

THE OUTCOMES OF FLIPPED LEARNING IN INFORMATION TECHNOLOGY COURSE IN HIGHER EDUCATION

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ABSTRACT

Learning environments have become learner-centered in line with the opportunities offered by the developing technology. Blended learning is one of the approaches in which learner-centered activities are successfully implemented with technology. At the same time, flipped learning technique within the rotation model of blending learning. In this study, the outcomes of flipped learning in information technologies course was investigated and the study was carried out in quasi-experimental research model as a pretest-posttest control group design. There were 40 pre-service teachers in the experimental group and 35 pre-service teachers in the control group. The computer and Internet accessibility outside the classroom was used as a criterion in the determination of the experimental group. In the analyses, independent samples t-test was used to determine whether there was a significant difference between the pre- and post-test mean scores and presentation evaluation points of the experimental and control groups. Paired samples t-test analysis was used to determine the difference between of pre- and post-test scores. Although there was no significant difference between the post-test scores of both groups, it was seen that pre-service teachers increased their test scores at the end of the process. When the effect size of the process was examined, the flipped learning technique had more effect than the traditional teaching method. At the end of the process, presentations prepared by pre-service teachers were examined by two field experts and evaluated through rubrics. According to results, flipped learning technique contributed more to the pre-service teachers' skills interested in designing and developing computer presentations.

Keywords: Flipped learning, higher education, information technologies.

INTRODUCTION

The process of advances in technology, deeply influencing educational practices, began with the spread use of printing in the 1400s. Electronic telegraph and radio in the 1800s, television and computer in the 1900s, the Internet and web technologies in the 2000s were widely used in the teaching process (Bishop & Verleger, 2013). Learning environments have become learner-centered in line with the opportunities offered by developing the technology. According to Mason, Shuman, and Cook (2013a), learner-centered activities make students more effective and provide opportunity to improve their skills. Blended learning is one of the approaches in which learner-centered activities are successfully implemented with technology-enriched environments. In blended learning, face-to-face activities are used to increase student-student and student-teacher interaction, and online learning environments are used to provide more personalized instruction based on each student's learning needs (Çakır, 2008; Davies, Dean, & Ball, 2013; Schwobe, 2013). Blended learning can be defined as the use of different teaching techniques in the process of combining the best aspects of face-to-face learning and e-learning or distance learning (Chipchase, 2013; Çakır, 2008; Dağ, 2011; Kazu & Demirkol, 2014; Staker & Horn, 2012; Ünsal, 2012). Staker and Horn (2012) state that blended learning can be applied in the form of four different models (rotation, flex, self-blend, and enriched-virtual). Flipped learning is one of the techniques in the rotation model (Staker & Horn, 2012). Combining different educational technologies such as videos and multimedia with teacher-guided practices is one of the main forms of blended learning (Driscoll, 2002). In flipped learning, after class hours, the content is delivered to the students in different locations. In face-to-face lessons, practices or projects are conducted under the guidance of teachers (Staker & Horn, 2012).

With the proliferation of open-access teaching materials on the Internet, flipped learning activities implemented by educators have started to increase. Flipped learning has become popular in education through the open-access portal (Khan Academy) established by Salman Khan and the efforts of Jonathan Bergmann and Aaron Sams (chemistry teachers) (Bishop & Verleger, 2013; Hamdan, McKnight, McKnight, & Arfstrom, 2013a; 2013b; Johnson, 2013). Simplification of the production of multimedia for personal computers, tablet PCs, and personal media players, and the proliferation of web-based tools for collaboration and communication are seen as two main reasons for the popularity of flipped learning (Frydenberg, 2013). The simplest definition of flipped learning is that the teacher delivers the content outside the classroom and the student assignments are done in the classroom (Davies et al., 2013; Lasry, Dugdale, & Charles, 2014; Slomanson, 2014). Teacher provides lecture videos for the course. Students have the opportunity to watch course videos as much as they want, which makes them more productive in classroom activities. Since the theoretical section of the course is provided through out-of-class activities, the teacher can use classroom time to further enable students' learning processes and to provide more individual support to them (Chipchase, 2013; Enfield, 2013; Hamdan et al., 2013b; Jump, 2013; Lasry et al., 2014; Mason et al., 2013; Slomanson, 2014). Thus, students can participate in the activities in the classroom more and practice-based teaching process can be experienced more (Kocabatmaz, 2016). In this case, according to Bloom's taxonomy (1956), low-level learning such as knowledge and comprehension is reserved for

outside the school, while high-level learning such as application, analysis, synthesis, and evaluation is focused in the classroom with teacher guidance.

The researches in the related literature indicate that the students are satisfied with the flipped learning technique (Herreid & Schiller, 2013; Johnson, 2013; Mac Callum, 2013). This is seen as a very important finding in terms of learner participation. Flipped learning technique transforms students from passive listeners to active learners (Davies et al., 2013). Students can take control and responsibility of learning and learn at their own pace at any time and place. From the teacher's point of view, it is an important advantage that having the chance to devote more time to the practices and answer the questions related to the content in more detail (Davies et al., 2013; Enfield, 2013; Herreid & Schiller, 2013; Mac Callum, 2013; Ng, 2013).

The most popular criticism for flipped learning is the necessity of students to have access to technology outside of school. This situation may be a problem in developing countries. However, by arranging post-course programs, students can have access to computers and the Internet in schools to solve this problem (Enfield, 2013; Ivala, Thiart, & Gachago, 2013; Ng, 2013; Siegle, 2013). Another issue is the motivation of the students. Students should be highly motivated to watch videos at the outside of the class and do other necessary duties. Students who come to class without watching videos and doing the necessary duties may interrupt the classroom activities (Enfield, 2013; Mac Callum, 2013; Siegle, 2013). In this case, teacher should benefit from different motivation strategies.

Although the positive features of flipped learning are predominantly mentioned, the number of studies that provide evidence that students improve their academic achievement or performance in flipped learning is not considered sufficient (Bishop & Verleger, 2013; Enfield, 2013; Goodwin & Miller, 2013; Jump, 2013; Tune, Sturek, & Basile, 2013). According to Hamdan et al. (2013a), as many qualitative and quantitative studies as possible should be supported to develop flipped learning activities. Hayirserver & Orhan (2018) also state that the flipped learning technique should be the subject of more research. Examples in flipped learning should be increased and expanded. When the blended and flipped learning studies conducted for computer courses are examined, it is stated that the studies on different subjects of the information technologies will contribute to the field (Bağcı, 2012; Kahyaoğlu, 2014; Usta, 2007; Ünsal, 2007). In terms of technology integration in education, undergraduate courses are important for the development of pre-service teachers' computer skills (Erdemir, Bakırcı, & Eyduran, 2009). Council of Higher Education (CoHE, 2018) updated the teaching undergraduate programs in Turkey in 2018. Computer I and Computer II courses, which were given as four hours (two theoretical hours followed by two practical hours) in two semesters, were transformed into three theoretical course hours as information technologies for a semester. This situation poses a problem in delivering the content and completing the activities. Instructors try to solve the problem with different approaches. In this study, the effect of flipped learning on pre-service teachers' presentation software knowledge and skills was investigated.

METHOD

Research Model

This study was designed to investigate the outcomes of the flipped learning technique used in Information Technology course at the undergraduate level. The study model was quasi-experimental research. It was carried out in a pretest-posttest control group design (Karasar, 1999). There was only one independent variable, flipped learning technique that was presented only to the experimental group, in this design. The dependent variables, whose effect on the independent variable observed, were the pre-service teachers' test scores and presentation rubric scores in preparing computer presentations.

In flipped learning, there can be many factors affecting learner success such as sound, image, and content quality of the videos. During the teaching process of computer software, the instructor usually lectures by the screen. The instructor who taught both study groups created the lecture videos. Therefore, it was possible to control the underlying factors related to instructor.

Participants

The research was carried out with the participation of pre-service teachers enrolled in the information technology course. In the study, the possibility of computer and Internet access outside the classroom was used as a criterion in the determination of the experimental group. There were 40 pre-service teachers in the experimental group and 35 pre-service teachers in the control group. In the control group, the lessons were taught by the traditional method and flipped learning technique was applied to the experimental group.

Data Collection Tools

Within the scope of the research, the academic achievement test was developed in order to determine the knowledge level of pre-service teachers and the evaluation rubric was used to examine the presentations.

Achievement Test

As the first step of developing the achievement test, table of specification was prepared. Then, 28 multiple-choice items were developed based on educational learning outcomes. Four faculty members who previously taught this course examined the items. In accordance with their opinions, the test items were updated and one item was removed. A pilot study was conducted for the analysis of the form with 27 items. Preliminary application was carried out with 194 undergraduate students. The responses of the students were analyzed through ITEMAN. After item analysis, 13 items had discrimination index of less than .40 and these items were excluded from the test. For the remaining 14 questions, the expert opinion was again received for the content validity of the test. The remaining 14 questions were applied to 139 pre-service teachers who had taken and passed similar courses before. The data obtained at this stage were re-analyzed. As a result of the analysis, the 14-item final version's

Kuder Richardson-20 (KR-20) reliability coefficient was found as .809 (the average item discrimination was .458, and average item difficulty was .588).

Evaluation Rubric

The rubric, developed for the evaluation of student presentations, was prepared in a Likert type with three options (poor, fair, and good). At the development stage, rubrics in the literature which used in the evaluation of the presentations, were examined and opinions of field experts were taken. The evaluation rubric consists of 13 items based on design principles such as the balance, emphasis, layout, text size and density, contrast, animation effects, and slide transitions. The lowest score can get from the rubric is 13 and the highest score is 39.

Experimental Process

The study was carried out for one month in the process of teaching the presentation software within the scope of information technologies course at the undergraduate level. All research ethics were followed throughout the process. In the control group, the course was carried out by the traditional method, the course content was lectured by the instructor at the computer lab and the students were asked to make the practices. In the experimental group, the presentation software's lecture videos were prepared by the instructor by recording the screen and shared with the students and also published in the online learning environment. The students watched the lecture videos outside the class hours and carried out their practices in the computer lab with the help of the instructor. Through the learning environment, students were also given the opportunity to ask questions by interacting with the instructor. At the beginning of the lesson, an in-class competition was held on Kahoot platform about the content to be watched. After the questions related to the content were answered, students tried to use the software. At the end of the process, pre-service teachers in both groups were asked to prepare presentations related to the topics given by the instructor. The achievement test developed by the researcher was applied as pre-test and post-test within the scope of the study. Two field experts examined the presentations, prepared by the participants, separately by based on the evaluation criteria developed for this study. The fit index between the evaluators was examined and a high level of compliance was observed ($r_{\text{pearson}}=.910$, $p=.000$). At the same time, Cohen's Kappa coefficient (κ) was calculated as .84 for consistency at the categorical data. This score shows high level agreement (Landis & Koch, 1977). So, the success scores were analyzed for determining differentiation between groups.

Analysis of Data

The data obtained were analyzed by quantitative analysis methods. Independent samples t-test was used to determine whether there was a significant difference between the pre- and post-test mean scores and presentation evaluation points of the experimental and control groups. Paired samples t-test analysis was used to determine achievement test scores the difference between before and after the process (Büyüköztürk, 2003).

In cases where the independent variable had a significant effect, Cohen's d calculation was used to determine the effect size. In the interpretation of Cohen's d value, Aydın (2006) was accepted as a reference. All analyses were performed in IBM SPSS Statistics 24 software.

FINDINGS

Independent samples t-test was used to determine whether there was a significant difference between the between Traditional (Control) and Flipped (Experimental) groups' before and after the teaching process in presentation software test scores (Table 1).

Table 1. Independent Samples t-Test Results Concerning the Pre-test and Post-test Scores of Traditional and Flipped Groups

	Group	N	\bar{x}	S	df	t	p
Pre-test	Traditional	35	7.51	2.17	73	-.571	.570
	Flipped	40	7.78	1.78			
Post-test	Traditional	35	8.37	2.13	73	-.951	.345
	Flipped	40	8.83	2.00			

When the results of the analysis in Table 1 are examined, there is no significant difference between the pre-test ($\bar{x}_{\text{Traditional}}=7.51$, $\bar{x}_{\text{Flipped}}=7.78$, $t_{(73)}=-.571$, $p>.01$) and post-test ($\bar{x}_{\text{Traditional}}=8.37$, $\bar{x}_{\text{Flipped}}=8.83$, $t_{(73)}=-.951$, $p>.01$) scores of the pre-service teachers participating in the process. This result shows that the control and experimental groups are equivalent to each other at the beginning and end of the teaching process. Although there is no any significant difference between the post-test scores of both groups, it is seen that the pre-service teachers increased their test scores at the end of the process. That means both traditional teaching or flipped learning technique have a positive effect on the presentation software training. Paired samples t-test analysis was performed to see whether the increase in post-test scores of pre-service teachers was significant (Table 2). Besides, Cohen's d value was calculated for effect size and is given in Table 2.

Table 2. Paired Samples T-test Results Concerning the Differences Between the Traditional and Flipped Groups' Pre-test and Post-test Scores

	Group	Test	N	\bar{x}	S	df	t	p	Cohen's d
Presentation Software Achievement Test	Traditional	Pre-test	35	7.51	2.17	34	-4.443	.000*	.40
		Post-test	35	8.37	2.13				
Presentation Software Achievement Test	Flipped	Pre-test	40	7.78	1.78	39	-4.374	.000*	.55
		Post-test	40	8.83	2.00				

* $p<.01$

The data in Table 2 show that the increase in the post-test scores of the pre-service teachers in both the traditional ($\bar{x}_{\text{pre-test}}=7.51$, $\bar{x}_{\text{post-test}}=8.37$, $t_{(34)}=-4.443$, $p<.01$) and flipped ($\bar{x}_{\text{pre-test}}=7.78$, $\bar{x}_{\text{post-test}}=8.83$, $t_{(34)}=-4.374$, $p<.01$) groups is also statistically significant. At this point, it can be said that the teaching process carried out in both groups was successful and the participants significantly increased their test scores interested in the presentation software. When the effect sizes of the processes are examined from Table 2, although the flipped

learning technique has more effect (Cohen's $d=.55$) than the traditional teaching method (Cohen's $d=.40$), both of them have a moderate positive effect (Aydın, 2006).

At the end of the process, presentations prepared by pre-service teachers were examined by two experts and evaluated through rubrics. Independent samples t-test results concerning the differences in the achievement scores of the preservice teachers' presentations are shown in Table 3.

Table 3. Independent Samples t-Test Results Concerning the Presentation Evaluation Scores of Pre-service Teachers

	Group	N	\bar{x}	S	df	t	p	Cohen's d
Presentation	Traditional	35	24.01	5.27	73	-3.315	.001	.77
Evaluation Rubric	Flipped	40	27.96	5.04				

According to results in Table 3, the evaluators found pre-service teachers in the flipped group more successful in preparing computer presentations ($\bar{x}_{\text{Traditional}}=24.01$, $\bar{x}_{\text{Flipped}}=27.96$, $t_{(73)}=-3.315$, $p<.01$). With this result, it can be stated that flipped technique contributes more to the pre-service teachers' information technologies skills interested in designing and developing computer presentation. When the effect size (Cohen's $d=.77$) of the technique is considered, it is possible to speak of an almost high level of impact (Aydın, 2006). Since the process was completed with the same instructor in both groups, it can be said that flipped learning technique makes a significant contribution to the skills development for information technologies.

Students' satisfaction with the teaching process is important for academic success and is influenced by the many factors such the duration of the course, the environment, and the instructor. Within the scope of the study, pre-service teachers were also asked about their level of satisfaction about flipped learning. While four pre-service teachers were not satisfied with the process, 36 pre-service teachers (90%) stated that they were very satisfied with the process. At the same time, all of them stated that the process contributed to their learning effectively.

CONCLUSION and DISCUSSION

The studies conducted in the literature on blended learning have different results (Pesen & Oral, 2016). In this study, there was no significant difference between the test scores of the control and the experimental groups. This result shows that the use of the flipped learning technique did not cause a significant difference. Similarly, Aksoğan (2011), Davies et al. (2013), Delialioğlu (2004), Demirel (2009), Erdem (2018), Johnson and Renner (2012), and Ünsal (2007; 2012) also found no significant difference between the groups' post-test scores. However, there are some studies showing that blended learning has a significant effect on academic achievement (Garrison & Kanuka, 2004; Karaca, 2016; Kurt, 2012; Rovai & Jordan, 2004; Tugun, Uzunboylu, & Özdamlı, 2017; Usta, 2007). It has been found that flipped learning technique has a positive effect on learner success in many different education areas such as computer programming (Balıkçı, 2015), information technologies (Turan, 2015),

business (Findlay-Thompson & Mombourquette, 2014), language (Boyras, 2014; Ekmekçi, 2014), media (Enfield, 2013), engineering (Mason, Shuman, & Cook 2013b), and medical (Tune et al., 2013).

It was found that pre-service teachers, participated in the control and the experimental group, increased their test scores significantly. It can be stated that the lecturer was successful in terms of the teaching process in both groups. When the effect size of the process was examined, it was revealed that flipped learning technique was more effective. Bañados (2006) stated that the process is also likely to be affected by teachers. Since same instructor in both groups taught the course in this study, it can be stated that the effect in the experimental group stems from the flipped learning technique. As a result of examining the presentations prepared by pre-service teachers at the end of the process, it was seen that pre-service teachers in the experimental group had higher success than pre-service teachers in the control group. Also, this difference was found to be statistically significant. When the effect of the flipped learning technique in the difference was examined, it was revealed that flipped learning technique's effect size was quite close to the high. At this point, it can be said that the pre-service teachers' skills in presentation preparing were improved more since there was a chance to practice more with the flipped learning technique. Similarly, in the study of Ünsal (2007), which provided a spreadsheet training with blended learning activities to the pre-service teachers, there was no significant difference between the post-test scores of the groups, but it was found that the blended learning group was more successful in the retention test scores. Ünsal (2007) claims that cognitive and psychomotor behaviors gained through blended learning are more permanent. Aksoğan (2011), examined the differences of the traditional and blended method in the computer hardware course, found no significant difference between the post-test achievement scores of the students in the blended learning environment and the face-to-face course, but in favor of the blended learning group, a significant difference was found at retention scores. Aksoğan (2011) states that the students, educated in a blended learning environment, learn the subjects permanently because of their repetition and practice. Deveci Topal (2013), who examined the effect of blended learning in health education, also worked with physician candidates in anatomy class in the medical school. The results of her study showed that there was no statistical difference between the groups according to the results of the theoretical examination, but a significant difference was found in favor of the blended learning group in the laboratory examination. According to Abeysekera and Dawson (2014), students are given the opportunity to study together and practice more, since the place and time of the content transfer changes in the flipped learning technique. According to Anderson and Krathwohl (2001), who revised Bloom's taxonomy, creating is a top-level learning. It can be stated that flipped learning technique is very useful for high-level cognitive learning since improves the pre-service teachers' presentation creating skills significantly.

It was found that about 90% of the pre-service teachers who participated in the flipped learning group were satisfied with the process. Balaman (2010), Davies, et al. (2013), and Turan and Gökteş (2015) found that blended learning and flipped learning technique increased students' motivation towards the course and students had a positive attitude towards the learning environment. Similar results interested in positive effect on motivation

and attitude were found at different disciplines such as medical education (Deveci Topal, 2013), informatics education (Aygün, 2011), language education (Boyras, 2014; Ekmekçi, 2014), or science education (Akgündüz, 2013; Balaman & Tüysüz, 2011). High satisfaction and motivation levels enable students to participate in the process more actively. Since student participation is also an important factor for success, it can be stated that benefiting from the blended and flipped learning technique at the teaching process will have a positive effect.

RECOMMENDATIONS

Although there was no significant difference between the experimental and control groups' post-test scores, it was revealed that flipped learning had a more positive contribution to the knowledge and skills of pre-service teachers about the presentation software. In the traditional method, the instructor should make more effort for learner success. Using the flipped learning technique in the information technologies course will make instructor's duty easier. The course's number and hours were reduced with the latest teaching undergraduate program by CoHE (2018). Therefore, the teaching process has become somewhat difficult. It can be suggested to use the flipped learning technique to increase pre-service teachers' satisfaction and motivation levels and to make more contribution to their knowledge and skills related to computer software. In this study, only the use of educational videos and the use of the flipped technique is examined. Blending learning's different methods and techniques can be investigated in future researches. At the same time, not only in the context of technology but also the examination of the process's social, cultural and epistemological aspects will contribute to the field as Enfield (2013) and Jump (2013) expressed.

ETHICAL TEXT

"In this article, journal writing rules, publishing principles, research and publishing ethics rules, journal ethics rules are followed. The author is responsible for all kinds of violations related to the article."

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