

TEACHING ANATOMY TO MEDICAL STUDENTS THROUGH FLIPPED CLASSROOM WITH GAMIFICATION APPROACH

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Abstract— Objective: To assess the effectiveness of 'Flipped Classroom with Gamification Approach' for teaching anatomy to first year medical students by comparing the students' performance in Traditional, Flipped and Flipped classroom with Gamification approaches.

Methodology: This was a Quantitative Experimental study conducted in undergraduate students for teaching anatomy in a private medical college of Lahore, from 16th July -31st August 2018. Intervention was flipped classroom and Gamification technique; Only knowledge content was assessed that is why the tool used for assessment was MCQ's. N=155 students of 1st year MBBS enrolled were divided randomly into three groups Group 1(Traditional n=50), Group 2(Flipped only n=50) and Group 3 (Flipped with Gamification n=50). Shapiro-wilk and Kolmogorov-smirnov test were applied to check the normal distribution of pre-test and post-test scores. A paired sample t-test to compare pre and post test scores resulted in significant decrease in the control groups while Experimental group had a significant positive change in their confidence and learning.

Results: Overall response rate is 98%. Findings of the study showed that students studied in Group 3(i.e. Flipped with Gamification) achieved the highest scores in post-test, compared with the other groups. Mean difference of Group 3 is (MD=-6.100) compared to Group 1(Traditional) which is MD=-1.040. Similarly, when compared the Flipped only (Group 2) with Traditional (Group 1), Group 2(Flipped only) showed MD=3.180 and paired sample t-test shows p-value=.000 of all three groups, thus evident from the statistics that students of group 3(Flipped with Gamification) achieved high scores as compared to other 2 groups.

Conclusion: This is a true student centered blended learning technique in which students actively took part in different activities and discussions and helping the students in retaining the information in long term memory. The role of teacher is more of facilitator. In future this teaching approach can be implemented for teaching medical students.

Index Terms— Flipped classroom, Gamification, Effectiveness

1 INTRODUCTION

Acquisition and retaining of knowledge is a big challenge for students from the start. Medical Students are making efforts from many years to make things interesting for them. (De, Corell, Regueras, & Verdu, 2018)[4] Now with the emerging trends in medical education use of different teaching and learning techniques provide different opportunities for students to gain knowledge and to retain the knowledge content for longer.(De et al., 2018) [4]

The students entering in first year MBBS are often unfamiliar with the new environment of medical college, they are unable to recognize the techniques that upgrade their learning skills and are unfit to assess their own particular learning abilities. (Strayer, 2012)[12]

Different teaching and learning strategies are being introduced in recent years to involve the students actively, as trends in medical education are changing day by day.(Lage & Platt, 2015)[7] Flipped classroom with Gamification is a new teaching strategy introduced from last few years, in which class time can be used for interactive sessions and problem solving. (Sohrabi & Iraj, 2016)[11] The idea is to design different study based games for the students, aligned with learning objectives, which encourage and motivate them to actively participate in class and helps them to retain the content for longer duration. (Hung, 2015)[6]

Flipped classroom with Gamification is the teaching methodology which helps students to become deep learners and take more interest in the subject.(Subhash & Bapurao,

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2015)[13] It is characterized as an instructive strategy which comprises of two sections: Different learning activities in small groups inside the class and introduction to the study material outside of class: course book readings, address recordings, PowerPoint introductions with voice over, and printable PowerPoint slides, the other section involves the student in small game like activities .(Bishop, Beach, & Engineering, 2013)[3]

Students always need a motivation to learn, whether intrinsic or extrinsic.(Rygula & Popik, 2016)[10] In searching for the reasons behind the motivation of students, educational psychologists recommend that by furnishing students with praise, consolation, fortification, gaming exercises enables students to create certainty and inspiration to proceed with the class task. (Berger et al., 2017)[2]

Methodology:

Study was carried out in University College of Medicine and Dentistry (UCMD), University of Lahore in Department of Anatomy from 16th July -31st August 2018. University of Lahore is one of the leading universities in private sector, the mission of the university is to impart education and training in an academic environment through comprehensive and up to date teaching. This was a Quantitative Experimental study conducted in undergraduate students for teaching anatomy in private medical college of Lahore, Pakistan. Intervention was flipped classroom and Gamification technique; students were assessed on pre and post test scores. Only knowledge content was assessed that is why the tool used for assessment was MCQ's. Data of Pre and Post-test (MCQ's) and scrabbles was validated by two anatomists. All the students of 1st year MBBS enrolled in UCMD were approached for this study, total 160 students of 1st year were divided randomly into three groups Group 1 n=50(Traditional teaching method), Group 2 n=50(Flipped Classroom method) and Group 3 n=50(Flipped with Gamification Approach) and scores of pre and post-test were analyzed.

Randomized control sampling was done and students were divided into three groups according to computer generated roll numbers. Three themes were selected from the Musculoskeletal Module, only knowledge content was assessed and the tool used for the assessment of students was MCQ's test, aligned with the learning objectives. Data collection is shown in Figure 1.

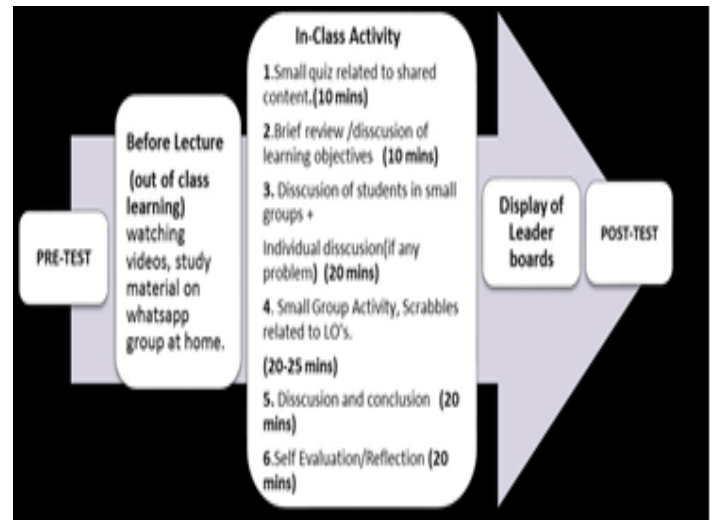


Figure.1: Data collection procedure

Results:

Total 155 students of 1st year MBBS participated in this study and were randomly assigned to three groups. Response rate of Traditional teaching group was 99% (n=50 students), whereas Flipped classroom group 100% (n=50 students) and Flipped with Gamification group 98% (n=50 students). Out of 155 students Results of 5 students were excluded due to incomplete pre/post-test.

Three sets of pre-post tests were designed according to themes taught in the musculoskeletal module. With respect to difficulty, most items appropriately fell in the moderate range (p-values 0.40–0.80) and all the items had positive item discriminations (Ds), indicating that more students chose correct answers in post-test than in pre-test. Total numbers of MCQs in three themes were 15 and their Reliability statistics is 0.801. In this study the quantitative data was analyzed by using SPSS version 21 by applying paired t-test between both the scores of pre and post-test of three groups. P value set for the study is: $p < 0.05$

The first part of the analysis consists of normal distribution and probability of scores across the groups, the second part describes the distribution of pre-test and post-test scores across the groups, and the third part elaborates the correlations of three groups.

The common tests Shapiro-wilk test and Kolmogorov-smirnov test are applied in this study to check the normal distribution of pre-test and post-test scores. Both indicates that the probabilities are more than 0.05 which thus rejects the null hypothesis. (Table-1)

Groups	Test	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Group 1 (Traditional approach)	Pretest	.186	50	.210	.932	50	.517
	Posttest	.201	50	.217	.901	50	.501
Group 2 (Flipped approach)	Pretest	.155	50	.200	.934	50	.527
	Posttest	.151	50	.200	.938	50	.682
Group 3 (Flipped with Gamification approach)	Pretest	.194	50	.214	.933	50	.599
	Posttest	.151	50	.200	.947	50	.637

Table 2 showing results of Paired sample statistics, which shows significant mean difference in pre-test and post-test results of all the three groups

Table 2
Paired samples statistics group wise pre-test and post-test results

Pair	Group	Test	M	N	SD
Pair 1	Traditional teaching method	Pretest	3.20	50	1.212
		Posttest	4.24	50	.938
Pair 2	Flipped classroom approach	Pretest	3.50	50	1.344
		Posttest	6.68	50	1.392
Pair 3	Flipped with Gamification approach	Pretest	3.28	50	1.67
		Posttest	9.38	50	1.398

Table 3 indicates the mean difference between pre-test and post-test scores

Table 3
Paired samples test group wise results

Pair	Group	Test	Paired Difference		t	df	Sig. (2-tailed)
			MD	SD			
Pair 1	Traditional teaching method	Pretest - Post-test	-1.040	.925	-7.951	49	.000*
Pair 2	Flipped classroom approach	Pretest - Post-test	-3.180	1.561	-14.406	49	.000*
Pair 3	Flipped with Gamification approach	Pretest - Post-test	-6.100	1.898	-22.727	49	.000*

*p<0.05

Thus it is evident from the scores that Flipped with Gamification teaching approach has more positive impact on students' performance. Paired sample t- test shows p value=.000 of all three groups, which is also significant. (Figure 2)

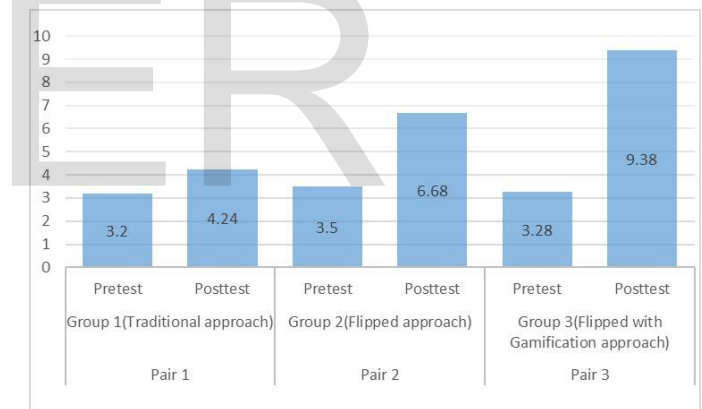


Figure:2 Comparison of Mean values of pre and post-test of three groups

Discussion:

Thus on basis of strong evidence of results the Null Hypothesis is rejected and is proved that students attending anatomy lecture with Flipped classroom with Gamification approach has significant effect on their scores.

Anatomy is a vast subject and many new methodologies are introduced in recent years to support the teaching of this subject.(Thai, Wever, & Valcke, 2017)[15] In 2012 a study was conducted by A-Khalid, which also indicates that traditional teaching method should be replaced with other new teaching strategies in Pakistani setup so that our students can perform better.(Ahmed et al., 2015)[1] A critical review of Flipped classroom by swan wick suggests that this teaching strategy can help students to perform better than the traditional teaching method. (Swanwick, n.d.) [14] Gamification is the key for

better engagement and higher levels of motivation. (Zhamanov & Sakhiyeva, 2016) [17] and students always need motivation to learn. (Landers, 2015) [8]

The results of Group 3, which was taught with Flipped with Gamification approach shows that retention was improved and students took more interest. Study based games helps to motivate the participants. It has been proved through various researches also that flipped classroom with study based games is better than simple flipped and traditional teaching technique. (Yilmaz, 2017) [16]

Limitations:

Sample size was small in this study; sample size can be increased to see the more generalized results. Due to time limit only one game i.e.; SCRABBLE was introduced as Gamification technique. It is suggested that in future MOODLE can also be used for online games.

Conclusion:

The approach for involving Gamification with Flipped classroom in small group discussion is worth pursuing in future. (Latulipe, Long, & Seminario, n.d.) [9] While Medical Education is expanding, students are among the ones who demands for the higher outcomes from their medical school or university. (Gillies, 2006) [5]

Findings and conclusion of this study suggests that Flipped classroom with Gamification may be employed as a teaching strategy in the curriculum of MBBS for teaching anatomy and other subjects also to the Medical students.

Source of Funding: None

Conflicts of interest and financial disclosures: None

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