An Assessment of Student Learning Perceptions in Concurrent Online and Face-to-Face Education Delivery Environments

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Abstract

In this paper we explore the impact of traditional versus online education delivery methods on student learning perceptions. We leverage and evaluate a unique concurrent face-to-face and distance learning educational context to measure and compare perceptions of different student groups. In this context the same instructor simultaneously conducts the same course in both face-to-face and online delivery modes creating what is effectively one virtual class. At the end of the course, student learning perceptions are collected and measured for each delivery mode / student group set. With this data we explore and analyze the effects of on-line education delivery as compared to traditional face-to-face classroom instruction. Our initial findings show that student perceptions of their experience, performance and learning outcome in an online environment are much lower and statistically different from those students in a traditional classroom setting.

Keywords

Student Learning, Education Delivery, Online Learning

Introduction

Traditional institutions of higher education are increasing their online course offerings to meet the growing market demand and to facilitate lifestyle changes and needs of those students who prefer online courses. The Sloan consortium, a leading professional online learning society devoted to advancing quality e-Education, periodically publishes reports tracking the growth of online education. In its 2012 report, they note that while online enrollment growth had declined to 9.3% from previous years, the proportion of students taking online courses remained at an all-time high of 32%. Allen & Seaman (2013) report that the percentage of institutions that do not see online instruction as an element of their long-term strategy had dropped to a new low of only 11.2%. A noteworthy statistic in this same report indicates that 77% of academic leaders believe that the learning outcomes of online education are the same or even superior to face-to-face instruction.

While the increase in online course offerings may be market driven, institutions of higher education have the moral responsibility to offer quality education that does not compromise either teaching resources or expected learning outcomes. In this study, we first set out to explore whether this claim or belief that the learning outcomes for online and face-to-face learning environments are really the same and are empirically supported. We focus our investigation on synchronous concurrent courses where the same instructors teach the same class to both online and face-to-face students simultaneously. Based on the theoretical foundations explained here, we conjecture that there are differences in learning perceptions.
between the two groups of students and further investigate the demographic and contextual factors responsible for the same. We specifically investigate four indicator variables: clarity of class procedures, clarity of the content, student effort and student quality and the perceived learning of the students.

**Theoretical Foundations**

Some prior investigations have compared and found that students in face-to-face courses have held a slightly more positive view of the instructor and overall course quality with no difference in student learning outcomes (Johnson et al., 2000). Another study has compared the student and faculty perception of online courses. Comparison of these groups has shown that a number of differences in perception exist, due perhaps to the heterogeneous points of view and motivations for online learning between faculty and students (Tanner, Noser & Totaro, 2009). With the proliferation of online education providers and the challenges presented by distance education, organizations must prepare themselves to demonstrate the quality of education they provide (Parker, 2011). It is thus important to further investigate the difference in these two modes of learning with respect to both the delivery components and the learning outcomes. We investigate this with respect to the following learning components of online and face-to-face delivery modes of information-systems related courses at both the undergraduate and graduate levels.

**Clarity of Procedures**

Intuitively it appears that clarity of classroom procedures would affect student-learning outcomes. And yet, it has not been studied extensively in an educational setting. However, parallel studies exist in management literature from which we can draw support in studying this as an indicator of student learning outcome. In a general organizational context, how communication improves path-goal clarity and its consequent effect on achieving performance objectives has been explored in management research (Coleman, J., 2008). This stream of research draws its foundations from Kahn et al’s (1964) identification of three types of information needed to adequately perform a role: (a) what the expectations of the role set are (e.g. rights, duties and responsibilities), (b) what activities will fulfill the role responsibilities (means-end knowledge), and (c) what the consequences of role performance are to self, others, and the organization.

**Clarity of Content**

In an educational setting, how a student can relate to the content of the class is critical to the extent to which the student has learned in the class. In information systems courses, the classes could range from purely managerial to completely technical in nature. Student performances in these two types of classes can drastically differ depending on how comfortable they are with the particular content of a class and also how well the material is presented to them. In an early study of twenty-four college teachers, it was found that Student evaluations of learning related significantly to instructional clarity (Solomon, Rosenberg & Bezdek, 1964). Prior research has also presented evidence to support that presentation clarity of the content is linked to desirable student outcomes (Cruickshank & Kennedy, 1986). Clear teachers stress important aspects of content and respond to perceived deficiencies in understanding by explaining unfamiliar words, asking questions to find out if students understand, answering student questions, and giving students time to think and practice. All these behaviors improve the clarity of the material presented to students (Finn & Schrodt, 2012).

**Student Effort**

Student effort has long been the discussed as the determinant of student achievement. In spite of its intuitive appeal, it has not been studied systematically as determining student learning outcome (Love, 2010). Control theory (Carver & Scheier, 1981, 1982; Klein, 1989) and social cognitive theory (Bandura, 1986) both support that individuals set goals and monitor their performance to accomplish these goals. Individuals attempt to reduce goal-performance discrepancies by changing effort levels (Mikulincer, 1994; Pittman & Pittman, 1980), as well as through other responses, such as adjusting goals (Donovan & Williams, 2003). In measuring student-learning outcome, it is important to account for the role of student effort. Closely related to student effort is the work motivation and we can adapt the existing theories from
organizational behavior literature that speak to the set of psychological processes that cause the initiation, direction, and persistence of behavior (Pinder, 2008).

**Student Quality**

Much of instructional research has focused on quality perception of students and programs (e.g. Gatfield, Barker & Graham 1999, Herron et al. 2012) but not on student quality itself. Along with the teacher, content, student effort, available resources, and delivery modes, what the student brings to the classroom has not received much attention. Here we resort to how the student has performed in the past as a measure of student capabilities. It is reasonable to expect the learning outcome to be affected by the inherent ability of a student to understand the material. The link between classroom practices and student academic performance by applying multilevel modeling has been studied and the findings show that the effects of classroom practices, when added to other teacher characteristics, are comparable in size to those of student background, suggesting that the students themselves also determine the educational outcome (Wenglinksky 2002).

**Instructor Quality**

Student perception of instructor quality can influence how well the student is motivated to learn as well as a student’s perception of how well the content was understood in a given course.

**Perceived Learning**

Studying learning outcomes is often done through instruments that directly measure the performance in a class. While the grade point in a class might be impacted by test design, student abilities in test taking, how well the student perceived that he or she understood the material presented may be more relevant to the current study. Recent investigations (Finn & Schrodt, 2012) have used this students’ perceived understanding as a measure influencing student empowerment. Schrodt and Finn (2011) have argued that students’ perceived understanding may provide a link of student perceptions of instructor behaviors to student and classroom outcomes. We have chosen to use this simple and direct measure of how well the students’ perceived they learned in the classroom. Therefore, our research inquiry is whether there are differences in this perceived level of understanding in face-to-face and online teaching environments.

**Research Methods**

**Sample and Instrument**

In this study, we investigate the extent of student perceived learning in online and face-to-face classroom environments. The classes studied were taught at a Midwestern university by four different instructors at both the graduate and undergraduate level. This multi-instructor, multi-level environment allows us to investigate if there are course level or instructor-based differences in student perceptions of course material delivery methods. The classes were taught concurrently, meaning that there were companion online course sections available for the same classes that were taught face-to-face. Thus the instructional resources and style were controlled for at the class level. The class lectures for the face-to-face students were available to online students who had the option of listening to the live lectures either synchronously or listen to them at a later time from the archived repositories. The classrooms were smart, equipped with audio-visual equipment and synchronous courseware communication applications and technologies such as Blackboard’s Wimba or Cisco’s Webx, which support the synchronous delivery and recording of the lectures. These classroom and web-based technologies enabled faculty to provide simultaneous instruction to both students in the classroom and remote students who could actively participate during the class sessions in a webinar-like format. All the same learning resources such as PowerPoint slides, class notes, student discussion boards were simultaneously available to both the online and face-to-face students. Thus, in all cases the instructor and instructional resources were the same for each given class. The nature of classes was either technical or managerial.

The survey instrument contained a standard list of questions (See Appendix A) administered at the end of the semester as part of the student evaluation process. An additional set of 5 questions explicitly
constructed for this study was used to collect data for this study. The students voluntarily filled in the survey, although a penalty of not being to see their course grades immediately was imposed by the university to enforce compliance. A Likert scale, ranging from 1 to 5 (strongly disagree to strongly agree) was utilized. As the data collection method was linked to the student evaluation process, the anonymity of respondents trumped any collection of personally identifiable demographic data. Overall, our sample included 141 subjects in a variety of undergraduate and graduate classes (85 online, 56 face-to-face). Mean self-reported GPAs (F=0.011, p<.916) and hours per week spent on study (F=0.024, p<.877) were not significantly different between online and face-to-face students. A summary that describes the courses and student level is provided as Table 1.

<table>
<thead>
<tr>
<th>Class Title</th>
<th>Undergraduate Course</th>
<th>Graduate Course</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Design</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Data Communications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Analytics</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Workflow Design &amp; Reengineering</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Business Analytical Tools</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Project Management</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Enterprise Resource Planning</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Data Visualization</td>
<td></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total number of courses</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Total number of students</td>
<td>31</td>
<td>110</td>
<td>141</td>
</tr>
</tbody>
</table>

Table 1: Survey Sample I.S. Courses and Students

Results and Analysis

Prior to our analysis, the principle researchers sorted each survey item into categories which reflect the theoretical constructs identified in the literature review. A series of one-way ANOVAs were conducted at the item level, with instructional medium (online versus face-to-face) as the factor.

Clarity of Procedures

Four questions assessing the clarity of procedures were utilized. The questions assessed the clarity of course requirements in the course syllabus, the clarity of the instructor’s explanations, the extent to which instructors followed procedure, and the clarity of student expectations. Results are presented as table 2.

<table>
<thead>
<tr>
<th>Item</th>
<th>Face-to-face</th>
<th>Online</th>
<th>Mean Difference</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural Clarity: Syllabus</td>
<td>4.25</td>
<td>3.54</td>
<td>0.71</td>
<td>13.260***</td>
</tr>
<tr>
<td>Procedural Clarity: Explanations</td>
<td>4.27</td>
<td>3.7</td>
<td>0.57</td>
<td>8.613**</td>
</tr>
<tr>
<td>Procedural Clarity: Procedures</td>
<td>4.31</td>
<td>3.75</td>
<td>0.56</td>
<td>8.49**</td>
</tr>
<tr>
<td>Procedural Clarity: Expectations</td>
<td>4.23</td>
<td>3.56</td>
<td>0.67</td>
<td>12.009***</td>
</tr>
</tbody>
</table>

Table 2: ANOVA results for Clarity of Procedures (* p <.05, ** p<.01, *** p<.000)
For each of the items, there is evidence that the perceptions of the clarity of procedures is different between face-to-face and online mediums, with face-to-face having higher mean scores.

**Clarity of Content**

Three questions assessing the clarity of content were utilized. The questions assessed the extent to which assignments contributed to learning, the course was appropriately challenging, and if the instructor encouraged students to broaden their thinking about the course. Results are presented as Table 3.

<table>
<thead>
<tr>
<th>Item</th>
<th>Face-to-face</th>
<th>Online</th>
<th>Mean Difference</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Clarity: Learning</td>
<td>4.5</td>
<td>3.98</td>
<td>0.52</td>
<td>11.365***</td>
</tr>
<tr>
<td>Content Clarity: Challenging</td>
<td>4.44</td>
<td>3.87</td>
<td>0.57</td>
<td>10.141***</td>
</tr>
<tr>
<td>Content Clarity: Broaden thinking</td>
<td>4.55</td>
<td>3.67</td>
<td>0.88</td>
<td>26.719***</td>
</tr>
</tbody>
</table>

Table 3: ANOVA Results for Clarity of Content (* p <.05, ** p<.01, *** p<.000)

For each of the items, there is evidence that the perceptions of the clarity of content is different between face-to-face and online mediums, with face-to-face having higher mean scores.

**Student Effort**

Three questions assessing the clarity of content were utilized. The questions assessed the level of student preparation, attendance each week of class, and the hours per week spent on the course. The first two questions utilized the 5 point Likert scale. The last question was coded to represent the category ranges that were selectable to answer the question. Specifically 0-3 hours was coded as a 1, 4-6 as 2, 7-9 as 3, 10-12 as 4, and 12+ as 5. Results are presented as Table 4.

<table>
<thead>
<tr>
<th>Item</th>
<th>Face-to-face</th>
<th>Online</th>
<th>Mean Difference</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Effort: Preparation</td>
<td>4.43</td>
<td>4.14</td>
<td>0.29</td>
<td>4.717*</td>
</tr>
<tr>
<td>Student Effort: Attendance</td>
<td>4.73</td>
<td>4.21</td>
<td>0.52</td>
<td>14.999***</td>
</tr>
<tr>
<td>Student Effort: Hours per week</td>
<td>2.5</td>
<td>2.47</td>
<td>0.03</td>
<td>.024 ns</td>
</tr>
</tbody>
</table>

Table 4: ANOVA results for Student Effort (* p <.05, ** p<.01, *** p<.000)

For the first two items, there is evidence that the perceptions of student effort is different between face-to-face and online mediums, with face-to-face having higher mean scores. However, there does not appear to be a significant difference between the means of the hours per week spent on the class between mediums.

**Student Quality**

One question assessing the quality of students was utilized. The question asked subjects to report their GPA range. The ranges were coded on a 4 point scale with 2-2.4 as 1, 2.5-2.9 as 2, 3-3.4 as 3, 3.5-4 as 4. Results are presented as Table 5.

<table>
<thead>
<tr>
<th>Item</th>
<th>Face-to-face</th>
<th>Online</th>
<th>Mean Difference</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Quality: GPA</td>
<td>3.52</td>
<td>3.51</td>
<td>0.01</td>
<td>.916</td>
</tr>
</tbody>
</table>

Table 5: ANOVA Results for Student Effort
Results indicate that there was not a statistically significant difference in GPA ranges between face-to-face and online students.

**Instructor Quality**

Five questions assessing the quality of the instructor were utilized. The questions assessed the extent to which the instructor created a favorable learning atmosphere, was well prepared, stimulated interest in the subject, gave meaningful, timely feedback, and was effective. Results are presented as Table 6.

<table>
<thead>
<tr>
<th>Item</th>
<th>Face-to-face</th>
<th>Online</th>
<th>Mean Difference</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructor Quality: Learning atmosphere</td>
<td>4.46</td>
<td>3.72</td>
<td>0.74</td>
<td>17.777***</td>
</tr>
<tr>
<td>Instructor Quality: Well-prepared</td>
<td>4.34</td>
<td>3.68</td>
<td>0.66</td>
<td>11.575***</td>
</tr>
<tr>
<td>Instructor Quality: Stimulated interest</td>
<td>4.53</td>
<td>3.67</td>
<td>0.86</td>
<td>23.688***</td>
</tr>
<tr>
<td>Instructor Quality: Good feedback</td>
<td>3.98</td>
<td>3.35</td>
<td>0.63</td>
<td>8.389***</td>
</tr>
<tr>
<td>Instructor Quality: Effectiveness</td>
<td>4.32</td>
<td>3.67</td>
<td>0.65</td>
<td>11.771***</td>
</tr>
</tbody>
</table>

**Table 6: ANOVA Results for Instructor Quality**  (* p <.05, ** p<.01, *** p<.000)

For each of the items, there is evidence that the perceptions of instructor is different between face-to-face and online mediums, with face-to-face having higher mean scores.

**Perceived Learning**

Four questions assessing perceived learning were utilized. The questions assessed the extent to the course proved to be a great learning atmosphere, students were satisfied with their performance, students lived up to their own expectations, and the overall learning from the class. Results are presented as Table 7.

<table>
<thead>
<tr>
<th>Item</th>
<th>Face-to-face</th>
<th>Online</th>
<th>Mean Difference</th>
<th>F-Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Learning: Atmosphere</td>
<td>4.41</td>
<td>3.55</td>
<td>0.86</td>
<td>19.121***</td>
</tr>
<tr>
<td>Perceived Learning: Performance</td>
<td>4.29</td>
<td>4.00</td>
<td>0.29</td>
<td>4.014*</td>
</tr>
<tr>
<td>Perceived Learning: Expectations</td>
<td>4.23</td>
<td>3.90</td>
<td>0.33</td>
<td>4.446*</td>
</tr>
<tr>
<td>Perceived Learning: Overall learning</td>
<td>4.43</td>
<td>3.96</td>
<td>0.47</td>
<td>7.425**</td>
</tr>
</tbody>
</table>

**Table 7: ANOVA Results for Perceived Learning**  (* p <.05, ** p<.01, *** p<.000)

For each of the items, there is evidence that the perceptions of the learning outcomes is different between face-to-face and online mediums, with face-to-face having higher mean scores.

**Discussion**

Our results suggest that the instructional medium has an impact on a variety of perceptions and outcomes. Given the unique nature of the concurrent classes studied, this leads to several interesting findings and directions for future research.

First, no significant differences were found between student quality and the number of hours studied per week. This suggests that our findings are not unduly influenced by the quality of students, or the weekly
effort put into classes. However, there are marked differences in other areas, with the overall trend suggesting that online students are less engaged and learn less.

We found that student perceptions of the clarity of procedures to be higher in face-to-face sections than in the online ones. This is curious, given that standard procedure for a concurrent class is to provide an electronic copy of the course syllabus to all sections, and to go over the syllabus in class on the first day. For the online sections, students may attend the session being broadcast live via Blackboard, and/or the recording is archived for later playback, providing a common experience. Yet, a large mean difference (0.71) between the perceptions of student clarity about class syllabi exists. One possible explanation might be that given the electronic availability of the syllabus, students opted not to listen to the podcast or video where the syllabus is further explained. This line of reasoning suggests that procedures, such as turning on Blackboard logging to check access records, might be a recommended way to enhance engagement and compliance.

Furthermore, results from several of the items are troubling from a pedagogical perspective. Students in the online sections had much lower perceptions on whether the class broadened their thinking (0.86), stimulated their interest (0.86), or provided a great learning atmosphere (0.86). While a few of the concurrent classes offered provided live, synchronous, methods of communication, the vast majority were taken in an asynchronous manner. These results suggest that along with compliance issues noted above, looking into alternative ways to engage and motivate students is necessary for future research.

For institutions looking to expand their concurrent or online classes, our findings with regard to instructor quality and learning outcomes are concerning. In all cases, perceptions of instructor quality and learning outcomes were poorer in the online sections, even though it was the exact same instruction content, delivery and style. Our data were collected as part of the overall student evaluation process, with lower scores in the instructor quality section having a large influence on the promotion and tenure process. Our experiences suggest that administrative support and patience will be required as the transition to and expansion of online learning occurs, including areas such as training, standardizing policies and procedures, providing adequate technical support, managing student expectations, and improving learning outcomes.

Limitations

As with any research, the present study is limited in several potentially important ways. First, interpretation of the present results should be treated cautiously because they are based on only one university. While we have sought to control for potential alternative explanations reflected in the sample based upon the extant literature, it is possible that our results were influenced by unspecified university-level characteristics.

Second the student responses in the sample are heavily weighted at the graduate level. Given that the undergraduate population is usually larger, the findings in this study may not fully represent traditional college students. Our personal experiences suggest that successful online students have to be self-motivated and possess good time management skills. These are characteristics that may be more developed at the graduate than undergraduate level. As such, differences in student classifications should be considered for future studies.

Third, although the course evaluation mechanism provided an expedient method of collecting data, there were several limitations that arose. Given the anonymous nature of an end of term course evaluation, we were not able to link and analyze student perceptions to more objective student learning outcome measures (such as tests and assignments). Also, the number of questions we were allowed to add (5 in total) did not allow us much flexibility. Naturally, this limited our inquiry and encourages future studies to identify potentially relevant constructs and control variables worth considering.

For example, asking students to self-report how many class periods they attended concurrently or online only would help better interpret the overall results. Also, questions about self-efficacy as well as prior experience with concurrent classes could have been included to explain or control for other effects on student learning outcomes. We were also unable to collect data such as demographics, prior work experience, and age ranges, variables which might be of interest.
And finally, our statistical analyses relied on the use of one-way ANOVA to look for differences between delivery environments. While the results indicate that there are significant differences and we discuss some of our thoughts in why those differences occurred, the exact causal mechanisms behind these differences could be better explored with a priori hypotheses, appropriate statistical tests, and additional control variables. We must note however, that as one of few studies which have looked at concurrent online classes, we saw this inquiry as a chance to first establish a reasonable baseline of whether differences did exist, and to encourage further debate and research on these issues.

Conclusion

This study explored and evaluated the impact of traditional versus online education delivery methods on student learning perceptions. By leveraging a unique concurrent synchronous face-to-face / online educational delivery context, we were able to collect data from students in multiple undergraduate and graduate courses to measure and compare the difference in student group perceptions of their learning environment, while controlling for bias in instructional resources and style for each course. The initial findings of this study show that student perceptions of their experience, performance and learning outcome in an online environment are much lower and statically different from those students in a traditional classroom setting. Although these findings are not unique, they further emphasize that the difference is noteworthy and should be taken into consideration when contemplating, planning, designing and deploying I.S. distance education courses or course components.

Appendix A – Survey Items

Q1. How many hours per week did you spend on this course outside of class?
Q2. How often did you ask the instructor for help?
Q3. I was well prepared for each class or online session.
Q4. I consistently attended this course.
Q5. The assignments contributed to my learning.
Q6. The course syllabus accurately and clearly described the course requirements.
Q7. The course was appropriately challenging.
Q8. Overall, I feel I have learned in this course.
Q9. The instructor created an atmosphere favorable to learning.
Q10. The instructor’s explanations of the subject matter were clear.
Q11. The instructor encouraged me to broaden my thinking about the course content.
Q12. The instructor was well-prepared.
Q13. The instructor stimulated interest in the subject matter.
Q14. The instructor did what he/she said he/she would.
Q15. The instructor gave meaningful, timely feedback.
Q16. Overall, I feel the instructor was effective.
Q17. This class/course proved to be a great learning atmosphere.
Q18. I knew what was expected of me in this course.
Q19. I was satisfied with my performance in this class/course.
Q20. I lived up to my own expectations in this class/course.
Q21. What were some reasons that you took this class in this format (face-to-face or online)?
Q22: GPA Range

REFERENCES


Coleman, J. (2008). "We Can Do It!": How Clarity Interacts With Collective Efficacy In Organizational Change (Doctoral dissertation, Case Western Reserve University).


Finn, A. N., and P. Schrodt. 2012, "Students' Perceived Understanding Mediates the Effects of Teacher Clarity and Nonverbal Immediacy on Learner Empowerment," *Communication Education* (61:2), 01/01, pp. 111-130.


