Application of Flipped Class Room (FCR) and Task Based Approach (TBA) to Improve Learning and Knowledge in Engineering Education

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Abstract: In today's dynamic world, the old traditional teaching methods no longer work. For a good teacher, the success depends upon many principal fundamentals and creating an adaptive learning environment for his students to acquire knowledge. It has been reflected during teaching one of the course in College of Engineering at Prince Sultan University, Riyadh that the students were not comfortable with the theory lectures whereas they feel comfortable while playing with number, meaning that their engagement in numerical problems. Flipped Class Room (FCR) and Task Based Approach (TBA) have been used for this research. It has been observed that motivating the students to read the topic in advance as a flipped classroom approach has produce satisfactory results whereas group task project as TBA approach significantly produced even better results for the identified problem. It has been concluded that Task Based Approach (TBA) should be promoted and applied for subject contains theory. It has been analyzed that the students acquire constructive knowledge and learning in TBA rather than traditional teaching strategy and flipped classroom approach.

Key words: Flipped classroom, task based approach, action research, academia, knowledge, adaptive learning

INTRODUCTION

Changes in student demographics, economic climate and technologies have reformed modern-day educational environment in comparison to what it was perceived before a decade. Consequently, most educators consider new models of education to produce successful graduates in today's society. While, similar technical viewpoints have existed for decades, formal methodology reduces a contemporary approach for education schemes. Education is always known as one of the elementary requirement for human and it also helps in social uplift and poverty eradication (Sivakumar and Sarvalingam, 2015). The inclination of private institutions is to acquire their specialty areas to make either profitable or non-profit businesses (Wilkinson and Yussof, 2005). The institutions offering higher education needs to recognize the significance of building an attractive image of quality education (Briukhanov et al., 2010). With quality higher education, students can acquire knowledge, skills and key transferable skills.

In recent decades, standards of higher education have focused on the likely significance of student centered learning environments where students are vigorously involved in greater level and supports their own learning. Student centered learning environments require implementation of new strategies in teaching to make an active class. The strategies include involvement of student presentations, working in groups, self-assessment, peer learning and group discussions. However, constructing such academia environment remains a challenge. Educators are not essentially ready to implement new pedagogies to support the increased duties and responsibilities associated with student centered learning. It has been witnessed by problems encountered in the design and learning support student centered. The environment created by higher education institutions influences the perception of quality students. Students, who study in universities that support high level of quality of education, in general have a higher level of perception for the quality of education. Therefore, university authorities should ensure a positive learning

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environment for students (Akareem and Hossain, 2016). To ensure the quality of higher education, quality control is necessary. Woodhouse (1998) defines quality as purpose fulfillment and the processes and procedures to achieve it as quality assurance.

The flipped classroom model intended to enhance active learning via interactions during class while moving content from teaching outside the classroom. It is usually achieved with the help of technology such as pre-recorded video and lectures (Koo *et al.*, 2016). Flipped classrooms have become gradually famous and occasionally controversial as well in the institution offering higher education. Various educators have plugged the potential benefits of this model and results went primarily positive in the initial research regarding implementation of it. Enhanced student engagement with content, larger and constructive faculty contact with students is the rationale behind flipped classroom methodology (Rotellar and Cain, 2016). The flipped class room model flips traditional in-class lectures with joint events has acquired numerous followers. Nevertheless, review of existing literature shows that this approach is still underutilized and its full implementation is under attention for institution offering higher education (Chen *et al.*, 2014).

Flipped classroom models have attempted to address these challenges by allocating more class time to active learning approaches and leveraging the accessibility of advanced technologies to support a blended learning approach. FCR approach allows students to access online lectures before class sessions so that students can make themselves ready to participate in more interactive way during the class. It helps students to make discussions and debates. Unlike traditional classroom approach where tutors deliver lecture in class and students take notes and complete assignments at home. Today, definition and coverage of flipped classroom approach is different because it has many names and approaches (Koo *et al.*, 2016). Students have the opportunity to be more active and interactive through group activities rather than passively listening to lectures. Teachers are also able to devote more time in class to assess student achievement and provide instant and adaptive feedback to an individual or group of students (Davies *et al.*, 2013; Fulton, 2012; Hughes *et al.*, 2012; Zappe *et al.*, 2009).

FCR has heavy reliance on student motivation. It recognizes that everyone learns at different rates, so, it uses a learning style to self-rate education. This approach operates on the principle that students are motivated. Some students are not as motivated as others and this method of teaching can decrease the motivation of students. While tutors can judge where each student is in

his or her learning level stands and even group them accordingly, it would be difficult to ensure that everybody learns at a persistent pace. A review of previous studies showed that FCR is still underutilized and underused as part of higher education (Demetry, 2010).

In task-based learning approach, functions are important to the learning activity based on principle that students can study efficiently when his mind is dedicated on the task assigned. A task is a "work plan", that is, it takes the form of material for research. Students can succeed in executing a task successfully. The truth of the matter is that there are ups and downs to each educational model including the FCR. However, educators should consider diversified models and approaches in their teaching methods to ensure the best balance of students and themselves.

This study evaluates the performance of both approaches in high education especially in theoretical classes. This will help the teachers to take proper decision while choosing approach for theory class in high education. It will also help them to make a constructive learning approach in their class to enhance the learning and knowledge of students.

Problem statement: It has been reflected that the students are not feeling satisfactory after lecturers that contents theoretical topics mostly. It has been observed that after first assessment of the student that most of them just memorize or cram the theory topics to pass the exam only. This is perceived to be for short period of time. It was also analyzed that the students are quite comfortable with lectures containing numerical mean involvement of numbers. It was also evident from the second assessment result. Hence, it is important to investigate this problem so as to improve teaching strategies in certain scenarios.

MATERIALS AND METHODS

Initially, flipped classroom approach was adopted to analyze the results. It has been suggested that students read the lecture topic in advance and in connection to that lecture handouts and relevant reading material were uploaded on Learning Management System (LMS) in advance. In the second phase, task/activity based approach was adopted to analyze the results. In this regard, different groups were made in the class. Each group with 4-5 members and they were suggested to give presentation on a theoretical topic (covered already) assigned to each group. The 3 week's time was given to the students for preparation of this task. The students were also encouraged to ask questions from each other.

Finally, reward question was asked at the end of each topic in the class as a task based approach and a small bonus was introduced on it periodically.

Data analysis: The flipped classroom approach was accessed from the quizzes results and classroom feedback (both from students and peer reviews). Group assignment as a task based approach was analyzed by researchers and reviewers. Two faculty members were invited to review the presentations and were also finally assessed by major exam. Reward question approach as a task based approach was also analyzed by the class teacher during the class response to reward questions. Anonymous survey was also carried out to analyze the gaps in the existing teaching methodology so as improvement can be made in the existing teaching methods and learning strategies.

RESULTS AND DISCUSSION

A set of 4 basic questions were asked from the students regarding the difficulties faced by them in class. Following pie charts shows the results (Fig. 1).

The results show that 71% of the students in class were not comfortable and happy with the theory lecture teaching method and plan. Only, 29% believes that existing approach is satisfactory. Meanwhile, all students want their teacher to change the teaching strategy and method for theory class. The results also show that 93% of the students in class were comfortable and happy with the numerical lecture with same teaching method and plan. Only, 7% believes that existing approach is not satisfactory. Similarly, only 21% of the student's strength wants their teacher to change the teaching strategy and method for numerical class. Hence, it is significant to identify the gape in the existing teaching method with reference to theory lectures.

Results of flipped classroom approach: For case study, FCR has been introduced in the class. The class has total strength of fifteen students. The students were advised to read the lecture in advance using LMS. After 20 lectures, the students were assessed to analyze the performance of FCR approach. The names of the students are not displayed to maintain the confidentiality. Table 1 shows the results of assessment after FCR. To analyze the difference between the assessment marks. Figure 2 shows the results of assessment after FCR with total marks as benchmarked.

Results of assessment after FCR were not that satisfactory meanwhile it was also observed that most of the students wrote exactly as written in the lecture notes.
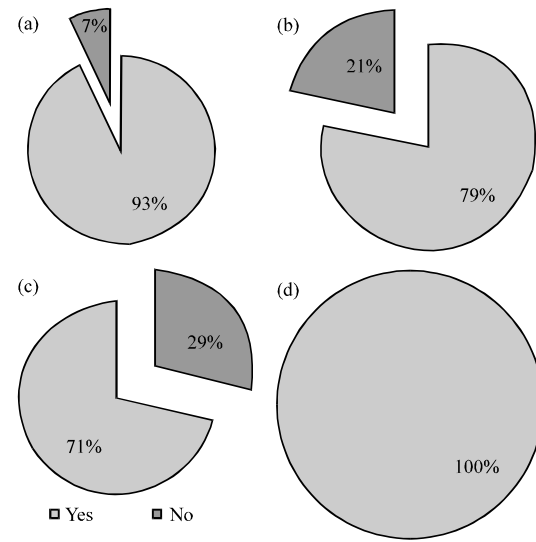

Fig. 1: General class survey: a) Are you comfortable with numericals in the subject? b) Do you think the teacher should change the method for numerical lectures? c) Are you comfortable with the theory lecture? and d) Do you think the teacher should change the method for theory lectures?

Table 1: Assessment results after FCR

Term 142 (10)	Term 151 (10)	Term 152 (10)
6.5	8	2
1.0	6	5
8.0	7	8
6.0	6	4
8.5	8	6
5.5	4	5
5.0	3	7
6.0	6	5
7.0	7	7
7.5	9	6
7.5	2	7
7.5	1	6
9.0	9	4
8.5	8	7
3.0	7	6

Similarly, Task based Approach (TBA) were also introduced in the class to observe the performance of the students and method. Table 2 shows the assessment results after TBA.

To analyze the difference between the assessment marks. Figure 3 shows the results of assessment after TBA with total marks as benchmarked.

Results of assessment after TBA were better and satisfactory meanwhile it was also observed that students made versatile discussions which were not part of lecture notes but it was the group discussions and cross questioning made by them during preparation of different topics. Finally, to get a clear picture of both assessments, theory question results of both assessments were
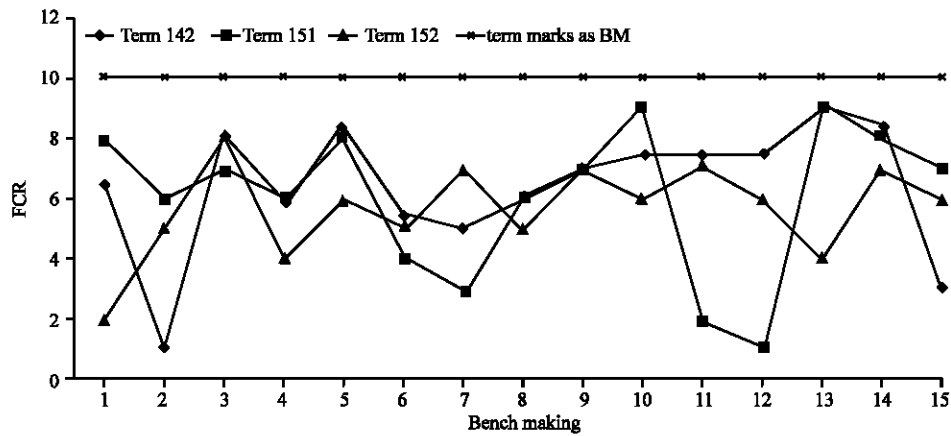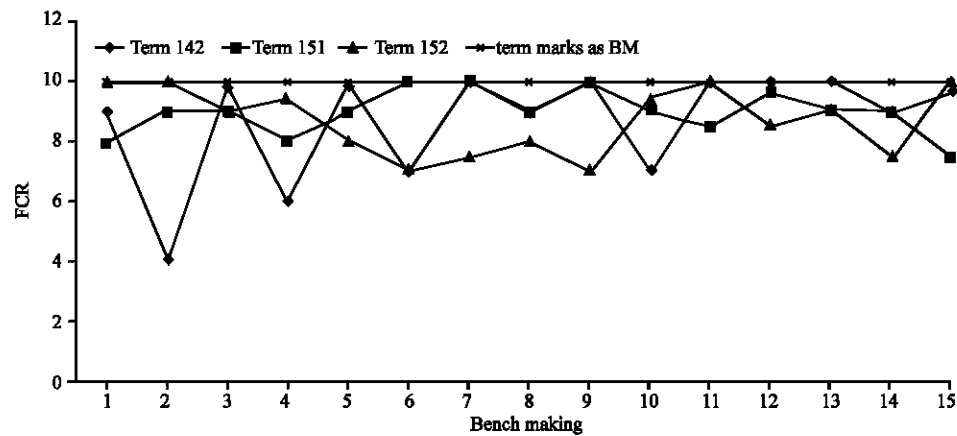
Fig. 2: Bench marking of assessment, FCR

Fig. 3: Bench marking of assessment, TBA

Table 2: Assessment results after TBA

Term 142 (10)	Term 151 (10)	Term 152 (10)
9	8	10.0
4	9	10.0
10	9	9.0
6	8	9.5
10	9	8.0
7	10	7.0
10	10	7.5
9	9	8.0
10	10	7.0
7	9	9.5
10	8.5	10.0
10	9.5	8.5
10	9	9.0
9	9	7.5
9.5	7.5	10.0

Table 3: Synthesize assessment of FCR and TBA

FCR marks 142 (10)	TBA marks 142 (10)	FCR marks 151 (10)	TBA marks 151 (10)	FCR marks 152 (10)	TBA marks 152 (10)
6.5	9.0	8	8.0	2	10.0
1.0	4.0	6	9.0	5	10.0
8.0	10.0	7	9.0	8	9.0
6.0	6.0	6	8.0	4	9.5
8.5	10.0	8	9.0	6	8.0
5.5	7.0	4	10.0	5	7.0
5.0	10.0	3	10.0	7	7.5
6.0	9.0	6	9.0	5	8.0
7.0	10.0	7	10.0	7	7.0
7.5	7.0	9	9.0	6	9.5
7.5	10.0	2	8.5	7	10.0
7.5	10.0	1	9.5	6	8.5
90	10.0	9	9.0	4	9.0
8.5	9.0	8	9.0	7	7.5
3.0	9.5	7	7.5	6	10.0

compared. Table 3 shows the results of combined assessment (FCR and TBA). To analyze the difference of both assessments, comparative results have been discussed for each term. Figure 4 shows the synthesize results of both assessments after FCR and TBA for terms 142, 151 and 152, respectively.

It is evident from figures that TBA has made significant changes among the students overall grade as they were able to solve theoretical topics in a better way and were able to secure better grades. The study was conducted in a same course at 3 terms with same
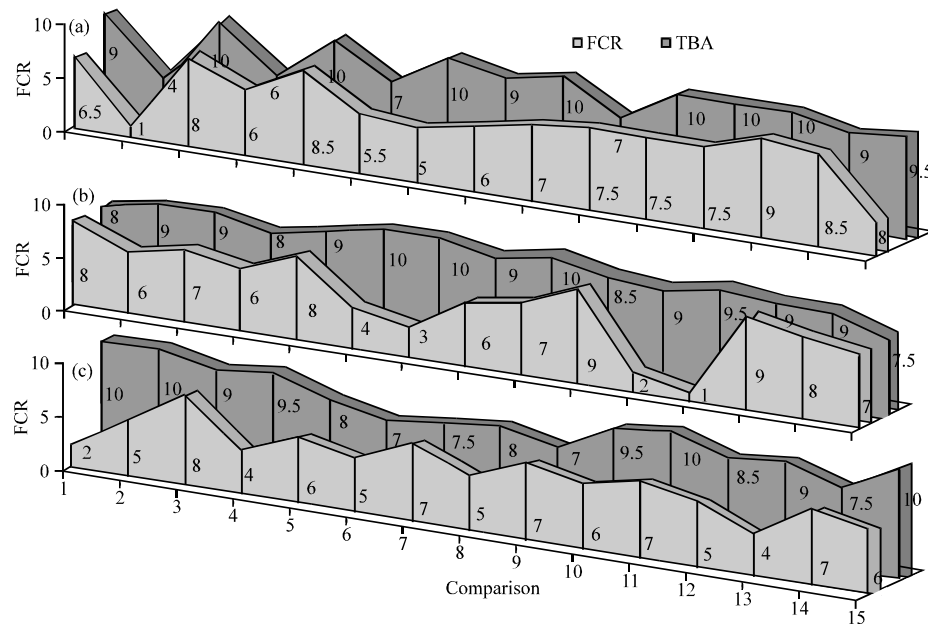
Fig. 4: Comparison of FCR and TBA Assessments for term 142, 151 and 152, respectively
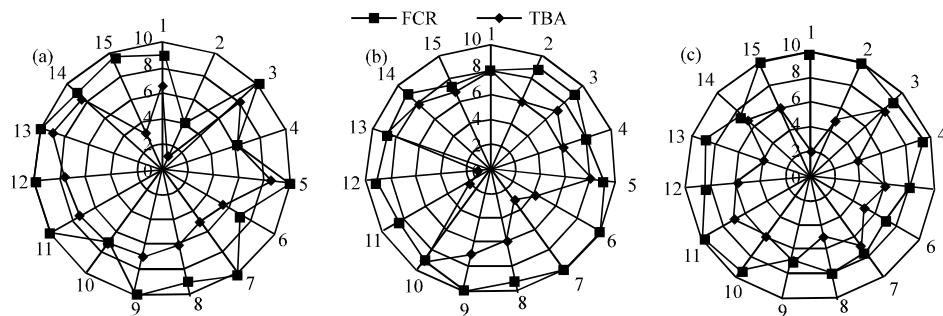

Fig. 5: a-c) Contrast Analysis of FCR and TBA Assessments for term 142, 151 and 152, respectively

faculty member teaching the course. It is evident from the results mentioned in Table 3 that TBA raises the student's interests in the courses of theoretical nature as students have small tasks set as milestones. It is suggested, to plan the tasks for theoretical courses accordingly in order to overcome the problem of lower outcome achievements especially in subject's contents more theory. An increase of 2-31% between FCR and TBA supports the argument of using TBA approach in theoretical course settings. Tasks like group or individual reading assignments along with presentation provided the students a better learning environment at graduate level theoretical courses.

As mentioned, it was realized while teaching theoretical course that students don't perform well in traditional class room settings and it is also shown in their assessments. In order to enhance the student participation and learning in theoretical courses task based approach was introduced in term 142 and it shows an increase of student grades by almost 23% and also increased interest in subject was noted administered by student feedback and peer reviews. Same approach was then adapted in two subsequent terms and showed promising results for each student that can be seen in Fig. 5 through contrast analysis of individual students for both approaches.

CONCLUSION

It has been analyzed that FCR has significantly less satisfactory results when compared with TBA. TBA has been proved to be an effective approach to enhance learning and knowledge of students in theory classes in higher education institutions. A comparative study has

also been carried out between FCR and TBA results. Significantly better results were obtained in TBA especially for theoretical topics which have been analyzed in this action research.

Teaching is hard work and some teachers never get anything better than mediocre. They do the bare necessities and very little more. A good teacher works tirelessly to create an exciting, challenging and nurturing learning class environment for his students. It is observed student-centered learning environment encourages students to become active learners and to be responsible for their own learning. It also requires that teacher should take the role of facilitator rather than material presenter. In such a role, it is observed that providing information and guidance aimed at supporting students to participate actively by so doing, students would develop self-confidence and good interpersonal skills. It is shown that students involvement, through the application of an action research practice by gradually introducing positive changes and by addressing some negative issues when observed through consistent feedback from peer reviews and students evaluation will uplift teaching level in high educational institutions.

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