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Final Exam Scores in Introductory Economics Courses: Effect of Course Delivery Method and Proctoring

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Abstract

There is a small but growing body of research exploring student learning in online courses. The current study compares student performance on the final exam in introductory economics courses taught online and in the classroom and considers the effect of proctoring the final exam. Students who took a course in the classroom did better on a proctored final exam than those taking the course online.

Key Words: cheating, economics, online delivery, proctored exams

Introduction

It was not the usual environment that spurs academic inquiry. "I took that class online" said a family friend, referring to our department offered *Principles of Macroeconomics* course. He went on to describe "the system" his housemates used to overcome the challenge of collaborating (cheating) when student exams are individually prepared by random draw from large test banks. They took advantage of what Rowe refers to as the 'birthday fallacy'. You may recall in a statistics course going around the classroom as each student indicates their birthday until there is a match, and perhaps your surprise at how quickly a match was revealed. This is of course because the probability of a match is calculated as

$$1 - \frac{(365)(364)\ldots(365 - n + 1)}{365^n}.$$

In a class of just 30 students, the probability of a match is 71%. It increases to 90% with 41 students. The 'birthday fallacy' also explains why only a handful of students could collect most of a testbank's questions even when the questions number in the hundreds.

The entrepreneurial students imported their pretest questions, drawn from the same testbanks as the exam questions, into a word processing file. Students combined their files to create a "student testbank" for each chapter prior to taking their individual chapter exams in our online course. Enough participants in the scheme ensured that the students had most of the possible questions (and answers, since students pretests are graded immediately after they are completed) in the test bank. Having them in a word processing file allowed them to easily locate specific questions during exams using the search function. Essentially one student would read the beginning of a question and his "assistant" on a neighboring computer would search the file and provide the answer.

I inquired why they would embark on this elaborate scheme which surely took approximately the same amount of time and more coordination than simply learning the material before taking the exam. Surprised by the naivety of my question, he responded "we may not learn the material, but we are guaranteed an A." This conversation sparked our interest in better motivating students to learn the material in our online courses. Our hypothesis was that including a proctored final exam and well-disclosing this from the onset of the course would improve student learning.

Literature

On-line Education

Recent literature claims that, during a given semester, between 2.3 and 3.5 million students are taking an online course in the U.S., and that two-thirds of all academic institutions offer some online courses (Allen and Seaman; Hogan and McKnight). Allen and Seaman computed the compounded annual growth rate in online courses over the past five years to be 21.5%. Student-based reasons for the popularity of on-line courses include the desire for additional flexibility in time and place and for independent learning. Institution-based reasons

include attracting new students and growing continuing education programs, rather than to reduce cost (Allen and Seaman).

There is considerable debate and some associated academic inquiry into the quality of online course offerings. Few would debate that quality is important in our courses. The reputation of an academic institution is also at stake, whether it is measured by official accreditation or otherwise (e.g., reputation among employers). Some literature supports that online classes are of equivalent quality to their classroom-taught counterparts as measured in a variety of ways. For example, Dutton, Dutton, and Perry compared two sections of a computer programming course, one taught online and one in the classroom. Although online students performed better than those in the classroom, once students' grades were adjusted for other differences (e.g., programming experience, number of credits taken), course grades were equivalent between the two groups.

Other research, particularly in the field of economics, concludes that online courses do not offer the quality of their classroom counterparts. Anstine and Skidmore found that, although online students did as well as classroom students, they did not perform as well when their grade was adjusted for other factors that differentiated students. Coates, et al. compared online and classroom course offerings by three instructors at three universities. End-of-class performance on the standardized Test of Understanding of College Economics (TUCE) was used to measure student-learning. Students in the classroom performed better than online students and this difference held even after analysis adjustments were made for effect of delivery method on performance and self-selection bias. The difference was especially notable for freshmen and sophomores, prompting the authors to advise against offering introductory economics courses in an online format.

Brown and Liedholm compared three course formats for introductory microeconomics. Online students did not perform as well as their classroom counterparts, but the authors concluded they would have performed better than their classroom counterparts if they had taken the class in the classroom. Online students performed comparably on definitional questions, but could not as well apply the material or respond to complex questions. Alternatively, they concluded that the performance of those taking the course offered in a hybrid format would not have changed substantially if they took the course either in the classroom or online. In general, students taking the course in the classroom put in more overall time than those taking the course online.

Another quality issue is that of course completion. In general, the literature that explores course retention concludes that online students are less likely to complete a course than their classroom counterparts (e.g., see Dutton, Dutton, and Perry; Vachris). Dutton, Dutton, and Perry found the difference disappeared once they accounted for the number of credit hours the student was currently taking, with those students taking more credit hours being more likely to complete the course. This raises the question whether the student audiences are the same for online versus classroom offerings. The literature in general supports that they are not. Vachris argues that online courses generally take more effort and therefore entice more active and independent learners. Dutton, Dutton, and Perry argue that online students are different, not only

demographically, but behaviorally and by what is important to them. Brown and Liedholm found that online students had higher ACT scores and had already completed more credits.

Faculty concerns about quality of online courses are especially commonplace. Allen and Seaman report that the two most critical barriers facing on-line education as elicited from academic leaders are faculty acceptance and a need for more discipline on the part of students. Four-year institutions have the lowest level of faculty acceptance. Only 15% of academic leaders at these institutions reported that their faculty accept and find legitimate online courses.

Academic Dishonesty

The first lesson from the literature is that students cheat (Passow, et al.; Varvel). Two useful classifications of cheating have been presented. One separates the occasions as panic versus planned, and another differentiates between those that involve others and those that do not (Olt). Most panic cheating involves copying from another student or using unauthorized material, while planned cheating generally involves preparing unauthorized material to use in class or making arrangements with other students or other advanced planning (e.g., obtaining test questions in advance of the test such as is the case described in the introduction to this paper).

There are many ways students cheat discussed in the literature, even in online courses (e.g., see Eplion and Keefe; Rowe). Students can obtain questions or answers in advance of the assessment, including retaking an assessment after they have had access to it by, e.g., claiming computer problems occurred during the exam. Students can obtain unauthorized help including having another student complete the material. However they cheat, the question of interest in the current study is whether online students cheat more than those in the classroom. Myth and anecdotal evidence suggest they do. It is argued that online students cheat more because it is easier because they are generally not observed while completing assessments (Kennedy, et al.), because online students are under more pressure, and that online students do not develop the same relationships with the instructor and other students as they would in a classroom setting and therefore have less commitment to the course (Rowe). Interestingly, those who argue online students cheat no more than classroom students argue that the isolation element works the other way; that students do not develop the relationships necessary to facilitate cheating and are not subject to a social "cheating culture" (Charlesworth, Charlesworth, and Vician; Smith, Ferguson and Caris). Perhaps most compelling is the argument that the opportunity does not present itself as often in online courses to panic cheat or cheat in ways that involve others (Grijalva, Nowell, and Kerkvliet). In online courses, coordination, sometimes substantial and complex, may be necessary[1]. And, this may limit use of assistance. Gustafson (2003) reported that, even when students were explicitly permitted to receive assistance on their online chapter exams in a classroom-taught introductory macroeconomics course, over half the students did not use assistance and most of the remaining students did so only periodically. Student's use of assistance declined over the semester.

Thus, the evidence on comparative cheating is inconclusive and seemingly in large part anecdotal, in no small part because it is very difficult to detect cheating, especially with the rigor required for academic discourse. It also may be easier for a student to disclose in general how students cheat in online courses than to describe specific instances of cheating in the classroom.

There is also evidence that students under-report cheating, even when an experiment is carefully designed to demonstrate to student that they have absolute anonymity (e.g., Nowell and Laufer). There are few empirical studies of cheating in online courses (Charlesworth, Charlesworth, and Vician).

There is some empirical evidence on who cheats. This small body of evidence draws expected conclusions. That is, those who cheat are those who can gain the most benefit from doing so (e.g., those doing less well in the class), are under the most pressure (e.g., those who work more), and those who are able to do so more easily (e.g., those in group housing) (Kerkvliet; Nowell and Laufer). Again, the evidence is limited. However the framework does aid in understanding cheating and results in a literature rich in matters related to reducing cheating (e.g., see Cordova and Thornhill; Eplion and Keefe; Kerkvliet and Sigmund; McNett; Olt; Rowe; Varvel).

Objectives

Thoughts regarding the role of online classes are not particularly well defined at our academic institution, but within our department, faculty range from vocal skeptics to those who are moving forward with online course offerings for what they presumably personally believe is the greater good, including the author. Add some rational but anecdotally-based skepticism to the previously discussed findings on comparative course quality and you have the natural question of whether our online introductory economics courses are 'at least as good' as our classroom courses. There is plenty of debate about, not only this basic question, but even about the definition of quality. Defining quality is not the purpose of this paper. Suffice to say, however, that groups of students working together to respond to exam questions without learning the material is not quality. Therefore, our objectives were two-fold. First, to determine whether students enrolled in the course were the students actually completing the work (i.e., determine the level of cheating). Second, to determine whether students learned, understood, and were able to apply the material and, at least in the short run, retain this knowledge.

Although admittedly and perhaps the initial rationale for a proctored unaided final exam was to punish those who cheated or "cheated themselves" by not learning the material, the work subsequently described does not allow one to speak to whether relative performance on the final exam is indicative of cheating on assessments prior to the final exam or if students did not learn simply because it was unnecessary to do so (e.g., because materials could be used during prior assessments). In fact, it only allows for consideration of performance on a final exam, and whether observable differences in student performance on exams and class (class, term of offering, online versus classroom offering, proctored or un-proctored final) can explain performance.

Methods

The initial design and later revisions of our online introductory economics courses have taken recommendations from the literature about how to minimize cheating and motivate learning into account. The importance of a social environment that does not allow nor tolerate cheating is stressed. Our honor code is shared and explained throughout the course (syllabus,

audio-introduction, announcements). We also try to make learning relevant by providing interesting material and helping students apply it to their everyday life. We make it more difficult to work with others (e.g., have a large number of individual chapter pretests and exams, none of which alone comprises a significant portion of the student grade)[2]. We use large test banks and each exam is formed with random draws so the exams of individual students are different. And, we added a proctored final exam when a majority of students are on campus (i.e., during the academic year, but not during the summer)[3]. We comprised the grading rubric so the proctored final was worth enough of the grade to motivate them to be prepared. There is some evidence from the literature that supports that cheating in economics courses may be greater when the exam is not proctored. Harmon and Lambrinos concluded that there was cheating on a non-proctored final exam by comparing the R^2 of models that estimated final exam score as a function of various indicators, including score on three non-proctored exams, for an online and a classroom course.

Because one instructor has offered three different courses under a variety of environments (online versus classroom, eight-week summer term versus 16-week academic term, and with a proctored versus an unproctored final exam), it is possible to determine whether our efforts to reduce cheating or otherwise improve learning were successful.

The Model

Performance on the final exam is estimated as a linear function of average exam performance with dummy variables used to represent the course, if it was offered in the classroom or online, and whether the final exam was proctored (Equation 1).

(1) $\text{Final}_i = \alpha + \beta_1 Exam_i + \beta_2 Course_i + \beta_3 Classroom_i + \beta_4 Noproctor_i + \varepsilon_i$ for i = 1, 2,…,n.

Where: B_i are the estimated coefficients and ε_i is the random error term.

$Final_i$ = percentage performance on the final exam for student i

$Exam_i$= average percentage performance on chapter (online) or midterm (classroom) exams for student i

Course = one or more dummy variables denoting the course or courses. In the initial model, dummy variables are included to depict non-base case courses where

ECON 201 (Principles of Microeconomics) = 1 if course is Econ 201, 0 otherwise

ECON 105 (Elements of Economics) = 1 if course is Econ 105, 0 otherwise.

Classroom = 1 if course was offered in the classroom, 0 if it was offered online

No Proctor = 1 if the final exam was taken online, 0 if it was proctored.

The base case is ECON 202 (Principles of Macroeconomics).

Courses

Data from three courses taught by the same instructor were included. Each course used Blackboard© as a delivery mechanism for course information (e.g., syllabus, audio introduction), materials (e.g., lecture notes), and announcements. In each online-, but not classroom-taught, course, students were allowed to use materials (e.g., notes, textbook) during completion of

assignments, pretests, and exams, but, on the honor system, were not allowed to receive human assistance. Specific examples of what was allowed (e.g., use of textbook and notes) and not allowed (e.g., receiving aid from a friend, having another individual complete the work) were provided during the audio introduction and specified in the syllabus.

ECON 105, Elements of Economics, is an introductory course including both micro- and macroeconomic principles. It is designed for non-majors. It was taught online in the spring of 2007. DiscoverEcon®, a commercial online assessment package tailored to the specific textbook used, was used for assignments, pretests, and exams. Students completed a pretest and exam for each assigned chapter of their textbook. The pretest grade was their initial and only attempt and students were instructed to complete the chapter pretest only after reading their textbook and completing chapter assignments. It was to be used by students to check their understanding prior to taking the exam. The recorded exam score was their last attempt. Students were allowed to retake each exam until they were satisfied with their performance[4]. The final exam was proctored and was comprised of an approximately equal number of questions for each chapter from the DiscoverEcon question banks (i.e., question banks used for the pretests and exams). Most students took the final exam during finals week in an auditorium at one of two available times. By exception, final exams were individually proctored by support staff, a clergyman, or a faculty member at another university.

ECON 201, Principles of Microeconomics, and ECON 202, Principles of Macroeconomics, were both offered in the classroom during an eight-week summer term in 2006. Three midterm exams and a final were proctored. Econ 201 was offered online during the summer of 2007. Econ 202 was offered online during the spring and summer of 2007. Online offerings of both classes relied on Blackboard© for course information, materials, and announcements. Students also took chapter pretests and exams in Blackboard© with questions drawn randomly from a test bank provided by the textbook publisher. Pretests were ten questions and were not timed. Exams consisted of 25 questions and students were limited to 50 minutes to complete each exam. As noted previously, individual chapter rather than midterm exams were used and a time limit imposed to reduce the likelihood students would seek outside assistance during exams. About one-quarter of the student's grade was their performance on chapter assignments in Aplia©, an economics homework management package tailored to the specific textbook used and available on the Internet. The final exam for the online-offered ECON 202 during spring term, 2007 was proctored, but those for the online 201 and 202 courses during the summer 2007 were not.

Exam questions for the final exams in all classes over all terms came from the test bank offered by the publisher and reflected an approximately even number of questions from each chapter. Questions were screened carefully for content and level of difficulty. All fifty questions on the final exam were the same across students in a class, and a nearly identical final exam was used in the summer 2006 and spring 2007 ECON 202 courses. The final exams used in the online offering of ECON 201 and ECON 202 during the summer 2007 were updated to reflect a new edition of the textbook (and an updated accompanying test bank). Except for slight changes, content and level of difficulty did not differ. Content was directly compared between

exams to gauge level of difficulty. Table 1 provides a summary of course details and final exam scores. Ordinary least squares was used to estimate performance on the final exam as a function of specified attributes as previously described.

Table 1. Summary of course offerings and final exam performance

Course	Term	Number of students	Location	Final exam	Final exam score average (standard deviation) and median
ECON 105	Spring 2007	70	Online	Proctored	50.94 (13.78), 49.00
ECON 201	Summer 2006	14	Classroom	proctored	73.21 (15.74), 76.50
	Summer 2007	31	Online	Unproctored	76.61 (15.26), 79.17
ECON 202	Summer 2006	9	Classroom	Proctored	77.33 (9.70), 80.00
	Spring 2007	27	Online	Proctored	60.74 (12.27), 60.00
	Summer 2007	18	Online	Unproctored	75.53 (15.38), 78.57

Results

The included variables explained 62.7% of variation in final exam performance (adjusted $R^2 = .616$) (Table 2). The coefficient on average percentage on chapter or midterm exams was significant and, at .816, as expected, it was reasonably close to one. Tested independent of other variables only for ECON 202, the correlation between average exam and final exam scores was lower when the final exam was proctored (.534, p = .004) than when the final exam was not proctored (.917, p=.000). Students in ECON 105 did substantially worse on their final exam than those in ECON 202 (the base case) and the coefficient was highly significant. The average final exam score in ECON 105 (proctored final) was only 50.94, compared to 71.67 over all offerings of ECON 201 and 202. The average for the ECON 105 final was also a full letter grade lower than that for the same semester ECON 202 class which was also offered online and also had a proctored final exam (50.94 versus 60.74, p = .002).

Table 2. Estimation Results: All Classes Considered

Final	B	Standard Error	t	Significance
α	-3.004	6.856	-.438	.622
Exam	.816	.083	9.788	.000
ECON 105	-16.314	2.609	-6.253	.000
ECON 201	-1.901	2.715	-.700	-.485
Classroom	17.875	3.582	4.991	.000
No Proctor	13.096	3.185	4.112	.000

$R^2 = .627$. Adjusted $R^2 = .616$.

When other differences were accounted for, students who took the course in the traditional classroom environment (during the summer of 2006) did substantially better than those students taking the courses online. The estimated coefficient indicates the advantage for the classroom students as 17.87 percent. And, all else equal, those students taking a non-proctored final exam did substantially better than those taking a proctored final exam. The associated estimated coefficient is 13.10.

The model variables were changed slightly to test the robustness of the model. The two dummy variables allowing for estimation of class effect were reduced to one which reflected whether the course was ECON 105 or was one of the principles courses. ECON 105 was only taught online and course format differed considerably from that of the online offerings of ECON 201 and 202, which were very similar to one another. The explanatory power of the model did not change (R^2 = .626, adjusted R^2 = .617) and estimated coefficients changed very little (Table 3).

Table 3. Estimation Results: All Classes Considered with Introductory Micro- and Macroeconomics Combined.

Final	B	Standard Error	t	Significance
α	-19.073	7.281	-2.619	.010
Exam	.813	.083	9.780	.000
Micro or Macro	16.291	2.605	6.255	.000
Classroom	16.709	3.166	5.278	.000
No Proctor	11.905	2.690	4.427	.000

R^2 = .626. Adjusted R^2 = .617.

Online Courses

To test for differences in student performance on the final exam between online sections when the final was proctored and those when it was not, the estimate was run only including online students. Again, estimated coefficient parameters and the explanatory power of the estimate changed very little (Table 4). Students taking a non-proctored final exam and allowed access to their textbook and notes scored more than one full letter grade higher than those taking a proctored final.

Table 4. Estimation Results: On-line Courses

Final	B	Standard Error	t	Significance
α	-2.438	7.815	-.312	.756
Exam	.809	.096	8.429	.000
ECON 105	-16.256	2.714	-5.989	.000
ECON 201	-2.931	3.439	-852	.395
No Proctor	13.779	3.500	3.937	.000

R^2 = .599. Adjusted R^2 = .588.

ECON 202

Consideration was next limited to a single course. Data from the three sections of ECON 202 were considered: Summer 2006 (classroom with proctored final), spring 2007 (online, proctored final), and summer 2007 (online, non-proctored final). Results are similar to those obtained from the previous models (Table 5). Again, the coefficient on the exam performance variable was close to one. Accounting for other factors, those taking the course and completing their exam in the classroom did much better than those taking the course online, but also completing their final in a proctored classroom environment. These results are not unexpected looking at the average percentage score on the final exam for the three sections. The summer 2006 (80.00) and summer 2007 (78.57) averages were not different; as the estimation predicts. Presumably, the classroom environment approximately compensated for the proctored final when compared to the online environment with a non-proctored final exam. In other words, although students taking the course in the classroom did not benefit from the open-note and open-book final enjoyed by their online counterparts, they did as well.

Table 5. Estimation Results: Introduction to Macroeconomics

Final	B	Standard Error	t	Significance
α	-8.647	9.366	-.923	.360
Exam	.888	.118	7.539	.000
Classroom	16.52	3.471	4.759	.000
No Proctor	13.68	2.748	4.978	.000

R^2 = .658. Adjusted R^2 = .638.

Discussion

The estimated coefficient on the variable representing students' average exam score was close to one and was always significant, indicating that students who did better on the final exam also did better on chapter or midterm exams. The relatively poor performance of students enrolled in ECON 105 on the proctored final exam relative to students in other classes lends itself to the conclusion that the assignments in DiscoverEcon® and/or the method of allowing students to retake their exams until they are satisfied with the grade were not conducive to student mastery of the material. The rationale behind allowing multiple attempts on each exam was so students would learn the material better if they worked additional problems (i.e., took the exam more than once). Because there was no time limit on exams, the expectation was that students would use their textbook and notes to determine the answers, similar to working homework problems. Although this was not successful, it is not clear why. A careful review of the assignments and exams in DiscoverEcon® is warranted. It is also important we consider whether the 'birthday fallacy' may have resulted in some students simply learning the questions (and answers) for each chapter prior to taking their record (last) exam for the chapter. This could be accomplished independently in this class because students were allowed an unlimited number of attempts on the exams.

The classroom environment apparently aided students in preparing for the final exam. The relevant question is how? One hypothesis is that the small class size and / or the classroom environment motivated student understanding and retention. In the classroom, new material was covered more consciously as building upon previous material. A regular review of previously-covered material was offered by the instructor as the course progressed. Problems were regularly worked in class, allowing students to master the material as it was covered. Relevance to current events was regularly discussed, facilitated by the instructor- (rather than self-) paced nature of the course. Students in the classroom also took three closed-notes, closed-book midterm exams rather than open-note, open-book exams for each individual chapter offered to online students, the latter designed to reduce the likelihood of collaborative work. For classroom students, the proctored final exam was taken in the same environment as their midterm exams, but simply covered more material. And, like the final exam, their mid-term exams required knowledge and understanding of material from multiple chapters. For online students, the proctored exam was unlike their previous experiences in assessment for this class, because it was on paper and was proctored, use of routine materials was not allowed, and it covered multiple (in this case all of the) chapters assigned.

Evidence indicates online students did not perform as well as their classroom counterparts, especially when they were required to take a proctored final exam. One hypothesis supported by Brown and Liedholm and casual observation of the exam completion process of our own students is that our online students did not spend enough time with the material. Many online students completed a large number of exams during the last week of the class. And, few students in the principles courses completed the practice problem sets assigned in Aplia©, but rather only completed the graded set for each chapter. This was disappointing because the practice sets, but not the graded sets, provided immediate feedback and additional tutoring. We do not have a good estimate of the amount of time students invested in each course. In future courses, this information can be tracked either through students volunteering the information (e.g., a survey or course activity diaries) or can be estimated by considering the amount of time students are online viewing or completing course materials.

It is clear that student expectations of the time required to complete the course were not well aligned with the actual time required. From their typed comments on the course evaluation instrument and from student emails, it appears many believed that a semester-long online course can be completed in a dedicated weekend or two (e.g., several explained they did not complete the last five to ten chapters because they unexpectedly had to go out of town for the weekend, were ill, and so on).

Regardless of precisely why students in the online courses did not perform well on a proctored final exam, the lesson is that students did not succeed. They were not required to learn the material to succeed on chapter-level assessments, or the individual chapter exam format did not encourage semester-long retention. The literature suggests how this challenge might be overcome resulting in the following recommendations to motivate student learning in our online courses.

- Retain the proctored final exam, and continue to announce this early, often, and broadly so students are ever-conscious that they will be responsible for the material in an un-aided environment. That is, that they will be expected to learn it, retain it, and know how to apply it.

- Ensure computer exam questions concentrate on application and more complex assessment questions to encourage active thinking versus looking up material. It is possible to select questions from the test-bank for the exam pool based on the type of question. This feature should be employed to limit the number of definition and general knowledge questions students face, as this information can easily be looked up during the assessment and, hence, does not require prior learning.

- Train students early to read, understand and practice. Require additional homework problems, coincidentally being beta-tested online by the firm supporting the publisher of the textbook used for Introduction to Microeconomics and Introduction to Macroeconomics. Further, require or otherwise motivate students to complete practice homework problems in Aplia©. Perhaps reduce the number of questions in both the practice and the graded problem sets to decrease the required time commitment of completing both. Ask students to write short papers describing a current event using economic concepts (e.g., why the price of gasoline is so volatile). The downside is that this will require an additional time commitment on the part of the instructor, and hence may limit the number of students who can enroll in the class, but this is true whether the class is online or in the classroom.

- Continue to tell students early, often, and in a variety of ways that the course may be time consuming relative to their expectations. A suggested schedule is provided to allow students to complete the course at a steady-pace and finish on time. Few students follow the suggested schedule. The initial three chapters must be completed one-quarter of the way into the course. This is to ensure that students understand the commitment and have a good idea of the time each chapter will require. However, students often stop working on the course once these chapters are completed, only to rush to complete the remaining chapters during the last week or two of class. While more difficult to manage, and somewhat against the nature of a self-paced online course, a second and perhaps additional deadlines would help students keep on track. And, it might help students overcome self-discipline problems noted by 80% of academic leaders (Allen and Seaman).

- Otherwise regularly engage students in the class. Regular announcements are posted in Blackboard© and a new feature allows these announcements to simultaneously be emailed to students. However, the self-paced nature of the course has somewhat hindered the subject matter and concepts discussed in messages designed to demonstrate relevance of course material to everyday life. Additional pacing would allow instructor-student or student-student discussion that relied on a specific level or breadth of subject matter knowledge. It would also facilitate additional means of engaging students such as chat sessions regarding material covered throughout the course.

North Dakota State University is one of eleven schools in the North Dakota University System Most partner schools fall under a joint articulation agreement which allows for seamless transfer of course credit within the system. Thus, we must be especially cognizant of, not only the quality of our own online courses, but of those of our state-partners. Coates, et al. concluded that teaching principles of economics courses online is a bad idea, in part because their research showed that freshmen and sophomores are especially disadvantaged by their online delivery. However, nationally, two-year schools offer the fastest growth rate of online course offerings (Allen and Seaman). In light of these challenges, retaining in-house quality control for the fundamentals courses supporting our academic majors may be a compelling reason to continue to grow our offerings of online courses, and to make these more widely available to off-campus learners and those at partner schools.

Endnotes

1. Alternatively, the family friend also described a means to cheat collaboratively with those with whom you have no relationship. He indicated that his cohorts also went online to find questions and answers from the textbook's test bank, not only that instructors post as practice for their students, but that other students post for one another. Of course, this behavior would also aid students on exams prepared with a publisher's test bank in a classroom-taught course.

2. We are cognizant of the risk that this may emphasize and encourage short term memory rather than long term understanding (Rowe).

3. Other useful ideas were gleaned from the literature, but not employed for these particular classes. They include issuing an identification number and password to each student just prior to them taking the exam, use of a webcam to record students as they take the exams, use of a lock-down browser to disable students' ability to cut and paste or save material, or access other programs including the Internet, and to require students to inform the instructor via telephone or email immediately at the time of a technical problem with their computer access to assessment instruments.

4. In retrospect, enterprising students might have thought to take the exam prior to the pretest. It draws from the same test bank and can be retaken, allowing students to practice prior to their sole attempt at the pretest.

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