A COMPARISON OF STUDENT KNOWLEDGE BETWEEN TRADITIONAL AND BLENDED INSTRUCTION IN A PHYSICAL EDUCATION IN EARLY CHILDHOOD COURSE

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ABSTRACT

Blended learning model combines different advantages of face to face education and e-learning to ensure an effective learning environment for students. The purpose of this study was to investigate the impact of traditional and blended instruction, in students´ knowledge in a Physical Education in Early Childhood course. For the purpose of this study a knowledge test was created and item analysis and validity and reliability tests were conducted. The course was developed to meet the learning needs of students and the course's objectives. The curriculum lasted 13 weeks and included for the traditional instruction 12 face to face lectures and for the mixed 7 face to face lectures and 6 on line lectures. The software platform supporting the operation of blended instruction was the course management system E-Class. The study involved 60 students, (35 men, 25 women) aged 19-23 years old (M=20,22, SD=.98). Data analysis indicated that the knowledge test was valid and reliable. Although both groups improved their cognitive learning in this course, the blended learning group was more successful than the traditional on students´ achievement. Based on the findings, blended instruction appears as an alternative teaching practice that should be embraced by educators, in order to assist students to improve their performance.

Keywords: Blended learning instruction; traditional learning instruction; knowledge test.

INTRODUCTION

In the last decade, universities are increasingly pursuing the incorporation of Information Communication Technologies into their systems and services in many different ways (Ginns and Ellis, 2007). An alternative instructional method that has gained considerable popularity in training and education in recent years is blended learning.

According to Picciano (2009), classes where face to face and online activities are integrated in a planned, pedagogically valuable manner and where online activities replace a portion of face to face time, are blended learning classes. Blended learning is a design approach whereby both face to face and online learning are made better by the presence of each other. Another term that has been widely used as an alternative term for blended learning is hybrid learning (So & Brush, 2008).

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According to Garrison and Kanuka (2004) a truly blended approach to learning should involve integration of face to face and online components and that "it is not enough to 'layer' one on top of the other".

They also point out that in order to do this educators should not be just re-packaging old content for use in a new medium but that they should redesign and reform teaching and learning styles and relationships within their module or course.

Blended courses offer a number of advantages over face to face teaching and completely online courses. Research have shown that this combination has the potential of promoting learner-centered, active and constructive learning (O'Donnell, Hmelo-Silver, & Erkens, 2006; Carmody & Berge, 2005, Salomon & Ben-Zvi, 2006; Stahl, 2006, Vernadakis, Antoniou, Giannousi, Zetou, Kioumourtzoglou, 2011). Also blended learning might improve students' learning experience by developing their capacity for reflection (Cooner, 2010).

Other advantages obtained include its greater flexibility (Macedo-Rouet et al., 2009) and greater cost effectiveness (Graham, 2006; Dziuban; 2006) compared to traditional classes. Among the benefits of blended learning reported by recent research were

> ➢ provides students with more control over learning;
> ➢ helps foster critical thinking (Garrison & Kanuka, 2004)
> ➢ effectiveness of online assessment system and computer tutorials (Abraham, 2007).

Additionally, blended learning produced a stronger sense of community among students than either traditional or fully on-line courses (Rovai & Jordan, 2004). According to Gomez and Igado (2008) BL maximizes effectiveness, promotes teacher-learner interaction, access online and physically feedback instantly. Due to the above advantages it had been considered very useful to explore all these possibilities on Physical Education in tertiary Education settings.

Prior Study in Blended Learning

Blended learning is a popular learning model, which grows rapidly especially in tertiary education. Therefore a number of educational institutions have already implemented the blended learning model, and much of the data from these experiences shows changes on student learning performance. Blended learning courses provide a very interesting focus for research into the evolution of e-learning. Research have shown that a student-centered pedagogy should be adapted in designing the course and especially online components, in order to achieve gains in student outcomes. Twigg (2003) suggested that the whole course needs to be redesigned to make "the teaching-learning enterprise significantly more active and learner-centered". The student-centered approach which is adapted in blended learning allows students' autonomy in self-paced learning increases the level of active learning strategies and enhances peer-assisted learning (Graham, 2006).

Melton, Graf, and Chopak-Foss, (2009) evaluated student satisfaction and achievement in a blended learning health course. Participants included 251 students enrolled in sections of the traditional or the blended health course. Although no significant difference was found in pre/posttest scores, students enrolled in the blended sections achieved higher in final course grades. Therefore it can be suggested that both the blended and traditional sections provided the same degree of knowledge acquisition.

In their research, Delialioglu and Yildirim (2008) investigated the effectiveness of the hybrid instruction in regard to students' achievement, knowledge retention, attitudes towards the subject, and course satisfaction in comparison to traditional classroom instruction with model for learning and teaching activities (MOLTA). The results didn't reveal any significant difference between the blended course and the traditional course in students' achievement and knowledge retention. Larson and Sung (2009) conducted a comparison of three delivery modes (traditional, blended, and online) using student exams and final grades.

Their analysis supported the "no significant difference" finding, despite delivery mode, regarding student satisfaction, learning effectiveness, and faculty satisfaction.

However there is a number of studies whose results have emphasized the effectiveness of blended learning in improving the students' achievement. El-Deghaidy and Nouby (2008), tried to determine the effectiveness of a blended e-learning cooperative approach to deliver a science teaching methods course in comparison to delivering the same course content by the same tutor in the form of traditional lectures. Their results indicated that students in the experimental group had higher achievement levels in their post-overall-course test, "comprehensive-score", and attitudes towards e-learning environments compared to those of the control group. In his research, McFarlin (2008) investigated the effect of a hybrid of physiology courses on undergraduate students' performance at Houston University. The researcher transmitted 50% of the courses to a hybrid format using webCT vista. A total of 658 students took part in the experiment being sub-divided into two groups. The results indicated that in the final exam students who were taught by hybrid format scored 9.9% higher than those who used traditional format. Furthermore, Pereira et al (2007) conducted a study to investigate the effectiveness of blended learning and traditional teaching on the academic performance and the degree of satisfaction of the descriptive anatomy course students at Pompeu Fabra University in Barcelona. The results of the study indicated that there was a statistically significant difference between both groups in terms of academic performance and pass rate favoring the blended learning group.

Many Physical Education departments have begun to offer blended courses, for instance the P.E. Department of the University of Wisconsin. The most common courses offered by the blended learning model, were fitness and elective courses (NASPE, 2007). Vernadakis et al. (2011), in their research examined the effectiveness of a hybrid learning approach to deliver a computer science course concerning the Microsoft office PowerPoint 2003 program in comparison to delivering the same course content in the form of traditional lectures. One hundred seventy two first-year students were involved in the research. Data analysis illustrated a significant difference between the hybrid student scores and the traditional student scores in the knowledge acquisition of Microsoft office PowerPoint 2003 program.

Despite the cautious, but yet quite positive feedback, researchers and educators still worry that the blended course option may not be the answer to distance education problems. Students' confusion about the blend of online and traditional delivery methods, increased student workload in blended sections, and weak online components are some of the concerns being raised by Reasons (2004). Moreover research in Physical Education higher education has been limited so far. In this study, a blended model of instruction was designed and developed to deliver content of "Physical Education in Early Childhood" course by technological means.

The purpose of this study was to investigate the effectiveness of the blended course in terms of students' knowledge, in comparison to traditional instruction. The research questions that guided this study were:

> ➢ Should one or more items on knowledge test be deleted or revised to obtain a better measure course's (Physical Education in Early Childhood) knowledge?
> ➢ Do students, on average, report differently on knowledge test using the traditional instruction (TLI) and the blended instruction (BLI) teaching approaches?
> ➢ Do students, on average, report differently on knowledge test for the pre-test and post-test measurements?
> ➢ Do the differences in means for knowledge test between the TI and BI teaching method groups vary between the pre-test and post-test measurements?

METHOD

Design of the Study

In this study a pre-test/post-test control group experimental design was used. A blended course covering Physical Education in Early Childhood was developed. The independent variable of the study was the treatment (blended instruction-traditional face to face instruction); the dependent variable was student's performance in a knowledge test, before and after the completion of the course.Both groups (TLI, BLI) had the same learning conditions, such as topics instructional content, constructive assignments and principles introduced in the treatments, and equal opportunities to achieve their learning outcomes. The equivalence between participants of the two groups ensured that the main variation was in the method of course delivery. In this case, post-test changes in the experimental group, could be attributed to the experimental treatment.

Sample

Study participants consisted of 60 undergraduate students enrolled in the "Physical Education in Early Childhood" course in the Department of Physical Education and Sport Science at the Democritus University of Thrace. Thirty five of the participants (58.33%) were male and twenty five (41.67%) were female. The participants ranged in age from 19 to 23 years old (M=20.22, SD =.98).

Participants were randomly assigned to one of the two different teaching methods: TLI (16males and 14 females) and BLI (19 males and 11 females) creating two independent groups of 30 students each. The convenience sample of participants was entered into the study through their voluntary participation. Prior to group assignments, participants were orientated to the purpose of the study, the experimental group to which they belonged, the method by which it would be taught and obligations for participation in the experiment.

The Blended Course

For the purpose of this study the "Physical Education in Early Childhood" course was redesigned and developed in a blended course format (part online, part face to face) according to Kerres's and De Witt's (2003) 3C-model of didactical components in a blended learning arrangement. This model includes three components that need to be taken into account:

> ➢ **a content component that makes learning material available to the learner**
> ➢ **a communication component that offers interpersonal exchange between learners or learners and tutors and**
> ➢ **constructive component that facilitates and guides individual to actively operate on learning tasks (or assignments) with different degrees of complexity (from multiple-choice to projects or problem based learning).In designing the blended course, formal and informal data gathered from students who had previous taken the course, were examined. Then the instructors specified the desired outcomes of the course in terms of goals and objectives.**

At the end, the content, the practice items and the assessment instruments were determined based on the course's basic goal and objectives.

The online components were delivered using the asynchronous course management system (e-Class). These online components promoted student-centered learning in a way that provides significant autonomy for students in terms of time place and occurrence of their study (Sparrow, Sparrow & Swan, 2000). The on-line portion of the blended course focused on content delivery, course management and extension of the in-class discussion to the web. Specifically, E-Class included course description, course schedule, documents (course content), announcements, forums, quizzes, links and student papers. A planned outline of the course content was placed on E-Class, indicating to students when content would be released.

The course duration was 13 weeks, and the students met for a 90-minute lecture with the instructor 7 times, every second week. The course commenced with a 90-minute Face to Face lecture where the learners had the opportunity to meet each other and the instructor. In this Face to Face introductory session students were presented with the learning objectives of the course.

The blended learning course required self-paced learning time since the course content was online, resulting in a major reduction in classroom lecture time. Students were expected to log onto the course individually from home, work or a University computing cluster, whichever was most convenient, and read that week's course material, download resources, and follow instructions to complete tasks. Assignments emphasized practical application and authentic tasks, all complemented with textbook readings. The blended course was structured to include bi-weekly online assignments focused on active-learning exercises. Weekly quizzes and self-evaluation questions were given online.

One of the negative aspects of blended learning involves student isolation and lack of peer interaction. The discussion boards aimed to create an environment where students could engage in supportive discussion surrounding their learning. This would lead to an enhancement of the students' ability to construct new ideas, undertake activities and receive feedback through dialogue with their instructor and the other students. Laurillard (2002) pointed out the importance of this dialogue/feedback in the promotion of higher levels of learning facilitating the linking of theory to practice. Students could communicate and interact with the instructor and with each other by e-mail or over discussion boards. Students were expected to post their comments regularly in an asynchronous online forum and to comment on and generate ideas with other students while the instructor coordinated the procedure. Topics of discussions were related with the concepts introduced in the course's modules. All contributions were graded.

Knowledge Instrument

A 36-item, True-False knowledge test was developed to determine students' achievement on cognitive learning of Physical Education in Early Childhood.

The procedure of the test construction was based on the criteria, guidelines, rules and examples suggested by the literature (Haladyna, Downing & Rodriguez, 2002; Kabitsis & Kabitsi-Charachousou, 1999; Mood, 1989; Safrit & Wood, 1995).

The questions were formulated based on the book «Physical Education at the beginning of the 21st century-Early Childhood Education, Aims-Goals & Objectives» (Zachopoulou, 2007) and on university's notes and other educational material of the course.

After the questions were constructed as explained above, a panel of experts in Physical Education in Early Childhood was used to evaluate and judge the content validity of the test instrument. They provided feedback on the content's suitability, language and clarity.

As a result of this process 8 questions were considered inappropriate and were removed from the original questionnaire, while others were modified. Every time a set of changes was made, the questionnaire was reviewed again by the consultants, until the instrument was deemed adequate.

After applying the necessary corrections to the questions, the test was given to ten students 18-19 years (5 male, 5 female), in order to help researchers eliminate unintended complexity and imprecision in wording. After few changes, mostly in the expression and formulation, the items were modified to meet the purpose of this study.

A pilot study was performed to access item difficulty and clarity of questions (Green & Salkind, 2007; Thomas & Nelson, 1996). Questions were scored one point (1) for a right answer and no point (0) for a wrong answer. Ninety eight students (N =98), aged $19 - 20$, evaluated the test. The participants consisted of 53 (54,1%) males and 45 (45,9%) females.

This population was chosen to keep the pilot study similar to the main study regarding participant's age. The questionnaire was given to the students once. The questionnaires took approximately 35 min to complete.

The questionnaires were all handed back to the researcher after being completed. The discrimination index and the index of difficulty were calculated for every question of the test. As a result of this process 6 questions were considered inappropriate and were removed from the original questionnaire. The revised version of the knowledge test consisted of a 22-item True -False questions.

Procedure

Both groups, BLI and TLI, had the same learning conditions, such as topics and principles introduced in the treatments, and equal opportunities to achieve their learning outcomes. Also, both courses received the same active-learning activities. At the beginning of the study, the achievement test was given as pre-test to both control and experimental groups to measure their prior achievement in Physical Education in Early Childhood. Then the experimental group attended the blended course (7 face to face meetings) while the control group was lectured in a traditional face to face course (13 face to face meetings). The treatment lasted 13 weeks and the same content was covered in both courses.

The BLI group, received an orientation session about how to use the online part of the course, and more specifically how the open eClass platform was functioning, the use of the cognitive tools, and how to choose username and passwords, at the beginning of the study. Also students were informed about, what was expected from them while using the online part of the course.

At the end of the study the same achievement test was implemented to both groups as post-test.

RESULTS

Homogeneity of variance and Sphericity was verified by the Box's M test, the Levene's test and the Mauchly's test (Green & Salkind, 2007). Initial differences between the two groups for the mean knowledge scores were tested using independent-samples t test.

An item analysis using the responses of the pilot study was conducted to determine the difficulty rating and index of discrimination. In determining the internal consistency of the knowledge test, the alpha reliability method was used.

Two-way analysis of variance (ANOVA), with repeated measures on the last factor, were conducted to determine effect of method groups (TLI, BLI) and measures (pre-test, post-test) on knowledge test.

Each variable was tested using an alpha level of significance .05. A listing of the results from the item analysis of the knowledge test in the pilot study can be found in Table: 2.

Means and standard deviation for the TLI and the BLI group in pre-test and post-test are presented on Table 1, while results of each analysis are presented separately below.

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Table: 1
Means and standard deviations for pre-test and post-test scores
of the two groups on knowledge test

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Factors	TLI (N=30)		BLI (N=30)	
	M	$S.D.$	M	$S.D.$
Knowledge Test 1st measure	10.6	1.83	11.27	1.46
Knowledge Test 2nd measure	13.7	1.84	16.57	1.59

Item Analysis
The pilot study knowledge test had a mean difficulty rating of .58%. When all items were analyzed, three questions, or 10.7% of the items, had unacceptable difficulty rating values.

The utilization of a difficulty rating criterion of between 20% and 90% resulted in 89.3% of the items yielding an acceptable level of difficulty. The pilot study knowledge test had a mean index of discrimination of .36. When all items were analyzed, two questions, or 7.1% of the items yielded an unacceptable index of discrimination values. The acceptable value for index of discrimination was .20 or higher. Acceptable index of discrimination values were observed for 92.9% of the items.

As indicated by the information in Table: 2, five of the items (2, 10, 13, 16 & 28) were therefore deleted from the test for the main study.

Table: 2
Summary of Item Analysis for pilot study knowledge test

Questions	Difficulty rating	Index of discrimination	Results
1st	.63%	.50	Retained
2nd	.83%	.42	Eliminated
3rd	.65%	.50	Retained
4th	.57%	.38	Retained
5th	.39%	.50	Retained
6th	.64%	.27	Retained
7th	.46%	.27	Retained
8th	.65%	.48	Retained
9th	.56%	.31	Retained
10th	.82%	.08	Eliminated
11th	.57%	.31	Retained
12th	.31%	.27	Retained
13th	.52%	.15	Eliminated
14th	.59%	.27	Retained
15th	.65%	.33	Retained
16th	.86%	.08	Eliminated
17th	.66%	.38	Retained
18th	.57%	.41	Retained
19th	.56%	.31	Retained
20th	.56%	.27	Retained
21st	.67%	.35	Retained
22nd	.68%	.46	Retained
23rd	.61%	.27	Retained
24th	.78%	.62	Retained
25th	.6%	.54	Retained
26th	.58%	.34	Retained
27th	.63%	.46	Retained
28th	.31%	.15	Eliminated

Reliability Analysis
An alpha reliability coefficient .76 was computed based on the inter-item correlation coefficients of the pilot study knowledge test. According to Green, & Salkind (2007), the reliability coefficient should be at least .70 for the test to be considered reliable. Thus, the determination was made that the pilot knowledge test was a reliable measuring instrument.

Two-way Analyses of Variances (ANOVAs) with Repeated Measures
There were no significant initial differences between the two teaching method groups for the mean knowledge test scores, $t(58) = 1.56$, $p = .124$.

A significant main effect was noted for the Time, $F(1, 58) = 563.19$, $p < .001$, and for the Group, $F(1, 58) = 19.66$, $p < .001$, while the interaction Time X Group was also significant, $F(1, 58) = 38.63$, $p < .001$.

Two independent-samples t test were conducted to follow up the significant interaction and assess differences among teaching method groups at each time period.

Differences in mean ratings of knowledge performance between the two teaching groups were not significantly different at first measure, $t(58) = 1.56$, $p = .124$, while the BLI method group yielded a significantly higher mean rating at second measure, $t(58) = 6.45$, $p < .001$. As shown in Figure 1, the difference in mean knowledge test scores was higher for the BLI method group at post-test measure.

Finally, two paired-samples t tests were conducted to follow up the significant Time main effect and assess differences across time at each teaching method group. Differences in mean rating of knowledge test in TLI group were significantly different between pre-test and post-test, $t(29) = 11.20$, $p < .001$. Similar, differences in mean rating of knowledge test in BLI group were significantly different between pre-test and post-test, $t(29) = 24.04$, $p < .001$. As shown in Figure 1, the post-test knowledge scores were remarkably greater than pre-test knowledge scores for the two groups.
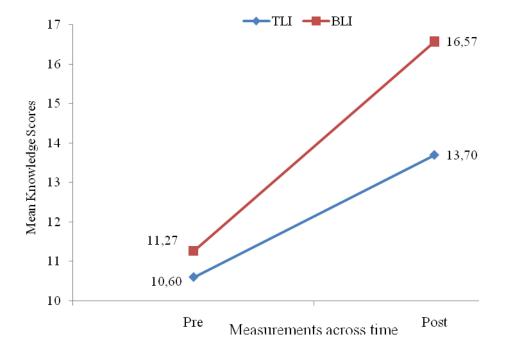

Figure: 1
Performance of the two groups on all measurements
across time of the Knowledge Test.

DISCUSSION

The purpose of this study was to investigate the effectiveness of the blended course in terms of students' knowledge, in comparison to traditional instruction.

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Data analysis revealed a significant difference between the BLI group scores and the TLI group scores in the knowledge acquisition of the course. Specifically, although both groups improved their cognitive learning in this course, BLI was more successful than the TLI on students´ achievement.

A possible explanation for these findings may be that the significantly improved results for the knowledge test occurred because students took advantage of the extra learning opportunities provided through the BLI. According to Sparrow et al. (2000), the online components promoted student-centered learning in a way that provides significant autonomy for students in terms of time place and occurrence of their study (Sparrow et al., 2000). Also the feedback supplied through quizzes, students' paper and forums might have helped students to learn from their mistakes, a fact that influenced the improved results in the knowledge test for those students exposed to the blended approach.

Furthermore the higher learning achievement by the students might be affected by the more active classroom teaching approach utilized in the blended format. A blended course model may actually led itself to more active learning due to students becoming more responsible for their learning, as they have the opportunity to view and interact with the content on their own time, while classroom time is spent with application of newly acquired knowledge. According to Di Napoli, (2004) when students are given the opportunity to take responsibility for their learning; they will be more likely to become active learners

The results of this study appear to be consistent with the results of a number of studies that have previously been reviewed (El-Deghaidy & Nouby, 2008; McFarlin, 2008; Pereira et al, 2007; Vernadakis et al, 2011). These studies have highlighted the effectiveness of blended learning in improving students' achievement. Therefore the instructor's presence coupled with the flexibility of e-learning method in terms of time and place seemed to provide a chance for students to thoroughly review the educational material besides performing other activities. Yet, some of the studies that have been reviewed, so far, tend to suggest that there are no significant differences between the blended learning and traditional learning as to their effectiveness on the students" achievement. These studies include Melton et al, (2009); Delialioglu & Yildirim, (2008); Larson & Chung-Hsien, (2009).

However, none of the studies that have been reviewed, so far, has indicated a potential negative impact of blended learning on students' achievement. The obvious discrepancy between the results nonetheless, could be attributed to other differences such as the differences in the appropriateness of the instructional design, the differences in the framework of blended learning or even the differences on the research design.

The main finding of the current study suggests that the implementation of blended learning instruction had a practical significance with regard to improving students´ achievement in the subject of Physical Education in Early Childhood. This result is very promising since students in BLI group reduced their classroom seat time and still exhibited higher learning outcomes. This results in reduction in teaching time and according to Graham (2006) and Dziuban (2006) to further cost reduction. There are two limitations that need to be acknowledged and addressed regarding the present study. The first limitation concerns the sample of this study. Students included in this study were only from the Department of Physical Education & Sport Sciences at Democritus University of Thrace. A larger and more diverse sample would provide a wider approach for cognitive learning.

Secondly, no attempt was made to control possible differences in computer skills and course management system experiences of the students or the effective learning time of the students' real engagement in the learning process. If these limitations have been controlled, the researchers might have reported more precise results for the effectiveness of TLI, and HLI methods on students' achievement in the Physical Education in Early Childhood course. As such, concrete conclusions cannot be drawn while further research may be needed in order to generalize the results. Based on these findings, it can be concluded that there is strongly supported evidence in favor of blended learning as an integral part of instructional design in higher education and specifically to the Physical Education in Early Childhood course. To make more generalizations there is a need for a more thorough investigation in different subject areas, at different students' levels, and with different design and development models. While not specifically tested, this study's findings also suggest that such a blended learning approach supports the development of life-long learning by providing a learner-centered environment. The flexibility of the blended environment provides a rich educational experience for students with an emphasis on active learning. Since Universities value and seek to inculcate the skills essential for lifelong and life wide learning, producing graduates who will continue to develop intellectually, professionally and socially beyond the bounds of formal education.

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