

Full Length Research Paper

Blended learning in vocational education: An experimental study

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Accepted 13 October, 2010

Technology is a key in modern production systems. Its use in education is increasing and various technology-based learning models have been developed. The definitions of blended learning are reviewed here from an instructional pedagogy point of view. A blended model can improve student performance and lead to more effective learning. A successful blended learning model can directly or indirectly result in higher production and employability in parallel with the skill level acquired. Blended learning has been applied in higher education and workplace learning settings, and can lead to improved pedagogy, increased access and flexibility, and better cost-effectiveness. The present study investigated whether blended learning can contribute to student performance in vocational education. Use of a blended learning model for footwear design training in a vocational education setting is a novel teaching and learning approach. The experimental results indicate that blended learning contributes to footwear design training in the context of vocational education.

Key words: Blended learning, vocational education, experimental study.

INTRODUCTION

In this 21st century, technology and students have been changing rapidly, so educators should be embracing “the new digital reality of the online computerized world” (Jukes, 2008: 6). Young (2002) predicted, “Within five years, there will be lots of blended models such as students going to school two days a week and working at home three days a week”. Another blended model...is “where a student takes five face-to-face courses at school and two virtual courses” (Picciano and Seaman, 2009: 5). Thus, blended learning is a method of the 21st century. In 2002, Prof. Bourne (Young, 2002) said: “within five years, you'll see a very significant number of classes that are available in a hybrid fashion somewhere in the 80 to 90% range.” Buckley (2002) and Barr and Tagg (1995) noted a paradigm shift in higher education leading to new models of teaching and learning. The studies report indicates that blended learning has the potential to play an integral role in this shift. Blended learning is a recent online innovation as a result of integration of technology into education. The term was then used in books and scientific journals, at professional conferences, in business culture, and on college and university campuses. In fact, educators have been preoccupied with integrating technology into the classroom for decades

(Dziuban et al., 2004). They are embracing rapid changes in internet technologies that in turn imply that blended learning should become an integral component of education (King, 2002). Advances in technology and changes in teaching and learning approaches (from teacher to student-centered) facilitate the emergence of new models such as blended learning. Watson (2008) suggested that blended learning involves a shift in strategy in three areas: from teacher to student-centered learning, from limited to high-frequency interactions between students and resources, and from intermittent to deliberate integration of formative and summative assessments.

In this process, Buckley (2002) and Barr and Tagg (1995) placed emphasis on student-centered learning paradigms, new technologies such as the internet and personal computers, and new theories such as brain-based learning, cooperative learning and social constructivism that can be combined to form new learning models. Blended learning “combines various pedagogical approaches (e.g., constructivism, behaviorism, cognitivism) to produce an optimal learning outcome with or without instructional technology” (Driscoll, 2002; Graham et al., 2003). With the increasing prevalence of computers

and the Internet, online learning environments are becoming more widespread. The criticism that online teaching-learning environments lack many of the advantages of face-to-face environments has led to the notion of blended learning. Sikora and Carroll (2002) reported that online higher education students tend to be less satisfied with totally online courses compared to traditional courses. Therefore, a combination of online and traditional learning environments could be much more useful in solving education problems and meeting educational needs (Murphy, 2003). According to Graham et al. (2003), blended learning was developed for its potential advantages of more effective education, convenience and access to teaching-learning environments. Others have defined blended learning simply as “maximizing the best of both worlds” to benefit simultaneously from the advantages of online and face-to-face learning environments (Morgan, 2005). Blended learning is generally defined by many instructors as a combination of different modes or delivery media with an emphasis on technological media. For example, Singh and Reed (2001) defined blended learning as “a learning program where more than one delivery mode is being used with the objective of optimizing the learning outcome and cost of the program.” According to Thomson (2003), a “...blended learning model uses a structured combination of instructional media...can include on-line instruction, mentoring/instructor-led support, and various sources of information and practice from text and electronic media.” Graham et al. (2003) stated that “blended learning means the combination of a wide range of learning media (instructor led, web based courseware, simulations, job aids, webinars and documents) into a total training program.” According to Dziuban et al. (2004: 3), “Blended learning should be viewed as a pedagogical approach that combines the effectiveness and socialization opportunities of the classroom with the technologically enhanced active learning possibilities of the online environment.” Julian and Boone (2001) reported that “blended learning solutions deliver a comprehensive learning experience using various methods (for example instructor-led training, CD-ROM, or e-Learning).” According to Valiathan (2002), “The term blended learning is used to describe a solution that combines several different delivery methods such as collaboration software, web-based courses, EPSS and knowledge management practices.” Kerres and DeWitt (2003) stated that “...‘blended learning’ refers to all combinations of FTF [face-to-face] learning with technology-based learning: traditional education can be enriched with the use of technology and learning with technology can profit from FTF meetings.” “Blended learning combines the best attributes of electronic and traditional classroom experiences to present and reinforce learning” (Anderson, 2001: 12). According to Rooney (2003), “Blended learning refers to events that combine aspects of online and face-to-face instruction”.

“Hybridity is the order of the day as teachers combine the distributed teaching and learning of distance education with the comfortable interaction of the classroom in an effort to achieve a synthesis of the two” (Sands, 2002).

What is blended learning?

Models of blended learning are gaining widespread acceptance globally but a generally accepted definition has not emerged yet. Scholars outside of education have approached the meaning of blended learning from a scientific angle, drawing on its title’s connection to biology and botany. Sands (2002) for example, noted that since the word hybrid, refers to the offspring of two different genetically dissimilar parents, teaching and learning in this framework must also involve the successful joining of opposing parts online and face-to-face methodologies. Osguthorpe and Graham (2003: 227) described blended models as “pedagogies that change according to the unique needs of learners. Those who use blended learning environments are trying to maximize the benefits of both face-to-face and online methods using the web for what it does best and using class time for what it does best.” There are numerous definitions of blended learning at the course level. According to Rossett (Graham et al., 2003), “Blended learning is the use of two or more distinct methods of training.” House (Graham et al., 2003) stated that blended learning is “...training delivered by a combination of methods.” Blended learning is a method for organizing the learning environment facilitated by effective combination of different modes of delivery, models of teaching and styles of learning, and is founded on transparent communication amongst all parties involved in a course (Heinze and Procter, 2006). Garnham and Kaleta (2002) defined blended learning as “courses in which a significant portion of the learning activities have been moved online, and time traditionally spent in the classroom is reduced but not eliminated”. Blended learning is a hybrid learning concept integrating traditional in-class sessions and e-learning elements (Reay, 2001; Rooney, 2003) in an attempt to combine the benefits of both learning forms. Blended learning was described by Thorne (2003) as “a way of meeting the challenges of tailoring learning and development to the needs of individuals by integrating the innovative and technological advances offered by online learning with the interaction and participation offered in the best of traditional learning”.

In the literature, blended learning is usually perceived as media-based method incorporation or a combination of online and traditional education methods (Usta, 2007). Graham (2006: 5) summarized three definitions of blended learning: (a) a combination of instructional delivery media; (b) a combination of instructional methods and (c) a combination of online and face-to-face instruction. The first two definitions reflect the debate on

instructional media versus instructional methods for learning and are too broad to make blended learning a distinct phenomenon, since virtually all learning systems include a variety of methods and media. Defining blended learning as a combination of online and face-to-face instruction more accurately reflects “the historical emergence of blended learning systems.” Singh and Reed (2001) defined blended learning as a learning program in which more than one delivery mode is used to optimize the learning outcome and the cost of program delivery. Singh (2003) refined this definition as follows: “blended learning focuses on optimizing achievement of learning objectives by applying the ‘right’ personal learning technologies to match the ‘right’ personal learning style to transfer the ‘right’ skills to the ‘right’ person at the ‘right’ time.”

Literature

Studies on blended learning have mainly focused on its use and advantages. The present study differs in, that is based on application to footwear design training in the context of vocational education. Ersoy (2003) carried out a study of 65 undergraduate students, enrolled on a course named “Programming Languages II” in the academic year 2002 to 2003. The course was taught using the traditional face-to-face instruction method and was supplemented by a web site. Students were asked to complete three questionnaires to collect data on their perceptions regarding web-based instruction, online cooperative learning and the online instructor. The results revealed that students had positive perceptions of web-based instruction and the online instructor, whereas they had uncertain perceptions of online cooperative learning. Robison (2004) investigated the experiences of ten faculty members in designing and teaching blended learning courses at Brigham Young University. The results revealed that participating faculty members perceived three major benefits of the blended learning experience. First was the more effective use of classroom time; second was increased flexibility in meeting time constraints of both the students and the teacher; and third was a greater ability to meet the needs of individual students. Thus, the study underlined the effectiveness of blended learning environments and the author recommended extensive use of this approach for undergraduate courses. Ünsal (2007) compared the effectiveness of blended and face-to-face learning environments in terms of student achievement and motivation. A web-based learning environment was designed in accordance with the blended learning approach, and a face-to-face learning environment was organized. A multidimensional evaluation of the effectiveness of the blended learning approach was carried out for 22 control and 24 experimental students enrolled on an undergraduate course called “Introduction

to Computer Science II.” The results revealed no significant difference between blended and face-to-face learning approaches in terms of academic achievement and students’ motivation scores. However, a significant difference in retention scores was observed between the groups. Moreover, the mean general achievement scores obtained in mid-term examinations was significantly higher for blended learning students compared to those for students taught by the face-to-face approach. Other results of the study demonstrated that a web-supported learning environment played a crucial role in areas such as access to information, progressing at one’s own pace, enriched learning and individual studies.

Akkoyunlu and Soyulu (2008) examined students’ learning styles and their views on blended learning. Results revealed that students’ views on blended learning process, such as ease of use of the web environment, evaluation, face to face environment etc., differ according to their learning styles. Results also revealed that the highest mean score corresponds to face to face aspect of the process when students’ evaluation concerning the implementation is taken to consideration. The overall findings showed no significant differences in achievement level according to students’ learning styles. Korkmaz and Karakuş (2009) investigated the impact of a blended learning model on student attitudes to a geography course and their critical thinking dispositions and skills for experimental pattern ($n = 28$) and control ($n = 29$) groups at Kırşehir high school. The experimental group experienced hybrid learning through a geography web page, whereas a traditional learning model was used for the control group. The blended learning model contributed more to student attitudes on the course and to critical dispositions and levels compared to the traditional learning model, and there was a positive correlation between student attitudes to the course and their critical thinking dispositions and levels. Yılmaz and Feza (2010) investigated whether the academic performance and satisfaction levels of pre-service English teachers varied with respect to their learning approach in a blended learning environment. They found that academic performance scores for students in a blended learning environment differed significantly between deep and surface learners. However, the average satisfaction level was significantly higher for deep learners than for surface learners.

Importance of the research

Technology is a key in modern production systems. Its use in education is increasing and various technology-based learning models have been developed. Blended learning has been applied in higher education and workplace learning settings globally and can lead to improved pedagogy, increased access and flexibility, and better cost-effectiveness (Graham, 2006). In addition,

blended learning can be used to “foster learning communities, extend training events, offer follow-up resources in a community of practice, access guest experts, provide timely mentoring or coaching, present online lab or simulation activities and deliver prework or supplemental course materials” (Bonk et al., 2006: 560). Blended learning has been popular both in academia and the corporate environment for various reasons (Dewar and Whittington, 2004). In the business world, the most important reasons for developing blended solutions include the ability to match learning styles, to create individually tailored solutions, to reduce class time, to improve learning rates and to exploit investments already made in reusable training resources (Sparrow, 2004). In academia, the initial cost-saving argument for e-learning (Gayeski, 1998; Wilson, 1999) has recently been replaced with a more refined understanding of how to integrate technology into an overall learning strategy. Blended learning is sometimes preferable because it provides pedagogical richness and access to knowledge, social interaction, and personal agency. It also can be cost-effective and facilitate revision (Osguthorpe and Graham, 2003).

Benjamin Bloom’s taxonomy uses a cognitive system to classify educational goals with a hierarchical arrangement of learning objectives from simple to complex and has been successfully used for teaching cognitive and psychomotor skills in nursing education (Bloom, 1966; Huit, 2007; Reilly and Oermann, 1985; Schmieding, 2002). A hierarchical arrangement of training methods from simple to complex might facilitate successful learning outcomes for participants in training programs and could accommodate a blended learning environment.

In the present study, a blended learning model was used in footwear design training, in a novel teaching and learning design for vocational education. This model can positively affect student performance through more effective learning. A successful blended learning model can directly or indirectly result in greater production and employability in parallel with the level of skill acquired.

Aim of the study

Problem statement

The aim of the research is to investigate whether blended learning can contribute to student performance in vocational education. The problem statement is thus: “does blended learning favorably affect the performance of students involved in vocational education?”

Hypotheses

The following two hypotheses were tested:

H1: Blended learning can significantly increase student’s

performance in vocational education. H0: Blended learning does not affect student performance in any way.

Limitations

The blended learning experiment was applied to footwear design students at the Technical Science College of Selcuk University, Turkey. Data for the control group were obtained in the first semester of the 2008 to 2009 academic year, and data for the experimental group in the first semester of 2009 to 2010.

METHODOLOGY

Research design

The research involved an experimental model. The control group of 28 students on a footwear design course in the first semester of the 2008 to 2009 academic year was trained in the traditional way. This involved face-to-face communication in the footwear design workshop at the college. The trainer examined the students to assess their theoretical and practical skills both before and after the training. In the 2009 to 2010 academic year, the same trainer added a virtual training centre for shoe design (<http://www.vtcforshoedesign.com>) as an online training tool to the training program for footwear design students, who followed the same curriculum as the control group. The virtual training centre for shoe design is an online training tool developed as a development of innovation project by a consortium coordinated by the author. The experimental group was also assessed before and after training in the same manner as for the control group.

Study group

The study group consists of two groups of students having trained at the department of footwear design of Technical Science College, Selcuk University. The study group consists of 56 students, 28 of whom are of control group and the other 28 students are of the experimental group.

Data collection and analysis

Considering the nature of the training field, which requires both theoretical knowledge and skill development, scores for examinations carried out before and after the training for both groups were collected as pre- and post-test results. Comparison of the pre-test results revealed that the two groups were balanced with a homogeneous structure. A two-sample t-test using SPSS 13.0 at a significance level of 0.05 revealed a p value of 0.966, indicating no difference in pre-test score between the groups.

FINDINGS AND DISCUSSION

The main objective of this study was to investigate whether a blended learning model increases the performance of students involved in vocational education. There was no difference in pre-test score between the control and experimental groups. The mean final examination score was 72.1429 for the control group and

Table 1. Arithmetic mean scores (Group statistics).

Scores	N	Mean	Std. deviation	Std. error mean
G12 score 1	28	72.1429	22.12877	4.18194
G12 score 2	28	84.1071	14.59665	2.75851

The statistical results reveal a higher mean score for the experimental compared to the control group. According to a two-sample t-test (Table 2), the difference is significant ($p = 0.021$).

Table 2. Two-sample t-test results for the control and experimental groups. (Independent samples test).

		Levene's test for equality of variance		t-test for equality of means						
		F	Sig	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
								Lower	Upper	
(Notiar)	Equal variances assumed	4.753	0.034	0.043	54	0.966	0.17857	4.15403	-8.14977	8.50691
(Notiar)	Equal variances not assumed			0.043	45.749	0.966	0.17857	4.15403	-8.18430	8.54145

84.1071 for the experimental group (Table 1).

The hypothesis that proposes blended learning can significantly increase student's performance in vocational education which is supported by the data, indicating that the blended learning model significantly affected student performance, yielding a higher success rate for students in vocational education (specifically footwear design) (Table 2). This finding is in agreement with other studies on blended learning in different disciplines. Sitzmann et al. (2006) conducted a meta-analysis of 96 experimental studies on online and classroom instruction between 1996 and 2005. Their findings indicate that blended learning is more effective than face-to-face classroom instruction for teaching both declarative and procedural knowledge. They concluded that blended learning optimizes the instructional advantages of both online learning and classroom instruction. In another meta-analysis, Zhao et al. (2005) found no difference in overall effectiveness between online and face-to-face learning, and the authors noted that courses applying blended learning resulted in better learning outcomes than distance or face-to-face education alone.

Despite findings supporting the present research results, other studies revealed unfavorable findings for blended learning. For example, Haytko (2001: 36) reported that students did not like the blended learning environment. Negative comments from students on a blended course focused on workload, technology problems, and lack of "interpersonal interaction with the faculty member." Although evidence shows that blended learning is more effective than online learning or face-to-face learning alone. The study by Sitzmann et al. (2006) indicates that learners react more favorably towards

classroom instruction than blended learning; therefore, perceived learner satisfaction may suffer. One assumption may be that blended learning courses are more demanding and time-consuming than online instruction owing to the incorporation of both online and classroom components (Sitzmann et al., 2006). Comparing the relative effectiveness and overall perceptions of blended learning and traditional classroom delivery, Chen and Jones (2007) found conflicting results. Despite comparable results for the effectiveness of the overall learning experience, traditional classroom students were significantly more satisfied with the clarity of instruction and had a more favorable overall perception of the instructor than blended learning students. Chen and Jones (2007) observed that blended learning students found the course more difficult and reported a significantly higher degree of agreement with the statement that their analytical skills had improved.

Conclusion

Courses that incorporate technology as a distinct feature combined with face-to-face delivery are called hybrid courses, blended courses or mixed delivery courses. However, Clark (1983) stated that technology is only a vehicle used to deliver instruction and has no influence on student achievement. According to Kanuka (2008), educators who favour user determinism, wrongly believe that technology is a neutral power whose effects are activated and wielded solely by students. Two flaws in this line of thinking include the notion that there is a technical solution for every classroom problem and that

broader social structures do not impact learning. Blended learning has the potential to improve learning experiences by adding the advantages of online instruction to traditional classroom settings. Blended learning, however, is not a single recipe (Garrison and Cleveland-Innes, 2004). There are many ways of combining online and face-to-face learning, falling within a spectrum between entirely face-to-face and entirely online education. The optimum balance can vary depending on the subject matter and the learning situation. Learning and communication theories suggest that the key to finding the perfect blend for each situation is a better understanding of the role of interactions in the learning process. Previous studies indicate that the quality and quantity of interactions affect academic results, the level of higher-order learning, and students' perception of their learning experience.

The prevalence of blended learning is increasing, so higher education and corporate training managers should develop strategic plans and directions with a focus on pedagogical methods in blended learning (Bonk et al., 2006). The present study indicates that blended learning can play a vital role in vocational training sessions, in educational organizations and workplaces. It is also not only a matter of higher education. It can be used for any vocational training based on skill development at any level. The implementation of blended learning model in a very specific field of vocational education (footwear design training) has yielded positive results. To identify other vocational areas in which blended learning models can be used, more research should be carried out with an emphasis on application and practice rather than theoretical knowledge.

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