



A NEW LEARNING APPROACH: FLIPPED CLASSROOM AND ITS IMPACTS

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Abstract: The aim of this study is to present opinions of undergraduate students towards Flipped Classroom (FC) practices and to determine their different aspects then traditional learning approaches. The case study approach is preferred to conduct the study. In this context, 34 volunteered students were included in the study group by purposive sampling method. The quasi-structured interview form developed by the researcher is used to collect the data. Furthermore, content analysis was used to analyze the data. According to the data obtained from the participants, FC practices are seen to be appreciated and they have many outstanding aspects compared to traditional learning approaches. In particular, FC practices have different effects in different stages of the courses. In this regard, FC improves readiness level of the students prior to the class, supports active participation during face-to-face courses, increases the retention of knowledge and shortens the learning process. However, there are also some limitations such as need for additional hardware, reduced influence of the instructor and troubles that may be caused by possible technical problems. Using these practices in learning environments and widespread adoption of FC practices are expected to contribute positively to the learning activities.

Keywords: Blended learning, flipped classroom, inverted classroom, student opinion

1. Introduction

Today, there is too much diversity to access the information and delivering the knowledge by different channels. The occurrence of this diversity may be resulted by especially advancements in communication technology and accordingly increased use of these technologies in our daily lives. These developments affects many sectors from military field to the entertainment industry. Education is also exponentially affected by these developments experienced in the field of information and communication technologies.

In present, different approaches come to the fore in the field of education. The dominant traditional perspective in educational environments is replaced by a more comprehensive understanding that is integrated with technology. From this point of view, in parallel to the developments especially in information and communication technologies, it has been possible to use different approaches in educational environments with continuous use of Internet technologies in these environments.

Distance education environments are prepared as an alternative to traditional learning systems and education has become an Internet-based training. However, using only distance education systems in the educational environment has some limitations such as lack of face-to-face interaction, individual learning difficulty, etc. Therefore, the idea of supporting traditional learning environments with distance education systems is considered more effective in the literature.

Considering that the main purpose in learning environments is creating a more effective learning environment, it is very normal to attempt to use new technologies and integrate these technologies to the educational environments in different ways. In this regard, Flipped Classroom (FC), which is a new learning approach being discussed in recent years, has become an important topic in the literature.

FC is first presented by Bergmann and Sams (2007). After this point, the interest of researchers increased and they began to study this subject. In the literature, there is not a common definition of FC, which is a new approach in the learning environments. For example, Fung (2015) defined FC as a new learning approach that allows students to use cooperative learning activities and problem-solving

processes together by presenting learning materials to them during extracurricular times. In addition to this, Sams (2011) explains FC as an approach where activities that should be performed in traditional education environments performed at home and the course activities are performed in the classroom and education are converted into a more flexible and personalized format. Besides, Bergmann and Sams (2012) state that FC includes active learning, the student-centered learning and constructivist learning approaches, which is a successful learning approach being used for years. Although there are many different definitions made by researchers, the common idea is presenting extracurricular activities and elimination of learning deficiencies in the classroom (Bergmann and Sams, 2012; Tucker, 2012; Weaver and Sturtevant, 2015).

In particular, in the literature there are studies presenting contributions of FC practices to the learning process such as supporting extracurricular activities and providing more practices in the learning environments. Bergmann and Sams (2012) stated that students could perform active learning in a more flexible learning environment in FC practices. Furthermore, the personal learning speed of learners in FC is considered as one of the outstanding aspects of this system. Moreover, Hamdan, McKnight, McKnight and Arfstrom (2013) listed some advantages of FC as follows;

- FC provides a flexible learning environment. Students perform a more collaborative and active learning by accessing course content anytime and from anywhere.
- Provides a change in the learning culture. Since learning is achieved during activities conducted outside of the classroom, an in-depth learning is provided in activities carried out in the classroom.
- Facilitates the use of appropriate content in accordance with the objectives. It is also effective in sharing multimedia elements with students.
- Contributes to the development of professional educational skills. Since the instructor is always active in the process and will guide students during the learning process, it has an important impact on preparing the content and guidance of the teacher.
- Tools such as presentation files, video and, audio recording etc. can be used effectively in these practices (McDonald and Smith, 2013).
- Activities such as online evaluation and messaging are also effective tools that can be used frequently in the FC implementations.

Using FC approach in the educational environments mediates increased implementations administrated towards this approach. Since technological advancements spread very fast in the educational environments, designing distance learning and face-to-face education activities together in the learning environment is considered to be important. Given all these features, conducting more studies about FC in the literature and conducting studies towards implementations of this approach are considered to be substantial studies. Because in these implementations, learning process is designed as planned and efficiently. In this regard, in the present study, it is aimed to present opinions of undergraduate students towards FC practices and determine their different point of views from traditional learning approaches. Furthermore, recommendations of teachers are also intended to be received in order to design the FC system more effectively. For this purpose, the following research questions were sought to be answered;

1. What are the opinions of participants with regards to the using the FC implementations in various stages of the course?
 - a. What are the opinions of participants about the FC implementations performed prior to the course?
 - b. What are the opinions of participants about the impact of FC implementations performed face to face during the class?
 - c. What are the opinions of participants about the impact of FC implementations performed after the course?
2. What are the opinions of participants with regards to the comparison of traditional learning environments and FC implementations?
3. What are the opinions of participants with regards to the instructional materials used in the FC implementations?

4. What are the views of undergraduate students to be considered for the realization of an effective FC implementation?

2. Method

Case study, which is one of the qualitative research designs, was used within the scope of the research. Case study is a research method that can be used with qualitative and quantitative research methods to produce results for a specific situation (Yıldırım & Şimşek, 2008). The case study method is used when a situation requires a thorough examination and it is a research method often preferred in the area of Social Sciences (McMillan & Schumacher, 2010).

Study Group

In this study, 34 pre-service teachers studying at Computer and Instructional Technology Department, Kazım Karabekir Faculty of Education, Atatürk University were selected as the study group. A purposive sampling method, which is considered as one of the most appropriate qualitative research methods, was used to select the samples to be included in the study. Purposive sampling method is used to deeply examine a case that already provides very sufficient amount of information (Yıldırım & Şimşek, 2008). Participants were included voluntarily in the study and this principle was taken as the basis in all other phases.

All individuals involved in the study group have the basic knowledge and skills about teaching design at the undergraduate level. Moreover, the participants have sufficient knowledge and skills to prepare presentations and to design and arrange multimedia elements.

Data Collection Tool and Data Collection Process

In the study, a quasi-structured interview form developed by the researcher is used to collect the data. Three academic experts were consulted while developing the form and the interview items were checked by an expert in the area of Turkish language. Such an interview form was created free of language errors. After this stage, pilot interviews were conducted with four participants who were not included in the study group. The final version of the form was created after making necessary modification in accordance with the findings obtained from pilot interviews.

After performing the FC implementation, the general opinions of participants about the study were obtained with quasi -structured interview forms. The interview form consists of open-ended questions and each question was explained to the participants in detail. The participants were given enough time to fill out the form and their additional opinions were also asked.

Data Analysis

Descriptive statistical analysis (percent, frequency) and content analysis methods are used to analyze the data. The data obtained from interview forms were subjected to content analysis in order to examine the opinions of participants in detail. In the content analysis, it is aimed to organize the words to be investigated in text or word phrases in accordance with some specific codes and categories (McMillan & Schumacher, 2010). The data is subjected to content analysis by two different researchers and the results are compared with each other.

Implementation Period

In the study, applications about Computer Hardware course were conducted. The participants were voluntarily divided into groups of three or four people depending on the subject. A total of 14 groups including 48 students in total were created. 4 groups preferred the FC implementation, while the 6 of the remaining 10 groups selected the traditional learning approach and 4 groups refused to participate in the study. So, study continued with a total of 34 students (10 groups) voluntarily participated in the study.

The experts of the field decided which subjects should be included in the FC implementation and which subjects should be included in the traditional learning approach after having interviews with them. Afterwards, participants were allowed to select the subjects according to the method they want

to use. With doing so, groups had the opportunity to prepare the appropriate subjects according to their capabilities.

Traditional Learning Approach

In the study, participants had to choose between the two basic methods. The first of these is presenting the course based on traditional learning approach. In the traditional learning approach, participants used some methods such as presentations, videos, question and answer activities and practical demonstration. However, the groups preferred to use this method did not have any activity before the class and carried out all activities face-to-face during the class.

Groups preferred the traditional learning approach presented the activities to be performed in the classroom and materials to be used to the experts of the field at least one week prior to the study. After this step, the process of controlling the appropriateness of the content was performed. The incomplete or incorrect content was determined with group members by initiating common meetings and they were modified in accordance with the teaching design principles. After making necessary corrections, the final version of the content was completed and become ready to be used in the classroom. Groups preferred the traditional learning approach performed their lectures by using presentations, videos, and evaluation questions that are controlled by the experts of the field.

FC Implementation

Groups preferred to use the FC implementation presented their content at least two weeks before the study. The reason is that the participants were allowed to reach the content of the FC implementation through social networking sites for at least one week prior to the classroom activities to be conducted face to face. Therefore, groups preferred to use the FC implementation performed their course activities through social networking sites for at least one week prior to the classroom activities unlike the other groups preferred to go with traditional learning approaches.

First, we have decided the channels that are going to be used to share the educational materials with the group preferred to use the FC implementation. As a result of these discussions, one of the most popular social networking sites Facebook was decided to be used to share the materials. The reason of choosing Facebook are very simple to create private groups, sharing multimedia files such as video and audio documents is very fast, it is very easy to prepare and share online questions and it takes less time to add files on Facebook. Moreover, all the participants have had Facebook accounts and they have been effectively using this social networking site.

After deciding Facebook as the medium, all groups presented the materials that will be used before the course to the experts of the field at least two weeks before the study. In the common meetings carried out with group members, the missing and incorrect parts of the content were examined in detail and converted into a format that can be used during the courses. Furthermore, the videos to be used were examined in terms of all aspects such as their content, purpose, duration and image quality and the necessary parts were supported by multimedia elements. Moreover, different and interesting videos that can be used during lectures were also determined and presented to the participants in a week. Before the course, online open-ended and multiple-choice questions were revised and ensured that they were within the scope of the study and covers the important points.

Groups preferred to use the FC implementation shared the course content with the participants via the social networking site at least one week prior to course. In this process, group members answered the questions of the participants. These questions often addressed the points difficult to understand. Group members helped participants to have a better understanding by using previously prepared additional video or links after providing a general explanation about the subject. Additionally, online question-answer sessions and discussion events were organized for a week in order to activate the participants.

After completing pre-course activities, group members made a list of most discussed issues or the issues that were not clearly understood during the discussions on the social networking site by the participants and addressed them during the lectures. Thus, possible learning deficiencies were eliminated. Furthermore, classroom events were designed according to the structure of the topic.

3. Findings

In this study, it is aimed to present opinions of undergraduate students towards FC practices and determine their different point of views from traditional learning approaches. In this regard, a total of 34 undergraduate students studying at Computer and Instructional Technology Department were selected as the study group. The findings obtained from participants were respectively explained according to the research questions. The views of participants were taken as the unit of analysis. Therefore, since a participant may have more than one opinion, the numbers given may be greater than the number of participants included in the study.

1. What are the opinions of participants with regards to using the FC implementation in various stages of the course?

In the study, the general opinions of participants regarding the FC implementation were investigated and their appreciation levels were presented. The appreciation levels of the participants of the FC implementation is given in Figure 1.

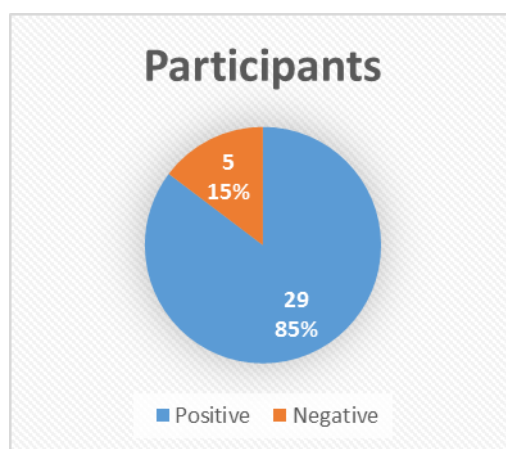


Figure 1. Opinions towards FC implementation

Considering the general opinions of the participants, their opinions about the FC implementation seem to be positive. Approximately 85% of the participants (n = 29) stated that they liked the FC implementation. On the other hand, 15% of the participants stated that FC implementations did not have any impact on them.

a. What are the opinions of the participants about FC implementations performed prior to the course?

The findings about positive impacts of FC implementation obtained from interviews conducted with the participants prior to the course are summarized in Table 1.

Table 1. Positive opinions of the participants towards the FC implementations conducted prior to the course

Positive Opinions	F
Provides a better and more comprehensive learning	18
Provides research opportunity.	9
Measures the level of knowledge.	3
Arouses curiosity.	3
Enables active participation in the course.	2
Increasing the competition.	1
Giving the impression that the subject is important.	1

Participants noted that FC implementations realized before the course provide a better learning. Furthermore, FC implementations give them the opportunity to make research, measure the level of knowledge, and increase their curiosity for the course. It is believed that the participants' level of readiness is important for this view to emerge. Furthermore, according to the opinions of participants, activities performed prior to the course enable active participation in the course. Participants may have

preferred this practice because they are active in the process. Some opinions of the participants regarding this matter are given below.

When I accessed the content before the class, I can listen to it whenever I want. I can listen to again and again... I can participate actively in class with this application.

It provides an active participation in the course. In this way, the information to be learned becomes clearer to understand.

Pre-access to the content makes it easier to remember the content during the class.

.... The class becomes more active since we come to the class well-prepared.

.... Since the lecturing part is shorter, we have plenty of time for practice during the class.

Courses are more fun.

There are also some limitations of the FC implementation in addition to its positive impacts prior to the course determined by the participants. These limitations are given in Table 2.

Table 2. Limitations of FC implementations, which were performed prior to the course, stated by the participants

Limitations of FC prior to the course	F
Evaluation questions should be prepared effectively.	7
All evaluation questions should be asked at the same time.	2
It would be more effective to ask the questions in the classroom.	2
Participation in questions should be improved.	1

According to the opinions of participants about the FC implementation received prior to the course, the questions asked online should be more effective. They have emphasized that participation should be ensured by improving the effectiveness of these questions. Some examples of the participant opinions about this matter are given below.

The questions asked prior to the course should be selected more carefully. Because an explanatory answer is sufficient for some of the questions. Other users become offline when this happens.

FC implementation takes too much time before the class.

b. What are the opinions of participants about the impact of face-to-face FC implementations performed during the class?

The findings obtained from face-to-face interviews conducted with the participants about the impact of the FC implementation are summarized in Table 3.

Table 3. The positive opinions of the participants regarding FC implementations performed during classes

Positive Opinions	F
Provides active participation in the class.	12
Increases the readiness level.	7
Ensures a better learning.	7
Creates a fun learning environment.	3
Increases the retention of knowledge.	2
Provides a study environment independent from time and location.	2
Increases the classroom activities.	1

The participants stated that FC implementations performed prior to the course have many positive impacts during the face-to-face classes. According to the opinions of the participants, this implementation provides active participation in the course, an increased readiness level, more effective learning environment, and more fun classroom environment. Participants increase their interest in the course when it comes to class well-prepared, and thus have emerged of the advantages listed in Table 3. Moreover, repeating these activities increase the retention of knowledge and they can study independent from where and when they want. Some examples of the participant opinions about this matter are given below.

Individuals, who do not usually participate in the class, also participated in the course.

Since we were well-prepared for the course, it was a more interactive and fun class.

Provided a better understanding and learning.

The class was more fluent and students were also more active because we were well prepared.

We were able to answer the questions suddenly asked in the class. Therefore, the retention was increased and the subjects were better understood.

We come to class well prepared and we have ideas in our minds.

It provides discussion and question-answer environments during the class.

I believe that it encourages students for the course. Retention is increasing. The class becomes more fun rather than a boring environment.

Considering the opinions of participants regarding contribution of FC implementations during courses, some of them stated that this implementation has also some limitations. These limitations are given in Table 4.

Table 4. Limitations stated by the participants towards FC implementations during the courses

Limitations of FC during classes	F
Comes with excessive responsibility.	2
The pre-course activities should be different.	1
Reduces the curiosity for face to face lectures.	1

Participants stated that FC implementations come with extreme responsibility during the face-to-face courses and therefore their anxiety levels increase. It was also claimed that their curiosity for the content of the course also reduces. Some examples of the participant opinions about this matter are given below.

We prepare for the course with FC method and we listen to the same things in the class, so there is no difference.

I think no interest remains for the class. I believe some students do not pay attention to the lecture because they think that they know what is going to be taught.

c. What are the opinions of participants about the impact of FC implementations performed after the course?

The findings obtained from interviews conducted with participants towards impact of FC implementations performed after courses in order to examine the general opinions of the participants towards FC implementations are summarized in Table 5.

Table 5. Positive opinions of the participants towards FC implementations conducted after courses.

Positive Opinions	F
Its retention increases.	14
Students become more active during the process.	5
The learning process becomes shorter.	4
More reinforcements are offered.	2
There is more interaction.	2
More preparation is done before the course.	1

The participants noted that FC implementations especially increase retention of knowledge after the courses. Besides, the learning process shortens and students are more active in this period of learning. However, two participants stated that FC implementations do not offer any difference compared to the traditional methods. Some examples of the participant opinions about this matter are given below.

We repeat the subject 1-2 times again rather than 10 times and it becomes easier to understand.

It provides a more durable learning in FC with the preparation before the class, by allowing students to be more active during the class as well as repeating the subjects during the class.

The ratio of correct information is increased in FC and students make comments about each question.

I think it is more effective and fun.

Effective and durable learning is provided in weeks when FC implementations are applied.

It is a new implementation used for the first time, so its impacts were very limited.

2. What are the opinions of participants with regards to the comparison of traditional learning environments and FC implementations?

Within the scope of the present study, participants were asked to specify the differences between traditional learning environments and FC implementations. Opinions of the participants are given in Figure 2.

Advantages	Limitations
<ul style="list-style-type: none"> •Improving the readiness level •Ensuring active participation in the course •Increasing permanence •Providing increased self-confidence •Providing the opportunity to work independently of time and place •Providing individual learning speed •Increasing interest in course •Giving responsibility •Increased amount of classroom activities •Giving research opportunities •Creating a fun classroom environment •Making students more active in the process •Providing easy access to information •Giving time for the application •Providing opportunity to repeat the content •Achieving better learning 	<ul style="list-style-type: none"> •It is an online system •Some content may be missed •Reducing the impact of the face-to-face course •Decline of the effect of the instructor •The need for additional hardware •Using similar applications in the face-to-face course •The inadequacy of the course content •Decline of curiosity and motivation •Spending too much time •Experiencing technical problems •Creating the obligation to study •Late uploading time of the contents •Problems arising from the platform where the course contents are presented •Lack of guidance

Figure 2. Advantages and limitations of FC compared to traditional learning approaches

Participants stated that the readiness level of the students is increased, active participation is ensured in the class, better learning environments are created and retention of knowledge is also improved in the FC environments compared to the traditional learning environments. The opportunity of studying independent from time and place stated as the advantages of distance education compared to the traditional learning environments as well as the opportunity of repeating the course contents are also stated as advantages of the FC implementations. Furthermore, active participation of the students, providing learning at individual learning speeds and easy access to information are also specified as the advantages of FC learning approach. Some examples of the participant opinions about this matter are given below.

Courses are explained in clear and unambiguous manner.

Students come to the class well-prepared and they participate in the course. The course is more fun.

The teachers explains the parts that are not understood well. The course becomes more durable.

It improves the readiness level and enables active participation during the class.

It ensures active participation of students. Teachers guide the process. It provides the opportunity of consolidation again.

The time is used effectively. The access to information is easier and exchange of information is possible. Moreover, students are more active in the process.

Interaction between students and learning speed is better.

Students may use the time effectively since they can listen to the lessons whenever they want.

Participants stated that FC environments have some limitations compared to the traditional learning environments in some ways. Some of these limitations are as follows; FC is an online system and it requires some hardware tools such as computer or tablet PC, possible deficiencies in the learning process due to the technical problems that may occur, deficiencies in the course content affecting the entire learning process and reducing the impact of instructors, students feeling too much responsibility in the FC implementations and they spend too much time in the learning process. Some examples of the participant opinions about this matter are given below.

It may be boring due to the repetitions.

We may have access problems and misunderstandings are possible.

The curiosity for course decreases since the content is already shared.

Each student is required to have technological devices. From this point of view, it would create a financial burden so it might be considered as a negative method compared to the traditional methods.

Since the lecture is already watched, some easy points may be boring.

Students experience difficulties and reluctance at first.

Sometimes it can be difficult to control the group and follow-up the content. Learning gaps may be seen.

I think that would not work in the absence of the Internet.

3. What are the opinions of participants with regard to the instructional materials used in the FC implementations?

Considering the opinions of the participants towards instructional materials used in FC implementations, it is observed that video elements attract more attention compared to the presentations and online questions asked. It can be suggested that in the pre-course applications, the negative feedbacks about online questions affect the opinions of the participants. The general opinions of the participants are given in Table 6.

Table 6. *Opinions of the participants about instructional materials used in FC implementations*

Video (F=28)	Presentation (F=10)	Online Questions (F=1)
Improves participation (F=17)	Facilitates understanding (F=4)	Enables to make research (F=1)
Facilitates understanding (F=7)	Improves the retention (F=2)	
Increases the attention (F=2)	Improves readiness (F=2)	
Summarizes the subject (F=1)	Supports active use (F=2)	
Increase the interest (F=1)		

Participants stated that video elements increase the retention of knowledge and they are effective in gathering attention by ensuring a better understanding. Besides, these video elements summarize the subject and increase the interest in the course. Some examples of the participant opinions about this matter are given below.

I think videos are more permanent. Because they appeal to the ear and to the eye.

Since videos appeal to several senses, they make the subject more effective and understandable.

I think videos are more effective in all areas since they increase the persistency.

Video was better. Because it summarizes the subject. It enables us to keep the subject in mind by appealing to all senses.

The videos given and visual materials used in accordance with the topic attracted my attention and made me focused on the course.

Considering the opinions of the participants about presentations used in the FC implementations, it is stated that these contents also help increasing the retention of knowledge as video elements by making the content easier to understand. Presentation elements also increase the readiness level and

participation of the students in the class. Some examples of the participant opinions about this matter are given below.

I would prefer presentations more than others. Because they inform us about the content of the course before the class.

I like presentations more... When I first study presentations then watch the relevant videos about the subject, it becomes more durable.

Presentations help me to understand the subject.

I liked the presentations most. Because they inform us about the content of the course. This helps to actively participate in the class by shortening the learning process.

In addition to video contents and presentations, online evaluations in the FC implementations are considered to be encouraging students to make research about the subjects. Some examples of the participant opinions about this matter are given below.

Online questions encourage students to do research. So students spend further efforts to find answers to the questions asked.

4. What are the views of undergraduate students to be considered for the realization of an effective FC implementation?

In the study, recommendations of the participants are also included in order to have a more effective FC implementation. Their suggestions are summarized in Table 7.

Table 7. Suggestions of the participants towards effectiveness of FC

Suggestions for more effective FC	F
Question - answer activities should be increased	5
The proper video type should be selected for the course	4
Subject should be detailed and interesting	4
Special platforms should be prepared for implementations	4
More applications should be included	2
Active participation should be encouraged	2
FC should be preferred more commonly	1
Students should be directed to do research	1
Online discussion activities must be increased	1

Participants stated that increasing question-answer activities before and during the class would increase the effectiveness of FC implementations. What is more, according to them, the proper video type should be chosen to teach the subject and detailed lectures would be more effective. Furthermore, including activities that enable students to participate in the course and encouraging students to do research are also important. Besides, they stated that the environment where the FC implementation is performed is also important and selecting proper environments to perform these implementations would increase the effectiveness of them. Some examples of the participant opinions about this matter are given below.

...More applications can be included in FC implementations.

...We shouldn't proceed to the next topic before finishing the current one by ensuring participation of all students.

Applications need to be more lively and energetic. Interactive videos can be used during face to face courses in the FC implementations.

The contents should be prepared in detail and supported by multimedia elements in accordance with the subject. Pre-course activities and classroom activities should be different.

More striking examples can be given and integrated into everyday life in order to increase interest in the course.

First, the active participation of the students should be ensured. Awards and penalties can be given during the implementations.

4. Results and Discussion

In the present study, it is aimed to present opinions of undergraduate students towards FC practices and determine their different point of views from traditional learning approaches. In this context, the results of the study according to the findings obtained from interviews conducted with the participants are described in categories below.

In this study, opinions of the students about FC implementations were found to be positive and they seem to be fond of this new approach. Using a new implementation in the learning environment may be the main factor that has an important impact on students to like this implementation they are using for the first time.

It is observed that FC implementations have different effects in different stages of the course. It can be suggested that especially pre-course FC implementations help students to increase their readiness level and accordingly improve their self-confidence about the course. Besides, FC implementations also offer students a study environment independent from time and place same as distance education systems. Similarly, Hamdan, McKnight, McKnight and Arfstrom (2013) stated that FC implementations provide a flexible study environment. Additionally, pre-course FC implementations give students opportunity to do research and enable them to learn the subject at their own learning speed. McDonald and Smith (2013) stated that students are active in the FC implementations and these activities facilitate learning. Moreover, presenting the content before the class and offering pre-course activities give responsibility to the students.

The pre-course FC implementations have also some limitations in addition to its advantages. Especially presenting the content of the course before the class reduces the interest of the students. Moreover, online tests and evaluation questions should be more effective and carefully planned. Since online tests and evaluation questions are considered to be effective in ensuring active participation of the students, effective use of these tools will also increase the effectiveness of FC implementations.

It is possible to discuss advantages of FC implementations performed during the face-to-face classes. In that manner, it can be suggested that FC implementations help students to participate in the course. Similarly, Critz and Knight (2013) emphasized that FC implementations help students to learn the subject better and ensure their active participations during the class. Moreover, the increased interest to the course is another result of performing FC implementations. The diversification of class activities are also admired by the students. For all these reasons and because of the changes in the learning environment, providing a fun classroom environment during face-to-face classes is another important benefit of FC implementations.

During face to face classes, it is observed that diversification of the pre-course activities and having different activities is important. Nonetheless, these implementations impose excessive responsibilities to the students and therefore they exceed the optimum level of anxiety. As a result of the pre-course activities, reduced interest to the course is considered as one of the limitations of FC implementations during face-to-face classes. Therefore, it can be suggested that teaching the implementations and missing points in an interesting way during classroom activities would be more effective.

Conducting FC implementations after the class has an important effect on ensuring the durability in particular. As a result of this, the learning process is observed to be shortened. It is considered that allowing students to learn the subject at their own learning speed and consolidating the subjects have important effects to shorten the learning process. Furthermore, considering the entire process, students seem to be more active and their interactions are increased. General results about impacts of FC implementations in different stages of the course are summarized in Figure 3.



Figure 3. *Positive opinions of the participants with regards to the use of FC implementations in different stages of the course*

Newly established FC implementations have many advantages as well as some limitations compared to the traditional learning environments. In this context, it can be suggested that increasing readiness level of the students and ensuring active participation during the class may be considered as the advantages of FC implementations. Bergmann and Sams (2012) stated that FC implementations support active learning process of the students and shape the learning process in accordance with their needs. Furthermore, since the learning process is shortened by FC implementations, retention of knowledge is also thought to be improved (McDonald and Smith, 2013). Since these implementations do not have any time or place requirements, it is also an important advantage compared to the traditional learning environments. FC implementations allow students to learn the subjects at their own learning speed. Furthermore, students seem to be actively participated in the course, more applications are performed and they are encouraged to make research in FC implementations, which suggests that these implementations offer better learning compared to the traditional learning environments. Similarly, in the literature, it is highlighted that using multimedia elements in FC implementations are effective in terms of learning, and students have more time to practice and they take more active roles in the process of learning (Bergmann and Sams, 2012; McDonald and Smith, 2013).

FC implementations have also some limitations in addition to its advantages compared to the traditional learning environments. At this point, especially the need for the Internet and additional hardware such as tablet, computer or cell phone can be considered as the main drawback of FC implementations. Besides, curiosity and motivation in classroom activities may be reduced in this implementations. There is a high possibility of having a boring learning environment if classroom activities are not well-planned and there are many repetitions. Moreover, it can be said that technical problems that may occur in FC implementations may lead to an ineffective learning process by causing incomplete or incorrect learning. Additionally, failing to provide effective guidance to the students in FC environments may also negatively affect the learning process.

In addition to the effects of FC implementation in different stages of the course, the pre-course materials are also considered to be important. The video elements presented in this context are considered to have important impacts in the learning process. Video elements facilitate understanding and therefore increase the retention of knowledge. Furthermore, they summarize the subject and increase the interest of students during the class. However, Zappe, et al. (2009) stated that it is very hard to prepare the video elements and videos especially longer than 20 minutes are not preferred a lot. Similarly, Yıldırım (2014) stated that video elements with a length of 2-12 minutes are considered to be effective in the learning process. Videos prepared by taking these concerns into account and short videos have positive impacts on the level of appreciation. In addition to video elements, presentations seems to have significant impacts in the FC implementations. Presentations are thought to increase the

level of readiness. These contents make it easier to understand and ensure retention of knowledge by increasing the active participation.

Question-answer activities and discussion events should be designed more effectively in order to have more effective and successful FC implementations. Furthermore, the instructional materials to be used should be consistent with the content and the topics should be detailed and interesting for students. Furthermore, active participation of the learners seems to be important to be successful in FC implementations. It can be also said that designing different activities consistent with nature of the course and creating practice environments towards the course are also considered to be important for success of the implementations.

Limitations

Limitations described below is considered to be important within the scope of the study.

- The study was conducted in a single semester.
- The working group was limited to 34 students.
- The Computer Hardware course that was suitable for application was preferred.

Recommendations

The recommendations are divided into two main groups in accordance with the results of the study.

Recommendations for Planners

- Although the students appreciate FC applications in general, it should be noted that the process is very difficult and tough.
- Before conducting FC implementations, the course should be planned in detail and the materials and questions to be used should be carefully organized.
- The multimedia materials should be selected according to the level of students and structure of the subject and they should be interesting and attract attention of students.
- The online tests offered before the class should be well-planned and active participation of all students must be ensured.

Recommendations for Future Studies

- The future studies should include larger sample groups.
- Opinions of students towards FC implementations can be investigated from different points of view by using different research methods.
- Especially opinions of instructors and administrators about FC can be investigated in the learning environments.
- The impacts of FC implementations on different courses can be investigated.
- Studies investigating the impact of multimedia elements used before the class in FC implementations can be conducted.
- Special environments can be created for FC implementations and effectiveness of these environments can also be investigated.

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