
Performance indicators in online distance learning courses: a study of management education

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Distance learning, Students, Performance measurement (quality), Internet

Abstract

Examines student performance indicators in online distance learning courses offered on the Internet at a mid-sized private college in the USA. A sample of 74 undergraduate and 147 graduate business students in ten courses were selected for statistical analysis of their grade performance and the relationship with various indicators. The research results include findings that gender and age are related differently for undergraduate and graduate students to performance in distance learning courses, and that undergraduate grades, age, work experience, and discussion board grades are significantly related to overall course performance. However, standardized test scores (SATs, GMATs) and organization position level are not related to the performance in distance learning courses. Makes recommendations for further qualitative and empirical research on distance learning student performance in online computer-mediated courses and programs.

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Introduction

Distance learning programs are proving to be an increasingly popular way for colleges and universities to expand enrollments and grow into new markets to offset shrinking enrollments and declining resources in traditional campus-based courses and programs (Nixon and Helms, 1997; Olsen, 2002).

Although the initial high expectations for online MBA programs several years ago evaporated to some extent (Mangan, 2001), online courses at post-secondary institutions are continuing to increase and a larger number of faculty are beginning to explore the many opportunities available for creating effective virtual learning experiences for their students. A recent survey found that the future of online business education seems quite bright, and that three-fifths of the 1,700 US institutions of higher learning that are engaged in distance education use some form of Internet-based technology to offer credit-bearing business courses (Evans and Haase, 2001). Certain demographics were found to be more influential than others in predicting the interest of potential students in online business education, particularly the student age, annual income and employment status. But what is the relationship, if any, of these types of factors with student performance in distance learning? Faculty who are preparing to teach online courses need to be informed not only of the strong student interest in online courses, but also of what factors may influence student performance, so that courses and programs can be crafted in ways that maximize the learning potential.

Online teaching is redefining faculty members' schedules, as well as their duties and relationships with students by requiring more pre-course planning, distribution of time online over the course implementation, and virtual connectedness with students on a daily basis (Young, 2002). As faculty are preparing more for these kinds of courses and establishing relationships with students through discussion boards, live chats, and other forms of communication, the performance indicators of success should be considered for planning purposes, delivery of the learning experience, and evaluation. This research study is intended



to help identify and begin exploring some of these issues, and offer nascent ideas for further consideration by faculty, administration, online course developers and others.

Literature review

This section provides a brief review of selected literature on performance factors related to student success in distance learning courses. Much of the literature consists of books or reports from faculty offering guidance on improving student performance in distance learning courses, or research articles by faculty on student performance in distance learning courses in comparison with on-campus courses. Faculty are often encouraged by experts to improve student performance in distance learning courses through intra/interpersonal communication, collaboration, effective organizing and course design, understanding different student learning styles, and other suggestions (Bozik and Tracey, 2002, pp. 207-25; Schweizer, 1999, pp. 3-10; Shedletsky and Aitken, 2002; White and Weight, 2000, pp. 27-32). Students have also been encouraged to improve performance in these types of computer-mediated instruction vehicles by carefully selecting appropriate courses, examining their intellectual and emotional background, and choosing a school that fits in with their goals (Connick, 1999, pp. 101-15). These recommendations to faculty and students who design and participate in online courses raise questions regarding what types of students will succeed in online distance learning courses and what factors faculty should consider as they are choosing, preparing, planning and implementing online curricula.

A major study was recently completed in the UK (Hawksley and Owen, 2002, pp. 1-70) by the Learning and Skill Development Agency, that examined common factors among high-performing distance programs through case studies at 11 educational institutions. The study methodology included several principles of process benchmarking, which have been defined as an effective tool for higher education organizations to adopt best practices for internal improvement (Alstete, 1995, pp. 88-93). The Hawksley study established that

good practice for distance learning requires effective planning, monitoring, and managing resources for achieving high performance. While this is probably true for all types of education courses, online courses require additional attention to detail, particularly in the planning stages. On-campus courses can often be planned with a draft outline of topics, assignments, and so on, with actual decisions made about implementation as the course progresses. For online courses to be effective, faculty and the administration of the educational institution need to integrate program planning, monitoring, management, and resource allocation and careful selection of learning materials, as well as to offer students pre-entry guidance, personal communication and feedback. These concepts lend strong support to the belief among online educators that distance learning courses that are offered online are not a cheap or discounted method of delivery, if the courses are to be established properly (Lawton and Barnes, 1998).

As a field of study, performance of students in online distance learning courses is still in its infancy, and a large portion of the studies focus on comparing online distance learning with traditional on-campus courses. Most of the research finds that participants in well-designed distance learning courses perform as well as those in well-designed traditional courses, and that students enjoy the online medium because they are provided with access to instruction that may otherwise not be available to them. One analysis of teaching methodology for online business courses found that faculty achieved considerable learning success by using a case study approach, because such approaches work well in the virtual classroom and move students away from dependent learning styles (Nixon and Helms, 1997). Another study by two psychologists that compared how much students learned in traditional classroom and online sections of the same course found that students with good general comprehension skills benefited from completing the online course, while students with less comprehension ability learned approximately the same in either format (Maki and Maki, 2002). In this particular study, several classes were followed through the course during a three-year period, with 94 students

completing the traditional classroom section and 95 completing the online version. In the online version, students met in a classroom for one hour once per week but completed all of their assignments online. The researchers found that students with the highest comprehension skills benefited from the Web-based courses, and this raises questions about student demographics and psychological make-up for effectiveness of online courses that need to be explored further.

Other studies have begun to explore some of these factors, such as one recently completed that examines the student performance in a distance learning business communication course (Cheung and Kan, 2002). The researchers examined 168 students in a distance learning course and found that tutorial attendance, gender, relevant academic learning experience were related to students' performance. Interestingly, although the course was offered at an Asian institution in a non-Western environment, the results were reported to be mostly similar to prior studies despite differences in culture, teaching mode, and subject. Gender was related to students' performance in that women generally outperformed men, and that this may be due to the result of female students' greater tendency to put extra effort and time into their studies. This finding is supported by other studies that examined these gender issues and student performance (Lanius, 1997; Lipe, 1989). The Cheung and Kan (2002) study also found positive correlations between previous academic achievement, relevant academic background, and attendance at tutorials with higher performance. This invites further inquiry into these areas for other types of business courses at Western-based institutions.

However, not all of the research studying student performance found positive results for online students compared with their classroom counterparts. Professors at Michigan State University found that students who completed an economics course online did not fare as well as students who completed a campus-based course (Brown and Liedholm, 2002). The study focused on 89 students in two online course sections and

363 students enrolled in two traditional classroom courses. Interestingly, the researchers found that women's performance was not diminished by the online environment as much as the men's, even though women traditionally did not perform as well in economics courses as men. In addition, the study discovered that students in online courses did not spend as much time studying as traditional campus-based students. However, this particular study was not without criticism for reaching unwarranted conclusions, ignoring individual differences, and not distinguishing enough difference in the final level of student learning (Wertheim, 2002).

Finally, a portion of the literature uncovered regarding student performance in online distance learning courses and programs discussed the importance of creating learning communities for students to maximize their performance. A study in 1999 of graduate business students investigated student perceptions and performance in three distance learning courses with the same instructor (Sugrue *et al.*, 1999). The performance in the two smaller classes was better than the performance in the largest class. Student characteristics and site variables accounted for a large portion of the variance. Another study described the development of learning communities within the context of asynchronous distance education, based on an analysis of 12 graduate students in a course that used Internet-based conferencing software (Moller *et al.*, 2000). Results of the empirical data, interviews, and student journals found a relationship between learning achievement and strength of community. Experiences from the delivery of online courses and programs seem to suggest that current emphasis on technical electronic delivery mechanisms by many facilitators needs to shift to greater importance on support for student engagement, learning enhancement, and program execution by educational institutions today (Roffe, 2002). The literature uncovered in this review does not provide an in-depth look at student performance indicators in the completion of online distance courses.

Methodology

Sample

The sample in this study consisted of 78 undergraduate students and 145 MBA students enrolled in online, distance learning courses at an AACSB-International accredited business school in the New York metropolitan area. All of the courses were in the areas of management or human resource management, taught by two instructors with similar teaching styles. The courses were complete online courses using the Blackboard e-learning course container, as distinct from a hybrid, video-teleconferencing, or some online and some in classroom sessions. The format of the courses in this study were very similar, and contained frequent announcements by the instructors, e-mail communication, optional live synchronous chats, required asynchronous discussion board participation, electronic submission of writing assignments and exercises. Useful external Internet links were also provided. Plagiarism was also checked by an online third-party provider (www.turnitin.com), for all written assignments. The ages of the participants ranged from 19 to 54 with an average age of 22.75 (SD = 3.91) for undergraduates and average of 31.50 (SD = 7.19) for MBA students.

Measures

This study is unique in that none of the measures was self-reported. Variables were associated with course performance measures (i.e. final grade, discussion board participation and thread initiation, and grade on an individual assignment), various demographic characteristics (i.e. age, gender, amount of work experience, organizational position level for MBAs), and standardized test scores (i.e. SATs, GMATs). A description of each of these variables follows (see also the Appendix for glossary of variables, parameters and acronyms):

- *Course performance measures.* These measures included the final grade assigned in the course on a five-point scale (A = 4, B = 3, etc.), participation in instructor-constructed and led discussion boards, student initiation of new discussion board threads, and score received on an

individually-based course assignment. Discussion board grades were based on quality and quantity of student participation. These grades were used as a performance measure (on a 100-point scale), as well as the number of student discussion board threads initiated (i.e. 0, 1, 2, etc.). Each course had several writing assignments, and an individual assignment was selected from each course for this study, based on its relative importance to the course learning objectives and relative weight in the overall course grade. This assignment was used as a performance sample for this study, and scored on a 100-point scale.

- *Standardized academic tests.* Scholastic aptitude test scores (SATs) were used for the undergraduate students in the sample. SATs included total score, verbal score, and quantitative score. Graduate Management Admission Test scores (GMATs) were used for MBA students. GMATs included total score, verbal score, quantitative score, and essay score (if available). In addition, high school GPA was collected for undergraduate students and undergraduate GPA was utilized for MBA students.

Results

The results are presented separately for undergraduate and MBA students, since they represent samples from two different populations. The first stage of the analysis involved computing Pearson product-moment correlation coefficients (a parametric measure of association between two variables). This step focused on correlations between the major performance variable (grade) and the other study variables. Subsequently, multiple regression analyses were computed for each sample (undergraduate and MBA) to assess multivariate predictors of online course performance. Multivariate predictors assess the impact of two or more variables on performance. Each of the study variables was regressed on performance (grade) to determine the unique and combined explanatory power exerted by the variables. Conventional

significance levels of 0.05 and 0.01 were used for all statistical tests.

Undergraduate sample

Individual assignment grades ($r = 0.53$, $p < 0.01$) and discussion board grades ($r = 0.80$, $p < 0.05$) were each significantly and positively related to final grade. Thus, two components of online course participation were moderately to strongly related to overall performance (grade). Further, the researchers examined the relationship between actual course activity levels as measured by the numbers of hits (recorded by the course management system, Blackboard) in relation to the course grade. Interestingly, there was a significant positive relationship ($r = 0.40$, $p < 0.01$). In effect, this unobtrusive and ungraded component of course activity significantly predicted the course grade.

Surprisingly, SATs were unrelated to course performance as measured by grade ($r = -0.11$, n.s.). Similarly, previous academic performance (high school grade point average) of this sample of undergraduates was also unrelated to grade. These findings offer the possibility that online course performance is a special type of academic aptitude or skill that is somewhat unique and not well understood. It should also be noted that neither chronological age nor gender was related to course performance.

The correlation results suggested some other significant relationships, namely, women were more likely to participate in course discussion boards than men ($r = -0.23$, $p < 0.05$). Although women are more active participants on the discussion boards, gender was unrelated to overall performance. Also, older students were more likely to initiate discussion board threads ($r = 0.45$, $p < 0.01$) possibly related to more experience in the world of work.

Regression analysis for undergraduates revealed that discussion board participation, thread initiation, and individual assignment score were significantly ($F = 34.21$, $p < 0.001$) related to grade when controlled for sex and age (Table I). This corroborates the correlation analyses by indicating the simultaneous contribution of the variables, while controlling for the relationship between the predictor variables.

Table I Multiple regression results for undergraduate and MBA samples

	Undergraduates		MBA	
	β		β	
SATTot	-0.01	GMAT	-0.01	
HSGPA	-0.05	UGPA	0.07	
Age	-0.05		0.09	
Gender	-0.20		-0.05	
ASSIGN	0.37*		0.22*	
DBPART	0.57*		0.71*	
DBTHREAD	-0.18		-0.03	
NUMHITS	-0.08		0.01	

Notes: * $p < 0.01$. Grade = final course grade. GMAT = graduate management admissions test. SATTot = SAT total score. UGPA = undergraduate grade point average. Age = participant's chronological age. Gender: 1 = female, 2 = male. ASSIGN = individual assignment score. DBPART = discussion board participation score. DBTHREAD = number of discussion board threads initiated. NUMHITS = actual number of hits for course communication areas

MBA sample

Correlation results indicated that undergraduate grade point average (UGPA) ($r = 0.21$, $p < 0.05$), amount of work experience ($r = 0.27$, $p < 0.01$), organizational level ($r = 0.20$, $p < 0.05$), and age ($r = 0.25$, $p < 0.01$) were each positively and significantly related to grades in online courses (see Table II). Although prior academic experience was a

Table II Pearson product-moment correlations for grade and major variables for undergraduate and MBA samples

	Undergraduates		MBA	
	Grade		Grade	
SATTot	-0.11	GMAT	-0.11	
HSGPA	0.03	UGPA	0.21*	
Age	-0.08		0.25**	
Gender	0.17		-0.24**	
ASSIGN	0.53**		0.43**	
DBPART	0.80**		0.81**	
DBTHREAD	-0.07		0.11	
NUMHITS	0.40**		0.32**	

Notes: * $p < 0.05$, two-tailed; ** $p < 0.01$, two-tailed. Grade = final course grade. GMAT = graduate management admissions test. SATTot = SAT total score. UGPA = undergraduate grade point average. Age = participant's chronological age. Gender: 1 = female, 2 = male. ASSIGN = individual assignment score. DBPART = discussion board participation score. DBTHREAD = number of discussion board threads initiated. NUMHITS = actual number of hits for course communication areas

significant predictor of grade for MBAs, the amount of variance accounted for was quite small. Nevertheless, this is a departure from the undergraduate findings and suggests that completion of college, the case for MBAs, does relate to online course performance. Similar to undergraduates, though, was the fact that standardized test scores (GMAT) were unrelated to course performance. The number of hits, similar to the undergraduate sample, was positively and significantly related to grade ($r = 0.32, p < 0.01$).

Gender was significantly ($r = -0.24, p < 0.05$) related to performance with women scoring better than men. Unlike the undergraduate sample, MBA women tend to perform better than men in online courses. Other findings relating to gender indicated that MBA women tend to participate more in discussion boards ($r = -0.21, p < 0.05$), initiate more discussion threads ($r = -0.18, p < 0.05$), and have a higher number of hits ($r = -0.29, p < 0.01$).

Multivariate results for MBAs indicated a similar pattern to that for undergraduates: the grade was significantly ($F = 43.24, p < 0.001$) predicted from knowledge of discussion board performance and individual assignment when controlling for sex, age, work experience, organizational level, and undergraduate grade point average (see Table I).

Discussion

The most robust result of the present investigation was the fact that, for both undergraduate and MBA samples, factors within the course design, particularly discussion board performance, are the strongest predictors of online course performance, a result supported by both correlation and regression analyses. This finding was strengthened by the fact that the number of hits (recorded by the course management system) was positively and significantly related to overall course performance for undergraduates and MBAs. Active participation in course discussion boards, perhaps as a proxy for course involvement, deserves additional consideration as a predictor variable in online course performance. It could also be argued that

computer and Internet skills, computer availability, and virtual team dynamics could affect such performance as well. Stated differently, there may be structural, access, and behavioral issues relating to online performance that are not fully appreciated at this time.

Standardized test scores were unrelated to overall performance for both samples. The lack of a relationship in this instance is, in itself, a noteworthy result. This finding certainly requires additional investigation and yet, at the same time, it is not particularly surprising that online courses have a specific set of aptitudes and skills which may not be tapped by the more traditional measures. Nevertheless, some relationship with standardized academic measures would be expected and future research should explore this possibility further.

The results suggest that there is a unique set of skills related to success in distance learning courses that is somewhat related to previous academic performance (for MBAs but not for undergraduates) but unrelated to standardized academic test scores. In this vein, learning to learn in an online environment may have a "learning curve" that interacts with various personal, academic, technological, and instructor characteristics that have direct and indirect influences on participation, learning, and grades.

Women do perform better than men, at least among the MBA sample, a finding that has been reported elsewhere (Brown and Liedholm, 2002). Gender differences, for example, in participation rates in online courses and online course performance may be a fruitful avenue for subsequent research. How is the differential performance of women explained? Do women use different learning styles from men in online courses? Do women participate more consistently in various course areas?

It is also possible that instructors make attributions based on high or low discussion board performance that affects ratings in other areas (i.e. halo effect). Instructor attributions of online performance, presumably more objective in a certain sense, may in fact be influenced by (perhaps subtle) student cues, just as in a more traditional classroom. For example, students making copious low quality posts on a discussion may actually have a positive impact on the instructor who sees the student's name

very frequently, prompting an attribution of high performance. This is an area worthy of additional research.

Student age also turned out to be a significant variable: older students are more likely to initiate discussion board threads (undergraduates) and tend to get better grades in online courses (MBAs). This is interesting in that some universities are now requiring all students, even entering first-year students, to take online courses. The present findings suggest that younger students may not be ready for the self-directed yet highly structured online format. Younger students may need special attention to enhance the benefits derived from online course formats. Although correlated with age, work experience for MBAs was related to higher performance levels. Age and experience appear to enhance performance in online courses, perhaps because such students bring more to the learning experience. On the other hand, younger students may feel intimidated by the presence of more experienced classmates and therefore be less prone to get fully involved in discussions. Taken together, these findings indicate that more work on age and experience variables is warranted as factors affecting performance in online courses.

As noted previously, none of the variables in this study was self-reported, which might be considered a major strength in some circles. The authors' initial sense was that this was a salient strength of this study. Yet, further insights into performance in online courses must consider individual and team characteristics that affect online learning success. A student who enrolls in such a course with the expectation that no class attendance is required might bring a motivational perspective that low effort will be required for successful completion of the course. Self-report data might provide some additional insights into the behavioral expectations of students for success or failure. Learning styles would seem to be a fruitful avenue for additional understanding of online performance dynamics. Nevertheless, the present findings do add to the growing body of literature on performance in online courses. Clearly, much more research is needed in this area. Student characteristics, professor characteristics, subject area, course requirements, length of course, among others,

afford ample opportunity for additional studies. The present authors suggest the inclusion of both objective and subjective variables in future research.

Conclusion

The results of this study show that certain characteristics of undergraduate and graduate business students are related to performance in online distance learning courses. Factors such as gender, age, previous undergraduate grades, work experience and/or job position level, and performance on intra-course assignments should be considered, as faculty and distance learning course designers set up online learning experiences. The findings here did concur with some of the previous studies' findings related to age, gender, and work experience on students' performance. Some factors that may be of particular interest to faculty and course designers are the relationship of discussion board participation and discussion thread initiation to the overall student performance. These participatory factors may need extra attention, perhaps through more explicit direction to students, orientation, emphasis in course materials, and examples for students from which to learn. Some faculty who have experience with online, and perhaps traditional in-person courses, may have anecdotal experience in seeing less participative students that do not perform and learn as well. Now that more empirical research in such matters is beginning to become available, it can be helpful for administrators and course developers to formulate more strategies and policies to make changes in course design to maximize student learning.

Future areas of study that should be examined include performance in non-business courses and programs, other standardized tests apart from the SAT and GMAT, student ethnic/cultural backgrounds, language fluency, previous participation in online courses, and psychological learning styles. Exploring attitudinal and affective measures, in addition to more objective variables, might help researchers to understand the complex dynamics associated with online, distance education.

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Appendix. Glossary

Study variables

- Age* – participants' chronological age recorded in years.
- Assignment (ASSIGN)* – grade for an individual assignment recorded as the number of points out of 100.
- Discussion board participation (DBPart)* – participation score on a 100-point scale (observed range 0-100).
- Discussion board thread initiation (DBThread)* – number of threads initiated by each participant (observed range 0-8).
- Gender* – sex of participants with 1 = female and 2 = male.
- Grade* – final course grade where A = 4, B = 3, C = 2, D = 1, and F = 0; major dependent variable in the study.
- Graduate management admissions test (GMAT)* – standardized academic test with scores ranging from 200 to 800 (observed range was 340-710) on a test that purports to measure ability to pursue graduate studies in management education.
- High school grade point average (HSGPA)* – average grade in all courses attempted in high school (grades 9-12). Recorded as a number where A = 4, B = 3, C = 2, D = 1,

and $F = 0$ (observed range was 2.13 to 3.81).

Number of hits (NUMHITS) – number of hits for the course communications area taken directly for the Blackboard course management database (range 178 to 8,258 hits).

Organizational level (ORGLEV) – level in current work organizational structure for MBA participants coded as: 0 = no experience; 1 = entry level; 2 = some managerial experience; 3 = middle manager; 4 = vice-president or equivalent; and 5 = president or chief executive officer.

Scholastic aptitude test (SATTot) – widely used standardized test for undergraduate admissions decisions with scores ranging from 400 to 1,600 (observed range was 520-1,350).

Undergraduate GPA (grade point average) – the cumulative average of student final course grades (A = 4, B = 3, C = 2, D = 1, and F = 0) on completion of their undergraduate degree.

Work experience – number of years of full-time work experience for MBA participants (average of 8.54 years with standard deviation of 6.01 years).

Parameters used in the analysis

F = the ratio where variance between groups is divided by the variance within groups. The magnitude of the ratio increases as the difference between groups increases and/or the variance within groups decreases.

p = the statistical significance, or probability, that an observed result is “correct”.

r = the correlation coefficient determines the extent to which values of two variables are related to each other.

SD = A measure of variability. The standard deviation is the square root of the average of the squared distances of the observations from the mean. It determines where the values of a frequency distribution are located in relation to the mean.

Acronyms

AACSB International = Associate for the Advancement of Collegiate Schools of Business. A specialized accreditation agency in post-secondary business education.

MBA = Master of Business Administration, which is a post-baccalaureate degree in business awarded by colleges and universities.