EFFECTS OF FLIPPED CLASSROOM MODEL ON ACADEMIC ACHIEVEMENT OF STUDENTS AT ELEMENTARY LEVEL

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ABSTRACT
An innovative teaching model known as flipped model has been introduced in education sector which shifts inside class activities to outside class and vice versa. This is a form of blended learning which advocates student-centered learning by using educational technology. Traditional teaching makes teacher's authority in classroom by discouraging critical thinking in students. It expects harder part to be done by students outside class and teachers usually not feel their responsibility to solve students' problems in next day class session. Basic purpose behind this study is to highlight the most effective method which may opt for raising student's achievement level. This experimental study was conducted to explore the academic achievement of students in flipped and traditional classroom at elementary level. Quasi-experimental research design was used for the study and instrument was pre-test and post-test. Experiment duration was 4 months. Sample consists of 7th grade of Government Girls Secondary School Magistrate Colony Rawalpindi, Pakistan. Analysis was carried out by using t-test. Findings revealed that treatment group had higher achievement scores than control group. Impact of flipped model (treatment) was very strong due to lecture videos at home and active session in classroom. Treatment group have greater understanding of General Science concepts. Study recommended that this model should be implemented at all levels in Pakistan. Lacking of educational technology is not a big concern for its implementation. Teacher training is also required for handling of this innovative model in classroom.
Keywords: Flipped Classroom, Academic Achievement, Traditional Classroom, Student-Centered Classroom, Educational Technology

INTRODUCTION
Flipped model is an innovative model which has capacity to confront the pedagogical problems of student in the 21st century (Cabi, 2018)**.** In 2000 flip teaching model was introduced as "inverted classroom" (Gómez-Tejedor, Vidaurre, Tort-Ausina, Molina-Mateo, Serrano, Meseguer-Dueñas, Sala, Quiles & Riera, 2020) and it replaces learning tasks of home and classroom with each other. In this innovative teaching model instructional material is provided to students before class (e.g., online lectures, handouts) and students apply their knowledge in-class (Alten, Phielix, Janssen & Kester, 2019). Flipped model is a new trend in teaching and learning which advocate pupil-centered classroom model (Alsowat, 2016) and discourage rote memorization in order to become problem solver and critical thinker in all individual and group activities. Purpose behind implementing flipped teaching model is to promote self-directed learning by applying innovative strategies, tools and teaching methods for both outside classroom and face-to-face session (Gómez-Tejedor et al., 2020).

Flipped teaching is inverted to traditional learning environment (Alten et al., 2019; Cabi, 2018; Herreid & Schiller, 2013; Verleger & Bishop, 2013; Wolff & Chan, 2016). Lecture and demonstration method is active in traditional learning environment in which teacher is responsible to deliver the content in class and students reflect on their learning later on in class (Andrade & Coutinho, 2016; Gómez-Tejedor et al., 2020). In flipped learning environment instructional material or theoretical component of the course is covered by students while at home and in-class session is reserved for various practical activities and exercises which are properly supervised by the teacher (Andrade & Coutinho, 2016; Gómez-Tejedor et al., 2020). Verleger and Bishop (2013) defines flipped classroom model in broader terms like inside class session consist of problem solving questions and open ended

exercises whereas outside class session includes close ended practice questions and watching lecture videos. Andrade and Coutinho (2016) stated that spaces for learning are inversed in both teaching methods. "Blended learning", "reverse instruction", "inverted classroom", and "24/7 classroom" are various terms in which flipped teaching model is expressed in literature (Bergmann & Sams, 2012 as cited in Gómez-Tejedor et al., 2020). Gariou-Papalexiou, Papadakis, Manousou and Georgiadu (2017) discussed that flipped model comprise of distance learning in addition with school education (blended learning), allow the learner to utilize ICT for learning purpose and create learners self-reliance in their teaching learning process by making them active. Cabi (2018) stated the findings of various studies in which impact of flipped class model was examined on various dependent variables i.e., student performance; engagement, learning outcomes, and motivation. Many studies show that this innovative model enhances student performance, engagement, learning outcomes, and motivation. It was also noted that this model makes the learners more fruitful and lively in their teaching-learning process. Findings of Smallhorn, Kim et al., Sun and Wu were not in favor of flipped class model (Cabi, 2018), their findings found no special impact of flipped model on their teaching-learning process.

Statement of the Problem

Traditional teaching model is not so effective in developing problem solving skills and critical thinking skills in students due to lack of student-centered face-to-face session which leads to lowers the achievement scores of students. The basic purpose behind this study was to explore flipped teaching model as a new model and its effects on student's confidence in understanding of concepts.

Research Objectives

1. To explore the effect of flipped classroom model on academic achievement of students.
2. To investigate the effect of traditional teaching model on academic achievement of students.
3. To compare difference in academic achievement of students in flipped and traditional classroom teaching.

Research Gap and Research Hypotheses

After vast literature review it is found that there is need to conduct a research study in Rawalpindi district, Pakistan and at elementary level. The purpose of research was also to determine academic achievement level in General Science Subject. Following were the research hypotheses of the study.

1. H_{01}: There is no significant difference in the mean pre-test achievement scores of students in experimental and control group.
2. H_{02}: There is no significant difference in the mean post-test achievement scores of students in experimental and control group.
3. H_{03}: There is no significant difference in achievement scores of students in flipped and traditional classroom.

REVIEW OF LITERATURE

Ozdamli and Asiksoy (2016) elucidated that technology is progressing rapidly in the 21st century and it affects not only education but all other fields as well. With the emergence of educational technology various learning needs and demands come out. Jeyaraj (2017) described that up to the end of twentieth century teaching-learning process carried out by the interaction of teacher and students just within the classroom. But later on in 2007 the concept of flipped classroom was originated (Bajunury, 2014; Wolff & Chan, 2016) as this model is in line with the needs of modern teaching method. Flipped classroom is defined by (Sultan, 2018) a technology based pedagogical method in which video lectures, reading handouts and practice problems are provided to students for outside class activity whereas interactive group-based problem solving activities conducted in face-to-face session. One form of blended learning is flipped classroom (Tolks, Pelczar, Bauer, Brendel, Gorlitz, Küfner, Simonsohn & Hege, 2014).
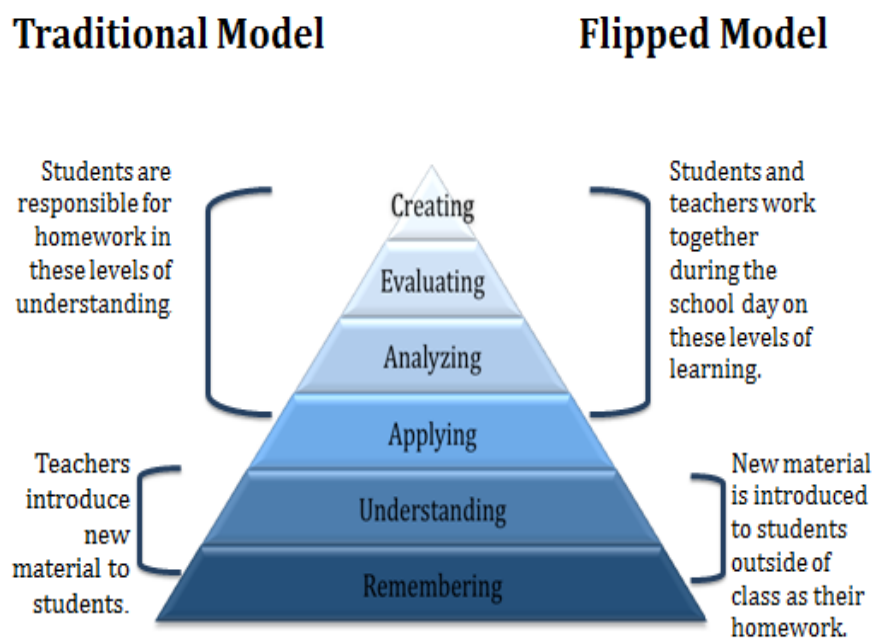
The expression "Flipped Classroom" was launched by two Chemistry teachers Jonathan Bergmann and Aaron Sams (Andrade & Coutinho, 2016; Bajunury, 2014; Ozdamli & Asiksoy, 2016). The main purpose of flipped classroom is to foster advanced skills in students during face-to-face session by avoiding passivity (Tolks et al., 2014). Andrade and Coutinho (2016) explained a short background of 'Flipped classroom'. Jonathan Bergmann and Aaron Sams launched a book in 2012 named "Flip Your Classroom: Reach Every Student in Every Class Every Day" in which they conducted an experiment on those students which are unable to attend the class due to any reason. They recorded PowerPoint presentation, notes, voice, videos of content and shared online for the help of these students. This shared content can be followed by other students as well. Therefore authors realized that it could

be a new teaching approach named 'Flipped Classroom'. Flipped classroom promotes students-centered classroom in which pupil and teacher have one-on-one interaction.

Theoretical Framework for Flipped Classroom

Overmyer (2014) and Tutuncu & Aksu (2018) explained 'Bloom's Taxonomy of learning' given in 1956 which is very helpful in pedagogy. In flipped model lower levels of cognitive domain i.e. knowledge and comprehension level carried out outside class by the students. They are provided with instructional material via online sources for getting knowledge and get preparation for the next class session. They noted down their problems in lectures to be discussed in discussion session. Higher levels of cognitive domain include application, analysis, synthesis and evaluation occurred in classroom under the supervision of teacher. It is a hard part of learning which actually needs teacher help and support. This part is carried out by using various problem-solving activities in which students are active and have interaction among each other. Teacher properly supports them as "guide on side" that actually not happens in traditional teaching model where teacher acts as a "sage on stage" only. Higher levels of cognitive domain foster critical thinking skills due which they think in big horizon to solve the problems. Traditional teaching method does not make a student problem-solver and critical thinker as only teacher is authoritative who leads all students in one direction by ignoring or leaving their problems unclear. Teacher focuses on just content delivery in classroom session by leaving hard part to be done outside the classroom. Tutuncu and Aksu (2018) portrayed the comparison of flipped model and traditional model in terms of Blooms taxonomy like:

Figure 1 Comparison of Traditional model and Flipped model (Tutuncu and Aksu, 2018, p.212)

Herreid and Schiller (2013) described that educational technology specifically used in teaching-learning process includes multimedia, smart boards, simulations, computer, internet, Camtasia, PaperShow, iPads, Virtual and Remote Laboratories, 3D Printing, games and Gamification, tablet computing, Mobile learning and Cloud computing etc. Teacher can use educational technology inside and outside the class and it creates the environment of self-learning (active learning) in which students are responsible of their learning (Gariou-Papalexiou et al., 2017). Literature pointed out a very crucial role of teacher in flipped classroom. For example, creating or finding good quality videos which are useful for students is a big challenge for teacher because too lengthy and irrelevant video will waste their time (Herreid & Schiller, 2013; Sajid, Laheji, Abothenain, Salam, AlJayar & Obeidat, 2016). Teacher should have good skill of using internet, knowledge about various educational websites and software. Gariou-Papalexiou et al., (2017) discussed that this model is recommended to be implement

because it allows learner to acquire knowledge through interaction among peer-peer and with teacher in active face-to-face session. Bajunury (2014) suggests various patterns in which teacher can flip her classroom include "traditional" flip, "partial" flip, "Khan Academy" flip, and "mastery-based" flip. Teacher can adopt any one depending upon nature of topic. 'Millennial' is a term used by (Roehl, Reddy & Shannon, 2013) in their study. 'Millennial' are the persons who have more connection with technology, information, and digital media 24/7 which is greater than their prior generation. This is a generation born between 1982 and 2002. Their exposure to information technology starts from very young age and they prefer flipped model because this model supports active learning having multitasking and various group activities. They are referred as "digital natives (Jeyaraj, 2017; Roehl, Reddy & Shannon, 2013).

Flipped model allows the students to keep their own pace in learning like students can any time play and watch videos for their purposes (Gonzaʼlez-Goʼmez, Jeong, Rodrıʼguez & Canˇada-Canˇada, 2016; Sultan, 2018). It does not demand presence of teacher at every time for lecturing. Videos enable them to get thorough study about the subject. It helps them in classroom session which demands active participation from all under the supervision of teacher. Students cooperate and collaborate with each other in various open-ended questions. It fosters critical thinking and innovation in their cognition. Self-regulation is a critical matter in flipped model (Lai & Hwang, 2016) because students with greater self-regulation learn better outside the class. They consult various educational resources and conduct a smart study. He will prepare himself better for inside class session whereas case of lower self-regulation is different. Students of lower self-regulation waste their time outside the class by surfing various internet and educational sites unnecessarily due to which they will be unable to participate in in-class activities. Teacher is responsible to motivate his students to become self-regulated if he wants to make his teaching process effective.

Sajid et al., (2016) conducted a research study in Saudi Arabia to evaluate student academic performance and perception in flipped and traditional teaching. This study was conducted on medical students. Study revealed that flipped teaching is a new concept in Saudi Arabia but even then students were more satisfactory in flipped teaching. They discourage traditional teaching method due to its passivity and teacher-centered approach.

A study conducted on Applied Linear Algebra course taught through flipped model and traditional teaching model by (Love, Hodge, Grandgenett & Swift, 2014). Results of the study revealed that in formative assessment students' performance was better in flipped classroom as compare to traditional group but summative assessment scores were not significant different in both groups. All students were positive towards the innovative model due to its greater teacher-pupil interaction, instructional videos and problem solving activities.

Performance of male and female prospective teachers was compared in flipped and traditional classroom teaching in the study conducted by (Minaz, Tabassum & Ahmad, 2018). Study was done in one affiliated college of education in Khyber Pakhtunkhwa, Pakistan. Pre-test and post-test was the instrument and true experimental research design was the design of study. Findings of the study showed that all students in flipped classroom perform better than control group but gender-wide difference in the performance has not seen in both groups. This study suggested that policy makers and university teachers should work on this innovative model to be implemented in Pakistan.

METHODOLOGY
Data Sampling and Instrumentation
Researchers conducted an experimental study to see the student's academic achievement level in flipped classroom model at elementary level. Quasi-experimental research design (Non-Equivalent Pre-test and Post-test Control Group Design) was adopted for the study. In this design subjects are non-randomly selected as researcher is not allowed to work in artificially-created environment (Alam, Alam & Khurshid, 2017). SPSS was used for data analysis.

Table No. 1 Representation of Design (Creswell, 2014)

	O	X	O
Treatment group	Pre-test	Treatment through flipped model	Post-test
Control group	Pre-test	Taught through lecture + demonstration method	Post-test

Sample of study was 7th grade of session (2019-2020) of Government Girls Secondary School Magistrate Colony Rawalpindi, Pakistan. There were two sections comprising of 45 students in each. Total population was 90 students. This study was confined to one school and administration does not allow the researcher to minimize the students. Therefore, all students were included in the sample of study. Both groups were having same instrument (Pre-test and Post-test). Levels of cognitive domain of Blooms Taxonomy were under consideration for the development of test. Instrument was self-developed by researcher. Test was of total 35 marks having 21 items. Classroom activities were also designed for students. Table of specification was developed.

According to (Mani, 2016), 50 % of the test can be attempted by average students, 20% by good students and the rest 30 % by intelligent students. Item difficulty index of the instrument was calculated on the basis of table 3.2. Total 33.3% items in the test were difficult, 57.1% items were average difficult and 9.5 % items were easy.

Table No. 2 Interpretation of Item Difficulty Index

p scores	Interpretation
<0.25	Difficult
>0.25 and <0.75	Average Difficulty
>0.75	Easy

Researcher selected two chapters of General Science of class 7th published by Gohar Publishers and approved by Government of Punjab for distribution in Government Schools. Chapters were as follows:

  i. Transport in Humans and Plants
  ii. Reproduction in Plants

Researcher was allowed one month for this experiment. Reason for selecting two units was that these were at school timeline then and enough to evaluate both teaching models.

Reliability and Validity of the Instrument

Experts of Science education, Classroom Assessment and Subject teachers of particular school validated the instrument. Researcher made corrections on the basis of their views and administered the final copy. Test-retest form reliability was applied for reliability analysis. Sample for pilot testing was n=25 of 7th class (2018-2019). Same test was administered twice with the interval of three weeks. Pearson Product Moment Correlation Coefficient was applied for reliability analysis. Where α=0.05 and r=0.89, the value of "r" suggests that participants responses were generally same in both attempts of the test. In addition subject teachers appreciated the researcher that test was good.

Experimental Setting

Experimental group and control group were taught through flipped model and traditional classroom model respectively. Total duration of the experiment was 4 academic weeks. Lesson plans were developed for each class on the basis of cognitive domain of Bloom's Taxonomy. Threats include same teacher, same environment and same physical facilities in both groups and these were also controlled in this study. Teaching methods (flipped and traditional classroom teaching) were independent variable of the study whereas student's achievement scores were dependent variable of the study.

District Education officer (DEO) gave administrative approval for the experimental study in the sample school. Experiment duration was one month for both groups from April 15, 2019 to May 14, 2019 of session 2019-20. Both sections of 7th class were pretested before the start of experiment. It was necessary to check their performance before experiment. Achievement scores were approximately same in both groups. Researcher randomly named both groups as experimental group and control group after pre-test. Bajunury (2014) suggested "Traditional Flip Classroom Model" which was followed by researcher in this study. In this model videos are provided to students via electronic means. All students watched these videos and get prepared for their next day in-class activities. Teacher starts with question-answer session to identify their clarity and weaknesses. Later on, teacher engaged them in various related activities.

Control group was taught with lecture and demonstration method. Researcher delivered lecture in class and assign home task related to higher levels of Cognitive domain. General A.V aids were used for their teaching purpose in classroom. Educational technology is an important requirement for flipped classroom. In Pakistani setting there was lack of educational technology in schools but this was not a

big deal. This problem can be solved by making CD of all content. Teacher made CD of two chapters and provided to students of treatment group. Researcher ensured that all students have computers in their homes before experiment. Researcher delivered demo session to experimental group about treatment (flipped model) and CD (saving and playing of videos). CD making was proof to be an effective technique for students because everyone can watch the videos in homes. Students of treatment group were very interested and enthusiastic after demo. They were ready to learn something new. Later on, experiment was started after all clarification. Experiment ended after one month then groups were appeared in post-test.

The main problem which was aroused in the start of experiment affecting the performance of students in treatment group i.e. students come to class with no questions as they feel watching video is unnecessary. When teacher involves them in oral or written quizzes they do not participate in it on daily basis. Students felt that it is normal if they do not prepare for the next day as they did in traditional teaching model. Actually they take flipped teaching model as a traditional teaching model initially. Later on teacher again told them about the importance of flipped model and ask for their cooperation. After that they followed proper pattern guided by the researcher.

Video lectures from 6-12 grade are available on the website (elearn.punjab.gov.pk) launched by Punjab Education Department in local Urdu language. Teacher may select videos from above site as well as from YouTube, sabak.com and many other educational websites.

Data were collected by comparing pre-test and post-test scores of both groups. For the analysis of difference in two groups Independent sample t-test was applied.

Analysis and Interpretation of Data

Hypothesis 1: The first research hypothesis of the study was there is no significant difference in mean pre-test scores of experimental and control group. Difference in mean pre-test scores of experimental and control group was calculated by using independent sample t-test.

Table No. 3 H_{01}: Result of pre-test scores

	Groups	N	Mean	t-test
pre-test scores	experimental group	45	7.71	2.140
	control group	45	8.71	

Analysis of first hypothesis by using SPSS shows that, value of p=0.062, where α=0.05; null hypothesis was accepted as p>0.05. Findings revealed that there is no significant difference in pre-test achievement scores of students in both groups. Pretest scores were the result of traditional and demonstration method. Students scored almost same marks. Videos and active face-to-face session was missing in lecture-based teaching model due to which performance of students was ordinary.

Hypothesis 2: The second null hypothesis was there is no significant difference in the mean post-test scores of experimental and control group.

Table No. 4 H_{02}: Result of post-test scores

	Groups	N	Mean	t-value
Post-test scores	Experimental group	45	12.60	3.502
	Control group	45	9.44	

Analysis of second hypothesis by using SPSS shows that the value of p=0.001 and α=0.05; null hypothesis was rejected as p<0.05. Findings revealed that there was significant difference in mean posttest achievement scores of students in both groups. Flipped classroom model had significant effect on academic achievement of students in experimental group as they achieved more scores in post-test than pre-test. Their learning was concrete due to active teacher-pupil interaction in class.

In flipped classroom students learn so many things more than control group. On the basis of post-test scores it was concluded that their understanding of the topics was good. Various open-ended questions in discussion help the students in exploration of their knowledge. Nothing left unclear in the mind of students related to topics as teacher and students tries to discuss each and every problem by creating student-centered classroom. Visual representation of the content (videos) helped in greater retention of concepts. They know about more things due to visualization instead of control group as they did not visualize the content via videos.

Hypothesis 3: The third null hypothesis was there is no significant difference in achievement scores of students in flipped and traditional classroom. Findings of hypothesis were drawn on the basis of

hypothesis 1 and 2. Mean pre-test score of both groups were same due to traditional teaching method. Mean post-test scores of both groups were different. Students of treatment group had higher post-test scores than control group. It means treatment (flipped model) was effective for the academic achievement of students. Their focus was not on rote memorization of concepts. They have more clarity than the other group because they have discussed all the problems in face-to-face session.

CONCLUSIONS

The conclusions of the study were as follows:

1. Flipped model is an effective way of enhancing student's achievement because it brings significant changes in learning of students. Higher order-thinking skills may develop in students by adopting flipped model and technology in teaching learning process. Students become more problem-solver and creative. Videos and problem-solving activities fascinate the students of treatment group for learning. Face-to-face session was active because they were free to ask questions. Student's problems were discussed and solved in face to face session by teacher.
2. Lecture and demonstration method discourages ownership of one's over own learning because all students had to follow teacher-centered classroom in which teacher is authoritative and lead all students according to one format. It does not develop logical reasoning skills, problem-solving skills and higher-order thinking skills in students as there is less interaction among peers and with teacher in classroom.
3. Flipped model is good to choose for teaching purpose because it makes students heuristic, self-regulated learners and experiential. Students may have more interaction with technology due to which students become more confident and active in higher studies.

RECOMMENDATIONS

1. Flipped model may be implemented at all levels in the whole country but it should be start at small level. Later on, it may be progressed.
2. It demands good teaching skills and strategies to cope with flipped model demands. Therefore, training of teachers is required about implementing flipped model like video formation by consulting various sites, selecting videos from open learning resources, relevant to topics from sites, using various electronic gadgets, laptops, smart phones and internet.
3. Traditional teaching method may be eliminated gradually to make students more practical because students will leave the habit of spoon-feeding developed by it. Society and working environment will be more pragmatic if students come through flipped model.
4. Flipped classroom model may be used for teaching different topics according to nature of topic. It will give a good understanding about the topic as students discuss their problems with peers and teacher in face-to-face session.
5. Principals and school management of every school may allow the teachers to apply the new teaching model in their teaching practice by providing available technology to them which helps the students to have hands-on technology.
6. If researcher was allowed more time for the experiment then students may become more strengthened in their concept-making. They become more interactive and participatory in learning practices. It increases teacher satisfaction level in novel teaching method as she is gaining hands-on handling the teaching method and it would result in good performance by the students.

Limitations of the Study

Only two chapters of General Science were taken for experiment because researcher was allowed for a month and these two units were allotted to researcher by subject teacher.

Recommendations for Future Researches

1. A comparative study may be done to compare gender-wise difference in both teaching models.
2. A study may be conducted in which academic achievement is compared in different rural and urban areas.

3. Comparison of student's performance may be executed.in different subjects (Mathematics, History, Geography etc.) or in different grade level.

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