Student Performance and Success Factors in Learning Business Statistics in Online vs. On-ground Classes using a Web-Based Assessment Platform

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Abstract

This study aimed to quantify the influence of student attributes, coursework resources, and online assessments on student learning in business statistics. Surveys were administered to students at the completion of both online and on-ground classes, covering student perception and utilization of internal and external academic resources, as well as intrinsic motivating factors for success in the course. Student performance as defined by quality points, various assignment points, and time spent on assignments, was not significantly different between on-ground and online students. However, use of resources and tools to complete homework and learn new topics differed. As a whole, students predominantly utilized homework as the first tool to learn new topics and complete homework, suggesting a paradigm shift in the way instructors should cater to student's learning habits.

1. Introduction

It has become the new standard for universities and colleges across the country to offer online versions of their courses. During the progression of online course offerings, a vast number of studies have been conducted to compare online courses with their traditional lecture counterparts, including courses in education (Kirtman 2009), elementary statistics (Ward 2004), and business statistics (Dutton and Dutton 2005). A website motivated by Thomas Russell's book *The No Significant Difference Phenomenon* (1999) highlights and updates the

overwhelming majority of studies concluding no differences in performance outcomes between online (or hybrid) and traditional courses (www.nosignificantdifference.org).

Other areas of online course research have focused on the creation, technique, and implementation of course material (Salmon 2004; D'Orsie and Day 2006), engaging students in the online environment (Oliver 1999), and finding differences in student composition (Dutton, Dutton, and Perry 2002; Dutton and Dutton 2005). Dutton and Dutton (2005) found that students across online and lecture offerings of business statistics were demographically and academically similar, with the only differences being a higher grade point average (GPA) and level of maturity of students in the online course.

Although these are important avenues to address when comparing course delivery modes, it is additionally important to determine how students learn material and complete assignments. Much emphasis has been placed on identifying student learning styles. Several learning style models exist, including Myers-Briggs Type Indicator™ (Myers and Myers 1980), Kolb/McCarthy Learning Cycle (Kolb 1981), Felder-Silverman Model (Felder and Silverman 1988; Felder 1993), and Gardner's Multiple Intelligences theory (1983). Montgomery and Groat (1998) summarize several of these learning styles and discuss their implications for educators, suggesting teachers can use knowledge of learning styles to their advantage. According to Guterl (2013), over 70 hypotheses on learning styles exist, with few peer-reviewed studies supporting advantages to identifying and implementing these styles in teaching strategies. Guterl's article quotes Daniel Willingham of the University of Virginia stating, "It's the material, not the differences among the students, that ought to be the determinant of how the teacher is going to present a lesson."

With so much emphasis on presenting the material, studies on the usefulness of student resources are sparse. No longer do students work solely out of the classic textbook, but have multiple materials at hand—e-books, Internet, homework management tools, discussion boards, etc. Increasing technological advances mean increasing media with which to learn, but they do not necessarily translate to better ways of learning. McNeish, Foster, Francescucci, and West (2012) found that students surprisingly still prefer printed textbooks, and such preference translates to students finding e-textbooks unsatisfactory in the benefits they provide. This coincides with other studies supporting printed textbooks (Li, Poe, Potter, Quigley, and Wilson 2011; Thayer et al. 2011). The recent advent of homework managers brings about new avenues for learning. Bonham, Deardorff, and Beichner (2003) compared computer and paper homework and found no difference in conceptual learning measures. Lenz (2010) reported that students have a higher affinity to attempt web-based homework and perform better than using the standard paper and pencil homework, but performance on exams did not change. Grinder (2008) reported improved test scores when students had the ability to not only check their answers in a homework manager, but additionally see the process in getting the answer using Flash™ movies. Gaffney, Ryan, and Wurst (2010) reported no difference in exam scores even when the answer process was given, but did see improvement in written cases and the comprehensive accounting cycle problem in finance courses. With these mixed results, it is imperative to analyze all resources collectively that students have at hand and assess student value and perception of these resources.

The evolution of the introductory Business Statistics courses to include new resources such as McGraw Hill's Connect homework manager led to this study's three goals: (1) to compare student performance in the online versus on-ground introductory Business Statistics course using quality points, assignment points, and time spent on assignments; (2) to investigate possible factors, including steps taken and resources used, to learn material and complete assignments; and (3) to identify student learning preferences for the course. Knowing the mechanisms used to learn material may help in identifying additional student success factors in an online course versus the on-ground equivalent. Determining student success factors can directly help with student course selection, faculty advising, course delivery, and development of academic requirements for online course registration.

2. The Courses

This study looked at the two-course sequence of business statistics within the College of Business at a mid-size public university. The courses have been traditionally taught in an on-campus environment to all business majors. The first course, taught at the sophomore level, covers foundational principles of statistics, such as descriptive statistics, probability, normal distribution and one-sample hypothesis testing. The second course, at the junior level, starts with hypothesis testing and includes ANOVA, regression, and several other hypothesis tests. These courses have been traditionally taught within a classroom setting with no more than 43 students per class in a lecture format. Each instructor made his or her own homework assignments, tests, and presentation materials.

Both courses were redesigned to incorporate a new textbook, an online homework manager, and standardized tests and assignments. Online courses were also developed to include online video instruction and tutorials utilizing Prezi (www.prezi.com) and Adobe Captivate (www.adobe.com/products/captivate.html). However, online video tutorials were provided for both class structures. Videos ranged from 5 to 10 minutes and were organized and available through the online class management system, Desire2Learn (www.desire2learn.com).

The online homework manager used was McGraw-Hill Connect, incorporated directly with the adopted textbook. All students had to use Connect to complete homework. Most problems were algorithmically generated, ensuring that each student had a different set of numbers or data for each question. Most of the problems were fill-in-the-blank, with some key concepts as multiple choice questions. Each student was also allowed to check the answer twice per question without penalty and receive feedback with explanations after submitting the homework assignment. Points were earned based on correct responses. They were then given a second attempt at the entire homework assignment, if they chose to do so, and the higher grade of the two attempts was recorded.

McGraw-Hill Connect's homework manager additionally has a learning tool called LearnSmart. This tool quizzes students on topics and concepts from the book and awards points based on participation. For example, to receive a perfect score of 10, a student would need to answer a total of 10 questions correctly, with as many questions needed to achieve 10 correct answers. Upon reaching 10, a perfect score was received.

McGraw-Hill Connect also includes an e-book, which allows direct access to content within the book to aid in answering the questions. Students had the choice of purchasing the hard copy of the book, which came with a license for McGraw-Hill Connect, or buying the online option of e-book and McGraw-Hill Connect. Both options included the e-book and gave students instant access to material when completing their homework.

3. Methodology

3.1 Sample

The study sample of 138 included 68 female and 70 male students, but did not include students that did not finish the semester or fill out the survey. The three Statistical Methods 1 courses included 72 students and the second course totaled 66 students. Most students in the first course (on-ground and online) were sophomores and juniors, while the second statistical methods courses comprised of juniors and seniors. It is interesting to note that all students in the online Statistical Methods 2 course were seniors. Also, the majority of all sampled students (52%) had completed an online course before and 81% had used the McGraw-Hill Connect homework manager (Table 1).

Table 1. Course section student numbers by gender, class rank, and previous experience.

	OG1-1	OG1-2	OL1-3	OG2-4	OG2-5	OL2-6	Grand Total
Gender							
Female	14	15	8	12	12	7	68 (49.3%)
Male	15	13	7	12	16	7	70 (50.7%)
Class Rank							
Sophomore	6	11	1	0	0	0	18 (13.0%)
Junior	17	11	5	10	12	0	55 (39.9%)
Senior	6	6	9	14	16	14	65 (47.1%)
Q1* …completed a distance education (online) course prior to this semester							
N	14	17	3	13	17	1	65
Y	14	11	12	11	10	13	71
Q2 …used Connect in a class before?							
N	7	7	4	3	3	2	26 (18.8%)
Y	22	21	11	21	25	12	112 (81.2%)
Total	**29**	**28**	**15**	**24**	**28**	**14**	**138**

Classes are categorized by on-ground statistical methods 1 (OG1), online statistical methods 1 (OL1), on-ground statistical methods 2 (OG2), and online statistical methods 2 (OL2). The number after each dash represents a different section of the course.
**Note: Two respondents did not answer Question 1*

Data could only be linked to students through their university identification number. If students did not provide this or if they did not fill out a survey, they could not be matched with their course performance (n = 38). Students who withdrew from the course were not included, nor did they participate in the survey (n = 7).

The overall average GPA for all students was a 3.002, with each class ranging from 2.884 to 3.026 (Table 2). Also included in Table 2 is the performance within the class, which includes LearnSmart (LS), homework (HW), time spent on LearnSmart, and quality points for the class. Quality points at this institution are calculated on a 4.0 scale with an A equaling a 4.0, a B equaling a 3.0 and so on. This institution also includes plus and minus grades, which equate to a 0.33 increase or decrease in the QP. For example a C would equal 2.0, a C+ would be a 2.33 and a C- would equal 1.67. It is expected that hours would vary from the first to the second course, but it is interesting to note the difference between online and on-ground hours (Hours in Table 2), with the average for OL2-6 extremely high at 142.69 hours (a student at this institution needs 120 hours to graduate).

Table 2. Averages for performance in the class, GPA, and Hours.

	Count	GPA	Hours	LS Points (out of 100)	HW Points (out of 300)	LS Time*	QP
OG1-1	29	2.893	89.79	84.03	218.67	13.49	2.56
OG1-2	28	3.131	83.14	91.58	250.13	13.89	2.88
OL1-3	15	2.884	100.29	92.28	226.87	13.24	2.29
OG2-4	28	2.932	112.07	90.83	235.60	16.12	3.12
OG2-5	24	3.135	111.53	89.68	238.72	16.40	3.18
OL2-6	14	3.002	142.69	88.35	226.62	19.09	2.74
On-ground	109	3.018	98.59	88.92	235.51	14.90	2.93
Online	29	2.941	120.76	90.38	226.75	16.06	2.50
Grand Total	138	3.002	103.25	89.23	233.67	15.15	2.84

Classes are categorized by on-ground statistical methods 1 (OG1), online statistical methods 1 (OL1), on-ground statistical methods 2 (OG2), and online statistical methods 2 (OL2). The number after each dash represents a different section of the course.
**Note: LS Time refers to minutes per Learn Smart assignment*

3.2 Data collection and measures

To measure student performance and success factors between online and on-ground classes, a survey (Appendix A) was administered and completed by 138 students in 6 classes. A total of three Statistical Methods 1 courses (2 on-ground and 1 online) and 3 Statistical Methods 2 courses (2 on-ground and 1 online) were surveyed at the end of the fifteen-week 2013 fall semester. The survey asked students to rank the resources and tools (in order) used to learn topics and complete assignments. They were also asked about agreement to statements based on the five-point Likert scale regarding frequency of accessing tools, coursework, and personnel resources, as well as learning preferences. Survey statements were adapted from Dutton and Dutton (2005) and Dutton et al. (2002) to include resources specific to the study.

3.3 Analysis methods

To further compare responses between online and on-ground courses, the survey responses were then integrated with student course performance as defined by final letter grades (quality points), assignment points, LearnSmart points, and time spent online using LearnSmart. For each course,

all homework and LearnSmart assignments were the same in terms of questions and points (30% and 10% of course grade respectively), and letter grades were assigned based on a standard cut-off of percentages, making comparisons possible. LearnSmart time equaled the time it took students to complete the course of flashcards for each section. Students may log on and off multiple times, but the time 'clock' only recorded when the LearnSmart flashcards were open. All on-ground courses were taught by the same instructor, while online courses were split amongst two instructors. The only subjective portion of the online course was in grading the exams (60% of course grade). Therefore, exam grades were not individually examined as performance measures.

Questionnaire groupings were identified based on specific topics for homework, technology use, textbook use, extra help, class instruction, flexibility to learn, and personal contact as prescribed in previous research (Dutton and Dutton 2005). These groupings allowed us to compare online vs. on-ground learning preferences and coursework resources (Appendix B).

4. Results

To identify differences between online and on-ground students, answers were compared for all survey questions. The first set of questions stressed the weekly habits of students (Table 3). These four questions looked at the frequency a student visited Connect, viewed online course content (available for all classes online and on-ground in Desire2Learn), emailed the instructor, and utilized the statistics tutoring lab. The Stats Lab comprised of graduate assistants providing free tutoring sessions in person (in 30 minute increments) to all statistics students Monday through Friday on campus within the department. Most students indicated they visited Connect and the online content between 1 and 4 times. The Stats Lab was not used by more than 80% of the students and the frequency of emailing the instructor did vary based on the type of class (online or on-ground).

Table 3. Student activity per week.

On average, about how many times per week did you …					
		Never	Between 1 and 4	Between 5 and 10	More than 10
Visit the course section on Connect	OG1	0.0%	93.0%	7.0%	0.0%
	OL1	0.0%	93.3%	6.7%	0.0%
	OG2	0.0%	86.5%	9.6%	3.8%
	OL2	0.0%	78.6%	21.4%	0.0%
Visit the course material on D2L	OG1	10.5%	71.9%	15.8%	1.8%
	OL1	0.0%	80.0%	20.0%	0.0%
	OG2	19.2%	57.7%	19.2%	3.8%
	OL2	7.1%	78.6%	14.3%	0.0%
Visit the Stats Lab	OG1	84.2%	5.3%	5.3%	3.5%
	OL1	73.3%	13.3%	6.7%	6.7%
	OG2	84.6%	13.5%	1.9%	0.0%
	OL2	85.7%	14.3%	0.0%	0.0%
Email the instructor	OG1	50.9%	43.9%	3.5%	1.8%
	OL1	13.3%	66.7%	20.0%	0.0%
	OG2	50.0%	50.0%	0.0%	0.0%
	OL2	28.6%	57.1%	14.3%	0.0%

For the next areas of analysis, t-tests were performed in a few different areas: 1) performance; 2) order of preference of material and tools; and 3) motivating factors. These three areas offer insight not only to the differences and similarities between these two types of instruction, but also help to better understand the motives and habits of today's student. F-tests were performed first to test for equality of variances. The appropriate t-test statistic was then chosen and reported here. A significance level of 0.05 was used for all testing procedures.

4.1 Performance factors and their differences between online and on-ground courses

We compared a student's performance in the class based on online versus on-ground instruction by performing t-tests for differences (Table 4). To measure performance, the quality points for the letter grade, current GPA (as of the end of their semester), points earned for homework assignments and LearnSmart assignments, and time spent on LearnSmart were compared. As indicated in Table 4, there were no significant differences between current GPA ($p = 0.510$), points earned on LearnSmart ($p = 0.696$), points earned on homework assignments ($p = 0.450$), and time spent on LearnSmart ($p = 0.439$). The difference in quality points between online and on-ground students initially looked to be large with on-ground students (2.926) performing better than online (2.505), but was not statistically significant ($p = 0.080$).

Table 4. Performance and use in class and school between online and on-ground courses.

Performance in class and school	Online	On-ground	Differences
Quality Points for Class	$\bar{x}$ = 2.505 s = 1.433	$\bar{x}$ = 2.926 s = 1.052	t = -1.767 (0.080)
Current GPA	$\bar{x}$ = 2.941 s = 0.509	$\bar{x}$ = 3.017 s = 0.563	t = -0.661 (0.510)
LearnSmart Total Points Earned	$\bar{x}$ = 90.383 s = 15.519	$\bar{x}$ = 88.918 s = 18.495	t = 0.391 (0.696)
HW Assignment Points Earned	$\bar{x}$ = 226.751 s = 64.305	$\bar{x}$ = 235.513 s = 52.800	t = -0.757 (0.450)
Total Time Spent on LearnSmart	$\bar{x}$ = 23:07.98 s = 09:17.27	$\bar{x}$ = 21:28.08 s = 10:29:67	t = 0.777 (0.439)

4.2 Preferences of use for materials and tools for learning and completing work

As part of our analysis, the survey asked students to rank six resources and tools (Table 5) used to either learn new topics or complete assignments. Students were to assign each resource or tool a 1 if used first and a 6 if used last, with ranking between 2 and 5 for other varying degrees of use. The resources or tools offered for ranking included homework assignments, LearnSmart, use of textbook, online video tutorials, other Connect material, and other uses of the Internet. 'Use of Textbook' referred to a hard copy of the assigned textbook, and 'Other Connect Material' referred to the e-book and other tutorials that were available within Connect. The video lectures and tutorials in Desire2Learn comprised the online video tutorials. Lastly, the use of the Internet referred to any other materials that were not part of the class management system or Connect.

Table 5. Order of preference to learn topics and complete coursework based on the means of rank orderings. () indicates overall order of ranking.

Resources/Tools	To learn new topics	To complete work
Assignments	$\bar{x}$ = 2.182 (1) s = 1.629	$\bar{x}$ = 2.030 (1) s = 1.727
LearnSmart	$\bar{x}$ = 2.964 (2) s = 1.307	$\bar{x}$ = 2.526 (2) s = 1.19
Use of Textbook	$\bar{x}$ = 3.277 (3) s = 1.375	$\bar{x}$ = 3.614 (3) s = 1.319
Online Video Tutorials	$\bar{x}$ = 4.073 (4) s = 1.527	$\bar{x}$ = 4.197 (4) s = 1.395
Other Connect Material	$\bar{x}$ = 4.270 (6) s = 1.769	$\bar{x}$ = 4.121 (5) s = 1.642
Use of Internet	$\bar{x}$ = 4.219 (5) s = 1.542	$\bar{x}$ = 4.366 (6) s = 1.510

As indicated in Table 5, students tend to go to the assignment first (2.182 for new topics and 2.030 for completing work), followed by LearnSmart, and then the textbook. The last three resources or tools were the online content, either through D2L (online course management system) or Connect, and other sources on the Internet.

There were differences between online and on-ground students in the order they viewed tools or resources (Table 6). The order does not change much, but the varying degree of first preference is statistically significant. In terms of learning new topics, LearnSmart (p = 0.696), use of Internet (p = 0.281), and use of textbook (p = 0.059) were not significantly different. Assignments (0.002), other Connect material (p = 0.017), and D2L content (p = 0.000) were significantly different. Online students indicated their rankings for use of textbook, assignments, D2L content, and LearnSmart to be the most preferred, with the range of these four tools or resources being 2.714 to 3.071. Other Connect material and the use of the Internet were far behind at 4.821 and 4.500.

Table 6. Differences between tools and materials used to learn new topics between online and on-ground courses.

Resources/Tools	Online	On-ground	Significance
LearnSmart	$\bar{x}$ = 3.071 (4) s = 1.804	$\bar{x}$ = 2.936 (2) s = 1.589	t = 0.392 (0.696)
Assignments	$\bar{x}$ = 2.857 (2) s = 1.297	$\bar{x}$ = 2.009 (1) s = 1.258	t = 3.161 *(0.002)*
Other Connect Material	$\bar{x}$ = 4.821 (6) s = 1.249	$\bar{x}$ = 4.128 (4) s = 1.375	t = 2.422 *(0.017)*
Online Video Tutorials	$\bar{x}$ = 3.036 (3) s = 1.527	$\bar{x}$ = 4.339 (6) s = 1.416	t = -4.277 *(0.000)*
Use of Textbook	$\bar{x}$ = 2.714 (1) s = 1.697	$\bar{x}$ = 3.422 (3) s = 1.765	t = -1.907 (0.059)
Use of Internet	$\bar{x}$ = 4.500 (5) s = 1.453	$\bar{x}$ = 4.147 (5) s = 1.562	t = 1.082 (0.281)

On-ground students overwhelming went to their assignments (2.009) first with the next highest being LearnSmart (2.936). Next came the use of the textbook (3.422), followed by the other Connect material, use of the Internet, and then D2L content.

Table 7 shows the equivalent summary for preferences in completing work. Although there was no difference in ranking for LearnSmart (p = 0.373), it was still indicated that students in online courses have an even higher preference for going straight to the assignment to complete the work (p = 0.006), regardless of whether they know the material or not. The other resources (other Connect, D2L content, textbook, and Internet) were also significantly different, with use of textbook and D2L content having a higher preference for online students as opposed to on-ground.

Table 7. Differences between tools and materials used to complete assignments between online and on-ground courses.

Resources/Tools	Online	On-ground	Significance
LearnSmart	$\bar{x}$ = 2.786 (2) s = 1.729	$\bar{x}$ = 2.458 (2) s = 1.728	t = 0.893 (0.373)
Assignments	$\bar{x}$ = 2.571 (1) s = 1.345	$\bar{x}$ = 1.888 (1) s = 1.110	t = 2.772 *(0.006)*
Other Connect Material	$\bar{x}$ = 4.500 (5) s = 1.106	$\bar{x}$ = 4.019 (4) s = 1.358	t = 1.724 *(0.087)*
Online Video Tutorials	$\bar{x}$ = 3.429 (4) s = 1.526	$\bar{x}$ = 4.404 (6) s = 1.289	t = -3.415 *(0.001)*
Use of Textbook	$\bar{x}$ = 2.893 (3) s = 1.729	$\bar{x}$ = 3.808 (3) s = 1.571	t = -2.617 *(0.008)*
Use of Internet	$\bar{x}$ = 4.821 (6) s = 1.467	$\bar{x}$ = 4.243 (5) s = 1.505	t = 1.814 (0.072)

4.3 Differences of Coursework and Learning Preferences

Students were given several statements that pertained to their motivating factors for learning and completing coursework. Based on the Likert scale, students were to determine their agreement from strongly disagree (1) to strongly agree (5) (See Appendix A for questionnaire). After grouping the data (see Appendix B), tests (as described in Section 4) were performed to indicate differences between online and on-ground courses (Table 8).

Homework and extra help were the only concepts not significantly different between the two types of classes. For homework, based on the mean of its four items, students felt homework assignments were useful (4.543 for online and 4.438 for on-ground). Students were neutral on the usefulness of extra help.

The other five concepts showed a significant difference between online and on-ground. Technology use and the textbook were indicated as more useful to online students than on-ground. For on-ground students, it was indicated that class instruction and personal contact were more useful.

Table 8. Differences of coursework resources and learning preferences between online and on-ground.

Learning or coursework concept	Online	On-ground	Significance
Homework	$\bar{x}$ = 4.543 s = 0.496	$\bar{x}$ = 4.438 s = 0.591	t =.871 (0.385)
Use of Technology	$\bar{x}$ = 3.919 s = 0.554	$\bar{x}$ = 3.234 s = 0.777	t = 4.464 *(0.000)*
Textbook	$\bar{x}$ = 3.845 s = 0.553	$\bar{x}$ = 3.087 s = 0.9449	t = 4.127 *(0.000)*
Extra Help	$\bar{x}$ = 3.226 s = 0.759	$\bar{x}$ = 3.304 s = 0.680	t = -.527 (0.599)
Class Instruction	$\bar{x}$ = 3.172 s = 0.869	$\bar{x}$ = 4.477 s = 0.6749	t = -8.683 *(0.000)*
Flexibility to Learn	$\bar{x}$ = 4.092 s = 0.563	$\bar{x}$ = 3.679 s = 0.701	t = 2.929 *(0.004)*
Personal Contact	$\bar{x}$ = 2.839 s = 0.991	$\bar{x}$ = 3.367 s = 0.902	t = -2.742 *(0.007)*

5. Discussion

Online and on-ground students did not perform differently in terms of course outcomes. This is consistent with the results of numerous other studies (see the Introduction). However, several differences existed in methodology of learning new topics, completing homework, and learning preferences.

Online students used the textbook as their primary source of information to learn new topics, then moved on to homework assignments and online video tutorials. This stresses the importance of having a textbook for online students in addition to some form of lecture replacement (such as online video tutorials). In contrast, on-ground students looked to the homework and LearnSmart assignments as their primary resources to learn new topics.

In terms of completing homework, both online and on-ground students used the assignments first, followed by Learn Smart. It is encouraging to see that online students still utilized the textbook and video tutorials to aide in homework. However, on-ground students heavily relied on homework assignments regardless of purpose. The fact that the data indicate a substantial preference for students to go directly to the assignment instead of the available materials contradicts the expected method of learning that most educators assume. The format of reading textbook material before lecture, then supplementing the concepts with at-home work may be outdated. Course designers may need to focus on a homework first teaching method, which exposes students to problems before covering the material. For instance, McGraw-Hill's Connect refers the student to the correct statistical table and gives only four multiple choice options at most, sometimes making the answer obvious. The study results highlight the importance of implementing critical thinking structure into the homework manager. Assignments could be structured as to force exposure to critical thinking concepts, for example, reading and answering

contextual questions first before encountering problems to solve, or having to choose the appropriate test without answer guidance.

It seems students are good at gauging the type of class to enroll in based on their learning preferences. Based on the survey, students from both groups found the homework assignments to be most helpful. This is reflected in the fact that collectively they went to the homework assignments first to both learn new concepts and complete assignments. However, several differences did exist. Online students have catered to their own set of learning preferences, opting for schedule flexibility and utilization of multiple resources. When given the same resources, on-ground students tended to de-emphasize such materials and placed high emphasis on class instruction for content outside of homework. This may not be surprising, but is useful in guiding an undecided student to the type of class during enrollment.

6. Conclusion

This study examined the mechanisms used to learn coursework material and complete homework, as well as student success factors in completing online and on-ground business statistics. The research findings suggest that students displaying more resourcefulness and desire for flexibility should be guided toward online courses, as opposed to students heavily relying on the face-to-face contact present in the lecture format. The findings also suggest a change in the way educators should view the habits of their students from learning and then trying assignments to trying assignments and then learning the material to complete the assignment. The implications for this are quite interesting if this information is embraced and educators cater to students' habits by creating homework assignments that enable students to learn the material as they go. Further research should include the implementation of this new approach to learning concepts, and comparing student outcomes and preferences between the standard and new approach.

Appendix A

Student survey administered to both online and on-ground students.

Student Activity Questionnaire

Please answer these questions based on your experience and perceptions of this course. There are no right or wrong answers and this is completely voluntary and you may stop at any time.

Please circle the best answer for each question.

1.	Have you successfully completed a distance education (online) course prior to this semester?	Yes	No
2.	Have you used Connect in a class before?	Yes	No

3. What percentage of your computer work for this course did you do in each of the following places (percentages should total 100%):

Computer lab in BAS	_____
Computer labs elsewhere on campus	_____
In your home or apartment off campus	_____
In your home or apartment off campus	_____
In your home or apartment off campus	_____
Other:	_____
Please State_____	
	Total (100%)

For questions 4 – 7, please indicate the number of times that have used/visited the following resources:		**Never**	**Between 1 and 4**	**Between 5 and 10**	**More than 10**
4.	On average, about how many times per week did you visit the course section on Connect?	1	2	3	4
5.	On average, about how many times per week did you visit the course material on D2L?	1	2	3	4
6.	During the semester, how many times did you consult the Stats Lab?	1	2	3	4
7.	During the semester, how many times did you email the instructor?	1	2	3	4

		Never	**A few**	**At least once each question**	**Multiple times per question**
8.	How often do you leave an assignment to review additional material or to stop before completion?	1	2	3	4

9. Rank the following resources from 1 (used first) to 6 (used last) in:

	Order for learning new topics (1 – 6)	Order for completing assignments (1-6)
Learn Smart	_____	_____
Assignment Problems	_____	_____
Other Connect Materials	_____	_____
Course Content in D2L	_____	_____
Textbook	_____	_____
Internet	_____	_____

Coursework and Personnel Resources

Answer questions 10 – 23 based on your agreement to the following statements.

	I found …	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10.	…the Learn Smart assignments useful in learning the course material.	1	2	3	4	5
11.	…the homework assignment problems useful in learning the course material.	1	2	3	4	5
12.	…the homework guided examples useful in learning the course material.	1	2	3	4	5
13.	…the homework two attempts useful in learning the course material.	1	2	3	4	5
14.	…the ‘check my work’ option in Connect useful in learning the course material.	1	2	3	4	5
15.	…other Connect materials useful in learning the course material.	1	2	3	4	5
16.	…course content in D2L useful in learning the course material.	1	2	3	4	5
17.	…the Excel tutorials in D2L useful in learning the course material.	1	2	3	4	5
18.	…the course textbook (hardcopy) useful in learning the course material.	1	2	3	4	5
19.	…the course textbook (e-book) useful in learning the course material.	1	2	3	4	5
20.	…the Internet useful in learning the course material.	1	2	3	4	5
21.	… the Stats Lab to be beneficial in learning the course material.	1	2	3	4	5
22.	… the professor’s office hours to be beneficial in learning the course material.	1	2	3	4	5
23.	… emailing the instructor to be beneficial in learning the course material.	1	2	3	4	5

Learning Preference

Answer questions 24 – 33 based on your agreement to the following statements.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
24.	Attending regular class meetings is an important motivator for me.	1	2	3	4	5
25.	Flexibility in setting pace and time for studying is important to me.	1	2	3	4	5
26.	I learn better from hearing a lecture.	1	2	3	4	5
27.	I learn better from reading lecture materials.	1	2	3	4	5
28.	I learn better from watching videos.	1	2	3	4	5
29.	I learn better when I have face-to-face contact with my fellow students.	1	2	3	4	5
30.	I learn better from student study groups.	1	2	3	4	5
31.	If I need help, I'm more likely to email my instructor than to meet with him/her face-to-face.	1	2	3	4	5
32.	Face-to-face contact with the instructors of my classes is very important to me.	1	2	3	4	5
33.	Face-to-face contact with fellow students in my classes is very important to me.	1	2	3	4	5

Appendix B

Questionnaire groupings based on topics.

		Coursework and Personnel Resources
Homework	Q11	I found the homework assignment problems useful in learning the course material.
	Q12	I found the homework guided examples useful in learning the course material.
	Q13	I found the homework two attempts useful in learning the course material.
	Q14	I found the 'check my work' option in Connect useful in learning the course material.
Technology Use	Q15	I found other Connect materials useful in learning the course material.
	Q16	I found course content in D2L useful in learning the course material.
	Q17	I found the Excel tutorials in D2L useful in learning the course material.
Textbook Use	Q18	I found the course textbook (hardcopy) useful in learning the course material.
	Q19	I found the course textbook (e-book) useful in learning the course material.
Extra Help	Q21	I found the Stats Lab to be beneficial in learning the course material.
	Q22	I found the professor's office hours to be beneficial in learning the course material.
	Q23	I found emailing the instructor to be beneficial in learning the course material.
Class Instruction	Q24	Attending regular class meetings is an important motivator for me.
	Q26	I learn better from hearing a lecture.
Flexibility to Learn	Q25	Flexibility in setting pace and time for studying is important to me.
	Q27	I learn better from reading lecture materials.
	Q28	I learn better from watching videos.
Personal contact	Q29	I learn better when I have face-to-face contact with my fellow students.
	Q30	I learn better from student study groups.
	Q33	Face-to-face contact with fellow students in my classes is very important to me.

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