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## An Experimental Study of the Performance of Prospective Teachers of Flipped Classroom and Non-Flipped Classroom

Maksal Minaz<sup>\*</sup>Rabia Tabassum<sup>\*\*</sup>Muhammad Idris<sup>\*\*\*</sup>

### Abstract

Video-recording of lectures and creating of podcasts for playback on the computer and other portable devices which accommodate the new formats of self-developed learning are identified as flipped classroom. The study was focused on the objective to Investigate performance of prospective teachers of flipped classroom and non-flipped classroom with respect to flipped classroom strategy. Therefore, null hypotheses were formulated; there is no significant difference between the mean scores of flipped classroom and non-flipped classroom of prospective teachers before and after treatment; Pretest posttest equivalent group experimental research design was taken for the study. A paired random sampling technique was employed to select the sample on the basis of pretest scores from the subjects.. Experimental group was named flipped classroom and control group was named non-flipped classroom. Treatment of flipped classroom strategy provided to the flipped classroom and the non-flipped classroom was thought through lecture demonstration method. Posttest was administered to collect data from both groups without delay after treatment of six academic weeks. Results of the study illustrated that there was significant difference between the performance of flipped and non-flipped classrooms prospective teachers. It was recommended that flipped classroom may be an integral part of curriculum of professional development courses in Pakistan.

**Keywords:** Flip classroom, video-recording, self-developed learning, professional development of prospective teachers.

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<sup>\*</sup> PhD Scholar at Northern University Nowshera, Email: maksalminaz@awkum.edu.pk

<sup>\*\*</sup> Professor Department of Education Northern University Nowshera

<sup>\*\*\*</sup> Assistant professor Department of Education Abdul Wali Khan University Mardan.

## Introduction

Emerging trends are rapidly making space in the field of teaching and learning, and technology creating ways for active learning (Morrison, 2016). Active learning is part of the constructivist approach where the students engage to discussion, reading, writing, problem solving and multiple activities at a time with the direct instructions of a teacher (Szparagowski, 2014). In adopting these emerging trends, firstly there is dreadful need of teachers to learn about the teaching approaches that are emerging. Secondly, they analyze critically the values and appropriateness of technological trends with respect to their discipline, courses, students, teaching styles and classroom experiences. Finally, each individual must place emerging trends in this context and balance with successful approaches that have worked over the years. Blending teaching and learning approaches bit by bit will result in a recipe whose gourmet creations will build up the appetites for the learners. Teaching and learning is a complex process, it is a universal truth that teachers has the most precious responsibility that mix simple, the many flavors-old and new to determine the ingredients and mixtures that best enhance learning (Akorede & Serifat, 2014).

According to Zainuddin (2015), blended learning is a gateway to active learning which provides a number of opportunities toward active learning. Flipped classroom is a part of blended learning model which is rapidly getting prominent in the field of teaching and learning. Flipped classroom is one of the elements of blended learning which is regularly called “reverse classroom” and “inverted classroom”. The notion of a flipped classroom draws on such concepts as active learning, student engagement, hybrid course design, and course podcasting (Szparagowski, 2014). FLIP for flexible environment, learning culture, intention context and professional educators that convert the passive students in active learners with the collaborative learning environment (Classroom, 2012).

Flipped classroom is comprehensively defined as an educational technique (Bishop & Verleger, 2013) which consists of two parts: interactive group learning activities inside the classroom and direct computer-based individual instruction outside the classroom. Flipped classroom inverted the old teaching methods and transformed theoretical contents to students online and leading towards problem solving into classroom. Students homework and classroom activities are placed into podcasts which students watch at home according to their pace and memory what they need to understand in the class.

Furthermore, Morrison, (2016) concluded that student-driven personalized learning and considered as a host of multi learning methods that are usually institution-driven. During this learning style, learners control their path, pace and time to become an active member of the learning society. During the personalized learning process the learner is not only the consumer of active learning but also an active participant of the process. Similarly according to Turan & Goktas, (2016), learners are the drivers of the personalized learning process. Most of the learners are the owner of their technological devices. There are plentiful amount of applications on smart phones to permit the learner to create, download, contribute to and accumulate useful contents and learning resources. The collaboration and ownership of technological devices include communication hubs which allow learner to utilize it inside and outside classroom activities.

Furthermore, Turan & Goktas, (2016) compared the flipped classroom and traditional technique. They investigated the efficiency of the flipped classroom method and its effects on students' achievement and cognitive load levels through quasi-experimental research designed. Treatment was provided (taught via flipped method) to one hundred and sixteen prospective teachers of spring semester 2013-2014 for six weeks while the control group was taught through routine method. Results of the study showed that participants were taught with the flipped classroom strategy, achieved higher learning achievements and lower cognitive loads. On the other hand, participants of control group showed lower learning achievements. The participants of flipped classroom showed higher instructional efficiency scores than those of the students in the traditional classroom. They concluded that flipped classroom may be applied as a positive strategy in higher education.

Similarly Plotnikoff, (2013) studied number of twenty eight undergraduate and graduate students of the Stanford School of Education, the participants were provided the videos and material before lecture for every lesson of neuroscience. "Researcher drew on data gathered from participants using Brain Explorer, a tabletop tool that stimulates how the human brain processes visual image". Results of the study illustrated that the participants were showed superior performance after exploring form videos the concept from stimulated human Barin process images. The performance of the participants who read neuroscience lessons were less effective than the participants who prepared through Brain Explorer. The performance was increased significantly more than 30% as compared to those who had coped with traditional materials.

Hussain, Minaz, Ahmad & Idris, (2016) studied the effect of e-reading and printed document reading on students' comprehension and retention power. Sample of thirty six prospective teachers were equally divided in two equal groups i.e., control and experimental group. Findings of the study illustrated that those prospective teachers who were experienced to read printed electronic documents prior to session has significant effect on their comprehension level. Results showed that retention power of experimental group was found higher than the control group.

The utmost stipulate of present era is modern technology, where teachers and students both are taking interest and get satisfaction to enhance their capabilities. According to Joanne & Lateef, (2014) flipped classroom strategy getting popularity among the professional teachers. The professional teachers believe flipped classroom as rewinding process that learners can easily pause, reverse and forward the lesson according to their desires. Flipped classroom strategy has always showed significant results in the field of teaching and learning. Ozdamli & Asiksoy, (2016) concluded that sometimes traditional approaches cannot satisfy teachers and learners needs to accomplish their targets in the modern era of technology.

### **Objective of the Study**

Objective was formulated to investigate the performance of prospective teachers of flipped classroom and non-flipped classroom with respect to flipped classroom strategy

### **Hypotheses of the Study**

- H<sub>0</sub>1: There is no significant difference between the mean scores of flipped classroom and non-flipped classroom of prospective teachers before treatment
- H<sub>0</sub>2: There is no significant difference between the mean scores of flipped classroom and non-flipped classroom of prospective teachers after treatment.

### **Research Design**

The purpose of the study was to compare the performance of prospective teachers of flipped classroom and non-flip classroom.

Therefore experimental research design was used. There are basically three research designs in experimental studies i.e. pre-experimental research design, true experimental design and quasi experimental design. Every design has its own criteria, demands and limitations, however according to Farooq, (2001) true experimental research designs are the most suitable where the internal validity of the treatment is ensured to a great extent and therefore its results could be generalized up-to-great extent. Therefore, the pre-test post-test equivalent group experimental research design was used for data collection.

The symbolic representation of the design:

	R	O	X	O
	Random	Pre-test	Treatment	Post-test
Experimental	selection of		through flipped	
group	respondents		classroom	
			strategy	
	R	O	X	O
	Random	Pre-test	Taught through	Post-test
Control group	selection of		lecture	
	respondents		demonstration	
			method	

### Sample

Prospective teachers of Sir Syed College of Education affiliated with Abdul Wali Khan University; Mardan was taken as a sample of the study. All forty eight (48) prospective teachers were further divided through paired random sampling techniques in two groups that are flipped classroom and non-flipped classroom on the basis of pretest scores. Each group was comprised twenty four participants.

Pretest was administered and random assignment of subjects was taken on the basis achieved score of the subjects. The targeted score for the random assignment of subjects as was 30, 31; 29, 29; 28, 28; 24.23 and so on. Among the pairs, one score was taken as experimental and the other as control group by lottery method.

### Instrumentation

Teacher made pretest and posttest was developed from selected contents of subject from B.Ed course Educational Psychology with clear guidance and consultation of supervisor and the supervisory committee.

Lesson plans were developed in the illumination of USAID (2007). Lesson plan were consisted four major phases that is firstly activating the background knowledge, secondly construct meaning, thirdly deep understanding and finally evaluating and applying. (Detail is provided in appendix 1) Following table is clarifying the phases of lesson plan;

Table 1  
*Sketch of lesson plan for flipped classroom*

SSStage		Duration	Flipped Classroom Activities	Instructor
Phase 1	Activating Background Knowledge	10 Minutes	Know want to learn (KWL), Discussion and Conceptual understanding	Provided support, immediate feedback and guidance with explanation of the confusing concepts
Phase 2	Construct Meaning	15 Minutes	Concept Mapping, Think Pair & Share, Co-operative learning, fish bowl	Immediate feedback, guides & facilitated the participants
Phase 3	Deep Understanding	20 Minutes	Concept Mapping, Co-operative learning & group discussions	Guided and facilitated the participants & feedback.
Phase 4	Evaluation & Applying	15 Minutes	Discussion, critical thinking and presentation Fish bowl Questions of students during different phases were written on a small piece of paper and were drawn in a bowl to clarify at the end of the session by discussions	Providing feedback and assign post class activities for next session.

(USAID, 2007)

Learning objectives were developed for the selected contents. Table of specification was developed. Three units were selected that is (i) nature and meaning of educational psychology, (ii) growth and development and (iii) learning. The pretest and posttest was constructed from the selected three units keeping in view revised blooms taxonomy Anderson & Krathwohl, (2001) where 27.5% items were meet the level of remembering, 30% understanding, 22.5% applying and 20% analyzing. Pretest and posttest was consisted of the number of forty items. Therefore fifteen items were selected from first unit, eleven items were from second and fourteen items were taken from third unit consecutively. Furthermore, 20% test items were true false and 80 % were consisted multiple choice items. The format of pretest and posttest is given in following.

Question: Indirect observable behavior, like feeling anger, sad, and joy known as overt behavior. (T/F)

Question: Learning theory of classical conditioning developed by Jean Piaget. (T/F)

Question: Capability in hypothetical and deductive reasoning, understanding objects and make rational judgments is;

- A. Sensory-motor Stage
- B. Preoperational Stage
- C. Formal Stage
- D. Concrete Stage

Question: Verbal learning takes place;

- A. When learning involves the formation on concept
- B. When learning involves the use of words
- C. When learning is concern with perception and sense
- D. When learning involves in the use of muscles.

### **Validation and Reliability**

Researcher requested to the experts in the field of educational psychology to refine test items of both pretest and posttest. Both pretest and post test were approved by the doctoral committee of the researcher. Assessment tests and flipped classroom strategy was pilot tested before starting the experiment. Therefore, twenty prospective teachers of Allama Iqbal Open University were preferred for the purpose of pilot test

that they were not the part of the study. The reliability of the pilot pretest was determined by applying the Spearman-Brown Prophecy formula where the correlation coefficient of the pretest was .80. The same pretest was administered as posttest after some sequential changes. Reliability was checked again and found the same .80.

## **Treatment**

Treatment was provided according to partial flipped classroom model (PFCM) where students not being punished or bound to lack of technology or equipments (Ozdamli & Asiksoy, 2016). Therefore treatment was provided to both flipped classroom and non-flipped classroom prospective teachers for total number of eighteen credit hours i.e. six academic weeks. Each session was one credit hour, total 3 credit hours per week. Participants of both classes was taught the same learning materials but the participants of flipped classroom was provided learning materials before the formal session with clear instructions while non-flipped classroom prospective teachers was taught through traditional lecture demonstration method. Two teachers with equal qualification and experience were engaged to teach the participants. Procedure of treatment was divided in three phases that is Planning, Performance and Evaluation. Researcher carefully planned lesson plan for selected contents, trained the teacher and searched the appropriate videos. All the prospective teachers were ensured that they have personal computers (PC) at their home. DVD was created where all lectures materials and videos including power point presentation were copied for those participants have no internet facility or flash drive. A calendar was also developed where the topic, duration of class and date of the class session was clearly mentioned. Furthermore, performance of prospective teachers was categorized in three phases that were before class, during class and after class activities. The instructor of flipped classroom was provided printed copies of learning materials for students before starting the formal session.

**Pre-Class** The extent of flipped video was 5-10 minutes including 5-10 slides of power point presentation therefore DVD with clear instructions was also handed over to students of flipped classroom before starting the experiment. The prospective teachers watched the video lecture at home or their leisure time and pointed out the unclear and puzzling concepts to participate in active learning during classroom.



**During-class** The prospective teachers of flipped classroom were engaged in collaborative learning activities like group discussions, think pair & share, critical thinking, presentations, Know Want & Learn, Fish Bowl and concept mapping.

**Post-class** In order to engage the learners in post class activities, instructor was assigned different tasks like after watching the video the participants were able to answer the following questions;

- i. What was the video about?
- ii. Make a list of ideas you perceived,
- iii. Most confusing part of the video and
- iv. Easiest parts of the lesson discussed in video.

On the next day, students came to the class with ambiguous concepts and aimed to clarify their confusions through classroom discussions and multiple activities or taking guidance from the instructor.

**Evaluation** The performance of prospective teachers of both groups was evaluated through posttest immediately after treatment.

### **Data Collection Instruments**

Data were collected from both the participants of flipped classroom and non-flipped classroom immediately after treatment of six academic weeks. Pretest and posttest were administered to compare the performance in pretest and posttest of flipped classroom and non-flipped classroom.

### **Analysis of Data**

Collected data from pretest and posttest were analyzed through *t*-test. Classification of frequency distribution was constructed. Effect size was also calculated. Data was tabulated accordingly.

### **Results**

H<sub>0</sub>1: There is no significant difference between the mean scores of flipped classroom and non-flipped classroom of prospective teachers before treatment

Table 2

*Frequency distribution of pre-test scores of flipped and non-flipped classroom*

lass Intervals	Frequencies of classroom	Flipped	Frequencies of flipped classroom	non-
31-35	1		1	
26-30	3		3	
21-25	8		7	
16-20	6		8	
11-15	6		4	
06-10	0		1	
Total	24		24	
Mean scores	19.88		19.92	

Table 2 shows that the mean scores (19.88 and 19.92) of both groups were identical before the treatment. Furthermore, range of the scores of flipped classroom was lies between 11 to 30 and the range of the scores of non-flipped classroom were between 10 to 31 which were almost equal. The results support that the mean scores of both prospective teachers of flipped and non-flipped classroom were almost same.

Table 3

*Comparison of the performance of flipped classroom and non-flipped classroom of prospective teachers before treatment*

Groups	N	df	Mean	SD	t-value	Effect size
Non-Flip classroom	24	46	19.92	5.31	.002	0.007
Flip Classroom	24		19.88	5.24		

$t$  at 0.05=1.679

Table 3 shows that total (N=48) mean score of flipped classroom was (M=19.88, SD=5.24) and non-flipped classroom (M=19.92, SD=5.31) was nearly equal. There was statistically no significant difference between the mean scores of both groups on pretest. The  $t$ -value  $0.002 \geq .05$  also support the results. Effect size for total score was 0.007 indicated by Cohen's  $d$  value is very small. Hence, both the groups could be treated equal before treatment. Therefore, null hypothesis was failed to reject that there is no significant difference between the mean scores of flipped classroom and non-flipped classroom of prospective teachers before treatment.

**Table 4**  
*Frequency distribution of post-test scores of flipped classroom and non-flipped classroom*

Class Intervals	Frequencies of flipped classroom	Frequencies of non-flipped classroom
36-40	3	1
31-35	9	1
26-30	10	14
21-25	2	7
16-20	0	1
11-15	0	0
Total	24	24
Mean scores	30.71	26.67

Table 4 shows that the mean scores of flipped classroom were higher after the treatment. Furthermore, range of the scores of flipped classroom was lies between 24 to 37 and range of the scores of non-flipped classroom were lies between 19 to 36 which provide strong support to the results. The results provide strong evidence that high mean scores of prospective teachers of the flipped classroom were due to flip classroom strategy.

**Table 5**  
*Comparison of the performance of flipped classroom and non-flipped classroom of prospective teachers after treatment*

Groups	N	df	Mean	S.D	t-value	Effect size
Non-Flip classroom	24	46	26.67	3.42	3.79*	1.09
Flip Classroom	24		30.71	3.96		

\*Significant  $t$  at 0.05=1.679

Table 5 shows that difference between mean scores of (N=48) flipped classroom (M=30.71, SD=3.96) and non-flip classroom (M=26.67, SD=3.42) varies significantly in the favor of flipped classroom. This implies that flip classroom strategy has positive impact on the performance of prospective teachers. Comparatively higher standard deviation of flipped classroom 3.96 shows that method has different effect on the performance of prospective teachers. The  $t$ -value

$3.79 \leq 0.05$  and effect size 1.09 shows a large affect in the scores (Cohen's  $d$  1988; and Sawilowsky, 2009).

Table 6

*Comparison of mean scores of flipped classroom on pre-test and post-test*

Flipped Classroom	N	df	Mean	S.D	<i>t</i> -value	Effect size
Pretest	24	46	19.88	5.24	8.100*	2.33
Posttest	24		30.71	3.96		

\* Significant  $t$  at 0.05 = 1.679

Table 6 shows that difference between mean scores of experimental group (N=48) on pre-test (M=19.88, SD=5.24) and post-test (M=30.71, SD=3.96) varies significantly in the favor of post-test. This implies that the prospective teachers of flipped classroom achieved higher mean scores on post-test. Comparatively higher standard deviation on post-test as compare to pre-test 3.96 shows positive effect of flipped classroom strategy on the performance of prospective teachers. The  $t$ -value  $8.100 \leq 0.05$  and effect size 2.33 shows huge affect in the scores (Cohen's  $d$  1988; and Sawilowsky, 2009).

Table 7

*Comparison of mean scores of non-flipped classroom on pre-test and post-test*

Non-flipped classroom	N	df	Mean	S.D	<i>t</i> -value	Effect size
Pretest	24	46	19.92	5.31	1.768*	1.51
Posttest	24		26.67	3.42		

\*Significant  $t$  at 0.05 = 1.679

Table 7 shows that difference between mean scores of non-flipped classroom (N=48) on pre-test (M=19.92, SD=5.31) and post-test (M=26.67, SD=3.42) varies significantly in the favor of post-test. This implies that the prospective teachers of non-flipped classroom improved achievement scores on post-test as compare to pre-test scores. The higher

mean scores indicate that lecture demonstration method of teaching was also effective and improved the performance of prospective teachers. The  $t$ -value  $1.768 \leq 0.05$  and effect size 1.51 shows a very large affect in the scores (Cohen's  $d$  1988; & Sawilowsky, 2009).

## **Findings and Discussion**

Results illustrated that the mean scores of both the flipped classroom and non-flipped classroom were identical before the treatment where mean score of control group were 19.92 and mean scores of experimental group were 19.88.

Results of the study illustrated that there was significant effect of flipped classroom strategy on the performance of prospective teachers after treatment. Furthermore, flipped classroom was achieved higher mean scores than the non-flip classroom prospective teachers. The results of the study were similar to the results of study conducted by (Hussain, 2016; Turan & Goktas, 2016).

In spite the fact that experimental group performance was higher than the performance of non-flipped classroom on posttest but the results were illustrated that the respondents of non-flipped classroom were also improved their performance on posttest. Improvement of the performance indicates that lecture demonstration method has also the potential to affect the performance of prospective teachers. Equivalent results were found by Iqbal, Sultana & Afzal, (2016).

## **Conclusion**

On the basis of findings it was concluded that; the null hypothesis there is no significant difference between the mean scores of flipped classroom and non-flipped classroom of prospective teachers after treatment was failed to reject. Therefore it was concluded that performance of flipped classroom on pretest was identical before treatment. The null hypothesis # 2 was rejected. Therefore, it was concluded that the students taught through flip classroom strategy was statistically significant different mean scores of those who were taught by the traditional lecture demonstration method. A positive effect was found on the performance of prospective teachers' flipped classroom for the reason that of flipped classroom strategy. Performance of non-flipped classroom improved in posttest as compared to pretest scores therefore it is concluded that the lecture demonstration method have also positive impact on the performance of students.

## **Recommendations**

Following recommendations were given in the light of conclusions; As the results of the study shown that flipped classroom strategy positively affects learning. Therefore, the government needs to take serious efforts to promote technological support and financial support for professional teachers to improve their pedagogical skills. There is a dire need of technological support of HEC to higher educational institutions in Pakistan to establish Learning Management Systems like Virtual University to help learners to have access to the online available course materials. Flipped classroom strategy needs to be included in professional training programs that the upcoming professional teachers can easily create their learning materials. Flipped classroom as a teaching strategy needs to be incorporated in Pedagogical Skills Course in Professional Teaching courses. Further research studies must be conducted to see the effect of flip teaching in different dimensions like keeping in view gender difference of the prospective teachers. Special projects related to flip teaching should be assigned to students to flip the contents of relevant course.

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