

A Comparison Between Online and Face-to-Face Instruction of an Applied Curriculum in Behavioral Intervention in Autism (BIA)

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Abstract

Behavioral Intervention in Autism (BIA) is a four-course, internet-based curriculum designed to provide early intervention personnel and parents with comprehensive training in behavioral intervention. This paper presents findings from field-testing of the first two courses in the curriculum series. Students enrolled in either an online or face-to-face version of the courses were asked by an external evaluator to complete three surveys during each course. Survey results, along with pre- and post-test data, suggest that students in both course types successfully learned the material and were quite satisfied with both the content of their courses and their course instructors. Results are discussed with a special emphasis on the experimental design difficulties of the online versus face-to-face comparison as well as the features that made the courses successful.

Introduction

With the growing number of online education programs, there is an increasing need for scientific studies that evaluate the efficacy of online courses, both on their own, and as they compare to traditional classroom courses. Research on the satisfaction and achievement of students in online versus classroom courses has produced mixed results; some findings suggest that students in online courses are not as successful or not as satisfied with their courses as students in face-to-face courses and others suggest that online students perform just as well or better than students in face-to-face classes (e.g., Kassop, 2003, Maki & Maki, 2002; Rivera & Rice, 2002, Spooner, Jordan, Algozzine, & Spooner, 1999).

One of the challenges in comparing online versus face-to-face instruction is that many online courses were originally face-to-face courses that were put online without thought to that medium; or conversely, courses that have been developed specifically for the web are compared with existing face-to-face courses. Needless to say, this makes comparisons between the two course types difficult. Thus, rather than make the comparison between course types, some researchers have begun to focus on just the online courses and are looking at the features that make the online courses successful (e.g., Kassop, 2003; Levy, 2003, Twigg, 2001)

The current project, *Behavioral Intervention in Autism* (BIA), combined these two issues. In particular, the project was a comparison between online and face-to-face courses that sought to determine the features of success (i.e., achievement, satisfaction, and retention) for both groups of students. Nonetheless, this project was not immune from the issues described above. Because the project goal was to offer the BIA curriculum to as many professionals and parents as possible the courses were specifically developed as online courses and the face-to-face versions evolved from those. However, the BIA online courses were developed with an eye towards good pedagogical approaches as well as factors that make online courses successful. In particular, the instructional design of the BIA courses was based on personalized system of instruction (PSI) model. This model encourages high student involvement, immediate feedback, and mastery learning. In fact, there is evidence that the PSI model is an effective pedagogical approach for both online and face-to-face courses (e.g., Price & Maushak, 2000). Thus, the current project attempted to develop the best possible online courses using pedagogy that would translate well into a classroom format.

BIA is a four-course, internet-based curriculum designed to provide early intervention personnel and parents with comprehensive training in behavioral intervention. BIA course development was funded by the U.S. Department of Education, Fund for the Improvement of Post-Secondary Education (FIPSE), Learning Anytime Anywhere Partnership (LAAP). The courses were designed by experts in behavioral intervention who taught pilot versions of the courses and continued their participation during the field-testing of the courses. As described above, the instructional design of the BIA courses was based on personalized system of instruction (PSI) model. This model encourages high student involvement, immediate feedback, and mastery learning. Thus, each course has complete sets of study questions, which students were encouraged to use to prepare for weekly mastery assessments (MAs). MAs were in the form of

short quizzes (online for the web-based courses) that utilize multiple choice, fill-in (technical terms), and T/F items, and which are scored electronically. For the online version, students received their score immediately, and could also scroll through their completed quiz as a means of receiving instant feedback. Specifically, they were able read the reasons why a particular answer was correct (and others incorrect), and receive direction on which study questions to return to in preparation for a retake, if needed. In addition occasional lab (simulation) and field exercises were assigned for hands-on experience, as were essays to test the depth and generality of students' learning. Finally, the online courses held online threaded-discussions. To participate in the threaded discussions, students logged on to the course site at their convenience during a 3-4 day window of time, read comments by the instructor, other students, or guests, and posted their own comments. The face-to-face students discussed the same topics during their scheduled class meeting time. All course assignments figured proportionally into the students' final grades. Mastery criteria required that students score at least 80% on all assignments and quizzes to pass the course. This paper presents the field-test data from BIA Courses 1 and 2 (Introduction to BIA in Autism and Teaching and Positive Behavioral Support in Autism, respectively).

Method

Design

During the field-testing of BIA, there were two sections of each of the online courses (referred to below as Courses 1a-2a and 1b-2b) and one section of the face-to-face versions (1f-2f). The face-to-face section was taught by one of the instructors who also taught the online pilot course. Students in the online courses were located internationally (but, primarily in the U.S.) and the face-to-face students were taught at a public university in Florida. It is important to note that because these courses were offered as field-tests, enrollment was limited and the sample sizes were predictably low. Furthermore, all students were given an honorarium upon completion of each course. Table 1, below, shows the number of students who enrolled in and completed each of the two BIA courses, by section.

Table 1. Number of Students Who Enrolled in and Completed Each Course

Course 1	# enrolled	# completed	Course 2	# enrolled	# completed
Course 1a	16	16	Course 2a	7	5
Course 1b	17	9	Course 2b	13	8
Course 1f	6	5	Course 2f	5	4
Total N	39	30	Total N	35	17

In addition to completing pre- and post-tests for each course, students were asked to complete evaluation surveys. Specifically, students were asked to complete three surveys for each course: one at the beginning of the courses, one mid-way through each course, and one at the end of each course. Surveys assessed students' background in the field, their technology experience and expertise, as well as their satisfaction with a variety of course features. All tests were administered and scored by the course instructors and the surveys were analyzed by the project's

external evaluator. The students enrolled in the online courses were able to link to the surveys from their course home page and completed their surveys online (online surveys were housed on the evaluator's server). The students enrolled in the face-to-face course completed paper versions of the surveys, which were collected by a student and sealed in an envelope that the instructor mailed to the project evaluator. The project evaluator kept students' feedback confidential in that no names or identifying information was shared with the instructors. Thus, students were encouraged to provide open and honest feedback about their courses.

Participants

The first survey administered in all sections of Course 1 contained a series of demographic, background, and experience questions. Results showed that on the whole, students in all three sections of BIA Course 1 were fairly educated and had backgrounds in the fields of education and/or counseling. Nearly all of the students were either relatives of a child with autism (30%) and/or worked in an agency that served children with autism or other disabilities (74%). As such, it is not surprising that the majority of students reported that their primary reason for enrollment was for professional development (69%, 71%, and 83% in Course 1a, 1b, and 1f, respectively), and the remainders were enrolled for personal interests, or career advancement/salary increase. The majority of students reported already having some experience with applied behavior analysis that had been obtained through a variety of activities such as observing live demonstrations, workshops, or lectures/talks.

All but one student had a computer at home and the students, in general, reported being somewhat savvy with computers. Students in both Courses 1a and 1b rated themselves as more expert with computers ($U = 27.00$), Internet browsers ($U = 41.00$), and email ($U = 41.50$) than students in Course 1f. There were no differences between students in the two online courses (i.e., Courses 1a and 1b). Although students in the online courses rated themselves as more expert with computers than students in the face-to-face course, several students in all of the courses reported having previously taken a course with online access to materials or an online discussion component. Despite the differences found in reported computer skills, students in all courses said that they preferred to learn through written material rather than lectures and that they preferred group discussions to one-on-one discussions.

Results

This section presents results from test-score data as well as students' ratings of satisfaction with their course and their instructor. Due to the small sample sizes and lack of ability to prove that the sample meets the assumptions of parametric tests, all statistical analyses between courses were conducted using non-parametric tests.

Test-scores

Analyses were conducted on students' pre-test and final exam scores to determine the level of effectiveness of the course and whether any differences in student achievement emerged as a result of the course version they completed. Table 2, below, shows students' average scores on

the pre-tests and the final exams for both courses. Students in the face-to-face section of Course 2 did not take the pre-test.

Table 2. Students' Average Scores (and Standard Deviations) on the Pre-test and Final Exam, by Course

Course 1	Pre-test	Final Exam	Course 2	Pre-test	Final Exam
Course 1a	55% (12.75)	84% (2.34)	Course 2a ^a	58% (12.58)	78% (10.70)
Course 1b	57% (15.57)	88% (16.02)	Course 2b	62% (11.38)	88% (12.09)
Course 1f	58% (17.56)	72% (22.55)	Course 2f ^b	---	87% (6.16)
Overall Averages	61% (13.76)	84% (12.88)	Overall Averages	61% (11.39)	84% (11.02)

^aOne student in this course did not take the pre-test.

^bNone of the students in this course took the pre-test.

As the above table shows, students' overall pre-test and final exam scores were similar across the two courses. Analyses comparing students' pre-test scores indicated that there were no significant differences between test scores based on individual sections of either course (i.e., no differences between 1a, 1b, 1f or 2a, 2b, 2f) or course type (online versus face to face), thus scores were combined for the purposes of measuring growth between the pre-test and final exam. Results showed that across all sections of BIA Course 1, students' scores increased significantly from the pre-test to the final; $t_{(30)} = 8.43$, $p < .01$. And, students in BIA Course 2 who completed both tests (2a and 2b), significantly increased their scores from the pre-test to the final; $t_{(11)} = 9.68$, $p < .01$. Furthermore, Kruskal-Wallis tests showed that there were no statistical differences between the course sections on final exam scores ($H = 4.05$, $p > .05$; $H = 4.96$, $p > .05$ for Courses 1 and 2, respectively).

Satisfaction ratings

On the mid- and end-course surveys, students responded to a variety of questions about their satisfaction with the course content, their course instructor, and the course discussions.

Collectively, students in all courses were quite satisfied with their courses. They consistently rated their satisfaction with their course content above 4.00 on a 5-point scale, with 5 being the most satisfied. Table 3, below, presents the course satisfaction ratings for BIA Courses 1 and 2. The table shows combined means from all three sections of each course. Nonparametric tests showed that there were no differences between students' mid- and end-course ratings on any of these items by course or course type. Furthermore, there were no statistical differences between Courses 1 and 2 for any of these ratings.

Table 3. Students' Average Ratings (and Standard Deviations) of their Satisfaction with Course Content, from End-of-Course Surveys, by Course

	BIA Course 1 ^a n = 19 Mean (SD)	BIA Course 2 ^b n = 14 Mean (SD)
Quality of information provided by your course	4.68 (.48)	4.43 (.85)
Relevance of information to course objectives	4.63 (0.60)	4.29 (.83)
Amount of information provided by your course	4.58 (.51)	4.57 (.85)
Usefulness of lab or field exercises	4.11 (1.05)	4.21 (1.05)
Usefulness of unit mastery assessments for learning the material	4.58 (.69)	4.29 (.99)

^aThese are means combined from Courses 1a (n=10), 1b (n=5), and 1f (n=4)

^bThese are means combined from Courses 2a (n=3), 2b (n=7), and 2f (n=4)

Previous research suggests that one of the components of successful online courses is the instructor. Thus, students were also asked to rate their satisfaction with their instructor. Table 4, below, shows the average scores (on a 5-point scale, with 5 being the most satisfied) on instructor traits, by Course. Table 4 shows combined means from all three sections of each course. Nonparametric tests showed that there were no statistical differences between Courses 1 and 2 for any of these ratings. There was only one significant difference between the online and face-to-face courses; students in the online sections of BIA Course 2 were more satisfied with the accessibility of their instructor ($M = 4.70$) than students in the face-to-face section ($M = 4.00$, $H = 4.16$, $p < .05$).

Table 4. Students' Average Ratings (and Standard Deviations) of their Satisfaction with their Course Instructor from the End-of-Course Survey, by Course

	BIA Course 1 ^a n = 19 Mean (SD)	BIA Course 2 ^b n = 14 Mean (SD)
Instructor's apparent knowledge of the course content	4.84 (.37)	4.75 (.50)
Instructor's level of involvement in the course	4.63 (.60)	4.00 (.82)
Accessibility of the instructor	4.42 (.84)	4.00 (.82)
Instructor's success in conveying enthusiasm/motivating students	4.47 (.90)	4.25 (.96)
Instructor's feedback and/or evaluation of your coursework	4.42 (1.07)	4.50 (.58)

^aThese are means combined from Courses 1a (n=10), 1b (n=5), and 1f (n=4)

^bThese are means combined from Courses 2a (n=3), 2b (n=7), and 2f (n=4)

The students who completed their courses online engaged in planned class discussions (threaded discussions) at designated points in the curriculum. Likewise, the face-to-face instructor engaged her students in discussions that paralleled those in the online courses. On the End-of-Course surveys, students in all courses were asked to rate their satisfaction with the class discussions on a scale of 1 to 5, with 5 being the most satisfied. Table 5, below shows the overall averages for Courses 1 and 2. Nonparametric tests showed that there were no statistical differences between Courses 1 and 2 or between the online and face-to-face sections for any of these ratings.

Table 5. Students' Average Ratings (and Standard Deviations) of their Satisfaction with their Course Discussions from the End-of-Course Survey, by Course

	BIA Course 1 ^a n = 19 Mean (SD)	BIA Course 2 ^b n = 13 Mean (SD)
Amount of Class Discussion	3.22 (1.11)	3.23 (1.17)
Quality of Class Discussion	3.67 (1.14)	3.77 (.83)
Your comfort with contributing to the class discussion	3.83 (1.34)	3.85 (1.40)

^aThese are means combined from Courses 1a (n=10), 1b (n=5), and 1f (n=4)

^bThese are means combined from Courses 2a (n=2), 2b (n=7), and 2f (n=4)

One the end-survey, students in the online courses were also asked their preferred method of learning new information; through distance learning (including online courses) or in a classroom. Half of the survey respondents (5) said that they preferred learning in a classroom versus distance/online; 4 said that they preferred distance or online learning (one person did not answer this question).

Students in all courses were asked to rate the overall quality of their courses; their average ratings across courses was 4.45 (SD = .74), with 4 = good and 5 = excellent. There were no differences in students' ratings based on course (1 or 2) or section (a, b, f).

What determines satisfaction with courses?

There were several factors that correlated with the perceived overall quality of the BIA courses. Generally, students who were pleased with the course content and instructor, rated the overall quality of the course as higher than those who were not as satisfied with those elements. Specifically, students' overall satisfaction with their courses increased as their satisfaction with several of the course content and assignment ratings increased:

- Quality of information provided by your course ($r^2 = .74$)¹
- Usefulness of lab exercises ($r^2 = .74$)
- Relevance of information to course objectives ($r^2 = .69$)

Students' overall satisfaction with their courses also increased as their satisfaction with the following instructor traits increased:

- Instructor's success in conveying enthusiasm/motivating learners ($r^2 = .78$)

¹ All correlations presented here are significant at $p < .05$.

- Instructor's level of involvement in the course ($r^2 = .75$)
- Accessibility of the instructor ($r^2 = .68$)
- Instructor's feedback and/or evaluation of your work ($r^2 = .61$)
- Instructor's apparent knowledge of course content ($r^2 = .60$)

Conclusions

The purpose of the BIA evaluation was to determine the effectiveness of the online version of the courses as compared to those offered in a traditional classroom format. Results suggest that the two versions of these courses were equally successful in teaching students about using applied behavioral analysis in autism education. Students in both course formats increased their scores from the course pre-test to the final exam and their combined means were above the designated mastery level (80%). Furthermore, students in both course formats were equally satisfied with the course content and instruction, consistently rating all features at or above 4 on 5-point scale. Students were also fairly satisfied with their course discussion, however their ratings suggest that students in both versions of the course would prefer that courses include more class discussions.

Overall, students' test scores and course satisfaction ratings were alike between the online and face-to-face versions of the course. The one statistical difference between the courses was students' ratings of the accessibility of their instructor. In particular, students in the online courses thought that their instructor was more accessible than students in the face-to-face course. This might have occurred because students who are completing their courses online are regularly using their computers and they know that with just a few clicks they would be able to email their instructor. Furthermore, the online students saw their instructor participating in threaded discussions throughout the week and received email instructions and reminders, which provide more regular contact from the instructor than a set class-meeting time. Conversely, students in the face-to-face course met once-per-week and may not have felt that making contact with their instructor was as easy because they were not certain about her accessibility and use of email. Thus, students in the face-to-face course might have felt more boundaries to communicating with their instructor because of their once-per-week meetings, while the online students felt fewer boundaries between them and their instructor due to the fact that computers make contacting their instructor seem easier and because their course did not meet on a particular day at a particular time.

Several course features were related to students' overall satisfaction with their courses. Specifically, as students' satisfaction with the quality and relevance of course content and with their course instructor increased, so did their overall satisfaction with their courses. The similarity in course satisfaction findings are interesting given that at the end of BIA Course 2, half of the online students said that they preferred face-to-face instruction to online instruction. For these courses satisfaction does not seem to be related to course format preference.

Discussion

There are several issues that cause problems with conducting experimentally designed studies between online and face-to-face courses, in particular, the comparison of dissimilar courses and

the self-selection of students to course types. As discussed earlier, the BIA Courses were designed as online courses, with the knowledge that face-to-face versions would be taught as well. As such, the courses that were compared were identical in content, design, and requirements. Furthermore, one of the course designers, who taught pilot versions of the online course, was the instructor for the face-to-face course. These factors lead us to believe that these courses were ideal for the purposes of making comparisons between online and face-to-face formats.

However, this project was not immune to the issue of self-selection into courses. Students who completed the BIA Courses were not randomly assigned to the course type; the face-to-face students needed to live in a particular region where the courses would be offered, while the online students could be anywhere in the country, or world. In spite of this self-selection to courses, students in all three courses reported having similar backgrounds and experiences. This is likely due to the fact that these courses were aimed at teaching very specific content for early intervention personnel or parents of children with autism. Students in the online courses did rate themselves as more proficient with computers, Internet browsers, email, however these differences were positive in that those students were completing their courses online and their more advanced technology skills would allow them to focus on the course content rather than the technology aspect of the course.

One issue that this project had to contend with was the small sample sizes. The online courses were purposefully enrolled at just over 15 students so as to have a manageable student-teacher ratio. However, it was difficult to find recruit the same number of students for the face-to-face course, with short notice, for its first offering on a University campus. And, all three courses did suffer from attrition. It is important to note that in most cases students dropped courses within the first couple of weeks because they felt that the demands in their work or home life would limit the amount of time they could dedicate to their course. Whatever the reason for the small sample sizes, it is clear that the samples were small and may not have been sufficient to find differences that might have existed between the courses. Thus, future studies comparing courses with identical content and design should be conducted with larger samples, or with combined samples from multiple sections of a course.

The results from this project are important for three reasons. First, the project was a scientific comparison between online courses and face-to-face courses that were identical in content and design (i.e., PSI) and that are pedagogically valid. Second, the results show that online courses can be designed to successfully teach applied curriculum; students in the online courses were just as successful at learning the content as students in the face-to-face courses. Third, results show that students in both online and face-to-face courses can be equally satisfied with their course content and instruction, even when they are not completing the course in their preferred medium. Overall, the findings from this project are important in that they are informative to researchers, practitioners, and developers of distance education courses.

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