A COMPARISON OF ONLINE, BLENDED, AND FACE-TO-FACE LEARNING MODES ON ACHIEVEMENT IN THE CARRIBBEAN

Natoya L. Thompson, Fatima College of Health Sciences

ABSTRACT

This study aimed to investigate the effects of three different learning modes–online, blended, and face-to-face–on student course performance. Performance was measured by achievement (grades). This study compared student grades in classes taught using each of these delivery methods. This study was designed to serve as a foundation for evaluating student outcomes in open-admission courses that are components of the program for earning a Bachelor of Education degree in a multicultural educational institution.

Participants at the target institution in the Caribbean included undergraduates enrolled in a specific education degree course that was delivered via the three instructional delivery styles (online, face-to-face, and blended). Participants were enrolled in either an online, blended, or face-to-face course. The researcher collected grades for all participants who were enrolled in the three versions of the course at the end of the semester. This study was comprised of a three-group comparison research design with one independent variable and one dependent variable. The independent variable was the instructional type. There were three independent variable levels—online, blended, and face-to-face instruction. Each level contained a group of undergraduate students participating in each instructional component.

The dependent variable was course grades. To evaluate the research questions, an independent *t*-test was utilized. The following were the research questions addressed by this investigation:

RQ1: Is there a significant difference in students' achievement as measured by their grades when instruction is delivered online compared to when it is delivered in a blended format?

RQ2: Is there a significant difference in students' achievement as measured by their grades when instruction is delivered online compared to when it is delivered in face-to-face format?

RQ3: Is there a significant difference in students' achievement as measured by their grades when instruction is delivered face-to-face compared to when it is delivered in a blended format?

This study presents an investigation of course delivery methods in the Caribbean as they relate to undergraduate learning. In today's world, it is hard for a developing country to compete with developed nations in distance higher education (Chandra, 2000). This is unfortunate because if governments fail to supply their citizens with distance education access, they have failed to compete successfully in an ever-changing world. Furthermore, according to Chandra (2000), distance education plays a vital role in higher education by meeting the needs of individuals who cannot get into traditional classrooms and would like to have an education past high school. Citizens of developing countries who live in remote areas and cannot get to a school site would like the opportunity to get a higher-education degree. Students may be able to attain such higher degrees with the help of CD-ROMs and the Internet, which require access to computers.

THEORETICAL FRAMEWORK

Ally (2004) supported the view that behaviorist, cognitivist, and constructivist theories should be combined to design better online learning materials. After closely examining the various theories,

Ally (2004) proposed a model for designing online learning programs that are based on several different educational theories. Before he developed this model, he emphasized that instructors should use a variety of learning styles to enhance students' learning activities. Learners will select the most appropriate learning style to meet their learning needs.

Ally's (2004) prescribed components for the design of online materials are as follows:

1. **Learner preparation.** At this stage, it is recommended that pre-learning activities be used to prepare learners for the lesson and get them motivated to learn the material that will be presented.
2. **Learner activities.** The online learners should be presented with different learning activities to achieve the outcome of the lesson and accommodate each learner's individual needs.
3. **Learner interaction.** It is important for learners to access the online materials. This should take place after the learners have completed learning activities that include a mixture of types of interaction.
4. **Learner transfer.** Learners should be able to apply what they have learned to real-life situations, so they can be inventive and go beyond what was presented in the online lesson.
5. **Looking ahead.** The behaviorist model should guide the teaching of facts, while cognitivist strategies should be used to teach principles and processes, and constructivist strategies should be used to both teach how these facts can be applied in real life and present background information.

STUDENT ACHIEVEMENT IN ONLINE VERSUS TRADITIONAL CLASSROOM COURSES

Many individuals have suggested that online learning is not equivalent to learning that takes place in a traditional classroom. However, as technology has changed, many people who seek to advance their careers have chosen to work toward a degree online. The time demands of family and work make online learning an attractive option. Therefore, institutions have shifted to a more student-centered approach that provides flexibility in terms of learning and accessibility to education, especially for working mothers.

Other researchers have suggested that there is no significant difference in students' achievement in online as compared to face-to-face classes. Jones (1999) conducted a study to compare student performance in an all-Web introductory statistics class and a similar course offered in a traditional classroom setting. Jones (1999) attempted to replicate a study that had been conducted at the California State University at Northridge (Schutte, 1996). The purpose of Schutte's (1996) study was to evaluate the effectiveness of an online course that was being offered by many universities. Results were that students in the virtual classroom scored 20% higher than their counterparts who received face-to-face classroom instruction.

Wehrner (2010) stated that:

> [L]ong term success of online teaching and learning as an alternative means of education should be measured by how well students perform over time. Therefore, research needs to continue in order to compare traditional versus non-traditional methodologies, so we may better serve our students (Wehrner, 2010, p. 312).

The following three quantitative research questions will be addressed for all three learning modalities.

RESEARCH QUESTIONS

Three research questions were used to ascertain the outcome of this research. These research questions will serve as a guide to understanding the relationship between instruction and students' achievement. The following quantitative research questions will be addressed:

1. Is there a significant difference in students' achievement as measured by their grades when instruction is delivered online as compared to when it is delivered in blended format?
2. Is there a significant difference in students' achievement as measured by grades when instruction is delivered online as compared to when it is delivered face to face?
3. Is there a significant difference in students' achievement as measured by grades when instruction is delivered face to face as compared to when it is delivered in a blended format?

These questions are designed to determine whether there are any significant differences among the examined methods of instructional delivery in terms of their effects on student performance. Student performance will be evaluated in terms of course grades.

METHOD

Participants

The participants in this study were a convenience sample of 164 students enrolled in a totally online, blended, or face-to-face course at an institution in the Western Caribbean. The participants included men and women from numerous islands in the region between the ages of 18 and 35. The participants were selected based on specific criteria. The 164 participants were all pursuing a bachelor's degree in Education. They were all undergraduate students enrolled in a specific undergraduate education degree course. The course was scheduled by the distance-education department at the institution of higher education and included three pedagogical components. The online format of the course was conducted as a self-study. The students had no interaction with the lecturer; as an alternative, they communicated with an e-tutor who was there to moderate and manage the discussion forum. The coordinator, who is also the instructor, is responsible for the course materials disseminated to the students and the e-tutors. The instructor was present during the discussion and only intervened when necessary. Students' final grades were based on 10 points for participation; two written essays comprised 40% of their grade, and their final exams 60%. The e-tutors graded all essays, but the course's final exam was graded by the instructor/coordinator.

The same instructor taught online and blended classes. In the blended format, the instructor met with the students on the first day of class, dispersed the syllabi, and taught. Students met with a tutor four times throughout the semester. The tutor's role in the blended course was the same as the online tutor. The final grades for students in the hybrid class were 10 points for participation, while two essays were worth 40% and the final exam was worth 60%. The tutor graded both essays, and the instructor evaluated the final exam.

Students in the face-to-face format of the study met with the instructor twice weekly and went to the lab once per week. Some met with their instructor, while others met with an assigned tutor. Students chose which section of the face-to-face format they wanted to enroll in.

The study took place over five months in the second semester of the academic year. To identify which delivery mode students were enrolled in, course and section numbers were used to verify whether each student was enrolled in the course's online, blended, or face-to-face version. The researcher collected grades for all participants in the course's three sections at the end of the semester.

INSTRUMENTS

The data collection instrument for this study included data from instructors' grade reports, which were used to address the research questions for this study.

PROCEDURES

Design

This research project utilized a three-group comparison model that included one independent variable and two dependent variables. The independent variable was the type of instruction. There were three levels of the independent variable: online, blended, and face-to-face instruction. Each level was represented by a group of undergraduate students who received that type of instruction. Comparisons were then made between the performances of the students in the different groups, as measured by course grade, which is tthe dependent variable.

Descriptive and inferential statistics were computed using the Statistical Package for the Social Sciences (SPSS), version 21. Specifically, means and standard deviations were calculated for the grades. The statistical test used to address the research questions was the *t*-test, a statistical procedure used to determine whether the difference between the mean scores of two groups is statistically significant (Gall, Gall, & Borg, 2003).

Data Analysis

Three research questions were addressed in this study. The procedures for collecting and analyzing data for each research question were as follows:

For all research questions, grades were given a week after instructors posted grades for the semester, and a list was provided to the registrar of the 164 participants in the study. The researcher

analyzed the data using SPSS to compute descriptive statistics (means and standard deviations) and inferential statistics (*t*-test). These descriptive and inferential statistics were used to respond to the research question.

RESULTS

This study sought to determine the impact of instructional delivery type (i.e., online, blended, and face-to-face).

FINDINGS FOR RQ1

The first research question sought to determine whether there was a significant difference in students' achievement as measured by their grades when instruction was delivered online compared to when it was delivered in a blended format. End-of-course grades were collected for 110 student participants in the online group and 18 in the blended group.

For the first procedure, Table 1 displays descriptive statistics for the two groups. An examination of findings in Table 1 shows the online group's mean grade is 53.86, while the blended group's mean grade is 50.56. The difference between the two mean grades is 3.30 points. The difference favors the online group, signifying that the online group slightly outperformed the blended group. In addition, the range difference for the online group is 43, while the range difference for the blended group is 25, indicating there was a greater spread across scores in the online group than in the blended group. The difference in standard deviations (8.53 vs. 6.67, respectively) confirms the greater variability in scores for the online vs. blended group.

In the second procedure, results from the *t*-test for independent samples shows $t(126) = 1.57$, $p = 0.119$ wherein 126 = degrees of freedom, 1.57 = *t*-value; 0.119 = SPSS generated probability value. Applying the statistical significance decision rule (Creswell & Plano-Clark, 2011), since the *p* value (0.12) is greater than the alpha value (0.05), the difference of 3.30 was not a statistically significant difference at an alpha level of 0.05 (see Table 2).

Finally, the effect size was calculated to assess the magnitude of the difference. Statistical significance (*p*-value) is limited because it only indicates how likely it is that an observed finding could have occurred by chance. This value does not say anything about the magnitude of the effect observed. Effect size measures the magnitude of a treatment effect. Unlike significance tests, effect sizes are independent of sample size (Green & Salkind, 2010).

The most commonly used effect size is Cohen's *d*. For this study, Cohen's *d* was computed from the value of the *t*-test of the differences between group means. Although the results for the first research question did not yield a *p*-value that indicated statistical significance, the effect size calculation results yielded Cohen's $d = .43$ (see Table 3). Researchers have indicated that effect size indexes of about 0 to .30 are typically regarded as small effects, between .30 to .60 as medium or moderate effects, and greater than .60 as large effects. This finding constitutes a medium effect size, indicating the strength of the difference between the online group's mean and the blended group's mean was moderate. This finding suggests the online format may have value as a model over the blended format when considering student performance as measured by course grades. The summary of inferential results is listed in Table 2.

To summarize the first research question with

Table 1 Online and Blended Groups Descriptive Statistics

Group	n	M	SD	MD	Min Score	Max Score	RD
Online	110	53.68	8.53	3.30	28	71	43
Blended	18	50.56	6.67		42	67	25

Note. n = number of participants in each group; M = mean; SD = standard deviation, MD = difference between the two means; RD = range difference.

Table 2 Online and Blended Groups Inferential Statistics

Group	n	M	MD	df	t	p	*Cohen's d*
Online	110	53.86	3.30	126	1.57	.12	.43
Blended	18	50.56					

Note. n = number of participants each group; M = mean; MD = difference between the two means; df = degrees of freedom; t-value = SPSS value from t-test; p =SPSS generated probability; Cohen's d = effect size

Table 3 Online and Face-to-Face Groups' Descriptive Statistics

Group	n	M	SD	MD	Min Score	Max Score	RD
Online	110	53.86	8.53	0.20	28	71	43
Face-to-face	36	54.06	12.88		0	71	71

Note. n = number of participants in each group; M = mean; SD = standard deviation, MD = difference between the two means; mis = minimum score; mas = maximum score; rd = range difference.

the analyzed data, there was no statistically significant difference in students' achievement as measured by their grades when instruction was delivered online compared to when delivered in a blended format. Results showed the online group's mean grade (53.86) was 3.30 points greater than the blended group's mean grade (50.56). The Cohen's *d* effect size was 0.43, indicating a moderate effect size. However, the mean difference (3.30) had no statistical significance at an alpha level of 0.05. Although this finding suggests that the mean difference was probably not caused by the independent variable (type of curriculum), the medium effect size may indicate that further exploration of the online model is worth pursuing, particularly given that the online group slightly outperformed the blended one.

FINDINGS FOR RQ2

The second research question sought to determine whether there was a significant difference in students' achievement as measured by grades when instruction was delivered online compared to when it was delivered face-to-face. The procedures and data analysis conducted were the same as in the first research question.

End-of-course grades were collected on 110 student participants in the online group and 36 student participants in the face-to-face group. Table 3 displays descriptive statistics for the two groups. An examination of findings displayed in Table 3 shows the online group's mean grade is 53.86, while the face-to-face group's mean grade is 54.06. The difference between the two mean grades is 0.2 points. The difference favors the face-to-face group, signifying that the face-to-face group slightly outperformed the online group, but only in very small terms. In addition, the range difference for the online group is 43, while the range difference for the face-to-face group is 71, indicating there was a greater spread across scores in the face-to-face group than in the online group. The difference in standard deviations between the online and face-to-face groups (8.53 vs. 12.88, respectively) confirms the greater variability in scores for the face-to-face vs. online group.

To determine significant differences between the online and face-to-face groups, results from the *t*-test for independent samples show $t(144) = 0.102$, $p = 0.92$, wherein 144 = degrees of freedom, 0.102 = *t*-value; .92 = SPSS generated probability value. At an alpha value of 0.05, the difference of 0.20 was not stastically significant.

Finally, the effect size was calculated to assess the magnitude of the difference between the groups. The effect size calculation results yielded Cohen's $d = 0.02$ (see Table 5). This effect size is considered small according to Cohen (1988, 1992). This effect size is consistent with the non-significant *t*-test findings suggesting no statistically significant differences between the online and face-to-face groups. Therefore, random chance is likely to explain the very small difference between the groups. The summary of inferential results is listed in Table 4.

To summarize the second research question's results, there was not a statistically significant difference in students' achievement as measured by their grades in regards to when instruction was delivered online compared to when it was delivered in a face-to-face format. Results showed the online group's mean grade (53.86) was 0.20 points less

Table 4 Online and Face-to-Face Groups' Inferential Statistics

Group	n	M	MD	df	t	p	*Cohen's d*
Online	110	53.86	0.20	144	.102	.92	.02
Face-to-face	36	54.06					

Note. n = number of participants in each group; M = mean; MD = difference between the two means; df = degrees of freedom; t-value = SPSS value from t-test; p = SPSS generated probability; Cohen's d = effect size

Table 5 Blended and Face-to-Face Groups' Descriptive Statistics

Group	n	M	SD	MD	Min Score	Max Score	RD
Blended	18	50.56	6.66	3.50	42	67	25
Face-to-face	36	54.06	12.88		0	71	71

Note. n = number of participants in each group; M = mean; SD = standard deviation, MD = difference between the two means; RD = range difference.

Table 6 Blended and Face-to-Face Groups Inferential Statistics

Group	n	M	MD	df	t	p	*Cohen's d*
Blended	18	50.56	3.50	52	1.08	.29	.36
Face-to-face	36	54.06					

Note. n = number of participants in each group; M = mean; MD = difference between the two means; df = degrees of freedom; t-value =SPSS value from t-test; p = probability; Cohen's d = effect size

than the face-to-face group's mean grade (54.06) and did not constitute a statistically significant difference. Cohen's *d* effect size was .02, indicating a minimal or very small effect size. This finding suggests that the mean difference was probably not caused by the independent variable (type of curriculum) but was more likely due to random chance.

FINDINGS FOR RQ3

The third research question sought to determine whether there was a significant difference in students' achievement as measured by grades when instruction was delivered face-to-face as compared to blended format.

End-of-term grades were collected on 18 student participants in the blended group and 36 student participants in the face-to-face group. Table 5 displays descriptive statistics for the two groups. An examination of findings displayed in Table 5 shows the blended group's mean grade is 50.56, while the face-to-face group's mean grade is 54.06. The difference between the two mean grades is 3.50 points. The difference favors the face-to-face group, meaning that the face-to-face group slightly outperformed the blended group. In addition, the range difference for the blended group is 25, while the range difference for the face-to-face group is 71, indicating there was a greater spread across scores in the face-to-face group than in the blended group. The difference in standard deviations between the blended and face-to-face groups (6.66 vs. 12.88, respectively) confirms the greater variability in scores for the face-to-face vs. online group.

To determine significant differences between the blended and face-to-face groups, results from the *t*-test for independent samples show $t(52) = 1.08$, $p = 0.29$, wherein 52 = degrees of freedom, 1.08 = *t*-value; 0.29 = SPSS generated probability value. Applying the statistical significance decision rule (Creswell & Plano-Clark, 2011), since the *p*-value (0.29) is greater than the alpha value (0.05), the difference of 3.50 was not a statistically significant difference at an alpha level of 0.05 (see Table 6).

Finally, an effect size was calculated to assess the magnitude of the difference between the groups. The effect size calculation results yielded Cohen's $d = 0.36$ (see Table 6). The effect size for this comparison, $d = 0.36$, is a moderate effect size. Despite the non-significant *t*-test findings, a medium effect size suggests that the face-to-face curriculum delivery model may be a superior method compared to the blended model.

To summarize the results of the third research question, there was not a statistically significant difference in students' achievement as measured by their grades when instruction was delivered in a blended format compared to when it was delivered in a face-to-face format. Results showed the blended group's mean grade (50.56) was 3.50 points less than the face-to-face group's mean grade (54.06) and did not constitute a statistically significant difference. The Cohen's *d* effect size was 0.36, indicating a medium effect size. This finding suggests that the mean difference may be related to the independent variable (type of curriculum delivery) in a practical sense but could also be a function of random chance.

DISCUSSION

For the first research question, analysis of the findings indicated no statistically significant difference in students' achievement as measured by

their grades when instruction was delivered online compared to when delivered in a blended format. Results showed the online group's mean grade was roughly 3 points greater than the blended group's mean grade. The Cohen's *d* effect size was moderate. However, the mean difference had no statistical significance. This lack of statistical significance suggested that the mean difference was probably not caused by the independent variable (type of instructional delivery); however, the medium effect size does suggest that further exploration of the online model may be in order, particularly given that the online group slightly outperformed the blended one.

For the second research question, analysis of the findings showed there was no statistically significant difference in students' achievement as measured by their grades when instruction was delivered online compared to when delivered in a face-to-face format. Results showed the online group's mean grade was 0.20 points less than the face-to-face group's mean grade and did not constitute a statistically significant difference. Cohen's *d* indicated a minimal effect size as well. This finding suggested that the mean difference was probably not caused by the independent variable (type of instructional delivery) but was more likely due to random chance.

For the third research question, there was no statistically significant difference in students' achievement as measured by their grades when instruction was delivered in a blended format compared to when delivered in a face-to-face format. The Cohen's *d* effect size was medium. This effect size indicated that the mean difference could be related to the independent variable (type of curriculum delivery) in a practical sense, but could also be a function of random chance. Therefore, additional replication of the study is recommended to determine differences in the achievement of these groups compared to one another.

The results of this study support previous research, which suggests that, regardless of the instructional delivery method, students' grades show no statistically significant difference across the type of instruction. The majority of the current research literature has found no significant difference in student performance when comparing online, blended, and face-to-face instructional models. As the literature review suggests, multiple studies on this topic revealed that there were no significant differences in terms of academic performance. Moreover, these studies were conducted across different content areas (Hodge-Hardin, 1997; McClloum, 1997; Schutte, 1996), across both single and multiple semesters (Friday et al., 2006), and across multiple achievement indicators including course grades and withdrawal rates (Cooper, 2001; Suanpang & Petocz, 2006). The body of literature continues to show that regardless of the delivery mode of instruction, distance learning students' seem to do just as well, or outperform, their traditional counterparts (Hogan, 1997). The debate about which modality results in greater levels of student achievement will continue; however, current research seems to indicate that online students can be just as successful as students instructed in traditional, lecture-based formats. As such, this study has important implications for distance education programming.

IMPLICATIONS OF THE STUDY

This study suggests several implications. Since the face-to-face group did outperform both the online and the blended group (though minimally) in their achievement rate, the university will need to look at potential factors that may have contributed to this outcome. The lack of student interaction with the lecturer/instructor in the online and blended programs may play a role; in the face-to-face group, students have more contact hours with the lecturer. Deka and McMurry (2006) asserted that contact hours between the instructor and students are fundamental to student success in face-to-face and online instruction. If this can be done for both the blended and the online groups, students may have better outcomes. In the online group, students interacted with the instructor only if the instructor decided to interject while the discussion session was going on. The instructor's availability is vital to students' success in any mode of delivery.

Related to this issue, Roach (2002) explored the reasons why the University of Phoenix's enrollment continues to grow. The author revealed that instructors completely lead classes at the University of Phoenix, and they are an essential part of the online class, just as those who lecture in face-to-face classes. The instructional media has taken the place of the instructor at many institutions.

According to Roach, the interaction between students and the instructor is very important to the university; "What we decided was the best way to approach that was to create an asynchronous classroom where students were required to log on five out of seven days every single week" (p.54). Students meet each other online in a weekly discussion, and attendance is taken each week. Roach (2002, p. 54) goes on to say:

> Literally, they have access to their instructor 24 hours a day, seven days a week in an asynchronous fashion, and, for the most part, are getting responded to from that faculty member within hours of their asking a question or submitting work. So, lots of interaction, lots of collaboration. Almost a social kind of environment as much as an academic environment has been a huge reason for our success.

This research contributes valuable information to institutions that are looking to improve upon their online programs. The need to have interaction between students and instructors is one way of improving students' performance.

Another significant implication that can be gleaned from this study is that the validity and efficacy of online distance education will demand further consideration from traditional universities and institutions of higher education that have resisted adopting this instructional mode. The results of this study provide additional confirmation to the growing body of research that suggests students perform equivalently across instructional modes. Opening up a wider array of course options and schedules through implementing online learning will attract more students and allow universities to remain competitive in the global arena of higher education.

RECOMMENDATIONS FOR FUTURE RESEARCH

There are five specific recommendations for future researchers who wish to replicate or extend this study. The study compares achievement among students in online, blended, and face-to-face courses. Future studies replicating this study should use more classes, a wider range of specialization, and more universities within the region. Secondly, conducting the research over the course of a year is also recommended to ensure the validity and reliability of the findings. More importantly, utilizing a larger sample size is also recommended to validate the results further. Also, a mixed-method design study that includes a qualitative component wherein the students who failed to complete the course or scored low in the course could follow-up using interviews or open-ended surveys. By doing so, the reasons for their failure or low grades could be investigated in more depth. Furthermore, the university must engage in a self-study of their programs to determine specific information, such as which students in which courses are experiencing difficulties and why.

LIMITATIONS

Several possible limitations to the study might affect the conclusions that can be drawn from the study's findings. First, the study was limited in that it contained students from only one university who were a convenience sample. Caution must be applied before generalizing the findings from this study to other universities and other students. Related to this point, limitations created by a relatively small sample size can have profound effects on the outcome of a study (Creswell, 2011). If the sample size is too small, finding significant relationships in the data can be difficult. Statistical tests normally require a larger sample size to ensure a representative distribution of the population and to be considered representative of groups of people to whom results can be generalized (Hackshaw, 2008).

Another possible limitation is that the researcher has little control over the composition of each of the three sections of the course and the number of students in each section. The students were not randomly assigned to the three groups, and there are no pretests for grades, so it is difficult to ascertain whether students were performing more or less typically than they normally would. Moreover, the blended group had 18 students while the face-to-face group had 36 students. These potential limitations could have affected the results.

People factors may constitute threats to internal validity that can influence the outcome of a study. It is possible, for example, that some individuals in this study who were more intelligent or diligent may have been disproportionately represented in certain groups. This threat was a factor because of the lack of random assignment to groups. There was also no researcher control over the life events

that may have influenced participants' ability or motivation to do well in their course or complete it successfully.

Still another limitation concerns the grades. Grades are very subjective, and a comparison of the three groups on grades might contribute to some unreliable findings. Furthermore, the length of the study is another factor, as it only lasted one academic semester, whereas additional semesters may have afforded time to test and re-test the findings.

A final limitation is the design itself. The design is a comparison group design, which is not as reliable as a true experimentalgroup design. The subjects could be assigned at random to one of three instructional groups. The three-group comparison group design has fewer internal validity controls than the true experiment.

CONCLUSION

Within many higher education institutions in existence domestically and globally, the delivery of undergraduate and graduate courses is enhanced through distance education and online learning technologies. The development and revolution of traditional academic courses for delivery via online means provide many opportunities for academic institutions and prospective students (Stansfield, McLellan, Connolly, 2004). An important issue that continues to require attention if online learning is to contribute positively across fields is investigating the quality of student achievement in online and blended environments versus traditional, face-to-face contexts.

This study sought to focus on distance education programs in the Caribbean. Distance education plays a vital role in higher education in these types of areas by meeting the needs of individuals who cannot get into traditional classrooms and would like to have an education past high school. Citizens of developing countries who live in remote areas and cannot get to a school site appreciate the opportunity to get a higher-education degree (Chandra, 2000). While much literature comparing online, blended, and face-to-face instruction have been published, very few studies have been conducted on this topic in the Caribbean. In this way, this study makes a substantial contribution by confirming existing research on this topic and adding to that research base by including findings from developing nations. In sum, this study confirms that the mode of instructional delivery (i.e., online, blended, traditional face-to-face) does not significantly affect student achievement, thereby reaffirming the value online programming can afford, particularly for students in remote areas of developing countries.

With the growing evidence in support of online programs, researchers must continue exploring the factors related to enhancing student performance in online learning environments and additional innovations that can facilitate access to and success in these educational contexts for all students, locally and globally. Factors such as effective learner strategies, self-sufficiency and persistence, adaptable access to learning materials, student management over the pace of study, and more meaningful and authentic assessments that develop deeper learner reflection are all issues that, if studied, could provide a more robust and complete picture of the technological factors and learner characteristics most closely associated with student success in online learning. In this way, the positive and challenging aspects of learning across all types of environments can continue to be explored with an eye on how to promote the learning of all students best.

References

Ally, M. (2004). Foundations of educational theory for online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and Practice of Online Learning* (pp. 3–32).Retrieved from http://cde.athabascau.ca/online_book/pdf/TPOL_book.pdf

Chandra, R. (2000). From dual-mode to multimodal, flexible teaching and learning: Distance education at the University of the South Pacific. *Proceedings of the University of the West Indies, Small States Conference.* Retrieved from http://www.col.org/colweb/webdav/site/myjahiasite/shared/docs/2_conf_proc_Chandra.pdf

Creswell, J.W. and Plano Clark, V.L. (2011) *Designing and conducting mixed methods research*. (2nd ed.). Sage Publications, Los Angeles.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* (2nd ed.). Hillsdale, NJ, NJ: Lawrence Erlbaum.

Cooper, L. (2001.) A comparison of online and traditional computer applications classes. *T.H.E. Journal, 28*(8), 52–58.

Dekka,T., & McMurry, P. (2006). Student success in face-to-face and distance teleclass

environments: A matter of contact? *The International Review of Research in Open and Distance Learning*, *7*(1). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/251/468

Friday, E. Friday-Stroud, S. S., Green, A. L., & Hill, Y. (2006). A multi-semester comparison of student performance between multiple traditional and online sections of two management courses. *Journal of Behavioral and Applied Management, 8*(1). https://doi.org/10.21818/001c.16698

Gall, D. M., Gall, J. P., & Borg, R. W. (2003). *Educational research: An introduction* (7th ed.). Boston, MA: Allyn & Bacon.

Green, S. B. & Salkind, N. J. (2010). *Using SPSS for Windows and Macintosh: Analyzing and understanding data.* Boston: Prentice Hall.

Hogan, R. (1997, July). *Analysis of student success in distance learning courses compared to traditional courses.* Paper presented at the Annual Conference on Multimedia in Education and Industry, Chattanooga, TN.

Johnson, M. (2002). Introductory biology online: Assessing outcomes of two student populations. *Journal of College Science Teaching, 31*, 312–317.

Johnson, S. D., Aragon, S. R., Shaik, N., & Palma-Rivas, N. (2002). *Comparative analysis of online vs. face-to-face instruction.* Champaign: University of Illinois, Department of Human Resource Education.

Jones, E. R. (1999, February). *A comparison of an all web-based class to a traditional class.* Paper presented at a meeting of the Society for Information Technology and Teacher Education, San Antonio, TX.

Roach, R. (2002). Tech talk: Tested practices buoy university of phoenix online. *Black Issue in Higher Education*, *19*(1), 54. Retrieved from http://search.proquest.com.ezproxylocal.library.nova.edu/docview/194202938?accountid=6579

Schutte, J. G. (1996). Virtual teaching in higher education: The new intellectual superhighway or just another traffic jam?

Stansfield, McLellan, E., & Connolly, T. (2004). Enhancing student performance in online learning and traditional face-to-face class delivery. *Journal of Information Technology Education*, *3*, 173–188

Suanpang, P., &Petocz, P. (2006). E-learning in Thailand: An analysis and case study. *International Journal on E-Learning, 5,* 415–438.

Werhner, M. (2010). A comparison of the performance of online versus traditional on-campus earth science students on identical exams. *Journal of Geoscience Education*, *58*(5), 310-312. Retrieved from http://nagt.org/files/nagt/jge/abstracts/comparison_performance_online_.pdf