Study of e-Learning outcomes: The Role of Late-Registration and Self-Selection

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Abstract

The objective of this paper is to study how the registration time (early versus late) and the availability of the self-selection options (online and face-to-face) affect the eLearning outcomes in higher education. The students' performance in terms of the GPA and the DFW (drop, fail, and withdrawal) is compared in two online sections of an undergraduate business core course. Each section represents a different characteristic in the context of the registration time and the available self-selection options. The results show the students who register late for the online classes and do not have an option to self-select between face-to-face and online sections achieve significantly lower grades and higher DFW (drop, fail, withdrawal) rates than those who register early and have self-selection options.

Key words*: e-Learning; Online Education; Self-Selection; Late-Registration.*

Introduction

The number of students taking online courses has grown by 5.6% from Fall 2015 to Fall 2016 to more than 6 million, and nearly 32% of all higher-education students in the USA are taking at least one online course (Seaman et al., 2018). The majority of the higher education institutes have started offering classes in three different delivery modes: traditional face-to-face, online, and hybrid. While face-to-face classes are in the traditional classroom setting with the mostly synchronous delivery of the teaching instructions, online and hybrid courses have a significant component of asynchronous delivery of teaching instructions. In general, the online courses have more than 80% of the teaching instructions delivered through the Internet, and hybrid courses offer a blended environment and combine the benefits of the synchronous face-to-face learning and asynchronous eLearning.

The proliferation of online education has generated enormous interest among researchers to compare the effectiveness of online and face-to-face education regarding achieving learning outcomes. Prior researchers have predominantly used students' performance in exams, assignments, quizzes and overall grade in online and face-to-face courses to assess the effectiveness of different delivery modes. Moreover, these studies have investigated the effects of factors such as demographics, student performance, and course type on performance outcomes in courses with different delivery modes. The results from these studies are inconclusive for determining which of the delivery mode is better. According to one meta-analysis of eLearning research between 1996 and 2008 (Means, Toyama, Murphy, Bakia, and Jones, 2009), the hybrid formats outperforms the traditional face-to-face delivery format. The same study also concludes that based on prior research, online instruction alone does not significantly improve the students' performance in eLearning outcomes. Other researchers have studied student heterogeneity and concluded that high-achievers perform equally regardless of the teaching mode. However, low achievers perform worse in the hybrid format (Joyce et al. 2014). Prior researchers have also shown that factors such as class size and course type also affect the performance of students in the online courses.

The objective of this paper is to study two additional factors, namely the timing of registration and self-selection that may impact eLearning outcomes in general and students' academic performance in particular. Research in higher education has demonstrated that late registration in the courses has a negative impact on students' academic performance. The majority of research in this field has been done in the face-to-face delivery mode setting. The majority of the previous research does not account for the self-selection factor. Students have different learning styles, and they may choose from the online, face-to-face, or hybrid instruction modes based on their abilities to perform better in that mode. High achievers may self-select to register for the online or hybrid course formats because of their higher perceived ability and suitability (Milroy et al. 2013), and they may have performed equally well in the face-to-face format as well. In this paper, the impact of students' self-selection (between online and face-to-face) and registration time (early or late) on the eLearning outcomes is analyzed in an undergraduate business core course. The course is offered in multiple sections in the same semester, including a face-to-face section and two online sections. While the first online section and a face-to-face section were opened concurrently, providing early-registrants an opportunity to self-select, the second online section was opened just a couple of weeks before the starting date of the semester, well after the other two sections were full. This allows us to analyze how late registration and self-selection affect eLearning outcomes.

The rest of the paper is organized as follows. Section 2 summarizes the brief literature review on the comparative analysis of learning outcomes in different instructional modes and the effect of late registration and self-selection on students'

performance. Section 3 provides details on our research method. Data collection and results are shown in section 4. Finally, section 5 concludes the paper.

Literature Review and Research Hypothesis

The effect of registration time and self-selection on the learning outcomes are well-studied in the prior literature. The focus of this paper is specifically on the impact of registration time and self-selection options on the learning outcomes in the context of online education or eLearning. The literature in the areas of eLearning, self-selection, and registration time is the most relevant to this research.

There is a dearth of research in comparing the learning outcomes between traditional face-to-face courses and the newer online and hybrid courses. At present, the evidence from the current research in this field is inconclusive. Neuhauser (2002) compared an online and a face-to-face section of the same course and showed that there were no significant differences in performance outcomes. Means et al. (2009) conducted a meta-analysis of e-Learning related studies between 1996 and 2008 and showed the superiority of the hybrid format over the face-to-face format. However, the study also points out that online format is only marginally better than the face-to-face format. Lack (2013) surveyed the literature on different delivery modes and did not find significant support of advantage of the online and hybrid format over face-to-face format. While e-Learning may be suitable for a group of learners, in general, the students are heterogeneous in their learning styles and requirements (Dunn, Beaudry, & Klavas, 2002). Prior studies have mentioned the lack of personalization as one of the significant challenges in e-Learning. Joyce et al. (2014) demonstrate that while high-achievers perform equally regardless of the format, low-achievers perform worse in the hybrid format.

Moreover, the performance of the students is negatively affected if the hybrid classes are based in large lecture halls. Figlio, Rush, and Yin (2010) show that face-to-face learning outperforms e-Learning for low-achievers, males, and Hispanic students. Xu and Jaggars (2014) demonstrate the ineffectiveness of e-Learning for community college students.

Prior researchers have shown that students' timing of course registration does matter in determining their course completion and GPA. Summers (2000) analyzed the relationship between students' enrollment behavior and course outcome and found that the semester GPA of the early registrants was significantly higher than the semester GPA of the late registrants. Diekhoff (1992) examined the impact of late registration in a course in a four-year liberal arts university and found that although there were no significant differences between the course exam scores of late and timely registrants, late registrants were more than twice as likely to drop the course. Summers (2000) and Johnston (2006) found that a 50-day advancement in registration time resulted in a 0.2 unit increase in the GPA. Summers (2000) and Zottos (2005) have shown that the late registrants were also more likely to have higher DFW (drop, fail, withdrawal) rates than the early registrants. Prior studies have also shown that the late registrants are more likely to stop attending the college in the following term. Mendiola-Perez (2004) and Summers (2000) show that the late registrants were less likely to persist in the next semester. The majority of this prior late registration related research was conducted in the context of the traditional face-to-face courses. The impact of late registration in online courses is not studied much in the prior research. In one of the few types of research in this area, Tompkins et al. (2018) show that the late registration continues being negatively related to student success in the online courses as well. In the context of massively open online courses (MOOCs), Anderson et al. (2017) summarized that the students registering in advance might have different motivations and commitment than the students who register late. They also noted that most of the late registrants in such courses are passive viewers rather than engaging students.

The self-selection bias is cited as one of the limitations of the prior research on the comparison between online and face-to-face teaching. In most of the previous studies, students were not randomly distributed among online, face-to-face, or hybrid sections of a course but they were selecting a section based on their needs, abilities, or availability. Self-selection is one of the major issues while comparing the performance of the students in online and face-to-face classes. Students may elect to enroll in an online or face-to-face section of the course. Coates et al. (2004) discuss that the students entering in an online course may be high-achievers and would have performed equally in online or face-to-face sections of the course and the students enrolling in face-to-face sections may be less able and would be a low performer in either type of instructional modes. Students may also be making a choice between online and face-to-face based on their learning styles. In such self-selection, students may perform better in online or face-to-face courses not necessarily because of the instructional mode but because of the suitability of their learning style with one of those instructional modes.

Students registering late may find that their preferred section (e.g., face-to-face) is full and may end up enrolling in a section which may not suit their learning style (e.g., online). Hence, students registering late may underperform in achieving their e-Learning outcomes because of the lack of commitment, engagement, or motivation and also due to the lack of self-selection options.

However, several studies have shown that students choose a mode of instruction (i.e., online versus face-to-face) not purely based on their learning style but also due to convenience and flexibility (Clinefelter and Aslanian 2015; Hittelman 2001; Kariya 2003). In online courses, students may register late not necessarily because of the lack of motivation or commitment but because they view it as a part of the overall convenience and flexibility that the online courses tend to offer. In this context, the registration time and correspondingly available self-selection options may not affect the e-Learning outcomes of the online courses. The following null-hypothesis is considered in this research.

H_{01}: The overall academic performance of the students registering late in the online class will not be lower than those students who register early.

Methodology

Higher education institutes have integrated online teaching in different ways. Most of the universities have started using online learning management systems (LMS) for their courses. While many universities are offering online degree programs, others offer a few online courses in their mainly face-to-face degree programs. At the Leighton school of business and economics at the Indiana University South Bend, we usually offer multiple sections of our business core courses every semester. As per our current online strategy, for every business core course, we offer one section online. This strategy allows our students to self-select from online and face-to-face formats based on their learning style. This research is based on the data collected from one of such multiple section undergraduate business course – Management of Information Systems (K321).

Usually, for the spring semester, students can start registering for the course in October. Two sections of K321 were planned to be offered in spring 2016, and the student registration was opened from October. Students could self-select between an online or face-to-face section of K321 for Spring 2016. In this paper, these two sections are referred to as Web_1 and f2f respectively. Once both the sections were full, an additional online section, referred as Web_2 here onwards, was opened by mid-December. At this time, enrolling students did not have an option to self-select between face-to-face or online sections but had to select the online section of K321. This has enabled us to study the effect of late registration as well as having a self-selection option on the e-Learning outcomes for the online courses.

For this study, all students who registered in Web_2 are considered as late registrants. The e-Learning outcome in the class is measured by the GPA and the DFW rate of students. It is important to note here that both Web_1 and Web_2 were being taught online, and both sections had the same syllabus, grading structure, teaching pedagogy, and assessment instruments. The weight of the different grading components for both of these sections was the same as well.

Data and Analysis

Table 1 provides details about the details of each of the online sections of this class. As discussed before, the students enrolling in Web_1 section were early registrants, and they did have an option of enrolling in the face to face section. However, as the face to face section was full, the late registrants who enrolled in the Web_2 section had no option to select the face to face section.

Table 1:
Online Course Sections Information

Details	Web1	Web2
Teaching Format	Online	Online
Self-selection Option	Yes	No
Registration open	October (last week)	Mid-December
No. of Students	41	26

The e-Learning outcome measured by the GPA and the DFW rate is provided in Table 2. The data clearly shows the very high rate of the DFW rate for the students enrolled in the Web_2 section (i.e., late registrants). Around one-fourth of the students in the Web_2 section dropped, failed, or withdrew from the class. The average GPA in the Web_2 was also around 0.5 points below the Web_1 section.

Table 2:
Student Performance in Online Courses

Details	Web1	Web2
DFW Rate	2.43%	23.08%
Average GPA	2.83	2.34
Total Students	41	26

The results of the two-sample t-Test for equal means are shown in Table 3. The value of the test statistic is greater than the critical value, indicating that the grade difference between the early registrants and the late registrants in the online courses are significant. Thus the null-hypothesis is rejected.

Table 3:
Two Sample t-Test Results (alpha = 0.05)

df	35	
t Stat	1.90	
P(T<=t)	0.03 (one-tail)	0.07 (two-tail)
Critical Value	1.69 (one tail)	2.03 (two-tail)

Table 4 provides the grade distribution of students in both of these sections. In the Web$_2$ section of the course, more students received the DFW grades than those who received grade C. It is possible that given a choice, some of these students would have opted for the face-to-face section of the course.

Table 4:
K321 Grade Distribution (Percentage of Students)

Grade	Web1	Web2
A	14.63%	3.85%
B	60.98%	53.85%
C	21.95%	19.23%
DFW	2.43%	23.08%
Total	100.00%	100.00%

It is also interesting to note that in table 4 the percentage of students receiving grades B and C remained quite similar in both of these sections. However, there is a significant difference between those receiving grades A and DFW. This once again highlights the importance of the availability of the self-selection option to the students.

Conclusion

This research indicates that the role of the registration time and self-selection on the e-Learning outcomes of the online courses can be an important influence. Students' performance in terms of the GPA and DFW rates are compared in two sections of the undergraduate business core course. The curriculum, content, the assessment, and pedagogy in both sections are the same. However, students registering in the first online section (i.e., early registrants) had an option to enroll in the face-to-face section while those enrolled in the second online section which was opened late in the semester (i.e., late registrants) did not have such self-selection option. Results show that in online courses, the late-registrants perform significantly lower than those who register early.

This research adds to the understanding of the factors that affect the students' outcomes in the online courses. Previous research has shown that late-registration as one of the factors that affect student's performance in the face-to-face courses. This research confirms that the adverse effect of the late-registration continue to persist in the online courses as well. The performance of the students registering late may also get adversely affected because of the non-availability of the alternate option of enrolling in the face-to-face section. There is a growing consensus among academicians that students are heterogeneous in their learning styles and requirements (Dunn, Beaudry, & Klavas, 2002). What works for one segment of students may not work for the other segments. Recent e-Learning research has started analyzing various heterogeneous student segments to compare the learning outcomes in different teaching formats. The students enrolled in the first online section may have selected an online section over the face-to-face section because of its perceived suitability. However, the students enrolled in the second online section did not have that option which may have affected their performance adversely. In this research, the student demographics and prior performance data are not considered, and the inclusion of such data in the future research could provide more details on the specific student characteristics that may have affected the performance of students.

References

Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2014, April). Engaging with massive online courses. In *Proceedings of the 23rd international conference on World wide web* (pp. 687-698). ACM.

Clinefelter, D. L., & Aslanian, C. B. (2015). Online college students 2015: Comprehensive data on demands and preferences. *The Learning House*, 8.

Coates, D., Humphreys, B. R., Kane, J., & Vachris, M. A. (2004). "No significant distance" between face-to-face and online instruction: evidence from principles of economics. *Economics of Education Review*, *23*(5), 533-546.

Deikhoff, G. M. (1992). Late registrants: At risk in introductory psychology. The teaching of Psychology, 19(1), 49-50.

Dunn, R., Beaudry, J. S., & Klavas, A. (2002). Survey of Research on Learning Styles. *California Journal of Science Education*, *2*(2), 75-98.

Hittelman, M. (2001). Distance Education Report, August 2001: California Community Colleges, Fiscal Years 1995-1996 through 1999-2000.

Johnston, G. (2006, May). *The date of course enrollment as a predictor of success and persistence.* Paper presented at the 46th Annual Forum of the Association for Institutional Research (AIR), Chicago, IL. Retrieved from ERIC database. (ED493834).

Joyce, T. J., Crockett, S., Jaeger, D. A., Altindag, O., & O'Connell, S. D. (2014). *Does classroom time matter? A randomized field experiment of hybrid and traditional lecture formats in economics* (Working Paper No. w20006). Retrieved from National Bureau of Economic Research website: http://www.nber.org/papers/w20006

Kariya, S. (2003). Online education expands and evolves. *IEEE Spectrum*, *40*(5), 49-51.

Lack, K. A. (2013). Current Status of Research on Online Learning in Postsecondary Education. *Ithaka S+ R, zuletzt geprüft am*.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Washington, DC: *US Department of Education*.

Mendiola-Perez, C. (2004). *The effects of early, regular, and late registration on academic success and retention of community college students.* (Doctoral dissertation). Retrieved from ProQuest database. (305222805).

Milroy, Jeffrey J., et al. "College students' perceived wellness among online, face-to-face, and hybrid formats of a lifetime physical activity and wellness course." *American Journal of Health Education* 44.5 (2013): 252-258.

Neuhauser, Charlotte. "Learning style and effectiveness of online and face-to-face instruction." *The American Journal of Distance Education* 16.2 (2002): 99-113.

Seaman, Julia E., I. Elaine Allen, and Jeff Seaman. "Grade Increase: Tracking Distance Education in the United States." *Babson Survey Research Group* (2018).

Summers, M. (2000, April). *Enrollment and registration behaviors as predictors of academic outcomes for full-time students in a rural community college.* Paper presented at the 42nd Annual Conference of the Council for the Study of Community Colleges, Washington, DC. Retrieved from ERIC database. (ED457940).

Tompkins, Patrick, Mitchell R. Williams, and Shana Pribesh. "An Examination of Late-Registering Students' Success in Online and On-Campus Classes." *Community College Journal of Research and Practice* (2018): 1-12.

Xu, D., & Jaggars, S. S. (2013). The Impact of Online Learning on Students' Course Outcomes: Evidence from a Large Community and Technical College System. *Economics of Education Review*, *37*, 46-57.

Zottos, G. (2005). *The impact of late registration on academic outcomes of urban community college students.* (Doctoral dissertation). Retrieved from ProQuest database. (305422423).