Impacts and Opinions on the Technology Self-Sufficiency of the Students who are Coding Education in the Flipped Classroom Adapted to the ARCS Motivation Model

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Abstract **– The aim of this study was to determine the effects of the use of technology self-efficacy in the 9th-grade students' opinions on the flipped classroom adapted to the ARCS motivation model and the effect of the pre-test to the final test. The research was an experimental study, in which a single group pretest, posttest, and student were devised according to the flipped classroom instructional survey research model. According to the results of the experiences of the students who participated in the study on the flipped classroom model adapted to the ARCS motivation model, it was determined that the students had a positive attitude towards the use of learning, teaching, cognitive skills and technology.**

Keywords **– Flipped Classroom, Digital Game, ARCS Motivation Model, Algorithm, Technology self-efficacy.**

1. Introduction

Along with the 21st-century digital era, the integration of technology in education has accelerated and the use of technology in classrooms has become widespread, and the integration of technology education has gained importance [1]. With the increasing use of technology in the classical or learning environments in the digital age, active participation of students in the classroom with technology has been ensured [2,3,4]emphasised that the use of technology in educational environments and their enrichment in terms, of course, student and teacher during the course of their studies.

When the literature is examined, researchers and course teachers make various studies in active course environments to raise their motivation towards their classes and draw students' attention [5]. From the researches carried out today, we can say that it is the flipped classroom model which is a new learning model that contributes to the students in their own learning environment and speed of learning for the students [6]. In addition, from the researches carried out it has been suggested that the flipped classroom model is positive for learners and teachers [7]. The course is being taught with the help of information technologies and multimedia designs in the flipped classroom teaching model. According to the studies done, the flipped classroom learning model is accepted by the researchers as a popular learning model [8, 9, 10, 11].

In his work,Mull (2012) [12] recognizes the flipped classroom learning model as a model in which learners are prepared to read the previous information by reading and listening to their own learning environments, taking advantage of multimedia design documents prior to their presentation. Milman (2012) [13] describes the flipped classroom learning model as a method of effective use of time within the classroom. The flipped classroom learning model can be taught in a variety of classroom environments and can be used not only with the traditional education model but also with classrooms equipped with technological tools, labs and meeting rooms, or online learning areas (Dove, 2013) [14]. In addition, the flipped classroom learning model can improve students' problem

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solving and application skills and abilities [15]. Millard (2012) [16] concludes that the flipped classroom instruction model improves student participation in class and motivation to class, develops group work and solo decision-making skills, develops new study strategies in their own learning environments, increases classroom awareness if the advantages of the flipped classroom learning model compared to the education model.
In order to use the flipped classroom learning model more effectively and efficiently, and to provide a better experience for the learners, easy to understand materials should be prepared by choosing the most appropriate teaching strategy or teaching design model to the flipped classroom learning model [17]. Accordingly, the only motivation model based on instructional design, which is important in increasing the effectiveness of the teaching environment and material, is the ARCS motivation model developed by Keller (1987) [18]. Many studies have investigated the influence of motivation on student achievement and performance in academic life [19, 20, 21, 22, 23] and it's been seen that motivation has played an important and effective role in the success of students throughout their academic lives. Motivation, in other words, pumping energy to the individual, makes it become willing to behave and emerges as one of the most important components of its effectiveness in the learning-teaching process [24]. In addition, motivation emerges as an effective, yet complex, component of learning [25]. Spitzer (1995) [26] argued that the effectiveness of a curriculum depends on student motivation and that if student motivation is low, it will be a low-quality and, if student motivation is high the curriculum will be in high-quality. ARCS Motivation Model [27], developed by Keller, is one of the models that demonstrate how the motivation of students in academic life is influenced in the teaching-learning process scan and help educators to design a layout that will motivate them. Keller developed the ARCS motivation model, cognitive psychology, social learning theory and motivation theories in order to increase the motivation factor in his design and the effectiveness of the teaching environment [28].

As seen from the researches made, it is understood how important the software education is for the software sector, as the technology enters into daily life and the life of the human beings. At the same time, new trends and researches have entered the field in recent years. One of these new approaches is the flipped classroom teaching model. It is thought that the flipped classroom teaching model adapted to the ARCS motivational model provides information and achievements positively to learners and teachers and also it will be able to bring active learning in teaching environments and be of better quality and interest. Besides all these, although there are many studies in the field, such as the ARCS motivation model, the flipped classroom teaching model, Scratch coding, there have not been found in the study field where all of them are used together.

2. Aim

The main aim of the study is to determine the views of the students who have learned to code in flipped classroom adapted to the ARCS motivation model and the effects on their technology self-efficacy. The sub-objectives for the research are as follows.

1. What are the views of the students who have been trained in flipped classroom coding adapted to the ARCS motivational model?
2. Is flipped classroom education differentiated from its pre test to post test that students who have been trained in flipped classroom for the effect of flipped classroom education on their technology self-efficacy?

3. Method

3.1. Research Model

The aim of the research was to determine the opinions of the 9th-grade students in the class adapted to the ARCS motivational model for flipped classroom and how the use of their technology self-efficacy has influenced from pre-test to post test. The study was a quantitative research and the one-group pretest was designed according to the posttest research model.

3.2. Creation of Working Group

The group of the study is the Turkish Republic of Northern Cyprus, the Ministry of National Education, and the 9th Grade students studying at the LaptaYavuzlar High School affiliated to the Secondary Education Department. 28 students participated in the study. 53.6% (15 people) are female and 46.3% (13 people) are male out of the students in the experiment group that participated in the study.

3.3. Data Collection Tools and Application

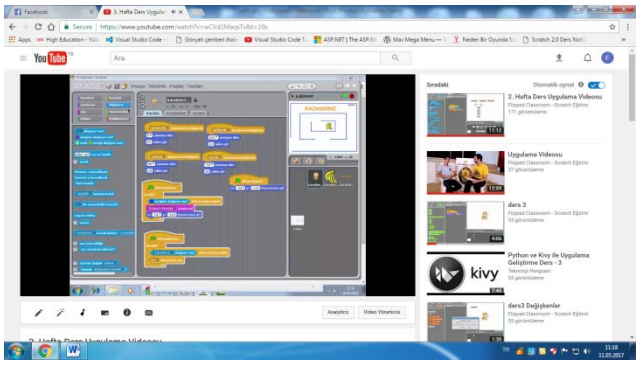
3.3.1. Data Collection Tools

To determine the opinions of the students on the collection of the data needed in the research conducted on the flipped classroom learning model adapted to the ARCS motivational model developed

by Kim & Others and the Turkish and cultural adaptation done by the researcher that is Flipped Classroom Teaching Model Student Experience Questionnaire and with the aim of determining the technology self-efficacy of students in the flipped classes.

3.3.2. Preparation of Educational Environment and Implementation

In order to make the study free and easy for every student to access, a training channel was created for the course named Flipped Classroom-Scratch Training on www.youtube.com website. Interactive videos were created using the Camtasia Studio program before the course videos were implemented. To understand that the students are watching the lesson, interactive questions and surveys have been added to the video and students are asked to respond during the video viewing. It was observed that students who did not answer the questions and the questionnaires were detected and after the necessary warnings were made in the classroom environment, the students watched the course videos completely. The course videos are limited to a maximum of 15 minutes and students are not distracted. The image of the video created on www.youtube.com website and broadcasted to the students is given in picture 1.



*Picture 1.*Scratch training video image

3.4. Application

The study was carried out according to the flipped classroom learning model adapted to the ARCS motivation model. The videos of the lesson are published on the channel named Flipped Classroom-Scratch Training opened on YouTube for the students to reach. Lessons learned in the classroom environment were treated as a class activity only in the flipped classroom method adapted to the ARCS motivation model and in the teacher guidance role.

The application lasted for a total of 7 weeks. During the application, coding and algorithm development training was conducted by using Scratch program for students to develop the digital game. The students participating in the research were trained in computer technology, which is a 3-hour weekly computer science lesson after watching the lesson videos in their own learning environments, and the activities of the lesson videos adapted to the ARCS motivational model and brain storming.

In the courses conducted in the classroom according to the flipped classroom learning model adapted to the ARCS motivation model; in order to draw the interest of the students to attention, the digital game prepared according to the subject of the application was played to the students in the classroom environment and the class was informed that these subjects helped to design the game in this way. As for conformity, the goals and objectives of the subject to be processed on that day are clearly stated before the lesson. The students were also informed about the necessity of the previous knowledge, the subjects taught before, in order to carry out the tasks and design the game successfully. In the confidence stage, during the last 20 minutes of each classroom activity to avoid the motivation against the lesson, they are asked to make a new game suitable for the students with a different game scenario and character with the code commands they have seen, in order to ensure the confidence to the lesson and for themselves. Because the subject is learned and the feeling of Scratch code software can be done, the student feels confidence in the lesson. At the stage of satisfaction, the learners explained what kind of benefits the lesson will provide to them at the end of the training. At the satisfaction stage of the students and at the end of each class application, a leisure time is created for them to develop their own games.

At the end of the study, the students' experience questionnaire developed by Kim et al. (2014) [29] was applied to students' views on the flipped classroom learning model adapted to the ARCS motivation model.

By using the Scale of Self-Efficacy Perception towards the Online Technologies –adopted to Turkish and culture by Horzum and Çakır (2009) [30], pre-test before the study and post-test after it were conducted with the purpose of evaluating the effect of the technology the students use in their learning environment on their self-efficacy in accordance with the flipped classroom learning method.

4. Result

4.1. Students' Experiences Toward Flipped Classroom Model

The averages and the standard deviations of the answers given to the measures in order to evaluate the attitudes of the students in the study group to the flipped classroom teaching method during the course of the practice were calculated. The findings obtained from the analyses are given in Table 1.

Table 1. Students' Experiences Toward Flipped Classroom Model

Material and Factors	Average	SD
Aspect I: Educational, Cognitive Presence and Usage of Technology		
The teacher made clear the objectives of the important events	4.25	.967
Teachers explained how we can participate in learning activities	4.25	.844
Teacher explicitly notified important completion dates / timetables about learning activities	4.00	.942
The teacher helped maintain attendance to the lesson and take part in productive discussions	4.28	.658
The teacher encouraged participants to discover new concepts in the activities	4.35	.731
Teacher's movements supported the development of class sense of belonging	4.28	.599
My teacher showed helpful examples/videos that helped the course content more understandable to me	4.42	.690
My teacher has provided me with informative explanations or other feedback to help me do things better	4.35	.678
I felt comfortable communicating via online environment	4.07	.899
I felt comfortable with my classmates	4.35	.780
When I do not agree with other course participants, I am comfortable with my self-confidence as well	4.03	.881
I felt motivated to discover questions about the ingredients	4.10	.737
The information obtained from the brain storm helped me to solve the problems related to the subject	3.82	.862
Combining new information helped to answer questions asked in classroom activities	3.92	.899
Learning activities helped me to create explanations/solutions	4.17	.722
Thinking and discussing the course content helped to understand the basic concepts in this class	4.10	.737
I can apply this knowledge to my own studies or other extracurricular activities	3.92	.940
In general, I am self-reliant in using technology related to extracurricular activities	4.00	.720
Finding and accessing materials for flipped classroom activities was easy	3.85	.931
It was easy to use the technology in extracurricular activities	4.14	.890
The technologies used for extracurricular activities have enabled me to collaborate with other students	4.14	.650
Aspect I Total	**4.12**	**.575**
Aspect II: Learning Presence		
Getting to know the other people attending the class made me feel a sense of belonging	3.82	1.020
I could make some impressions about some of the participants	3.89	.916
I felt comfortable myself joining the debate in the class	4.10	1.196
I felt that my opinion was accepted by the other participants	3.96	.792
Online discussions helped me to create a sense of unity	4.17	.862
I use various sources of information to explore the problems that arise in this class	3.71	.975
I have set myself a goal in every period to direct my own activities while working for the events	3.92	.899
I ask questions myself to be sure of the activities I work on	3.92	.813
I changed the way I work to comply with the activity requirements and the teacher's teaching style	3.75	.967
I work hard to get a good note even some subjects do not interest me	3.67	1.306
Instead of just reading material or following instructions I tried to think about it and decide what to learn	4.10	.785
I thought about things I needed to do before I started working	4.10	.685
I've been trying to decide what concepts I do not understand well while I'm working for events	4.03	.637

While I was working on learning activities, I paused my work from time to time	4.07	.813
Aspect II Total	**3.94**	**.590**

According to the findings obtained, it can be said that the students have positive experiences about teaching, cognitive presence and technology use (x = 4.12) in the implementation process. They also found positive experiences (x = 3.94) on learners' presence.
As shown in the table above, the students in the experimental group explained how teachers were able to clarify important activity goals (x = 4.25), explain how to participate in learning activities (x = 4.25), maintain their teaching and help in participating in discussions (x = 4.28) (X = 4.35), encouraged them to explore new concepts (x = 4.35), their movements supported the development of class sense of belonging (x = 4.28) (X = 4.35) that they feel comfortable with their classmates.
In addition, the students said they approved that the teachers announced the important dates (x=4.00), students feel comfortable communicating online (x=4.07), they are comfortable with their confidence (x=4.03), motivated (x=4.10), Brainstorming technique helps solve (x=3.82) etc.

4.2. Self-efficacy Perceptions of Students for Flipped Classroom Teaching Model

With the aim is to identify the perceptions of the students involved in the research on their own use in their own working environments, which are used in the flipped class teaching model, The Self-efficacy Perception Scale for Online Technology was applied. The t-test was applied to determine whether the students had changed from the pre-test for their own technology self-efficacy perceptions to the final test. The data obtained from the analyses are given in Table 2.

Table 2.Self-efficacy Perceptions of Students for Flipped Classroom Teaching Model

	Group	N	Mean	SD	df	t	p
Technology Self-efficacy	Pre test	28	3.31	.898	54	-5.47	.000
	Final test	28	4.33	.395			

When Table 2 is examined, it was determined that the students who participated in the study had a meaningful difference from the pretest to the final test of the technological perceptions they used in their own learning environments according to the application of the flipped classroom learning model adapted to the ARCS motivation model. Moreover, it was determined that the average of the self-efficacy scores of the students who participated in the study was residual from the pre-test to the final test. According to this result, according to the flipped classroom learning model adapted to the ARCS motivation model of the students, it can be said that the technology they use in their own learning environments is effective in promoting student perceptions.

5. Conclusion and Discussion

According to the results of the experiences of the students participating in the study on the flipped classroom learning model adapted to the ARCS motivational model, it was determined that the students had a positive attitude towards the use of learning, teaching, cognitive skills and technology during the application period. Kakosimos (2015) [31] tested the flipped classroom teaching model in his work. There is one control group in the study. In practice, learning has been done in the chemical engineering fluid process module. In the qualitative evaluation of the control group, it was determined that the flipped class instruction model observed an improvement on student perception. In addition, an overall improvement in the control group has been observed.

Another result from the study is that the students who applied for the course according to the flipped classroom learning model adapted to the ARCS motivation model had a significant difference from the pre-test to the post-test in the technology self-efficacy of the students who used technology in their own learning.According to the survey, it was determined that there was an increase in the post-test from the pre-test. In his study of Roach (2014) [32], he investigated student visions for flipped classroom and found that there was a meaningful difference between the traditional class and the experimental class, and used positive expressions for the flipped class of students and found a significant difference in favour of the flipped classroom. In the future research, it can be tried to turn the flipped classroom learning model adapted to the ARCS motivation model into a more effective model by blending it with other instructional design models into a larger design model.

The effective implementation of the flipped classroom teaching model of the course teachers increases the motivation and success of the students who are open to innovation and in addition, it is encouraging to use the course materials that are prepared with the flipped classroom teaching method that they will use in their lessons in other lessons.

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