International Journal of Research in Teacher Education (IJRTE)
15(1): 20-40
ISSN: 1308-951X, Copyright © 2024
DOI: 10.29329/ijrte.2024.654.01

ORIGINAL ARTICLE

Comparison of Secondary School Students' Academic Achievement and Opinions Between the Gamified Flipped Classroom Model and the Traditional Model on the Subject of Algorithm

Berin Balci[1*], Necmi Esgi[2]

[1] MA English Information Technologies Teaching, Şehit İbrahim Doğan Middle school, Tokat, Türkiye.
ORCID: 0000-0003-0824-6622

[2] Ph.D, Computer and Instructional Technology, Tokat Gaziosmanpaşa University, Tokat, Türkiye.
ORCID: 0000-0001-5655-7965

Ethical Statement
Provide how you addressed ethical issues. *E.g.*, consent forms were distributed, ethical board approval was granted (No: 12/34, Institution), etc.

Funding Information
No funding was received for the study.

Conflict of Interest
No conflict of interest is present in the conduction or the reporting of this study.

ABSTRACT

The research was aimed to examine the effect of the using gamified flipped classroom model while teaching algorithm on the academic achievement of 6th grade secondary school students and students' opinions about the instruction method and learning experiences. A pretest-posttest design with a control group was used in this quasi-experimental research study. The study group was composed of 44 students, 22 of whom were in the experimental group, and 22 of whom were in the control group, studying in the 6th grade at a public middle school. When the analysis results of the academic achievement test applied simultaneously to the experimental and control groups were examined, it was seen that there was a positive difference between the posttest scores of both groups and that this difference was statistically greater in the experimental group than in the control group. the analysis of the interviews revealed that, the students in the experimental group found the experience entertaining and instructive, but they stated the lack of technological infrastructure for watching the videos at home and the technical problems experienced on the EIN platform as negative features of the experience. Control group students complained about the difficulty doing homework at home and lack of activities in the classroom.

Keywords: Comparision,, academic achievement, flipped classroom,, Traditional Model

Received: 01/11/2023 **Accepted**: 28/02/2024

***Corresponding Author:** Lecture. Berin Balcı, Information Technologies Teaching, İbrahim Doğan Middle school, Türkiye
Email: berinbalci@gmail.com

INTRODUCTION

In the century we live in, science and technology are developing rapidly; the needs of individuals and societies are changing; and learning and teaching approaches are changing in parallel with these changes. By breaking away from the traditional education system that focuses on the teacher, new approaches in which technology is used in education that focuses on the learner have emerged, and the use of these approaches has become a necessity (Kotluk and Kocakaya, 2015). Individuals' activeness during the learning experiences has formed the basis of new approaches (Sarıkaya, 2017). Since the large number of students in classes reduces the time allocated for each student, there is a need to focus on extracurricular practices. In this context, different teaching methods such as blended learning, mobile learning, flipped classroom, and gamification have emerged as an alternative to traditional teaching methods.

One of these approaches in which technology is integrated into education is the flipped classroom model. The flipped classroom model, in which the traditional teaching model is reversed, is a concept frequently used in recent years (Strayer, 2009). The flipped classroom model is a model in which the teacher delivers the lesson via video outside the classroom and works on problem solving and project creation in the classroom. In the flipped classroom model, the student watches the videos sent by the teacher at home and participates in activities in the classroom (Bergmann & Sams 2012). Another one of these new approaches that has been frequently used in educational environments recently is the gamification. There are various definitions of the gamification approach. Deterding et al., (2011) defined it as the use of digital game elements in non-game environments to provide experience to learners and to increase learners' commitment to the environment (Alsancak and Seferoğlu, 2017). Gökkaya (2014) defined it as making learning fun and creating emotional attachment in users by using game components in daily life tasks. Considering that secondary school students are in the game age, it was thought that the gamification approach would positively affect the education experience. When the literature was examined, this idea was supported. Gamified course designs could increase students' academic success, interest and motivation towards the course (Ar, 2016; Kalkan, 2016; Özkan and Samur, 2017). Kırcı and Kahraman (2019) concluded that the gamified education application they conducted with the primary school students increased motivation and participation. It was seen that the use of gamification approach in education would yield with positive results in terms of various variables such as academic success, attitude and motivation of secondary school students (Kunduracıoğlu, 2018).

Classraft was used as a gamification platform in the research. Classcraft is a cloud-based platform that can be used on computers, tablets or smartphones via its web page without requiring any application. Classcraft is a gamification application preferred by educators for reasons such as personalizing the curriculum, evaluating the functioning of the experience in real time, and strengthening interaction with students. An example screenshot of the Classcraft platform is provided in Figure 1.

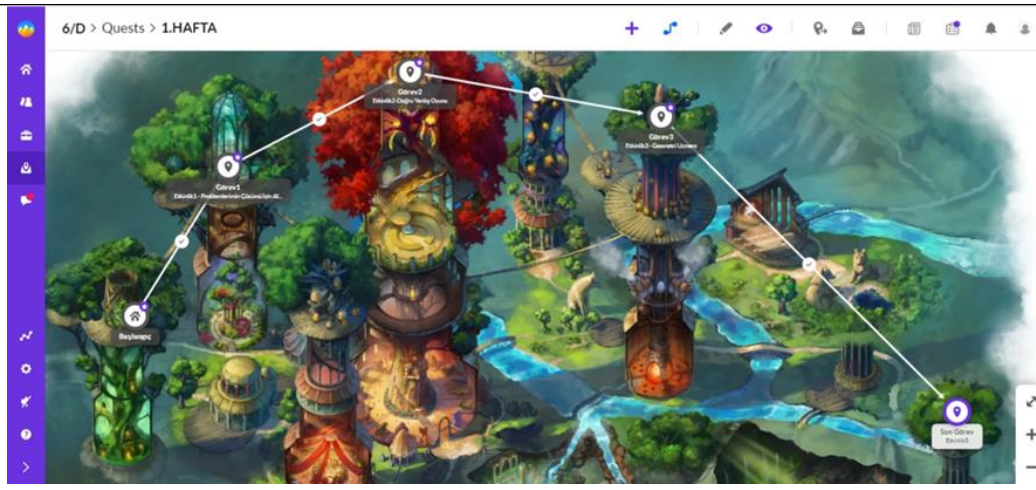

Figure 1. Classcraft Screenshots

The use of this application has been effective due to its features such as being able to be used at different grade levels, being free of charge, being adaptable to each lesson and subject, being accessible via computers, phones and tablets, and the fact that visual elements such as maps and avatars are appreciated by students. Classcraft application was seen by students as a gamification application that prioritizes both individual and team success, develops collaborative working skills and makes learning fun. Previous studies indicated that Classcraft could improve learning and be fun for students (Aktaş, 2021; Cunha et al., 2019; Papadakis and Kalogiannakis; 2016, Ulus, 2021).

Programming education has been given importance in recent years, considering that programming education will play a major role in teaching basic skills such as algorithmic thinking, creative thinking and problem-solving skills that 21st century individuals should have (Shin and Park, 2014). Huff and Jenkins (2002) stated that programming is one of the most difficult courses, and Bennedsen and Caspersen (2008) stated that students have difficulty learning this subject because programming courses have complex structures. Özmen and Altun (2014) stated that the difficulties experienced in programming education; They argued that it occurred due to reasons such as lack of practice and inability to create algorithms (Karaca and Ocak, 2017). In order for students to learn programming, they must first have a good grasp of algorithms. The algorithm forms the basis of all programming languages. As a result, based on these difficulties in teaching the algorithm subject, which is the basis of the information technologies and software course, it is different from the traditional model. It was thought that using the flipped classroom model and gamification approaches would be effective in motivating students more. For this purpose, this study aimed to examine the effect of the gamified flipped classroom model and the traditional model on the academic achievement and opinions of secondary school students regarding the algorithm.

In this context, the study examined whether the gamified flipped classroom model creates a significant difference in the academic achievement of secondary school students compared to the traditional model, the students' opinions about the gamified flipped classroom model and the traditional model, and what the differences were between these views. In the literature, studies using the flipped classroom model and gamification approach were very limited, and no study using the gamified flipped classroom model on teaching algorithms to secondary school students has been found. Therefore, it was thought that the study would contribute to the literature and guide future studies.

METHOD

Research Design

The aim of this research was to examine the effects of teaching through the gamified flipped classroom model on the achievement of secondary school students in the algorithm and to examine student opinions. A mixed research method utilizing both quantitative and qualitative data collection methods were used in the study. Mixed method research is research in which qualitative and quantitative methods are used together to make inferences (Tashakkori and Creswell, 2007). In this context, a quasi-experimental design model with pretest-posttest control group was used to examine the effect of the gamified flipped classroom model on students' achievement in the algorithm. In the qualitative dimension of the research, a semi-structured interview form was used to obtain the opinions of both groups about the course and to compare the opinions of the both groups.

Setting and Participants

The study group of the research consists of 44 students at sixth grade studying in two separate branches of Tokat Şehit İbrahim Doğan Secondary School in the 2021-2022 academic year. The experimental group consists of 22 students, including 14 female (63.6%) and 8 male (36.4%) students, and the control group consists of 22 students, including 14 female (63.6%) and 8 male (63.6%) students. The study group was selected through convenience sampling method. The appropriate sampling method allows the researcher to choose the sample that is most easily accessible in terms of time, effort, and cost (Büyüköztürk et al., 2013). The experimental and control groups were selected among the groups that had access to the most information technology devices among all the sections and were close to each other in class size.

Instruments

"Algorithm Achievement Test" and Semi-Structured Interview Form developed by the researcher were used as data collection instruments in the study. “Algorithm Success Test” was prepared to be applied to the experimental and control groups as both a pretest and a posttest. The test items consisted of 14 outcomes of the "Algorithm" subject of the "Problem Solving and Programming" unit in the 5th Unit of the sixth-grade information technologies and software course. A pool of questions about the achievements was created by reviewing the literature and the reference books. For the scope and face validity of the test, it was submitted to the opinions of a linguist and three experts from the field of Computer Education and Instructional Technologies (CEIT). In line with the expert opinions, changes were made to the choices and the placement of the questions in some item stems. The draft form of the achievement test included 28 questions. The first form of the achievement test was applied to 10 seventh grade students at Tokat Şehit İbrahim Doğan Secondary School, who had previously received algorithm training, before the pilot application. Students were asked to report any unclear questions to the researcher. At the end of the application, it was observed that 40 minutes would be sufficient to complete the test. According to the feedback of the students who participated in the pilot application, necessary changes were made to clarify the questions. The test, which took its final form after the pilot application, was applied to 140 seventh grade students studying at Tokat Şehit İbrahim Doğan Secondary School for reliability study. Seventh grade students were chosen because they had studied the subject of algorithms. Data were analyzed with TAP 6 (Test Analysis Program). The item reliability coefficient calculated as a result of the analysis was found to be KR-20 =

.859. After the item analysis, the average item difficulty of the test was calculated as 0.55, and the item discrimination index was calculated as 0.52. The result of all items analyzes shows that the item difficulty and discrimination levels of the "Algorithm Achievement Test" were at an acceptable level. Since it was seen in the pilot application that one lesson hour was sufficient for the achievement test, no question reduction was made. The test items were scored as 0 and 1. Students who answer the items correctly received 1 point for that item; Students who answered incorrectly received 0 points for that item.

The semi-structured interview form was created by reviewing the literature. The semi-structured interview form was sent to three faculty members and a language expert working at the CEIT department to obtain expert opinions. Adjustments were made according to the feedback given by the experts and the semi-structured interview form took its final form after the changes.

Procedure

The research was conducted with 6th grade students studying in the first semester of the 2021-2022 academic year at Şehit İbrahim Doğan Secondary School, affiliated with the Ministry of National Education, located in the central district of Tokat province, for 4 weeks and 2 lesson hours. In accordance with research and publication ethics, ethical approval was received from Tokat Gaziosmanpaşa University Social and Human Sciences Research Ethics Committee. Necessary permissions were obtained from Tokat Provincial Directorate of National Education for the study. The achievement test and the interview form, and the parental consent form for the parents of the students who will participate in the study were approved. The research was carried out as planned through the experimental and control groups. The achievement test was applied as a pretest to the experimental and control groups. Since the researcher was working at the school where the study was conducted, she carried out the teaching in the experimental and control groups herself. Teaching the algorithm subject was carried out with a gamified flipped classroom model in the experimental group and with a traditional model in the control group. After the completion of the teaching, the Algorithm Achievement Test was applied as a posttest to the experimental and control groups. The opinions of all students in both groups about the course were obtained through a semi-structured interview form prepared by the researcher. Interviews were conducted with all students in both groups. Explanations were given to the students about the questions. It was stated that there was no need to write their names and surnames on the interview forms, and they were asked to answer the questions sincerely. The interview forms were filled out by the students within one class hour under the supervision of the researcher.

Data Analysis

Before the experimental procedure, the Shapiro-Wilk test was applied to the achievement test scores of the experimental and control groups, and the skewness-kurtosis values were calculated to see whether the groups showed normal distribution. Situations where skewness-kurtosis values are between +1.5 and -1.5 indicate that the group is normally distributed (Tabachnick and Fidel, 2013). As a result of the analyzes performed for the algorithm success test, it was seen that it showed a normal distribution in the experimental and control groups. The normal distribution of Shapiro-Wilk test and skewness and kurtosis values enabled the 'Independent Groups t-test' to be performed.

The equivalence of the Experimental and Control groups was tested with the independent groups t-test regarding the Algorithm Achievement test pretest scores. In the t-test results, it was found that there was no statistically significant difference between the Algorithm Achievement Test pre-test results of the experimental and control group students. This demonstrates that the experimental and control groups are equivalent to each other. An independent sample t-Test

was conducted to examine the difference between the algorithm achievement test posttest scores of the Experimental and Control groups.

Content analysis method was used to analyze the qualitative data obtained within the scope of the research. Themes were created based on the questions in the semi-structured interview form. For this purpose, semi-structured interview questions including students' answers were transcribed in to the computer environment. The raw data obtained was analyzed with content analysis and themes and codes were determined. The interviews took a total of 13 pages in a Microsoft Word file, in Times New Roman font, 12-point font, and 1.5 line spacing. Interview participants given numbers to distinguish their responses such as S1, S2 for the confidentiality of the students. Tables were created for each theme and the number of opinions was indicated by frequency. To ensure internal validity, themes were determined by another expert independent of the researcher and the consistency between the coders was calculated. For internal consistency calculation, it was calculated with Miles and Huberman's (1994) "consensus/ (consensus + disagreement) formula and was found to be 0.91.

RESULTS AND DISCUSSION

Upon the data analysis, the findings related to each theme were presented in the following tables. In addition, the findings were interpreted according to the results in the tables.

Findings Regarding the Comparison of the Gamified Flipped Classroom Model and the Traditional Model in Terms of Students' Academic Achievement

To determine the effect of the gamified flipped classroom model implemented within the scope of the research on the achievement of secondary school students in the algorithm, the pretest and posttest scores of the experimental and control groups were compared both within and between the groups. In this context, the results of the associated sample t-Test regarding the difference between the algorithm achievement pretest and posttest scores of the experimental group were given in Table 1.

Table 1. Related Sample t-Test Result Regarding Algorithm Achievement Test Pretest and Posttest Scores of the

	N	X	SS	*sd*	*t*	*p*
Pre-test	22	35.23	.10415	21	-9.199	.000*
Post-test	22	70.78	.16629			

*p<.05

When Table 1 was examined, it was seen that the posttest scores of the algorithm achievement test of the students in the experimental group were higher than their pretest scores (Xpretest=35.23; Xposttest=70.78). There was a statistically significant difference (t(21)=-9.199, p<.05) between pretest and posttest scores. Accordingly, it could be said that the education with the gamified flipped classroom model used in the experimental group increased the academic achievement of the students. The results of the related sample t-Test regarding the difference between the algorithm achievement test pretest and posttest scores of the control group were given in Table 2.

Table 2. Related Sample t-Test Result for Algorithm Achievement Test Pretest and Posttest Scores of the Control Group

	N	X	SS	*sd*	*t*	*p*
Pre-test	22	30.52	.0846	21	-7,142	.000*
Post-test	22	56.73	.13829			

*p<.05

When Table 2 was examined, it was seen that the posttest scores of the algorithm achievement test of the students in the control group were higher than their pretest scores (X̄pretest=30.52; X̄posttest=56.73). There was a statistically significant difference (t(21)=-7.142, p<.05) between pretest and posttest scores. Accordingly, it could be said that the education with the traditional model used in the control group increased the academic achievement of the secondary school students. The results of the independent sample t-Test regarding the difference between the algorithm achievement test posttest scores of the Experimental and Control groups were given in Table 3.

Table 3. Related Sample t-Test Result for Algorithm Achievement Test Posttest Scores of the Experimental and Control Groups

	N	X	SS	*sd*	*t*	*p*
Experimental	22	70,78	.16629	42	-3,046	.004*
Control	22	56,73	.13829			

***p<.05**

When Table 3 is examined, there was a significant difference (t(42)=-3,046, p<.05) between the posttest scores of the algorithm achievement test of the students in the experimental group and the students in the control group (X̄experiment=70.78; X̄control=56.73). Accordingly, it could be said that the experimental group was academically more successful than the control group.

Findings Regarding the Opinions and Differences of Students Educated through the Gamified Flipped Classroom Model and the Traditional Model

Within the scope of the research, data was collected through a semi-structured interview form to determine and compare the opinions of the students in the experimental and control groups about the experience in which the algorithm topic was explained. During the interviews, opinions were received regarding the course , the activities used, the teacher's attitude, course resources and the tools and equipment used.

Students' Opinions regarding overall learning experience

During the interviews, the opinions of the experimental and control students about the learning experience were taken, and these opinions were presented by categorizing them as the situations they had difficulties with during the experience, why they had difficulties, what they did to overcome these difficulties, the parts they enjoyed the most and the degree to which they learned the subject, as shown in Table 4.

Table 4. Opinions of Experimental and Control Group Students Regarding the overall learning experience in which the Algorithm Topic is Covered in the Information Technologies and Software Course.

Experimental Group			Control Group	
Category	**Codes**	**Frequency**	**Codes**	***Frequency***
The most challenging situation	Watching video at home	58	Homework	15
	No	5	No	6
	Classcraft Platform	2		
Reason for difficulty	Poor Internet Connection	8	Difficult homework	8
	System errors with EIN (Education Information Network)	5	No assistance at	4
	Disliking the online courses	2	Much homework	2
	Disliking to play	2	Not understanding the subject	2
How to solve	Getting assistance from the teacher	10	Getting assistance from the teacher	9
	Refreshing the Internet connection	4	Getting assistance from internet	6

Experimental Group			Control Group	
Category	**Codes**	**Frequency**	**Codes**	***Frequency***
How to solve	Studying through the other sources	1	Getting assistance from the internet	6
	Getting assistance from the family	1		
	Nothing	1		
The most entertaining part	Games Getting Score	12 7	Course activities None	12 10
	Racing as a team	2		
	Learning through videos	1		
	Learning completely	14	Learning completely	10
Thinking to learn the subject	Learning mostly	6	Learning mostly	8
	Not learning	2	Not learning	4

When Table 4 is examined, it can be seen that during the learning experience where the algorithm topic was explained, the experimental group had difficulty in watching the lesson videos at home and the control group had

difficulty in doing their homework. Some students' comments regarding this difficulty felt in the experimental group were: “Watching videos at home was difficult. EIN did not open the video sometimes. “I had to refresh the page over and over.” (S3), "Frankly, I had a hard time watching the course videos because he does not like watching videos on EIN. I think it is more memorable if our teacher explains it live." (S18), "I had a hard time watching the lecture videos because I did not have an internet connection. I got help from my teacher on this matter. Z helped me use the computers in the library whenever I wanted.” (S17) Some student comments regarding this difficulty experienced in the control group are that “I had difficulty doing homework. “I got help from my teacher and the internet to overcome this difficulty.” (S2), “I had a little difficulty doing my homework and I got help from my sister” (S3), “I had a hard time doing my homework because there was no one to get help from, and I got help from my teacher.” (S5).

Student Opinions on Activities in the Course

During the interviews, the opinions of the experimental and control students about the activities carried out in the learning experience were taken, and these opinions were presented in two subcategories as positive and negative opinions, as seen in Table 5.

Table 5. Opinions of Experimental and Control Group Students on the Activities Used While Teaching the Algorithm Topic in the Information Technologies and Software Course

Theme	Category	Experimental Group		Control Group	
		Codes	Frequency	Codes	Frequency
Activities used in the course	Positive	Entertaining	15	Entertaining	15
		Informative	10	İnformative	10
		Visuals	6	Visuals	6
	Negative	None	17	Varied	5
		Some difficult activities	4	None	9
				Some difficult activities	4

When Table 5 is examined, students in the experimental and control groups frequently stated that the positive aspects of the activities carried out during the learning experience of the algorithm were that they were fun and instructive. Some of the opinions of the experimental group students about the activities used were: “I liked that the events were visual and fun.” (S13) said, "The activities were fun and instructive, I liked doing them in the game" (S21), while control group students said, "The activities we did in the classroom were enjoyable." (S5), “I think the activities were fun. “There were many different activities, but I think some of them were difficult.” They expressed their opinion as (S8).

Student Opinions on the Teacher's Attitude During the Course

During the interviews, the opinions of the experimental and control students about the teacher’s attitude

during the course were taken, and these opinions were presented in two subcategories as positive and negative opinions, as seen in Table 6.

Table 6. Opinions of Experimental and Control Group Students Regarding the Teacher's Attitude During the Course in which the Algorithm Topic was Discussed in the Information Technologies and Software Course

Theme	Category	Codes	Frequency	Codes	Frequency
Teacher attitude	Positive	S/he taught what I didn't understand.	9	S/he does the best for us to learn.	14
		S/he does the best for us to learn.	6	S/he helps us for the homework.	10
		S/he solves the problem whenever we have.	5		
	Negative	S/he lectures through the video.	1	-	-

When Table 6 is examined, it is seen that almost all of the students in the experimental and control groups evaluated the teacher's attitude positively throughout the course where the algorithm topic was discussed. Some opinions of the experimental group students regarding the teacher's attitude in the course; "...It is positive because our teacher helped us a lot while doing the activities. For example, when I couldn't do an activity, he explained it again, which helped me understand the subject better." (S1), "I would like to thank our teacher for helping us in this experience. She helped me when I had difficulty, and I could consult my teacher when I encountered a problem." (S4), "I evaluate negatively because my teacher teaches the lesson via video because I did not understand the video." (S12), "I would like to thank our teacher very much for her help during this experience. I could reach him immediately when there was a problem, and he explained the parts I couldn't understand very well until I understood them." (S21). Some of the control group students' opinions about the teacher's attitude in the experience were: "I evaluated our teacher positively because he helped us a lot both at school and at home." (S11), "I evaluated our teacher positively because he helped us with our homework." (S16), "I evaluated positively because he taught the subject well and helped us with our homework both on EIN and WhatsApp." (S18).

Student Opinions on the Materials Used in the Course

During the interviews, the opinions of the experimental and control students about the materials used in the course were taken, and these opinions were presented in two subcategories as positive and negative opinions, as seen in Table 7.

Table 7. Opinions of Experimental and Control Group Students Regarding the Materials Used While Teaching the Algorithm Topic in the Information Technologies and Software Course

Theme	Category	Experimental Group		Control Group	
		Codes	Frequency	Codes	Frequency
Course Materials	Positive	Entertaining	14	Nice slide shows	9
		Understandable videos	13	Nice activity pages	7
		Short videos	10	Instructive	4
		Accessible whenever and wherever needed	8	Visual	2
		Technological	4	Entertaining	2
	Negative	None	18	None	16
		Long videos	2	Some difficult materials	2
		Some difficult materials	2		

When Table 7 was examined, it was seen that most of the students in the experimental and control groups evaluated the course materials used throughout the course of discussing the algorithm topic, positively. Some experimental group students, regarding the materials used, stated that “She explained the subject in a very understandable way in the videos and it was very useful for me to be able to watch it over and over again.” (S1), “What I like about the course resources is that I can watch the videos again when I did not understand them, and that the videos were clear and instructive. Also, the videos were short” (S2), “The videos sent by our teacher were both short and understandable, and I did not get bored while watching them.” While (S6) stated the following, the control group students said, "The presentations our teacher used while teaching the lesson were nice." (S7), “I liked the presentations in the course resources.” Comments were made as (S15).

Student Opinions on the Tools and Equipment Used in the Course

During the interviews, the opinions of the experimental and control students about the tools used in the course were taken, and these opinions were presented in two subcategories as positive and negative opinions, as seen in Table 8.

Table 8. Opinions of Experimental and Control Group Students Regarding the Tools Used While Teaching the Algorithm Topic in the Information Technologies and Software Course

Theme	Category	Experimental Group		Control Group	
		Codes	Frequency	Codes	Frequency
Opinions on the tools used in the course	Positive	Technological	15	Interactive board	16
		Fast computers	8	Technological	6
		Individual	7	None	1
		Ergonomic	6		
	Negative	None	9	None	15
		Slow computers	7	Not individual	7
		Classcraft demo version	4		
		Difficult to use	2		

While the students in the experimental group used computers as tools throughout the teaching the algorithm subject, an interactive board was used in the control group. While students in the experimental group generally evaluated the use of computers in class positively, there were some students who expressed negative opinions due to various features of computers. Some of these opinions were that “Computers were starting late and the internet was slow.” (S13), “Negatively, the operating system of the computers is not Windows, and the computers are slow.” (S17). Since the traditional teaching method was used in the control group, the lesson was teacher-centered and conducted via an interactive whiteboard. While the students in the control group evaluated the use of interactive whiteboards and the fact that they were beautiful and technologically positive, there were also students who evaluated the lack of individual use as a negative feature. Some opinions regarding this; “My negative opinion is that we do not have our own computer.” (S17), “We taught the lesson via smart board. “I think it would be better if we used a personal computer.” (S19).

DISCUSSION

As the influence of technology is increasing, these lead to some new developments in the field of education, similar to other fields. These developments have paved the way for the active use of technology in education both in and out of schools . For this reason, the blended learning model, which is an integrated learning model, has started to be used to support and complement the face-to-face learning model. However, in the blended learning model, the lack of allocating enough time for practice and other activities in the classroom has emerged. Thereupon, as a result of different studies and applications within the blended learning model, the flipped classroom model has emerged, in which the traditional classroom is reversed, and homework is done at school and lessons are done at home. Another approach that has become very popular today and has started to be used in education is the gamification approach. Gamification is

defined as the use of game components in non-game areas (Werbach, 2012). In this study, the gamification approach was included in the course, aiming to make the applications and activities carried out throughout the course more interesting and entertaining. When the literature was examined, it was seen that there were very few studies in which the flipped classroom model was blended with gamification, and among these studies, no studies were found on algorithms, which are included in the information technologies and software course curriculum and are the basis of programming. To support the elimination of this deficiency in the literature, in this study, the flipped classroom model, which emerged as a sub-model of the blended learning model, was blended with the gamification approach and its usability in the Turkish education system, especially in the information technologies and software course, the effect of students' academic achievements and the students' opinions about the model were revealed.

In this section, the effect of the gamified flipped classroom model on the success and opinions of sixth grade secondary school students regarding the subject of algorithm in information technologies and software course is revealed and examined. The findings obtained from the quantitative and qualitative data of the study were discussed with the research findings in the literature. Within the scope of quantitative findings in the study, it was examined whether there was a significant difference between the academic achievement scores of the control group, which continued with the traditional teaching model in the sixth-grade information technologies and software course, and the experimental group, which utilized the gamified flipped classroom model, on the algorithm before and after the application. Before the experimental study, the achievement test was applied to the experimental and control groups as a pretest, and since no significant difference was found between the groups, it was concluded that the groups were equivalent to each other. Lesson plans were prepared and implemented according to both models. The results obtained from the posttest scores showed that the achievement of both groups increased, while the achievement of the experimental group students who were instructed with the gamified flipped classroom model increased more. When the literature was examined, many studies with similar findings were found. Fidan (2019) investigated the difference between the academic achievements of secondary school students in the experimental process in which the "Ethics and security" unit of the information technologies and software course was taught with the gamified flipped classroom model and the traditional model. The data obtained as a result of the research concluded that the posttest scores of the experimental group students taught with the flipped classroom model and gamification approach were significantly different from the posttest scores of the control group students taught with the traditional model. Ince (2022), in a quasi-experimental study with a pretest-posttest control group in which he investigated the effect of the flipped classroom model on the academic success of secondary school students in the information technologies and software course, revealed that there was a significant difference between the academic achievement posttest scores of the experimental and control groups in favor of the experimental group. Likewise, Öztürk (2016) and Şahin (2019) reported that sixth grade secondary school students about information technologies and software course programming; Çukurbaş (2016) tenth grade high school students about computer programming; Karagöl (2020) in the programming course of first-year computer programming associate degree students; Aydın (2016) concluded that the flipped classroom model used by CEIT department undergraduate students in the programming II course and Karaca (2017) in the algorithm and programming course of mechanical engineering and computer programming students increased the academic success of the students. The results of these studies in the literature coincide with the conclusion reached in this study that the flipped classroom model increases student success. In general studies indicated that teaching information technologies and computer courses with the flipped classroom model increases academic success compared to the traditional model. In addition, many studies conducted at different education levels and courses have obtained results supporting that the flipped classroom model increases student

achievement. There were studies on the flipped classroom model at the primary school level (Demir2018; Nayci, 2018), at the secondary school level (Aksoy, 2020; Arslan 2021; Dursunlar, 2018; Güç, 2017; Keskin 2020; Şahin 2021; Uzun, 2019), and at the higher education level (Akgün, 2015; Bergman and Sams, 2012; Boyraz, 2014; Topalak, 2016) concluded that the model increased the academic success of students. In the study conducted by Uzun (2022), which investigated the effect of using the flipped classroom model in the science course of seventh grade secondary school students on their academic achievement, a pretest-posttest unequal control group design was used. As a result of the study, a significant difference was found between the academic achievement posttest scores of the experimental and control group students in favor of the experimental group. In another study conducted by Yanardağ (2021), the effect of the flipped classroom model on the academic achievement of eighth grade secondary school students in the science course "Seasons and Climates" unit was investigated. In the study where the experimental model was used, the experimental group was taught with the flipped classroom model, while the control group continued with the traditional model. The findings obtained as a result of the research found a significant difference in favor of the experimental group students. The results of these studies in the literature coincide with the conclusion reached in this study that the flipped classroom model increases students' academic achievement. When the studies on the flipped classroom model in the literature were examined, it was seen that, unlike the current study's findings, there were studies showing that there was no statistically significant difference in the academic achievement of students when the model was compared to the traditional model. In the study conducted by Taşkın (2020), the effect of gamification on the academic success of associate degree students studying in the flipped classroom model in the computer course was investigated and conclusion was, it had no effect on increasing academic achievement. In the study conducted by Perçin (2019), in which the flipped classroom model was compared to the traditional model in the programming course of second-year associate degree students, a quasi-experimental paired design with a pretest-posttest control group was used. The experimental group was taught with the flipped classroom model, and the control group was taught with the traditional model. At the end of the fourteen-week course, no statistically significant difference was found between the programming academic achievement scores of the experimental group students and the control group students.

Some studies showed that the flipped classroom model would increase the academic achievement of students, on the other hand few other studies concluded that it would not have any effect on their academic achievement. The underlying reasons for this dilemma could be listed as the grade level where the method was used, the course and subject in which the studies was conducted, the researcher's ability to plan and carry out the flipped classroom model, the readiness and interest of the participating students, the suitability of the videos and other materials used for the instruction to the subject matter and student level, the lack of technological devices and internet infrastructure, parents' negative view of the model, and some other unknown reasons. It is thought that if these elements are carefully considered and good planning and implementation is done, the flipped classroom model can meet today's student needs.

When the results regarding the qualitative findings of the research were examined, the control group students stated that the activities carried out during the course were enjoyable, but a limited number of activities were carried out. In the traditional model, one of the disadvantages of the model is that there is not much time for activities during the course.

It is seen that the experimental group students enjoyed the most during the course and stated that the course was fun and instructive because the activities were presented on the gamification platform. Fidan (2019) stated that in his gamified flipped classroom application in the "Ethics and Security" unit of the information technologies and software

course, students found general flipped learning and gamification activities interesting, instructive and entertaining. It is suggested that adding gamification components to educational environments makes students' learning processes more enjoyable and entertaining (Sanchez et al., 2017). It is supported by many studies in the literature that gamified flipped classroom practices are generally evaluated positively by students (Güç, 2017; Mohammed, 2018; Sarıkaya, 2017). When the most difficult situations in the course were examined, homework was one of the main difficulties experienced by the students in the control group. In the traditional model, due to the emphasis on explaining the subject during class time, but limited activities and exercises in the remaining time, students were provided with homework to deepen the subject. That's why students have difficulty doing homework at home (Küçükahmet, 2001). The difficulties experienced by the experimental group students in the course were insufficient internet speed, difficulty in logging in to the EIN portal, and device inadequacy. When the literature was examined, it was seen that the flipped classroom model had internet connection, site access, device inadequacy, and technical infrastructure problems, and this was a disadvantage for the flipped classroom model (Akdeniz, 2019; Akkuş and Keskin, 2016; Nayci, 2017). It has also been observed that there was a systemic problem in the EIN portal, and students had problems logging into the system and viewing their course progress. Many researchers, such as Güç (2017) and Turan (2016), have touched upon similar disadvantages of flipped classroom use in their studies.

When the control and experimental group students' opinions were asked about the teacher's attitude throughout the course, it was seen that the majority of the students evaluated the teacher positively. It seems that the control group students evaluated the teacher positively mostly due to their help and support regarding homework outside the classroom. As can be understood from here, while in the flipped classroom model, the teacher was with the students in situations where they can deepen their learning when they need it most and reach higher level skills, in the traditional model, the students are left alone at home at this stage. Experimental group students, on the other hand, evaluate the teacher positively due to his help and support in the classroom. In cases where students had difficulties, they received guidance from their teachers. In the literature, Bergman and Sams (2012), Fulton (2012) and Talbert (2012) stated in their studies that in the traditional model, the teacher only focuses on students who actively participate, while passive students remain in the background. This situation seems to coincide with the findings of this study. Candidates of the gamified flipped classroom model saw the teacher as a guide in the issue they were having trouble with and received guidance from their teachers in solving their problems. When looking at the literature, it could be seen that the results of this study overlapped with many previous studies. For example, Bergman and Sams (2012), Fulton (2012) and Talbert (2012) stated in their studies that in the traditional model, the teacher only focuses on the students who raise their hands, while the students who passively listen to the lesson remain in the background.

Experimental group students stated that the course videos were understandable, short and concise, that they could access the videos whenever and wherever they wanted, and that they were convenient, as positive features regarding the materials used for the course. One of the advantages of the flipped classroom model is that students can access videos of course content whenever they want and watch these videos as much as they want. In his research, Türkoğlu (2021) concluded that students liked the videos very much in the flipped classroom model. Kaya (2021) stated that the experimental group students used the Flipped classroom model in lesson videos and being flexible in their learning times, etc. He stated that they found it remarkable for several reasons. Hamzah et al. (2017) mentioned that gamification has a positive effect on teaching materials. These findings support the current study’s findings.

CONCLUSION AND RECOMMENDATIONS

When the academic achievement test scores of the experimental group and the control group were examined, it was concluded that the academic achievement posttest scores of the students in the experimental group were higher than their pretest scores. Accordingly, it can be stated that the instruction based on the gamified flipped classroom model used in the experimental group improved the students' academic achievement in the algorithm. Also, the academic achievement posttest scores of the students in the control group, who were instructed with the traditional model, were higher than the pretest scores. Accordingly, it can be said that the traditional model also improves students' academic achievement in algorithms. When the difference between the posttest scores of the experimental group students taught with the gamified flipped classroom model and the control group students taught with the traditional model was examined, a difference was found in favor of the experimental group students. Accordingly, it can be said that the gamified flipped classroom model increases students' academic achievement in the algorithm more than the traditional model.

When the opinions of the experimental and control group students regarding the experience were examined, the students in the experimental group stated that they had difficulty in watching videos at home due to internet connection speed problems, and the students in the control group stated that they had difficulty in doing their homework because there was no one to help them at home. Students in both groups sought help from their teachers to overcome these difficulties.

While both groups found the activities in the course entertaining and instructive, the control group stated that they found the activities in the course to be few in number. Especially the experimental group students found the activities more motivating because they carried out the activities through the gamification platform and included elements such as points, race and competition.

Students' opinions about the teacher's attitude during the course wee positive. They stated that they could easily reach the teacher whenever they needed. While the experimental group students stated that they received support and help from their teachers mostly in the classroom, the control group students stated that they received support and help with homework outside the classroom.

While the experimental group students stated that they liked that the materials used throughout the course were fun, that the course videos were understandable, short and concise, that they could access the materials at any time, and that they were technological, the control group students also stated that they liked the visual appeal of the presentations and activity sheets used in the course. While the control group evaluated the use of interactive whiteboards in the course negatively because it was not individual, the experimental group expressed a negative opinion that the computers used in the course were slow.

In addition, some academic and practical recommendations can be given for future studies. A list of the recommendations is presented as below.

-The research had a positive impact on the academic achievement of the students in the algorithm subject of the information technologies and software course at the secondary school level. The developed method can also be used in a different subject or course.

-The key point in the flipped classroom model is that students watch the videos before the lesson and then come to class.

If the flipped classroom model would be used, it should be carefully monitored whether the students watch the videos before the lessons.

-In the study, it was observed that students experienced frequent errors on the EIN portal, especially when it came to watching course videos. Course videos can be uploaded to alternative applications such as YouTube or different virtual classroom applications other than EIN, and students can be asked to make short notes on the videos watched in order to keep track of whether the videos are watched.

- In the study, it was observed that students liked gamification more than the flipped classroom model. Different studies can be carried out by adding gamification elements to the traditional instruction model.

-"Classcraft" was used as a gamification platform in the study. Similar studies can also be done with different gamification platforms.

- Students had problems with no or weak internet connection. The Ministry of National Education can work to ensure that every student has access to high-speed internet.

-The applicability of flipped classroom and gamification methods can be expanded by designing in-service training for teachers by the Ministry of National Education.

-This study was conducted with sixth grade students and the change in the academic achievement of the students in the experimental group of the method in the field of information technologies and software algorithms was examined. The effectiveness of this method can be tested by trying it on different dependent variables.

- In this study, the gamified flipped classroom model was compared with the traditional model. Studies can be conducted comparing the gamified flipped classroom model with different models.

-The study was conducted with secondary school students, and its effectiveness can be investigated at all other levels.

-The study was carried out over a four-week period. The effect of the model on students can be examined by conducting longer studies.

-In the study, the effect of the model on information technologies and software course algorithms was examined. The effectiveness of the method can be investigated in different courses and subjects.

REFERENCES

Akdeniz, E. (2019). Ters yüz sınıf modelinin akademik başarı, tutum ve kalıcılık üzerine etkisi. Masters Theses, Necmettin Erbakan Üniversitesi Eğitim Bilimleri Enstitüsü, Konya.

Akgün, M. (2015). Ters - düz sınıfların öğrencilerin akademik başarısı ve görüşlerine etkisi. Unpublished Masters ThesesFırat Üniversitesi, Eğitim Bilimleri Enstitüsü, Elazığ.

Akkuş, M. and Keskin, Y. (2016). Harmanlanmış öğrenme modeliyle ilgili öğrenci tutumlarının incelenmesi. Journal of Research in Education and Teaching. 5(2).

Aksoy, İ. (2020). Ortaokul Fen Öğretiminde Ters Yüz Sınıf Uygulamaları. Unpublished Masters ThesesKastamonu Üniversitesi, Kastamonu.

Aktaş, O. (2021). Oyunlaştırma uygulaması classcraft ile desteklenen ingilizce dersindeki sınıf yönetimine ilişkin öğrenci görüşleri. Unpublished Masters Theses. Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Alsancak, S. D. and Seferoğlu, S.S. (2017). Ters yüz sınıf modelinde bireysel özelliklerin rolüyle ilgili bir değerlendirme. Eğitim Teknolojileri Okumaları (ss.726-749). Sakarya: TOJET.

Ar, N.A. (2016). Oyunlaştırmayla öğrenmenin meslek lisesi öğrencilerinin akademik başarı ve öğrenme stratejileri kullanımı üzerine etkisi. Unpublished Masters ThesesSakarya Üniversitesi, Eğitim Bilimleri Enstitüsü, Sakarya.

Arslan, U. (2021). Ters yüz sınıf modelinin ortaokul öğrencilerinin matematik dersindeki akademik başarıları ve öz düzenleme becerileri üzerine etkisinin incelenmesi. Masters ThesesÇukurova Üniversitesi, Adana.

Aydın, G.(2016). Ters yüz sınıf modelinin üniversite öğrencilerinin programlamaya yönelik tutum, öz-yeterlik algısı ve başarılarına etkisinin incelenmesi. Masters Theses Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, İzmir.

Bennedsen, J., Caspersen, M. E., ve Kölling, M. (Eds.). (2008). Reflections on the teaching of programming: methods and implementations (Vol. 4821). Springer.

Bergmann, J. and Sams, A (2012). Flip Your Classroom: Reach Every Student in Every Class Every Day. Washington, DC: International Societyfor Technology in Education, USA.

Boyraz, S. (2014). İngilizce öğretiminde tersine eğitim uygulamasının değerlendirilmesi. Unpublished Masters ThesesAfyon Kocatepe Üniversitesi, Sosyal Bilimler Enstitüsü, Afyonkarahisar.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö.A., Karadeniz, Ş. and Demirel, F. (2013). Bilimsel araştırma yöntemleri. Ankara: Pegem Akademi Yayıncılık.

Cunha Freire, D. S. and Amorim Carvalho, A. M. (2019). Classcraft: Learning becomes a permanent challenge. Revista Intersaberes, 14(31), 163–174.

Çukurbaşı, B. (2016). Ters yüz edilmiş sınıf modeli ve lego-logo uygulamaları ile desteklenmiş probleme dayalı öğretim uygulamalarının lise öğrencilerinin başarı ve motivasyonlarına etkisi. Unpublished Doctoral DissertationSakarya Üniversitesi, Sakarya.

Demir, D. (2018). Algoritma öğretiminde sanal gerçeklik kullanımına yönelik öğrenci görüşlerinin öğrenme stilleri bağlamında incelenmesi. Unpublished Masters Theses. Çanakkale Onsekiz Mart Üniversitesi, Eğitim Bilimleri Enstitüsü, Çanakkale.

Deterding, S., Dixon, D., Khaled, R., and Nacke, L. (2011, September). From game design elements to gamefulness: defining"

gamification". In Proceedings of the 15th international academic MindTrek conference: Envisioning future media environments Sunuldu, Finland.

Dursunlar, E. (2018). Ters yüz sınıf modelinin 7. Sınıf sosyal bilgiler dersi yaşayan demokrasi ünitesinde öğrencilerin akademik başarısına etkisi. Masters ThesesAtatürk Üniversitesi, Eğitim Bilimleri Enstitüsü, Erzurum.

Fidan, G. (2019). Beşinci sınıf bilişim teknolojileri ve yazılım dersi etik ve güvenlik ünitesinin ters-yüz öğrenme ve oyunlaştırma yaklaşımları ile öğretimi. Unpublished Masters ThesesBalıkesir Üniversitesi, Fen Bilimleri Enstitüsü, Balıkesir.

Fulton, K. (2012). Upside down and inside out: Flip your classroom to improve student learning. Learning & Leading with Technology, 39(8), 12-17.

Gökkaya, Z. (2014). Yetişkin eğitiminde yeni bir yaklaşım: Oyunlaştırma. Hasan Ali Yücel Eğitim Fakültesi Dergisi, 11(21), 71-84.

Güç, F. (2017). Rasyonel sayılar ve rasyonel sayılarda işlemler konusunda ters yüz sınıf uygulamasının etkileri. Masters Theses, Amasya Üniversitesi, Fen Bilimleri Enstitüsü, Amasya.

Hamzeh, F., Theokaris, C., Rouhana, C.ve amp; Abbas, Y. (2017). Application of hands-on simulation games to improve classroom experience. European Journal of Engineering Education, 42(5), 471-481.

Huff, A. S. and Jenkins, M. (Eds.). (2002). Mapping strategic knowledge. Sage.

İnce, E. (2022). Bilişim teknolojileri ve yazılım dersinde ters yüz öğrenme modelinin öğrenenlerin akademik başarılarına, motivasyonlarına ve teknolojiyle kendi kendine öğrenme düzeylerine etkisi. Masters Theses, Mimar Sinan Güzel Sanatlar Üniversitesi , Sosyal Bilimler Enstitüsü, İstanbul.

Kalkan, A. (2016). 3B sanal dünyalarda oyunlaştırmanın ortaokul 5. sınıf öğrencilerinin başarı akış ve tutumlarına etkisinin araştırılması. Unpublished Masters ThesesAtatürk Üniversitesi, Eğitim Bilimleri Enstitüsü, Erzurum.

Karaca, C. (2017). Yükseköğretimde programlama eğitimi için ters yüz öğrenme modelinin kullanılması ve etkisinin değerlendirilmesi. Unpublished Doctoral Dissertation, Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Karaca, C. and Ocak, M. (2017). Algoritma ve Programlama Eğitiminde Ters Yüz Öğrenmenin Üniversite Öğrencilerinin Akademik Başarısına Etkisi. International Online Journal of Educational Sciences, 9 (2), 527 – 543.

Karagöl, E.A. (2020). Ters Yüz Sınıf Modelinin akademik başarı, akademik motivasyon ve bilişsel kapılma üzerindeki etkisinin incelenmesi. Unpublished Masters ThesesSakarya Üniversitesi, Eğitim Bilimleri Enstitüsü, Sakarya.

Kaya, M. (2021). Ters Yüz Sınıf Modelinin öğrencilerin bilimin doğası anlayışlarına ve erişine etkisi. Unpublished Masters Theses, Akdeniz Üniversitesi, Eğitim Bilimleri Enstitüsü, Antalya.

Keskin, E. (2020). Ters yüz sınıf yönetiminin 10.sınıf öğrencilerinin kimya dersi "Asitler, Bazlar ve Tuzlar" ünitesindeki akademik başarılarına etkisinin incelenmesi. Unpublished Masters Theses, Atatürk Üniversitesi, Erzurum.

Kırcı, P. and Kahraman, O. (2019). Oyunlaştırma ile eğitim android uygulaması. GSI Journals Serie C: Advancements in Information Sciences and Technologies, 1(2), 58-65.

Kotluk, N. and Kocakaya S. (2015). 21.Yüzyıl Becerilerinin Gelişiminde Dijital Öykülemeler: Ortaöğretim Öğrencilerinin Görülerinin İncelenmesi. Eğitim ve Öğretim Araştırmaları Dergisi, 4(2), 2146-9199.

Kunduracıoğlu, İ.İ. (2018). Oyunlaştırma kavramı üzerine içerik analizi çalışması. Unpublished Masters ThesesBalıkesir Üniversitesi Fen Bilimleri Enstitüsü, Balıkesir.

Küçükahmet, L. (2001). Öğretim ilke ve yöntemleri. Ankara: Nobel Yayın Dağıtım.

Miles, M, B. and Huberman, A. M. (1994). Qualitative data analysis: An expanded Sourcebook. (2nd ed). Thousand Oaks, CA: Sage.

Mohammed, D. A. (2018). Gamification in e-learning: The effect on student performance and perception at an Iraqi university. Unpublished Masters ThesesÇankaya Üniversitesi, Fen Bilimleri Enstitüsü, Ankara.

Nayci, Ö. (2017). Sosyal bilgiler öğretiminde ters yüz sınıf modeli uygulamasının değerlendirilmesi. Unpublished Masters ThesesAnkara Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Özkan, Z. and Samur, Y. (2017). Oyunlaştırma yönteminin öğrencilerin motivasyonları üzerine etkisi. Ege Eğitim Dergisi, 18(2), 857-886.

Özmen, B. and Altun, A. (2014). Undergraduate students' experiences in programming: difficulties and obstacles. Turkish Online Journal of Qualitative Inquiry, 5(3), 1-27.

Öztürk, S. (2016). Programlama öğretimindeki ters yüz öğretim yönteminin öğrencilerin başarılarına, bilgisayara yönelik tutumuna ve kendi kendine öğrenme düzeylerine etkisi. Unpublished Masters ThesesAnkara Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Papadakis, S., Kalogiannakis, M. and Zaranis, N. (2016). Developing fundamental programming concepts and computational thinking with ScratchJr in preschool education: a case study. International Journal of Mobile Learning and Organisation, 10(3), 187-202.

Perçin, F. (2019). Programlama öğretiminde ters yüz öğretim yönteminin öğrencilerin başarılarına, teknoloji tutumlarına ve bireysel yenilikçilik düzeylerine etkisi. Unpublished Masters Theses, Marmara Üniversitesi, Eğitim Bilimleri Enstitüsü, İstanbul.

Sanchez, E., Young, S.ve Jouneau-Sion, C. (2017). Classcraft: from gamification to ludicization of classroom management. Education and Information Technologies, 22(2), 497-513.

Sarıkaya, D.A. (2017). Oyunlaştırılmış Tersyüz Sınıf Modeline Yönelik Öğrenci Görüleri. On dokuz Mayıs Üniversitesi Eğitim Fakültesi Dergisi, 36(1), 114- 132.

Shin, S. and Park, P. (2014). A study on the effect affecting problem solving ability of primary students through the scratch programming. Advanced Science and Technology Letters, 59(1), 117-120.

Strayer, J. (2009). Inverting the classroom: A study of the learning environment when an intelligent tutoring system is used to help students learn. VDM-Verlag Müller.

Şahin, İ. (2021). Ters yüz sınıf uygulamalarının 6.sınıf öğrencilerinin sosyal bilgiler dersindeki akademik başarı ve tutumlarına etkisi. Unpublished Masters ThesesNevşehir Hacı Bektaş Veli Üniversitesi, Sosyal Bilimler Enstitüsü, Nevşehir.

Şahin, S. (2019). Programlama öğretiminde ters yüz sınıf uygulamalarının ortaokul öğrencilerinin akademik başarısına etkisi. Masters Thesesİnönü Üniversitesi, Eğitim Bilimleri Enstitüsü, Malatya.

Tabachnick, B. G. and Fidell, L. S. (2013). Using multivariate statistics (Sixth Edition). USA: Pearson Education Limited.

Talbert, R. (2012). Inverted Classroom. Colleagues. c.9. s.1: Article 7. Erişmi adresi: https://scholarworks.gvsu.edu/cgi/viewcontent.cgi?article=1183&context=colleagues.

Tashakkori, A. and Creswell, J. W. (2007). The new era of mixed methods. Journal of mixed methods research, 1(1), 3-7.

Taşkın, N. (2020). Oyunlaştırmanın ters yüz öğrenme ortamında öğrenim gören öğrencilerin motivasyonuna, katılımına ve akademik başarısına etkisi. Unpublished Masters ThesesGazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Topalak, Ş. (2016). Çevrilmiş öğrenme modelinin başlangıç seviyesi piyano öğretimine etkisi. Masters ThesesİnönÜ Üniversitesi, Eğitim Bilimleri Enstitüsü, Malatya.

Turan, İ., Akça, M., ve Küçükkurt, M. (2016). Temel kodlama eğitimi 2. İstanbul: Pusula.

Türkoğlu, H. (2021). 10. sınıf öğrencilerinin fonksiyon kavramı bağlamında online Ters Yüz Sınıf Modelinin akademik başarıya ve tutuma etkisi. Unpublished Masters ThesesGazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.

Ulus, G. (2021). Madde ve Değişim Ünitesi İçin Oyunlaştırma Kullanımının Öğrencilerin Akademik Başarı Ve Motivasyonlarına Etkisi. Yayımlanmamış Yüksek Lisans Tezi. Dokuz Eylül Üniversitesi, Eğitim Bilimleri Enstitüsü, İzmir.

Uzun, E. (2019). Ters yüz sınıf modelinin 7.sınıf sosyal bilgiler dersi üretim dağıtım ve tüketim ünitesinde uygulamasının akademik başarıya etkisinin incelenmesi. Masters Theses, Aksaray Üniversitesi, Aksaray,

Uzun, İ. (2022). Fen Bilimleri dersinde Ters Yüz Sınıf modelinin akademik başarı ve bazı duyuşsal değişkenlere etkisinin incelenmesi. Unpublished Masters Theses, Atatürk Üniversitesi, Eğitim Bilimleri Enstitüsü, Erzurum.

Yanardağ, H. (2021). Ters yüz sınıf uygulamalarının mevsimler ve iklim ünitesinin öğretiminde 8.sınıf öğrencilerinin akademik başarı, tutum ve öğrenme kalıcılıklarına etkisi. Unpublished Masters Theses, Dicle Üniversitesi, Eğitim Bilimleri Enstitüsü, Diyarbakır.

Werbach, K., Hunter, D. and Dixon, W. (2012). For the win: How game thinking can revolutionize your business (Vol. 1). Philadelphia: Wharton digital press.