The Effectiveness of Blended Distance Learning

A Multi-Dimensional Analysis within ICT Learning

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Abstract—eLearning as an educational mode of delivery presents many new challenges to educators and students. The change in modality of the teaching/learning environment begs many questions in regard to effectiveness and efficiency of student learning (the main goal of our educational system). The focus of this research and paper is the effectiveness of Blended Distance Learning for training instructors. Blended Distance Learning, growing in popularity recently, has learners doing part of their studies in person, and part of their studies remotely (either synchronously, asynchronously, or a combination). Effectiveness of Blended Distance Learning will be measured in two dimensions: instructor outcomes and then subsequent outcomes of students. The study looks at both attitudinal and academic outcomes of students and instructors by instructor training modality. The results of this study hold implications for education in general, but specifically for those making decisions about learning methodologies and platforms to use when training teachers.

Keywords-Blended distance learning; e-learning; teacher training

I. INTRODUCTION

With the current attention paid to eLearning, we become aware that this modality of education is growing and here to stay. Although eLearning is not a panacea for all of education problems, it does present another tool, with benefits and detriments for the student and the instructor, in terms of both attitudes and resulting learning (the ultimate goal of our educational system). With this new modality, a series of questions arise, centering on educational effectiveness (learning), the efficiency of this new modality, and the ways to use different instructional methodologies within the framework of eLearning.

The focus of this research and paper is on the effectiveness of Blended Distance Learning (BDL), a specific form of eLearning, for training teachers. BDL has learners doing part of their studies in person and part remotely (synchronously, asynchronously, or a combination). BDL has the attraction of not fully abstracting the course or the people involved, while also allowing the freedom and flexibility that remote learning offers. Many major institutions and entities have settled on this as a key learning methodology in their business plan. However, others have expressed concern that BDL classes can be as challenging and effective as in-person classes.

While there has been a fairly large body of research on student BDL training, less is known about training teachers via BDL methodologies. This is the question this paper will explore.

Effectiveness of BDL will be measured in two dimensions. The first dimension will compare the final exam and satisfaction survey scores of instructors who took a course via BDL with instructors who took the course in a purely face-to-face traditional manner. Although the instructors were not randomly assigned to the two test groups, similarity was sought in age, gender, and background of the instructors.

The second dimension of this study will look at the students of these two instructor groups. Each of these instructors, after training in a specific ICT cognate area, went to their classrooms to instruct their students in the same ICT cognate area. Effectiveness was measured in their students by their final exam scores and their course satisfaction survey. The instructors and the students were provided the same final exam score and satisfaction survey.

The results of this study hold implications for education in general, but specifically within the BDL environment. The results of this study also hold merit for studying the effects of BDL instructor training on the instructors directly and their students that they teach. In the paper below we will first review relevant literature, then describe the analysis of instructor and student outcomes based on instructor training type, and finally end with a discussion of implications.

II. LITERATURE REVIEW

The National Center for Education Statistics [1] reports that the K-12 public school enrollment in distance learning classes in the U.S. grew 65% in the years from 2002 to 2005. A more recent study by Picciano and Seaman [2] finds that more than a million students were educated via DL methodologies in the academic year of 2007-2008. Caution should be used when looking at the phenomenal growth of DL first because DL courses, and especially BDL courses, and include everything from correspondence courses to course with minimal remote use [3], but it is clear that the practice of taking courses remotely is increasing.

Analysis and study in the field of eLearning has been going on since eLearnings' inception. The results have been varied but meta-studies conducted recently point to some consistencies and trends in evolution and results [3]. Because this DL and BDL field has existed long enough and

has high appeal for researchers and policy makers, enough studies of BDL have been done to warrant a meta-analysis of results. Meta-analysis is a technique for combining the results of many research studies to obtain a composite estimate of effect. It is essentially research on research, combining all the results of similar studies. Of over 90 studies reviewed by this meta-analysis only ½ provided sufficient statistical data and methodologies required to fit the rigor of this analysis. Most of these studies were conducted in higher education and/or specific cognate areas (Military, Training, ICT area). The studies ranged from 1994 – 2008.

The main finding of the study was that those in distance education classes had slightly better outcomes than those in face to face classes [3]. However, on further examination, it became clear that in fact the outcomes from face to face instruction and pure online instruction were approximately equal (all other elements being equal), but that BDL offers an advantage as seen by differences in exam scores across the studies in the analysis. The authors note that students in BDL classes often have both additional learning time and more instructional elements than those in face to face classes. Therefore, differences in outcomes may be due to these factors rather than any media or delivery method per se.

There has also been some work done on student satisfaction in BDL courses as applied to traditional face to face courses [4]. Besides the obvious benefits of DL and BDL, comfort and convenience [5], other items came up in research related to satisfaction in BDL courses. Five themes seem to emerge as constant and consistent; 1) classroom climate, 2) learning needs, 3) learner efficacy, 4) interaction and 5) appropriate format for the content [6]. At first blush one would not think of these are benefits of BDL course but the clientele in the study. The implications are many but seem to center around the recognition of different formats require different methodologies, Responsiveness to the variety of learning styles in the "classroom", empowering students and quality of material and format used in distance learning.

In regard to the degree of blendedness (mixture of face to face and remote), Voos [7] suggested it is unlikely that the proportion makes the difference in the course but that reconsideration of course design, new instructional media choices, and learning strengths and weaknesses make the difference. As Privateer [8] states so eloquently, "Opportunities for real change lie in creating new types of professors, new uses of instructional technology and new kinds of institutions whose continual intellectual self-capitalization continually assures their sites as learning organizations" (p. 72). Interestingly most of these studies have focused on the effects of BDL on students [9]. This study examines the effect of BDL learning during instructor training.

III. STUDY 1

The first study looks at the effects of instructor training method on instructor outcomes.

A. Participants

The context of this study is the Cisco Networking Academies. This study analyzed existing data from two groups of instructor trainees in the Academy: one trained in a BDL class and one trained via in-person classes. Instructors in the Network Academies are required to complete training courses in each of the classes they are going to teach. These courses have traditionally been five day, eight hour per day, in-person classes. However, in more cases, these classes have been distributed over time and place. Instructor trainees who completed instructor training in one of the four Exploration courses in the 2009 calendar year were included in the study. The BDL sample was also limited to trainees with completed course feedback forms and final exam scores who were trained in a class with more than one student were included in this study. The determination of whether a class was offered in the BDL format was made based on the instructor trainers' indication of method of offering classes indicated in the online class management system.

There were 364 instructors trained via BDL in the year. There were 10,412 instructors trained via in-person classes. In an attempt to get a better-matched sample, in-person trainees taught by the same instructors who taught BDL students were selected. We then randomly selected participants to get a similar sized sample with equivalent geographic and education level characteristics, resulting in a sample of 400 instructors trained via In-person classes. The groups are distributed as shown in Table 1

TABLE 1. DISTRIBUTION OF SAMPLE BY CLASS MODE

	BDL		In-Person	
	n	%	n	%
Network Fundamentals	135	37.5	150	37.5
Routing Protocols and Concepts	95	26.4	105	26.25
LAN Switching and Wireless	68	18.9	75	18.75
Accessing the WAN	62	17.2	70	17.5
Total	364	100.0	400	100.0

The participants were distributed by geographic theater as follows: Asia Pacific: 3.0%, Western Europe: 20.9%, Emerging Markets (Latin America, Middle East, Africa): 49.7%, and United States and Canada: 26.4%. There were relatively few participants from Asia as the BDL approach has been less adopted there in the Networking Academy.

B. Measures

Four measures were used to assess outcomes for both the instructor trainees: Satisfaction, Confidence, and Instructor rating subscales from the Course Feedback form and Final Exam scores. The Satisfaction, Confidence, and Instructor rating scores are each the means of a set of questions on the Course Feedback Form that the instructor trainees complete after a class. The Satisfaction scale asks students to rate their overall satisfaction with items such as labs, assessments, and course materials. Ratings are made on a five point scale (1 = Very Dissatisfied; 5 = Very Satisfied). The Confidence scale asks students to rate their confidence in performing various networking-related tasks taught in the course. Ratings are again completed on a 5 point scale (1 = Not at all confident; 5 = Very confident). The Instructor scale asks students to rate their instructor on things such as preparedness and approachability. These are rated on a 5 point agreement scale (1 = Strongly Disagree; 5 = Strongly Agree). The final exam is taken by each student at the end of every class. It is a 50 question multiple choice exam. Requirements from the Networking Academy require that the exam be proctored, whether the class is BDL or in-person.

C. Results

There are significant mean differences between the BDL and In-person groups for all four measures, as seen in Table 2. The Confidence, Satisfaction, and Instructor subscales have significantly higher means for the BDL group, while the Final Exam scores are significantly higher for the In-person group. However, it should be noted that the effect sizes are extremely small. This means that although there were statistically significant differences between the two groups, for most practical purposes, their ratings were very similar.

TABLE 2. INSTRUCTOR RESULTS BY CLASS MODE

	BDL	Mean	Effect Size
Final Exam*	BDL	90.63	-0.15
	In-Person	92.84	
Confidence*	BDL	4.19	0.14
	In-Person	3.98	
Instructor*	BDL	4.67	0.07
	In-Person	4.58	
Satisfaction*	BDL	4.33	0.10
	In-Person	4.21	

Analysis by Curriculum

Comparisons were also conducted by curriculum subgroups: Network Fundamentals, Routing, Switching, and WAN. Tables 3 and 4 show these results. Effect sizes are provided for statistically significant differences

In the Network Fundamentals subgroup, the only significant mean difference between the BDL and In-person groups is for the Final Exam. The mean Final exam score for the In-person group is significantly higher than the BDL group with a small effect size. Again, this means that the difference between the groups is small, however, it may be that taking the first class in the Networking Fundamentals curriculum is slightly more difficult with a remote component.

In the Routing subgroup, the means for the BDL group are significantly higher than the means for the In-person group for the Confidence and the Instructor Subscales. In the Switching subgroup, the mean scores for the BDL group were significantly higher than the In-person group for the Confidence and the Instructor Subscales. In the WAN subgroup, the mean scores for the BDL group were significantly higher than the mean scores for the In-person group on the Confidence subscale.

TABLE 3. DIFFERENCES BY CLASS-NF AND ROUTING

		Network Fundamentals		Routing	
	BDL	Mean	ES	Mean	ES
Final Exam	BDL	88.76		91.44	
	In-Person	93.55	-0.27	92.14	
Confidence	BDL	4.24		4.26	
	In-Person	4.14		4.03	0.15
Instructor	BDL	4.60		4.76	
	In-Person	4.62		4.59	0.16
Satisfaction	BDL	4.31		4.34	
	In-Person	4.22		4.22	

TABLE 4. DIFFERENCES BY CLASS – SWITCHING AND LAN

		Switching		WAN	
	BDL	Mean	ES	Mean	ES
Final Exam	BDL	91.84		91.87	
	In-Person	92.58		93.34	
Confidence	BDL	4.14		4.04	
	In-Person	3.93	0.14	3.74	0.19
Instructor	BDL	4.76		4.59	
	In-Person	4.59	0.15	4.53	
Satisfaction	BDL	4.36		4.34	
	In-Person	4.21		4.19	

TABLE 5. OUTCOMES FOR STUDENTS BY INSTRUCTOR TRAINING MODE

Group		N	Mean	ES
Confidence*	BDL	3514	3.61	
	In-person	3410	3.51	0.06
Instruction*	BDL	3470	4.30	
	In-person	3328	4.23	0.05
Satisfaction*	BDL	2477	3.80	
	In-person	1723	3.72	0.06
Final Exam*	BDL	2430	80.53	
	In-person	2476	79.59	0.03

IV. STUDY 2

Study 2 examines the outcomes of students based on the training modality of their instructor.

A. Participants

This study examined existing data of students who took classes from instructors who were examined in Study 1. This resulted in overall samples of 3514 students of BDL-trained instructors and 3421 students of In-person trained instructors.

B. Measures

As with the instructors, four measures were used to assess outcomes for both the instructor trainees: Satisfaction, Confidence, and Instructor rating subscales from the Course Feedback form and Final Exam scores.

C. Results

When the data for all four courses is combined, the means for the Confidence, Instruction, and Satisfaction subscales and the Final Exam scores are significantly higher for students enrolled in classes taught by BDL-trained instructors (see Table 5). However, it should be noted that the effect sizes were very small.

For Network Fundamentals, the Confidence subscale, Instruction subscale, and Satisfaction subscale means were significantly higher for students enrolled in classes taught by BDL instructors. For Routing, the Confidence subscale mean is significantly higher for students enrolled in classes taught by BDL-trained instructors, although the effect size was small. There were no significant differences in the other measures.

For Switching, the means for the Confidence, Instruction, and Satisfaction subscales and the Final Exam scores are significantly higher for students enrolled in classes taught by BDL-trained instructors. The difference in final exams is the only one that approaches even a small effect.

For WAN, the means for the Confidence, Instruction, and Satisfaction subscales and the Final Exam scores are significantly higher for students enrolled in classes taught by BDL-trained instructors. Both satisfaction and final exam approach a small effect.

V. CONCLUSIONS

This section discusses the results of Study 1 and 2, the limitations of the studies, and conclusions we might reach.

A. Discussion

The purpose of this study was to determine whether there were differences in outcomes for instructors trained via BDL and those trained via in-person classes. In addition, it explored potential differences in their students' outcomes. As the results are examined, it is important to keep in mind the general rule of thumb that effect sizes less than .20 are negligible and likely not clinically important (i.e., there will be little noticeable difference in the individuals). Effect sizes from .20 to .40 are generally considered small [9].

When looking at differences in instructors, the difference in final exam scores between BDL and In-person trainees in the Network Fundamentals course is significant and falls in the range of a small effect. This suggests that for the first course, students may perform slightly better when trained in In-person classes. Given that this is the first class in the sequence and for many students may be their first exposure

to the content, it is possible that the camaraderie and support available during In-person classes may be particularly helpful. In addition, it may be that access to real equipment is more important in this class. Although there are other significant differences in the opinion survey questions favoring BDL classes, these are of negligible effect size.

When examining differences in student outcomes, effect sizes of differences are even smaller. The results overall indicate that there are not meaningful differences in student outcomes dependent on mode of instructor training.

B. Limitations

It should be noted that the instructors who participated in the BDL model of instructor training were self selected. Therefore, a causal link cannot be established because this is not an experimental study. In addition, the instructor trainers for the two groups were not identical. Results therefore cannot absolutely be attributed to class format. We also do not have any visibility into the details of the BDL offering (e.g., how many days/weeks long the course is, what proportion and activities are offered remotely vs. in-person etc.) This analysis relies heavily on student survey responses. Although we have removed students who were clearly not taking this seriously (e.g., those with the same response to each question), the heavy reliance this potentially unreliable source should be considered. Finally, we rely in instructor trainers to accurately report whether their class is offered in a BDL format. It is unknown the extent to which trainers may mis-label their classes.

C. Conclusion and Future Work

Future research should look more closely at the variables that are associated with successful BDL offerings for teachers. There are likely both characteristics of instructor trainees and course practices that are related to positive outcomes for both instructors and their subsequent students. In addition, research might explore differences between initial teacher training and ongoing professional development.

There are continued questions about the impact of training instructors via blended distance learning. This study examined this question with a global sample of instructors and revealed there are very few differences in instructor outcomes or the outcomes of the students they teach. There was some suggestion that instructors may have slightly lower exam scores in the first course in the sequence when taken via BDL. Other than this, differences were negligible and, if anything, favored the BDL solutions. These findings align to a growing body of literature that suggests that BDL solutions produce similar results to In-person learning.

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