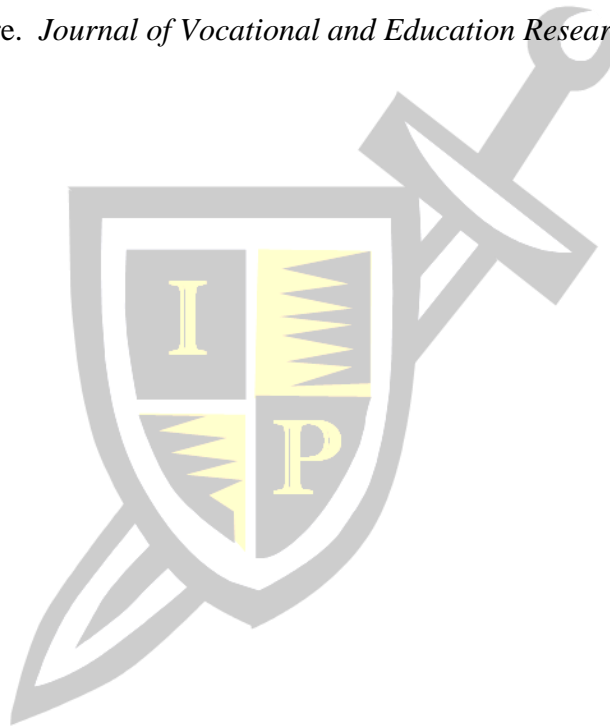
significant across both models. Hence, for the data set surveyed, we can conclude that the predictors of success in quantitative and qualitative courses are not the same.

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APPENDIX

Table 1: Descriptive Statistics of Sample

	MEAN	STD DEV	MEDIAN	MODE	MAX	MIN
Quantitative course - FINC 302: Financial Management						
GRADE	1.3438	1.3483	2	0	4	0
GENDER	0.3984	0.4915	0	0	1	0
AGE	23.9219	3.1737	23	23	36	20
CRSLD	7.4844	3.6392	6	9	15	3
#WDS	6.2656	5.0982	5	5	29	0
#ATTS	0.8828	1.1814	0	0	6	0
ACTCOMP	21.2500	3.3836	21	21	30	14
ACTENG	21.7891	4.3374	21	19	34	8
ACTMATH	20.5859	3.7068	20	18	34	13
ACTREAD	22.3516	5.0362	22	23	35	11
SEMGPA	2.2953	0.9488	2.33	3	4	0
CUMLGPA	2.4620	0.5497	2.47	3	3.90	1.24
Qualitative course - FINC 341: Principles of Real Estate						
GRADE	2.4850	1.1973	3	3	4	0
GENDER	0.6285	0.4902	1	1	1	0
AGE	23.9429	2.8382	23	22	32	21
CRSLD	7.5143	3.3987	6	6	15	3
#WDS	5.6000	5.8672	4	2	26	0
#ATTS	0.2571	0.9805	0	0	5	0
ACTCOMP	20.9429	3.2715	20	20	31	15
ACTENG	21.6571	4.5716	21	20	34	8
ACTMATH	21.0000	3.2988	20	19	30	16
ACTREAD	21.5429	4.6167	21	19	34	12
SEMGPA	2.5213	1.0315	2.75	3	4	0
CUMLGPA	2.7263	0.5825	2.60	none	3.95	1.67

Table 2: Regression Results of Predictors of Student Success: Quantitative versus Qualitative Subject Matter

variables	Quantitative subject FINC 302	Qualitative subject FINC 341
CONSTANT	0.3376 (0.2353)	4.3136 (1.1928)
GENDER	-0.1952 (-0.8082)	0.6318 (1.2611)
AGE	-0.0102 (-0.2532)	-0.0877 (-0.7744)
CRSLD	-0.0472 (-1.4968)	0.0198 (0.2603)
#WDS	-0.0228 (-0.8274)	0.0645 (1.1278)
#ATTS	-0.0569 (-0.9974)	-0.0479 (-0.1759)
ACTCOMP	-0.1748 (-1.0573)	-0.5142 (-1.7086)
ACTENG	0.0586 (0.9697)	0.1024 (0.8990)
ACTMATH	0.1234 (1.9446)*	0.1341 (0.9694)
ACTREAD	0.0405 (0.6671)	0.2146 (1.7380)*
SEMGPA	0.3850 (2.7441)**	0.2834 (0.8815)
CUMLGPA	-0.0005 (-0.7375)	0.5786 (0.8105)
R ²	0.2077	0.2607
F	2.7641**	0.7375
N	128	35

Note: t-statistics are in parentheses.

*denotes significance at 10%

**denotes significance at 5%