

Learning online, offline, and in-between: comparing student academic outcomes and course satisfaction in face-to-face, online, and blended teaching modalities

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Abstract The purpose of this study was to conduct a three-way comparison of face-to-face, online, and blended teaching modalities in an undergraduate Child Development course to determine if there were differences in student academic outcomes and course satisfaction across modalities. Student academic outcomes were measured by three examinations, one research paper assignment, and the overall course total grade. Course satisfaction was measured by administering the Student Opinion Questionnaire (SOQ) across the three teaching modalities and the Constructivist On-Line Learning Environment Survey (COLLES) to online and blended modalities. Results indicated that students performed equally well on all three examinations, research paper, and the overall course total grade across three teaching modalities, allaying traditional reservations about online and blended teaching efficacy. The SOQ and COLLES analysis found students from the three modalities were equally satisfied with their learning experiences. A *Two-Factor Model* identifying Face-to-Face Interaction and Learn on Demand (Flexibility) as factors determining student academic outcomes was proposed. Implications, limitations, and future research direction were discussed.

Keywords Face-to-face · Online · Blended · Student academic outcomes · Learning mode comparison

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1 Introduction

In the last two decades, educators have begun to explore utilizing digital media and technology in teaching. According to a report from the Babson Survey Research Group, Allen et al. (2016) reported that approximately 5.8 million American students are currently engaged in some form of online learning. The increasing number of students enrolling in online education points to an important shift in the American higher education landscape, necessitating in-depth research on different teaching modalities to inform efforts to enhance success for all students.

Research has consistently demonstrated that positive student learning outcomes are associated with online teaching modalities (Donnelly 2010; Nguyen 2015; Woltering et al. 2009; Jesus et al. 2017). Numerous studies have found no difference in student success across online and face-to-face teaching, and others have found that incorporation of computer-mediated elements improved student performance (Newlin et al. 2005; Fallah and UBell 2000; Mascuilli 2000; U.S. Department of Education 2010). In spite of the evidences, however, support of online education has dropped among higher education institutions and faculty in recent years (Allen et al. 2016). Instructors in higher education feel less confident in online teaching, citing concerns about lack of pedagogical support and perceptions of poor student-teacher interactions (Smith 2016; Ubell 2017; Kelly et al. 2009).

When considering the merits of online teaching, it is important to acknowledge the institutional and personal obstacles to wider implementation of the online modality. Instructors' concerns about copyright, heavy workloads, inadequate time for feedback, and impact of online teaching on tenure or promotional opportunities are substantial (Johnson et al. 2015; Ubell 2017). In addition, faculty with less experience with technology may receive insufficient pedagogical support in crafting curricula in an entirely new medium (Smith 2016; Ubell 2017). While an instructor new to the online teaching modality may understandably struggle to produce quality student outcomes without adequate development opportunities, research has demonstrated that online classrooms can be just as effective as face-to-face classrooms with proper preparation and faculty familiarity with technology (Jesus et al. 2017; Newlin et al. 2005; Fallah and UBell 2000; Mascuilli 2000; U.S. Department of Education 2010). As instructors before had to be trained in how to effectively utilize email and online grading systems, current educators seeking to incorporate technology-mediated teaching (e.g., chat room, online discussion, etc.) into their curriculum should be given substantial development opportunities and support.

Quality teacher-student interaction has been found to be an integral part of student learning (Rovai and Jordan 2004; Garrison and Cleveland-Innes 2004), and is often believed to be absent in courses delivered online (DeLacey and Leonard 2002). However, research has found that appropriate incorporation of technology can allow instructors to facilitate quality teacher-student interactions, foster increased student engagement, and improve student learning outcomes (Hastie et al. 2010; Simonson et al. 2012). Hege (2011) reported that instructors can design an engaged online learning community by creating opportunities for increased student interaction with fellow students, instructors, and digital course materials. Such opportunities can take the form of a well-moderated online discussion board, recorded online modules, and greater instructor availability for answering questions. In addition to enabling the utilization of novel teaching modalities such as the

online education model, technological advances have also paved the way to new features, activities, and tools that instructors can utilize to supplement and enhance student learning at their discretion and inclination.

Ubell (2017) defines blended learning as a course where 30%–70% of the instruction is delivered online, a teaching form that combines the face-to-face and online modalities by allowing instructors to utilize the best features from each model. Recently, the blended modality has become an essential alternative in addressing the limitations of online teaching, while increasing instructor flexibility in teaching and easing the pedagogical transition to more technology-mediated models (Ho et al. 2016; Shorey et al. 2018). In addition to being as effective as the conventional face-to-face modality, research has suggested that the blended modality can be more effective than online and face-to-face models because it capitalizes on the strengths of both modalities, leading to positive student outcomes (Ho et al. 2016; Jesus et al. 2017; McCutcheon et al. 2015). Ho et al. (2016) also reported that students learning in a blended modality showed a significantly higher level of knowledge of hands-on approaches and overall satisfaction with the course than the face-to-face group. Discussion of online education can take on a polarized all-or-nothing approach, and instructors may feel that they must choose one modality or the other. However, the blended modality offers a promising middle-ground in allowing instructors to flexibly combine the two.

Larson and Sung (2009) conducted the first three-way comparison of student grades in an introductory Management Information Systems class and found no significant differences among the teaching modalities, with the blended and online modes rated particularly highly on measures of “student satisfaction, learning effectiveness, and faculty satisfaction.” It was likely that students with an information system major were comfortable with technology, hence adopted to online or blended section equally well. Whether such a result can be replicated among students from different majors or students with limited technology proficiency is not clear. Though extensive research has been conducted on comparisons of face-to-face vs. online learning, or online vs. blended learning (Wandera 2017), very few studies have utilized a three-way comparison to examine the impact of different teaching modality on student success. The purpose of this study was to conduct a three-way comparison of face-to-face, online, and blended teaching modalities in a Child Development course to determine if there were differences in student academic outcomes and course satisfaction across modalities.

There are two objectives for this study,

1. Are there significant differences in students’ examinations, research paper and overall course total scores across the three teaching modalities?
2. Are there significant differences in students’ course satisfaction across the three teaching modalities?

2 Methods

2.1 Participants

Eighty-six students registered for the undergraduate upper-division Child Development course. However, one student withdrew from the online class so the final number of

participants was 85 students. The same course was offered three times, in a face-to-face modality ($n = 23$), online modality ($n = 33$), and blended modality ($n = 29$). The prerequisite was an introductory class on Child and Adolescent Development. The description of participant characteristics by group is listed on Table 1.

2.2 Course design

Students self-selected the course and modality through the online course registration system. The course objectives included demonstrating knowledge of normative and atypical development in infancy/toddlerhood, analyzing individual differences and environmental contexts including developmental changes, and describing developmental theories and their implications.

Class components for the three teaching modalities were as follows. All classes had the same instructor, course content, examinations, assignments, and textbook. The same instructor evaluated all the examinations, the assignments, and all the course homework from all the modalities. Students were required submitting their assignments to [Turnitin.com](https://www.turnitin.com), which is an internet-based plagiarism-detection service, to help them avoid plagiarism (Turnitin 2012). Lecture delivery, discussion format, and teacher-student interaction varied by modality. Table 2 illustrated the class design components for each teaching modality.

PowerPoint lecture notes, handouts, practice quizzes, and external resource links were made available to students in all three sections before each class meeting. All students were expected to read assigned materials and participate in discussion. In addition, students in the online and blended classes were given access to recorded lectures, modules, and online chat rooms. Students in the face-to-face modality were engaged in traditional classroom discussion and were given weekly quizzes testing their understanding of child development theories and key course themes. Online and blended students engaged in a weekly online discussion activity with the same purpose of testing students understanding of course themes in addition to interacting with students, E-tutors, and the instructor.

Vygotsky's (1962) social constructivism practice was implemented in the online discussion board activities as the instructor scaffold student discussion step-by-step.

Table 1 Description of participants characteristics by group

	Group	Number	Percentage
Gender	Female	84	99%
	Male	1	1%
Class standing	Freshman	1	1%
	Sophomore	8	9%
	Junior	39	46%
	Senior	36	43%
	Others	1	1%
Major	Child and Adolescent Studies	46	54%
	Psychology	15	18%
	Sociology	7	8%
	Others	17	20%

Table 2 Class design in three teaching modalities

	Lecture	Discussion	Exams	Research paper	Teacher-student interaction
FTF	75-min lecture twice a week	In-class small and large group discussions	In class	Turnitin online submission	In-class interaction with the instructor
Online	Watch recorded modules/lectures	Online discussion board activities	Online	Turnitin online submission	Online communication with the instructor and E-tutors
Blended (20% FTF)	Watch recorded modules/lectures + some FTF lectures	Online discussion board + in-class small group discussions	Online	Turnitin online submission	In-class and online communication with the instructor and E-tutors

*[Turnitin.com](https://www.turnitin.com) is an internet-based plagiarism –detection service

The instructor encouraged peer-to-peer interactions and created channels of open communication between the students and the E-tutors and instructor through timely responses and constructive feedback to students' online posts. The instructor and E-tutors also used positive reinforcement to praise students who demonstrated exemplary work in their posts. Discussion prompts were carefully selected and related to the weekly course themes. Students were divided into four groups, each comprised of 8–9 students and one E-tutor, and were required to post one initial post towards the discussion prompt and to respond to at least one of their classmates' posts. From Weeks 2–5, E-tutors provided sample posts that demonstrated high quality discussion with appropriate online Netiquette. Students were encouraged to follow the sample posts and create their own posts. E-tutors provided feedbacks to students' posts, provoked new ideas, and facilitated and monitored discussions. From Weeks 6–9, E-tutors selected one student, who consistently submitted exemplary work, to submit a sample post. After Week 9, students engaged in discussion board activities on their own under the E-tutors' supervision.

2.3 Assessments

2.3.1 Academic outcomes

Achievement of course objectives was assessed by looking at the grades for two midterm examinations, one final examination, research papers, and the overall course total. The three examinations each contained 35 multiple-choice questions and 3 short essay questions. Midterm Exam II and the Final Examination were cumulative tests. The research paper grade comprised a proposal, an APA-style reference page, a draft, and a final paper. Table 3 lists academic evaluations that were either shared among three modalities or unique for a certain modality.

For the research paper assignment, there are four steps involved: 1) write a proposal, 2) complete an APA-style format reference page, and 3) submit a draft research paper,

Table 3 Course Requirements and Evaluation Across Three Teaching Modalities

Course requirement	Score
1. Midterm exam I	100 points
2. Midterm exam II	100 points
3. Final exam	100 points
4. Research paper	70 points
a. Proposal (5 points)	
b. APA-style reference page (10 points)	
c. Draft research paper (5 points)	
d. Final paper (50 points)	
5. Quizzes (6 points × 10) ^a or Online discussion Board (6 points × 10) ^b	60 points

^a FTF only

^b Online and Blended only

and 4) write your final research paper. Students need to write a 7-page APA style research paper on a topic related to child development from conception through age eight, worth a maximum of 50 points. Students need to submit their paper to the [Turnitin.com](https://www.turnitin.com) via course website. All papers must have an originality score of 25% or less (meaning that 75% or more of the content is original to the author). See Table 4 for the scoring rubric for the final research paper.

2.3.2 Course satisfaction

Student opinion questionnaire (SOQ) The SOQ was conducted at the end of each semester for the three teaching modalities and consisted of 10 six-point rating items covering areas of teaching effectiveness and students' course satisfaction (A = Excellent, F = Poor). Sample item from the SOQ: "The professor demonstrates knowledge of the course subject matters." The scores were then recoded to calculate Mean (1 = Poor, 4 = Excellent). Meanwhile, space was provided for students' qualitative comments.

Online learning environment The Constructivist On-Line Learning Environment Survey was administered at the end of the semester to assess students' satisfaction with the online and blended learning environments. Though the COLLES also has a "preferred" form that identifies students' ideal online learning environments, only the measures regarding students' actual satisfaction with the class were administered in this study because the purpose was to assess the students' satisfaction with the online learning environment. The COLLES consisted of 24 five-point Likert scale items with criteria including Relevance, Reflection, Interactivity, Tutor Support, Peer Support, and Interpretation. Each criterion consisted of four questions. Participants indicated how frequently each activity occurred in the online environment on a five-point scale (1 = never, 5 = almost always). An individual's COLLES score was determined by calculating the score for each criterion

Table 4 Research Paper Scoring Rubric (50 points possible)

Scoring Rubric

Content (40 Points)

Introductory paragraph (with citations) (5 points)

Introduce general idea

Explains why this topic is important

Define the age range that you will focus on

Explains what the paper will cover

Specific developmental characteristics/trends related to topic and age/life phase are discussed (7 points)

Content is accurate, comprehensive, relevant to developmental phase overall (7 points)

Major points are stated clearly, supported by specific details, examples, and analysis (7 points)

Integration of research findings, background reading is appropriate, supports rationale (information from at least 6 high quality sources is included) (7 points)

Recommendations/implications for developmentally appropriate practice are logical, follow from discussion (7 points)

Organization (10 points)

Meets minimum page requirement (1 point)

Clarity of expression (1 point)

Clarity of expression (1 point)

Grammar (3 points)

Conciseness (2 points)

APA-style format (2 points)

and aggregating responses to all 24 items. The operational definition of each subscale is listed below.

- **Relevance:** How relevant is on-line learning to students' professional practices?
- **Reflection:** Does on-line learning stimulate students' critical reflective thinking?
- **Interactivity:** To what extent do students engage on-line in rich educative dialogue?
- **Tutor Support:** How well do tutors enable students to participate in on-line learning?
- **Peer Support:** Is sensitive and encouraging support provided on-line by fellow students?
- **Interpretation:** Do students and tutors make good sense of each other's on-line communications?

3 Results

3.1 Academic achievement

A Multivariate Analysis of Variance (MANOVA) was conducted to determine if there were significant differences in students' examination scores, research paper, and the final course grade. The results showed that teaching modality did not impact outcomes

of students' Midterm Exam I, Midterm Exam II, Final Examination, overall research paper, and the final course grade. That is, no significant differences in students' academic achievement across the three teaching modalities (Tables 5, 6 and 7).

3.2 Course satisfaction

3.2.1 Student opinion questionnaire (SOQ) across the three teaching modalities

A linear regression was conducted to determine if there were significant differences in students' course satisfaction across the three teaching modalities. The instructor experimented with three teaching modalities in the same course in three consecutive semesters, and the SOQ indicated that students from the three teaching modalities were equally satisfied the learning environment the instructor created.

3.2.2 Online environment satisfaction: COLLES outcomes

Twenty-nine students in the online class and 23 students in the blended class completed the COLLES. A two-sample *t*-test was conducted to compare group means. The overall scores of the online and blended modality groups were compared - no significant differences were found ($M = 4.07$; $M = 4.17$, respectively, $ps = n.s.$). Results indicated that participants generally were satisfied with their online learning environment. Among the six criteria, both online and blended participants reported having the highest satisfaction with course "Relevance" ($M = 4.40$, $SD = .63$; $M = 4.59$, $SD = .56$, respectively). The lowest rating for online modality students was "Interactivity" ($M = 3.73$, $SD = .94$), while the lowest rating for blended modality students was "Peer Support" ($M = 3.59$, $SD = 1.23$).

4 Discussion

4.1 Academic outcomes

The results from this study found no differences in student examination scores, research paper, and the final course grade across the online, face-to-face, and blended teaching modalities. There were no significant associations between class standing, majors, examination grades, and research paper grades. However, students in their senior years

Table 5 Means and standard deviations for measures of academic outcomes by across different teaching modalities

	Exam I		Exam II		Final exam		Research paper		Final grade	
	M	SD	M	SD	M	SD	M	SD	M	SD
FTF	81.43	9.98	82.91	7.85	83.30	8.14	55.67	7.91	84.35	7.09
Online	81.21	8.75	82.67	9.46	83.15	8.43	51.88	13.65	84.12	7.95
Hybrid	83.50	8.20	82.39	11.37	84.57	9.18	57.61	10.37	85.28	12.03

Table 6 MANOVA results on measures of academic outcomes across the three modalities

Variable	<i>df</i>	<i>F</i>	<i>p</i>
Exam I	2	.57	.57
Exam II	2	.02	.98
Final Exam	2	.23	.79
Research Paper	2	2.05	.14
Final Grade	2	.36	.70

Note: $p > .05$

scored higher on their overall course total grade than their counterparts. These findings support the existing literature that online and blended teaching modalities can be as effective as face-to-face teaching modality, allaying traditional reservation about online and blended teaching efficacy (Allen et al. 2016; Larson and Sung 2009; Nguyen 2015).

The results from this study were similar to the research conducted by Larson and Sung (2009). The three-way comparison was found to be effectively investigated the academic achievement outcomes across three teaching modalities. Even though students from the Child Development majors were not as technology savvy as Management Information System students, students in the online and blended modalities have demonstrated high level of technology proficiency and were able to reach the same academic outcomes as students in the face-to-face modality.

After reviewing the literature and examining the three delivery modalities of the current class, we proposed a *Two-Factor Model* illustrated in Fig. 1, which will guide our future research direction. Regardless of teaching modality, we believed that two important factors were imperative to student academic success: Face-to-Face Interaction and Learning on Demand (Flexibility).

Learning on demand (flexibility) The availability of online resources enabled students to learn on demand and partake “flexibility” in their learning, a feature highlighted by several research universities such as Duke, Harvard, Georgia, and Massachusetts Institutes of Technology as beneficial to student learning outcomes and early graduation (Straumsheim 2014; Vanslambrouck et al. 2018). Data gathered from this study demonstrated that allowing students to review assignments, lecture notes, and paper examples on the course website in addition to engaging in online communication with the instructor and E-tutors would enhance student academic achievement and course satisfaction.

Table 7 The Student opinion questionnaires (SOQ) across three teaching modalities

	Mean	Department mean	A & B rating	Department A& B rating
Face-to-face	3.68	3.53	96%	89%
Online	3.44	3.58	88%	93%
Blended	3.84	3.61	98%	93%

The department defined excellent teaching by combining students’ A and B rating for SOQ. If an instructor’s rating in Categories A and B combined was above 85%, then his/her teaching was considered “excellent”

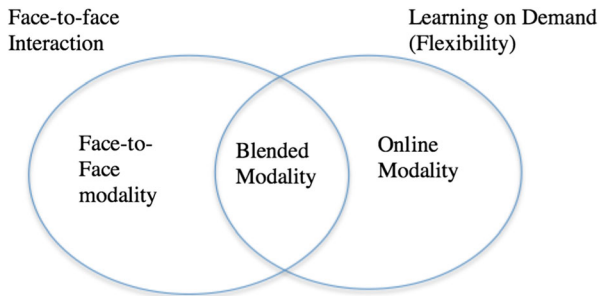


Fig. 1 Two-factor model: factors contribute to student academic outcomes across modalities

Face-to-face interaction Some learners still prefer the traditional face-to-face learning teaching modality and believe that the face-to-face component is an imperative part in their learning experience. For qualitative assignments requiring content integration and synthesis such as a research paper, the availability of supplementary resources and additional interaction opportunities may have been useful in facilitating student comprehension, synthesis, and application of course material. In addition, the additional component of face-to-face interaction increase student opportunities for social presence and peer interaction. Data gathered from the COLLES showed that the lowest ratings from the online and blended environment were Interactivity and Peer Support. Even though students were satisfied with the learning environment, but they gravitate toward interaction. In future study and pedagogical practice, we would examine the proposed *Two-Factor Model* carefully in order to inform instructor about the best features and practices to support student learning.

4.2 Course satisfaction

4.2.1 Student opinion questionnaire (SOQ)

The instructor experimented with three teaching modalities in the same course in three consecutive semesters, and the SOQ indicated that students from the three teaching modalities equally satisfied the learning environment the instructor created. In addition, the overall COLLES scores of the online and blended sections were compared, and no significant differences were found. The results showed that students from both online and blended sections were equally satisfied with their online learning experiences.

In the present study, online discussion activities were carefully designed to scaffold student learning, encourage student interaction, and create channels of communication between students, the E-tutors, and the instructor. Although certain studies on online teaching have reported difficulties in fostering student interaction, the careful use of scaffolding and guided discussion has been demonstrated to create quality peer-to-peer, E-tutor-student, and instructor-student interactions.

One contribution of the present study was that we were able to replicate the results of Larson and Sung's 2009 study with the students in an upper-division Child Development course. Through the three-way comparison of the child development course with the identical materials taught by the same instructor, we were able to see how teaching modalities alone contributed to different student learning outcomes. The limitations of

the study were the small sample size, demographic data such as GPAs not controlled for and not included in the analyses.

5 Implications

Recent data has shown that the number of students enrolled in online courses has continued to grow steadily in the last few years (Johnson et al. 2015). As many public institutions of higher education struggle with fiscal constraints and overcrowded campuses, more instructors have turned towards online and blended courses in order to address the needs of growing student populations (Ubell 2017). However, as faculty continue to express concern and reluctance about teaching online, researchers in the field should replicate the three-way comparison studies for different teaching modalities and to inform instructors about the best feature and practice to support student learning.

In addition to being as effective as the conventional face-to-face modality in numerous empirical comparisons (Jesus et al. 2017; Newlin et al. 2005; Fallah and UBell 2000; Mascuilli 2000; U.S. Department of Education 2010), the blended modality might be more practical in facilitating student success for more instructors. Not all faculty members have the same level of familiarity, proficiency, and pedagogical support with the technology used in online teaching. Making the switch from a traditional face-to-face classroom to a purely online one can be daunting and requires the use of new skills (Vaughan et al. 2017; Wandera 2017). For example, hosting an effective, productive online discussion requires different strategies from hosting an effective small-group discussion. Given the wide variation in technical support and training that higher education faculty received, advocating for more teachers to switch to online teaching may not be practical, feasible, or beneficial to student learning outcomes.

However, the institutional challenge of student overpopulation and budgetary constraints must be addressed. The blended modality offers more instructors the ability to transition towards a more technologically-mediated classroom, giving them greater opportunities to continue teaching in face-to-face sessions while also selecting the online teaching practices and features that best serve their students. Faculty can exercise greater flexibility and selectivity in designing blended curricula, ultimately allowing them to optimize their teaching for more students.

As the American student body continues to grow and change, teaching practices must change and grow as well. Technology offers instructors many tools with which they can supplement their teaching, improve student learning, and connect with more students. However, it is critical to remember that the process of learning to utilize this technology in education can be challenging. When compared to previous calls to more widely adopt the online teaching modality, we suggest a modest approach of scaffolding the instructors in the higher education starting form blended and then to fully online in order to benefit both students and faculty members.

6 Conclusion

Results showed that students performed equally well across all three teaching modalities, allaying traditional concerns about online and blended teaching efficacy. In

addition to demonstrating that online classes can be just as effective as face-to-face classes in producing satisfactory student outcomes. Our results also highlight the potential for blended modality classrooms to improve student academic outcomes by combining the best features from both face-to-face and online teaching. The use of three-way comparison showed that quality student learning can occur online, offline, and in between. Analyses of the SOQ and COLLES found students from the three teaching modalities were equally satisfied with their learning experiences. The use of scaffolding and guided discussions can foster online classrooms with high interactivity and peer support.

In order to meet the needs of a growing student body, respect instructors' needs as educators, expand the definition of "good teaching practice", the institutions can support their faculty by offering more opportunities for professional development, technological proficiency skill-building, and providing more pedagogical support. As instructors strive to provide the best learning environments for their students, teachers of all types can benefit from technological tools and practices in order to best support learners of all backgrounds.

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