The Effectiveness of Flipped Classrooms in the Academic Achievement of University Undergraduates

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ARTICLE INFO	ABSTRACT
	This study aims to investigate the effectiveness of flipped classrooms in improving the achievement of university undergraduates. A quasi-experimental approach was used and three achievement posttests were performed. The participants were 32 undergraduate students at Najran University in Saudi Arabia who in advance were distributed into two groups, the control and experimental. Analysis of the students' achievement grades revealed that the effectiveness of the flipped classroom as a learning method needs time to have an effect on their academic achievement and understanding of the learning materials because of the nature of the approach, which flips the whole learning process. Therefore, students need time to become familiar with this new learning. The results show that there was no significant difference between participants' achievement mean scores in the first posttest at the end of the fifth week based on use of the flipped classroom or of ordinary methods. However, there was a significant difference between students' achievement mean scores in the second posttest in favour of the experimental group students who learnt the course content through the use of the flipped classroom. In addition, there was a significant difference in the participants' mean scores in the third posttest, also in favour of the experimental group. In light of these findings, it was concluded that the instructor and students need to be patient for before the effectiveness of using the flipped classroom learning method is noticed. Moreover, considerable time should be spent on familiarising students with this new learning method.

1. INTRODUCTION

Since the beginning of the 21st century, the world has been witnessing impressive, qualitative and scientific achievements, among which is the educational technology that is now widely used in classrooms and lecture halls all over the world. Therefore, the interest of those in charge of the educational process to improve the level of students' achievement has been continuous and growing, particularly with the spread and development of educational tools. They are continually trying to introduce new technology-based educational methods and procedures in order to reduce the problems of learners' low motivation levels toward study and academic achievement. Many studies have attributed these problems to the teacher-centered rather than student-centered teaching methods used (Farah, 2010). Therefore, such studies have recommended instructors to employ varied educational technology tools inside and outside the classroom to enhance learners' motivation (Abu Moumer, 2017; Abu Laban 2017) and act as a panacea to reduce the shortcomings in education and the mainly face-to-face educational methods used (Ibnian, 2018). Nowadays, such use of new education technology-based methods has been a priority, not a luxury, mainly because of the emergence and ongoing spread of the Covid-19 pandemic. One of these new methods is the use of the flipped classroom (FC), which has made a difference in students' academic achievement (Lofnertz, 2016).

Using the flipped classroom involves facilitating student-student and student-teacher interactions besides enhancing students' engagement in the classroom, enabling motivation towards and in-depth comprehension of the learning materials (Basal, 2015; Choe & Seong, 2016). The approach helps students retain information for a longer time and develop positive attitudes towards their learning (Nanclares & Rodríguez, 2016; Pudin, 2017). It also enables students' advance learning of the lesson content before coming to class, which in turn makes them fully engaged when in class and more active as a result of effective participation in class discussions (Zainuddin, 2017).

Use of the flipped classroom not only helps students to understand the learning content in depth, but also improves their achievement levels and consequently turns the educational process from a teacher-centered to a student-centered one, thus completely changing the roles of the teacher and students (Obari & Lambcher, 2015). Moreover, blending traditional teaching methods and active learning methods makes the flipped classroom an appropriate teaching method (Bishop & Averleger, 2013). Instructors' ability and the opportunity to have more time to work with students who need help in the classroom is the philosophy behind the idea of flipping. In addition, students can work together to solve problems, rather than sitting alone at home doing work that they might not understand. Figure 1 summarises the main activities involved in the flipped classroom. It shows how the approach incorporates the basics of blended learning such as digital learning materials, how reviewing and reinforcing activities take place, and how teacher-student interaction changes (Nwosisi, Ferreira, Rosenberg, & Walsh, 2016)
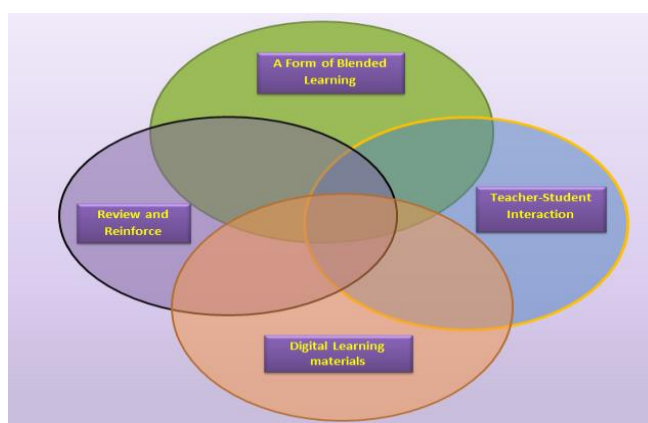

Fig 1. Flipped Instruction

Many studies have indicated that flipped classroom is very impactful and advantageous in different areas. Some studies have shown that flipped classroom is effective in promoting students' academic achievement levels (Vaezi, Afghari, & Lotfi, 2019; Hashemifardnia, Namaziandost, & Shafiee, 2018; Boyraz & Ocak, 2017) generating positive attitudes towards learning various kinds of materials (Al hamadani & Albreki, 2018; Choe & Seong, 2016; Lofnertz, 2016; Evseeva & Solozhenko, 2015; Bouchefra, 2015) reinforcing students' motivation toward learning (Singh & Boisselle, 2018) developing students' ability to comprehend the learning materials (Huang & Hong, 2016) and promoting students' writing abilities (Afrilyasanti, Cahyono, & Astuti, 2017) and engagement in the classroom (Aycicek & Yelken, 2018).

Taking into consideration all the benefits of the flipped classroom in teaching, this study assesses its effectiveness in improving university undergraduates' level of comprehension of the subjects being taught to them during their academic courses. Moreover, it aims to assess the effect the method has on university undergraduates' achievement by the end of the "Strategies of English language teaching and Learning" course offered by Najran University, as shown in their grades in the three posttests which they took during their course.

PROBLEM STATEMENT AND RESEARCH QUESTIONS

Despite the tremendous efforts made by those in charge of the educational process to overcome Saudi students' low motivation levels, many problems still require urgent solutions. The insistence of instructors to using traditional methods is the main challenge faced (Al-Sohbani, 2015). Education problems in the Saudi education regime are not different from those all over the world. Most studies conducted in this area have demonstrated that student-student and teacher-student interactions inside traditional classrooms are not very effective (Alqahtani, 2019). Many conventional teaching methods, such as lecturing, are teacher-centered and so students' participation and engagement in the classroom are limited (Alrabai, 2016). Furthermore, instructors' low qualification levels related to the use of modern technology results in various difficulties when they are asked to adopt new technology-based teaching methods. Therefore, delivering knowledge in interactive and motivating ways that increase students' role in the classroom and give them control over their individual differences is still problematic (Ji & Liu, 2018).

Based on these shortcomings, which affect students' academic achievement, and on the perspective of the advantages of the flipped classroom, the study aims to investigate the effect of this new approach on the academic achievement of Najran University undergraduate students. It aims primarily to establish whether there is any statistically significant difference ($\alpha=0.05$) between the academic achievement of students as a result of using the traditional or flipped classroom methods. To obtain satisfactory results, three questions were posed:

1. Is there any statistically significant difference ($\alpha=0.05$) between the academic achievement of students in the first posttest, i.e. the first midterm exam, due to use of the traditional or flipped classroom teaching method?

2. Is there any statistically significant difference ($\alpha=0.05$) between the academic achievement of students in the second posttest, i.e. the second midterm exam, due to use of the traditional or flipped classroom teaching method?

3. Is there any statistically significant difference ($\alpha=0.05$) between the academic achievement of students in the third posttest, i.e. the final exam, due to use of the traditional or flipped classroom teaching method?

MERITS OF THE FLIPPED CLASSROOM

Since its emergence in education, the flipped classroom has been an example of modern technology use via online videos that are electronically delivered to students before attending class. One of its important advantages is that it helps the teacher deliver the learning content to students before they come to class and to actively interact with them using a set of activities related to the content of the new lesson (Johnson & Renner, 2012). Other studies define the flipped classroom as a teaching strategy that has flipped the dominant traditional ones by making students responsible of their own learning. Therefore, students do their assignments, inquiries, and investigations at home and watch the delivered videos, PowerPoint presentations and read the learning materials. Inside the classroom, students will be ready to solve the problems, analyse the texts, and investigate solutions (Schmidt & Ralph, 2016). More recently, the flipped classroom has been referred to as "A two-component technology-supported pedagogy. The first of these components is the direct computer-based individual instruction outside the classroom through video lectures whereas the second is the interactive group learning activities inside the classroom (Lo & Hew, 2017).

In teaching, the flipped classroom works as a bridge between traditional and modern teaching methods, in which technology is integrated to show the main lesson content. In this way, the whole in class time is completely devoted to discussion and activities using closed-ended videos and quizzes or hands-on exercises (Bishop & Averleger, 2013). Through the videos, students can study at home what their instructor would have explained in the classroom using conventional teaching. In the classroom, students undertake activities and practise what they have learnt at home in a dynamic and interactive manner by themselves changing the role of the teacher into one of guidance and supervision (Sun & Wu, 2016).

A further advantage of the flipped classroom is its appropriateness in overcoming the problems caused by students' frequent absence due to social conditions such as the Covid-19 pandemic. It is also of great benefit for students with learning disabilities (Bergman & Sams, 2014). Teaching using the flipped classroom has many advantages. For example, it guarantees that all students will receive the same learning content, regardless of any barriers. It enables the teacher to identify students' abilities and at the same time allows students to watch the videos repeatedly anytime and in any place. It also promotes students' interaction through peer-based learning and increases students' attention, as they will be trying a new way of learning (Bergmann & Sams, 2012).

Furthermore, the flipped classroom assumes that the effort students make on preparing the material will inevitably help them when they complete the overall work. Finally, it provides more time for self-paced activities, as well as exercises and content review (Hoshang, Abu Hilal, & Abu Hilal., 2021). With regard to higher education institutions, the flipped classroom is a place designed to maximise classroom interaction time and minimise lecturing time. It is also designed to enable more effective interaction, and give more time for the use of extra strategies. Moreover, it replaces the burden of lecturing and assignments with deep teaching and learning. (Demirel, 2016). In brief, it can be argued that the effectiveness of the flipped classroom learning model refers to its role in encouraging students to study the learning material before going to class. In addition, it also plays a significant role in reducing the teacher's dominance in the classroom, resulting in making teacher-student interactions more effective and enjoyable (Purba, Kristiani, Sangka, & Hussain, 2021).

IMPLEMENTATION OF THE FLIPPED CLASSROOM

One important fact that instructors should consider is that the flipped classroom and flipped learning are not interchangeable terms. Flipped learning is an approach that allows instructors to implement a methodology or various methodologies in their classrooms. Therefore, flipping a class by having students read texts outside the classroom, watch supplemental videos, or solve additional problems, does not necessarily lead to flipped learning. Before considering flipping a classroom, an instructor should understand completely the four pillars of flipped learning. First, they need to make the learning environment flexible. That is, the learning environment should enable them to observe and monitor students and make appropriate adjustments providing them with different ways to learn and show their understanding and mastery of the learnt content. In addition, such a flexible learning environment should allow students to interact and reflect on their learning. Second, instructors need to instill in their students the culture of learning, making them responsible for their learning through activities that are meaningful and rich and gradually reducing their reliance on the teacher and making learning student-centered. Third, the teaching/learning content delivered to students should be intentional. Direct instruction must be used in teaching certain concepts and then videos can be employed to foster and practise the concepts learnt. Active learning strategies and student-centered methods can be used to make the content accessible to all students. Moreover, not all instructors can flip learning as flipping learning requires professional educators who are always available during class time to guide their students, whether they are working collaboratively or individually. Instructors must be experts in the way feedback is provided for future instruction evaluation and improvement depending on their observation of the students' work and interaction inside the classroom (FLN, 2014).

Depending on instructors' understanding of the main requirements of flipping learning, they can employ the flipped classroom as a new teaching method by following a set of stages. First, they should choose affordable or free authoring apps to create interactive course content such as videos. They can make the videos more interactive by incorporating questions to evaluate students' knowledge and skills. They should monitor when students log in and out, and how long each one has watched the video. There should be a link to provide each student with verbal or written feedback about their performance. Second, they can utilise collaboration, communication and coaching tools to help students be connected and stay organised in an online classroom before the face-to-face class. They can also use class time efficiently by employing learner-centered activities such as think-pair-share, and including task cards, role play, inquiry-based learning, debate, and reflective thinking practices. Third, they should carefully design the assessment methodology and evaluation criteria for example, evaluation of student logs and assignments, classroom interactions, and relevant questions (Sezer et al., 2017). Figure 2 presents a summary of the activities that instructors can employ to plan for and implement a successful flipped classroom.
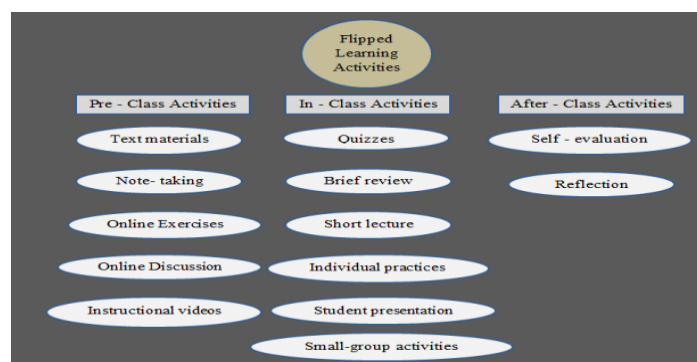

Fig 2. Common Flipped Learning Activities

As shown in Figure 2, instructors can divide the flipped classroom into three stages. Pre-class activities can involve asking students to read text-based materials, take notes, do online exercises, and be involved in online discussion. In-class activities can consist of conducting short quizzes, making a brief review, giving a short lecture, asking students to work individually and in small groups, and ending the activities by asking them to make presentations. The after-class activity phase includes students' self-evaluation and reflection on their learning (Lo & Hew, 2017).

OBSTACLES TO FLIPPED LEARNING AND THE FLIPPED CLASSROOM

With every success, there are many obstacles to be faced. The flipped classroom model is not an exception. Studies in this field have shown that different types of challenges can hinder its success if not overcome. These obstacles can be classified into internal and external ones. Internal ones involve the instructor's attitudes, confidence, beliefs and tendency that makes him unwilling to adopt innovative practices in classroom. External barriers include the lack of support and resources, which may be the main causes for teachers' unwillingness to adopt technology in the classroom. For some, this justification is acceptable and logical, as no instructors have authority or control over such external barriers (Wang, 2017).

Obstacles can also be classified into student-related and faculty-related ones. The most important student-related obstacles are students' conventional view of learning difficulties in becoming accustomed to flipped classroom routines difficulties in staying focused on watching long and boring videos and the need for clearer instructions on how to work productively in groups during class. The time spent at home, and the inability to ask questions immediately during video lectures, also have a negative impact on students' interest in the flipped classroom. Instructor-related obstacles can relate to their misunderstanding of the value of the flipped classroom and lack of instructional videos and handouts. The belief that preparing flipped learning teaching materials needs considerable effort and time have been found to be among the most common faculty-related obstacles (Lo & Hew, 2017).

2.   RESEARCH METHOD

RESEARCH DESIGN

The study adopted a quasi-experimental approach to establish whether the use of the flipped classroom model has an effect on students' academic achievement. The rationale behind the use of this design was its role in the process of identifying dependent and independent variables and the relation between them (Kirk, 1995). Furthermore, random distribution of the students was not possible because they were distributed into group A and group B by the university admission and registration department in advance. Therefore, this design was chosen to be used (Talan & Gulsecen, 2019). Pretests and posttests were conducted to answer the main research question.

PARTICIPANTS

All the students were enrolled in groups A and B in the "Strategies of English Language Teaching and Learning" course in the second semester of the 2020/2021 academic year. Students in group A (N=17) were assigned as the control group and those in group B (N=15) were appointed as the experimental group. The participating students in both groups were purposefully selected as they were all studying the course taught by the researcher.

INSTRUMENTS

Achievement tests were the main instruments used to collect data on the effectiveness of the flipped classroom on the students' academic achievement in comparison to that of conventional teaching methods. Success and failure regulations at Najran University state that each student should take three exams during each academic course, namely a first mid-term, second mid-term, and final exam. Accordingly, the learning materials for the course were distributed in three main stages with each part around five weeks to complete. The first test was held at the end of the 5th week coinciding with the end of the first part. The second test was conducted at the end of the 10th week, and the third one at the end of the course immediately on completion of the third and final parts of the course.

The items in the three achievement tests were prepared based on the desired learning outcomes of the course, as stated in the formal course description. The first and second tests each included (25) multiple choice items. Items in the first test aimed to measure students' knowledge of the concepts of educational strategies, approaches, methods and techniques. Those in the second test intended to measure students' knowledge of main features of the most common approaches to teaching English as a foreign language. The third achievement test consisted of 50 multiple choice items aimed at testing students' abilities in teaching the main language skills, i.e. listening, speaking, reading and writing. Assigned grades were 25, 25, and 50 for the first, second and third exams respectively.

HOMOGENEITY OF THE PARTICIPANTS

The participants were all students in the same academic course, which was their seventh overall. Hence, it was assumed that their academic achievement levels were homogeneous, since they all had studied and passed all the requirements of the course in which the experiment was conducted. Nevertheless, they all sat for an online test in English language and structure to ascertain their homogeneity. The mean scores of the students' grades in this pretest are shown in Table 1.

Table 1. Mean scores and standard deviations of students' grades in the pretest

Group	N	M	SD	Standard Error Mean
Control	17	28.00	1.06	0.26
Experimental	15	28.13	1.25	0.32

The results in Table 1 show that the mean scores of the students' grades in both groups were approximately the same; M=28.00 for the control group students, and (M=28.13) for those in the experimental group. To determine whether this slight difference was significant, T- test for the independent samples was conducted. The results are shown in Table 2.

Table 2. T-test results for the difference between the mean scores of students' grades in the pretest

Group	N	M	SD	Mean Difference	T	Sig.
Control	17	28.00	1.06	0.13	0.327	0.746
Experimental	15	28.13	1.25			

Analysis of the data in Table 2 indicates that there was no significant difference in the mean scores of the students' grades in both groups. In other words, they were equivalent prior to the experiment taking place.

COURSE IMPLEMENTATION

Online learning was used for both groups because of the general closure caused by the Covid-19 Pandemic in the time of the study. Therefore, all instructors and students at the university employed the Blackboard educational system, which uses Learning Management System (LMS) tools, whose effectiveness in teaching and developing students' skills in various learning aspects was emphasised by Masadeh and Elfeky (2016). In addition, Blackboard, with its numerous software tools, makes virtual classes possible by the use of software called "Blackboard Collaborate", without which learners and instructors would not be able to take part in the classes. These tools involve links to Blackboard Collaborate, announcements, blogs, course messages, course portfolios, discussion boards, self and peer assessment, emails, tasks, tests and surveys, a grade centre, and content.

Using Blackboard, the course learning materials were uploaded to the course content area, after being distributed for use in twenty-eight lectures where sessions held twice a week for 14 weeks. Each session lasted for 75 minutes. An online learning environment was designed for both groups because traditional face-to-face lectures were not possible because of Covid-19 when the study was conducted.

Students in the control group studied the course content through conventional teaching methods; i.e. PowerPoint presentations by the instructor, followed by whole class discussion and questions. After class, students were expected to take part in certain learning activities at home and to submit their assignments as usual. The electronic content of each lecture was uploaded to Blackboard in the course content area. Each student had to access and follow up the course e-content of each lecture by signing into Blackboard using their usernames and passwords. Subsequently, they could choose the course by looking for its code and section. Using the course tools, they could click on Blackboard Collaborate and join the course classroom. On doing so, they could share the microphone and video; chat with the instructor and peers; raise their hands in relation to any queries or notes; use the information and files board to upload and/or download files; and take part in other tasks and activities as required by the instructor.

At the beginning of each session, the instructor used to comment on the previous lecture activities and on students' performance. He then began presentation of the lecture subject and discussed it in sections without the need for students' advance content preparation. In the remaining few minutes, questions were asked to check students' comprehension and to summarize the topic. Assignments were submitted via the assignment link in the course content area. A kind of delayed feedback about each student's performance and assignments using the grade centre link was sent to each as soon as their submission was complete.

On the other hand, students in the experimental group learned the course content through the materials prepared and delivered to them prior to the lecture in the context of the flipped classroom, and so they actively participated in the learning activities. Figure 3 indicates the activities undertaken throughout the course. That is, the same activities were employed in teaching the learning materials for each topic.

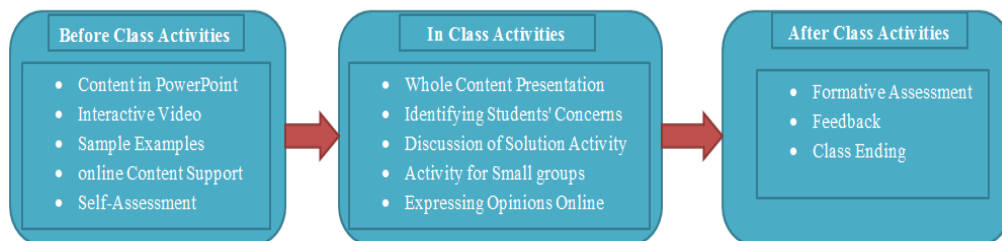| Before Class Activities	In Class Activities	After Class Activities
• Content in PowerPoint • Interactive Video • Sample Examples • online Content Support • Self-Assessment	• Whole Content Presentation • Identifying Students' Concerns • Discussion of Solution Activity • Activity for Small groups • Expressing Opinions Online	• Formative Assessment • Feedback • Class Ending

Fig. 3: Summary of the activities in the context of the flipped classroom during the whole course

To join the course class, students in the experimental group followed the same steps as their peers in the control group. Nevertheless, the way the lectures were delivered was different. The content of each lecture was delivered to students through a video downloaded from You Tube, a PowerPoint presentation, a short quiz, and a group discussion, which were uploaded onto the course content area a day before the class using the Create Content icon. This gave the students the opportunity to review and study the content thoroughly at their own pace and come to class well-prepared, having fully understood the details.

Therefore, each student could review the content of each lecture by sharing knowledge through the discussion board and student-student and student-instructor interaction. At the end of each topic, the students were asked to complete a short quiz using self or/and peer-assessment links, tests, surveys, and polls. Feedback on students' performance was provided immediately during the online lecture. Ideas concerning the lecture content were discussed through the discussion board or the course classroom, where they could use their microphones and cameras. Assignments were sent to students via the task link attached to the course content. For further explanation, students were encouraged to contact the instructor through course messages or email outside lecture time.

3. FINDINGS

Once the course ended and students had finished their third test by the end of the academic semester, their grades on the three tests were documented and analysed. Mean scores, standard deviations and a t. test were used to make the required comparisons between the students' academic achievement levels to determine if there were significant differences in these due to the use of either the flipped classroom or conventional teaching methods.

FINDINGS ON STUDENTS' ACHIEVEMENT IN THE FIRST POSTTEST

Details of the collected data with regard to students' grades in the first achievement posttest in both groups are shown in Table 3.

Table 3: Mean scores and standard deviations of students' grades in the first achievement posttest for both groups

Group	N	M	SD	Std. Error Mean
Control	17	18.94	2.26	0.57
Experimental	15	18.80	2.31	0.60

The results in Table 3 indicate that the mean scores of students' grades in the first achievement posttest, namely the first mid-term exam, were M=18.84 and M=18.80 for students in the control and experimental groups respectively. That is, there was no major difference as a result of use of either traditional teaching methods or the flipped classroom. A T-test for the independent samples was also conducted to ascertain whether the difference is significant. The results are presented in Table 4.

Table 4: T-test results for the difference between the mean scores of students' grades in the first achievement posttest

Group	N	M	SD	Mean Difference	T	Sig.

Group	N	M	SD			
Control	17	18.94	2.36	0.14	0.171	0.866
Experimental	15	18.80	2.31			

The results of the T-test shown in Table 4 demonstrate that there was no significant difference between the mean scores of students' grades in the first achievement test in both groups. In other words, use of the flipped classroom was not effective in improving the achievement of students in the experimental group.

FINDINGS ON STUDENTS' ACHIEVEMENT IN SECOND POSTTEST

Descriptive statistics of the data on students' grades in the second achievement posttest in both groups are shown in Table 5.

Table 5: Mean scores and standard deviations of students' grades in the second achievement posttest for both groups

Group	N	M	SD	Std. Error Mean
Control	17	18.18	1.85	0.45
Experimental	15	21.33	1.18	0.30

The statistics in Table 5 indicate that the students' mean scores in the second achievement posttest, namely the second mid-term exam, were 18.18 for the control group and 21.33 for the experimental group. That is, there was a difference in the achievement level of students in the control and experimental groups in favour of latter. In order to understand if this difference was statistically significant, a t- test for the independent samples was conducted. The results are presented in Table 6.

Table 6: T-test results for the difference between the mean scores of students' grades in the second achievement posttest

Group	N	M	SD	Mean Difference	T	Sig.
Control	17	18.18	1.85	3.16	5.682	0.000
Experimental	15	21.33	1.18			

The results presented in Table 6 show that the difference between students' scores in the second achievement posttest was statistically significant and in favour of those in the experimental group. In other words, the achievement level of students who were learning through the flipped classroom approach was superior to the that of their peers in the control group.

FINDINGS ON STUDENTS' ACHIEVEMENT IN THE THIRD POSTTEST

The mean scores and standard deviations of students' grades in the third achievement posttest for both groups are shown in Table 7.

Table 7: Mean scores and standard deviations of students' grades in the third achievement posttest for both groups

Group	N	M	SD	Std. Error Mean
Control	17	37.06	3.56	0.86
Experimental	15	42.13	2.59	0.67

The statistics in Table 7 show that the mean score of students' grades in the third achievement posttest in the experimental group M= 42.13 was superior to the that of their peers in the control group M=37.06. That is, use of the flipped classroom led to a significant difference in the experimental group students' understanding of the course content. To ascertain if this difference was significant, a t. test for the independent samples was conducted; the results are presented in Table 8.

Table 8: T- test results for the difference between the mean scores of students' grades in the third achievement posttest

Group	N	M	SD	Mean Difference	T	Sig.
Control	17	37.06	3.56	5.07	4.555	0.000
Experimental	15	42.13	2.59			

The results of the t- test shown in Table 8 indicate that the difference between the mean scores of students' achievement was significant and in favour of the experimental group. The superior achievement level was due

to the use of the flipped classroom. that is, this method was more effective in improving students' academic achievement compared to conventional approaches.

4. DISCUSSION

The main aim of the study was to identify the effectiveness of using flipped classrooms in developing the academic achievement level of university undergraduates in comparison to that of using conventional teaching methods. All the participants in the two groups took three achievement tests. The main aim of these was to understand how and when improvement in students' achievement in line with the use of the flipped classroom took place during the course.

The first achievement test was conducted at the end of the fifth week to investigate the effect that the use of the flipped classroom had had on students' understanding of the learning materials in the first part of the course. Data analysis of the students' scores showed that there was no significant effect of its use. Nevertheless, the mean score of the students in the control group (M=18.94) was slightly higher than that of those in the experimental group (M=18.80). However, the difference between the two means was not significant. In other words, there was no evidence that either the flipped classroom or the conventional teaching method generated any improvement in students' achievement.

To interpret this result, it can be asserted that students in the experimental group were still treating the flipped classroom as an ordinary teaching method. For them, it was a new approach to learning, so it was difficult for them to use or even accept it. In addition, application of the method was not easy and could not have been successful unless the targeted students were convinced and well-prepared for it. More effort is needed from learners and instructors to formulate the learning materials before any session takes place, whereas using conventional teaching methods is easier and more common (Hoshang et al., 2021). Moreover, the creativity of the instructor in designing the teaching-learning process, the use of different kinds of media for the outside classroom interaction, and the sharing of videos related to students' learning might have been insufficient (Halili & Zainuddin, 2015).

The quality of the downloaded and shared videos might have been poor, so students' interest and attention were low (Milman, 2012). In addition, the idea behind using the flipped classroom might not be clear in relation to the enhancement of learning, and it should not be used as a means to just record boring class lectures and force students to watch them on their own time (Schmidt & Ralph, 2016). Internet access where students live could also be a significant cause of difficulty for students to watch the instructors' videos. Moreover, the focus of the instructor could be on downloading or creating instructional videos without paying attention to teacher-student and student-student interactions outside classroom time, with the result that their role is not one as facilitator of the teaching activities (Tucker, 2012).

On the other hand, flipped classroom implementation not only requires the instructor's knowledge of how video lessons are managed, but also the knowledge about how to interact with students in and out of classroom (Sams & Bergmann, 2013). Other factors such as the lack of access to technology at home and the conviction that assignments needlessly rob students of their free time are also important sources for the failure of flipped classrooms (Nielsen, 2019). It should not be forgotten that the sudden increase in students' workload is significant and negatively affects their acceptance of the method (Tune, Sturek, & Basile, 2013).

In short, the lack of experience of students and instructors may contribute to the ineffectiveness of the flipped classroom. Students first need to understand the aims and procedures of the approach, and then change their belief that it is different to any teaching method they are accustomed to. Likewise, instructors, before employing the flipped classroom, need to change their students' opinions and attitudes toward such a new teaching method. They must prepare their teaching content in a way that fits students' needs, interests and learning culture and must be patient as understanding the needs, interests and potential of all students does not occur overnight.

However, the analysis of the students' mean scores in the second and third tests revealed that the achievement levels in the experimental group were better than those of their peers. In other words, use of the flipped classroom was effective in promoting students' academic achievement. This improvement can be attributed to the instructor's and students' understanding of the way in which flipped classrooms are conducted. It can be argued that some weeks after becoming competent, the instructor became more responsive and well-

trained, resulting in an improved ability to maintain students' engagement and interaction. Their classroom management works as a source of inspiration for students enabling them to handle the learning content very well, understand their roles, and feel self-confident. Moreover, the instructor's experience would empower them to carefully design and choose videos, with the result that students would be more and more eager to watch them through.

With regard to the present study, it can be argued that the developed instructor's experience in the production of learning contents after some weeks of using flipped classrooms became accurate, stimulating and pertinent. Therefore, this experience could make student-teacher and student-student interactions more effective and encouraging. Assignments that were to be done either individually or in groups reassured the students and led to their acceptance of the flipped classroom. These findings match the recommendations of Khairudin, Khairudin, Salleh, & Ibrahim (2017) regarding effective and successful flipped classroom implementation.

Furthermore, it is not easy to change students' attitude within a few days or sessions, so no clear improvement in their achievement levels was at first noticed, as shown by their grades in the first posttest. But with time, the effective and attractive design of the learning content, the technology use design, active learning, motivation, guidance, and self-regulated learning played significant roles in student and instructor's use of the flipped classroom. These success factors corroborate the argument of Liu, Ripley, & Lee (2016). Moreover, variation in the learning content, such as using worksheets together with the videos, as proposed by Szparagowski (2014), could motivate completion of work. Instead of presenting learning problems to students, they were asked to solve them themselves. Insistence that the students used the forums attached to the Blackboard system, which was the main means of teaching, yielded fruit, and is completely in line with the findings of Sirakaya and Özdemir, (2018) because of their benefits in encouraging students to answer questions, summarise the video content, and discuss open-ended questions.

The gradual satisfaction of the students with the flipped classroom was able to generate a high level of motivation, which made a big difference to their achievement. This result agrees with the findings of Shukla and Mcinnis (2021). The kind of teaching activities employed could enhance students' achievement because they aimed to change their roles, taking into account the importance of technology adoption in life, as stated by Rotellar and Cain (2016). Reciprocity of self-regulated learning, as argued by Kim, So, & Joo (2021) helped the students discover the different opportunities provided by the flipped classroom and to achieve the course goals previously developed.

5.   CONCLUSION

The study has investigated the effectiveness of flipped classroom use in promoting university undergraduates' academic achievement during a whole semester, i.e. 14 sessions. During these sessions, three achievement tests were conducted. The comparison between the achievement results of the students in the control and experimental groups proved that it was not easy to produce an effect on students' achievements when the flipped classroom learning method was first used. The comparison after five weeks of using the approach showed no significant difference between the students' achievement mean scores. However, a comparison of students' results in the second test that was conducted in the last session of the tenth week showed a significant effect on students' achievement levels in favour of those in the experimental group. In addition, a comparison of the mean scores in the third test at the end of the course also indicated that the achievement level of the experimental group students was superior to that of their peers in the control group. These results demonstrate that it is unlikely that the use of any new learning method, the flipped classroom for example, will make any difference in students' learning when first used, because students first need to be satisfied with the approach. Nevertheless, effectiveness needs time to materialise and students need to be accustomed to the new learning environment. Even the instructor has to be careful and aware of the effective design of the learning content, mainly the activities that aim to transform the educational process from being teacher-centered to student-centered through teacher-student role exchange. Insistence and perseverance are needed for success to occur. Created or downloaded videos should be interesting, active and take into consideration students' attitudes, interests and needs. Assignments that students need to do at home should be

serious, but not impinge on their after study time without showing any benefit.

In addition, changing students' conviction regarding the way they learn does not take place at once. It is difficult to make them adopt and like any new learning/teaching method, especially if they have been accustomed to conventional methods for a long time. In short, flipping learning is a job that not any one can do as it requires a flexible learning environment, learning culture, intentional learning materials, and a professional instructor. Therefore, it would be a risk for instructors to use the flipped classroom unless they are aware of and can manage the four pillars, i.e. flexible environment, learning culture, intentional content, and professional educator.

Therefore, people in charge of the educational process and regime should pay attention to teachers' training if they genuinely seek to maintain and develop the educational process and mainly students' achievement. Instructors can not develop themselves without help from experts, in addition to financial incentives in order to be able to design and create learning materials by themselves. Schools and higher education institutions should establish learning environments in which instructors and learners can meet and practise using new teaching methods that are technology-based. Otherwise, dependence on traditional teaching methods will continue and none will benefit from the results of the numerous studies conducted.

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