



# ACHIEVEMENT OF XI-STANDARD STUDENTS IN ORGANIC CHEMISTRY THROUGH FLIPPED CLASSROOM APPROACH

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**ABSTRACT:** Education is an important instrument to technological and socio-economic development of every nation. Science students answered chemistry questions poorly and also failed to draw correct structures (Amadi, 2016). Technology integration with pedagogy can change the scenario of outcome based teaching-learning model. The purpose of this study was to assess the achievement of XI-standard students in organic chemistry through Flipped Classroom approach. The researcher used E-Content Videos which were prepared by the researcher and validated by the expert's opinion. The effectiveness of Flipped Classroom approach on student's achievement was measured through quasi-experimental research using pre-test post-test control group design. This study was confined to 96 sample students having chemistry as their major elective subject. Sample students were drawn from one Senior Secondary School affiliated to CBSE in Purba Bardhaman District in West Bengal. The sampling technique employed was purposive and random sampling. Samples were divided into two groups e.g. Experimental group and Control group. The data were collected at pre-test and post-test phase. Data were analyzed by independent sample t-test and pair sample t-test using SPSS software. The result showed that the achievement of XI-standard student in organic chemistry was more improved through Flipped Classroom approach than conventional approach.

**Index Terms** – Flipped Classroom, Achievement, Organic Chemistry.

## **I. INTRODUCTION:**

Now-a-days, different instructional approaches and modules are used in the classroom for providing maximum learning experiences to students. Role of teachers is changing from authoritarians to facilitators; autocratic to democratic in classroom teaching by using the modern teaching-learning methods using technology. In many research works more emphasis is given over methods and techniques that may help the students to understand the concept instead of merely helping them to acquire knowledge. A group of individual teaching approaches depending on the students' individual differences that needs different ways of teaching process like flipped classroom approach. Technology in the twenty-first century allows instantaneous access to information through various technology tools such as computer, laptop and smart phone (Fu, 2013). Flipped classroom approach brings a revolution in the pedagogical model of school education.

## **II. SIGNIFICANCE OF THE STUDY:**

Due to advancements in science and information technology during this century a large number of inventions were made and these have also influenced the education system as a whole, particularly in teaching. Current teaching-learning practices may be invalid nowadays if it is totally converted to teacher centric autocratic system of teaching. In the past the teaching students were restricted on traditional materials like Blackboard and text book. It will be better for future generation if teaching-learning process transformed to learning-teaching process by the minimum help of teacher and maximum effort of learners. This can be achieving by using this innovative pedagogy like Flipped Classroom approach.

## **III. LITERATURE REVIEW:**

Sankar and Edward (2022) conducted a study on Flipped classroom in learning chemistry at the secondary level. The present study employed a pre-test, post-test and control group design. The results of the study showed that flipped classroom method was effective than the traditional method of learning chemistry to the secondary level students. It is concluded that there was a significant difference between the pre-test and post-test score of achievement in chemistry learning through flipped classroom method among the secondary level students of the experimental group. Sujisha (2018) conducted a study on Effectiveness of flipped classroom strategy on achievement in organic chemistry among standard ix students. The result revealed that the post-test means scores of achievement in organic chemistry for experimental and control group was compared the calculated t-value was 4.042 which was greater than the required value 2.58 for significant at 0.01 level. Hence there was significance difference between the post-test mean scores of experimental and control groups. This showed that the treatment given to experimental group was effective for the achievement in organic chemistry.

#### IV. METHODOLOGY:

##### Objectives of the study:

1. To compare the pre-test achievement score of XI standard students in organic chemistry taught through Flipped classroom and Conventional approach.
2. To compare the post-test achievement score of XI standard students in organic chemistry taught through Flipped classroom and Conventional approach.
3. To compare the pre-test achievement and post-test achievement score of XI standard students in organic chemistry taught through Flipped classroom and Conventional approach.

##### Hypotheses:

**H<sub>o1</sub>.** There is no significant difference in pre-test achievement score among XI standard students taught through Flipped Classroom Approach and Conventional approach.

**H<sub>o2</sub>.** There is no significant difference in post-test achievement score among XI standard students taught through Flipped Classroom Approach and Conventional approach.

**H<sub>o3</sub>.** There is no significant difference between pre-test and post-test achievement score of XI standard students taught through Flipped Classroom Approach.

##### Variables:

Dependent: Achievement

Independent: Instructional Approaches (Flipped Classroom approach & Conventional approach)

##### Delimitation:

- This study was confined to the content of XI standard Organic Chemistry syllabus of CBSE Curriculum.
- This study was confined to the XI standard students those who came from CBSE board and passed 10<sup>th</sup> Class board exam under CBSE board.

##### Definition of Important terms:

- **Achievement:** Achievement is the result of what students learned directly after the end of the educational topics or units or element.
- **Flipped Classroom:** In Flipped classroom is an instructional approach where short video lectures are viewed by students at home before the class session and in-class time is devoted to exercises and discussions with the same students and same content.

##### Population and Sample:

This study was conducted in one CBSE school near Burdwan town of district Purba Bardhaman in West Bengal. This study was confined to 96 XI standard students of science background having Chemistry as their major subject.

**Sample frame:**

Experimental Group (Flipped Classroom approach)	Control Group (Conventional approach)
48	48

**Statistical Technique and Software used:**

Statistical techniques used were: Descriptive statistics (Mean, SD) and Inferential Statistics (Independent sample t-test and Pair sample t-test).

Software used were: MS Excel-2010 and SPSS-21

**Tools used:**

- **Teaching Tools:**

“Teaching Videos” for Flipped Classroom Approach were prepared and validated by the researcher.

- **Assessment Tools:**

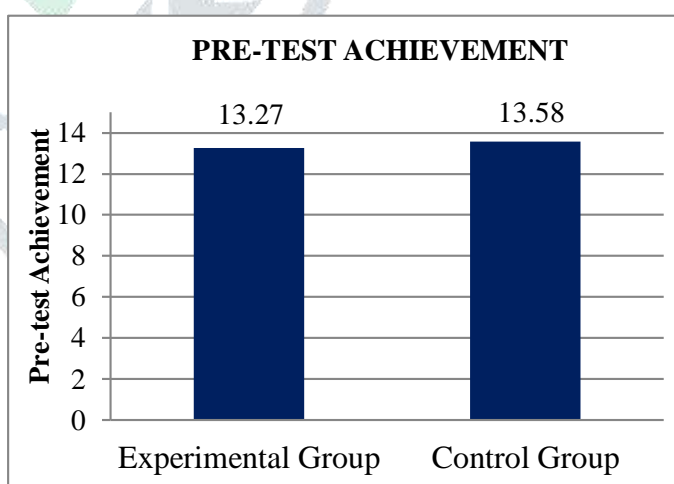
Tool used in this study was “Achievement Test in Organic Chemistry (ATOC)” for XI standard students as per CBSE Curriculum. It has been constructed for Pre-test and Post-test and both tests were standardized by the researcher.

**V. ANALYSIS AND INTERPRETATION:**

**H<sub>01</sub>.** There is no significant difference in pre-test achievement score among XI standard students taught through Flipped Classroom Approach and Conventional approach.

**Descriptive statistics:**

Groups	Experimental Group (Flipped Classroom)	Control Group (Conventional Approach)
<b>Descriptive Statistics</b>		
<b>N</b>	48	48
<b>Mean</b>	13.27	13.58
<b>SD</b>	2.229	2.872



**Figure-1:** Bar Diagram showing mean pre-test achievement score in Experimental group and Control group

From the table-1 and figure-1 it is seen that there was a little difference of mean pre-test achievement score between experimental group (Flipped Classroom approach) and Control group (Conventional approach). So, Inferential statistics (independent sample t-test) was run to know whether the difference is significant or not.



**Inferential Statistics:** Independent sample t-test has been performed.

**Table-2**  
Independent sample t-test of pre-test achievement scores between  
Experimental Group and Control Group

Instructional Approaches	Statistics			df	t	Sig. (p)
	N	Mean	SE			
Experimental Group	48	13.27	0.322	94	0.596	0.553 (P>0.05)
Control Group	48	13.58	0.415			

\*sig. at 0.05 level,  $p > 0.05$

### Interpretation:

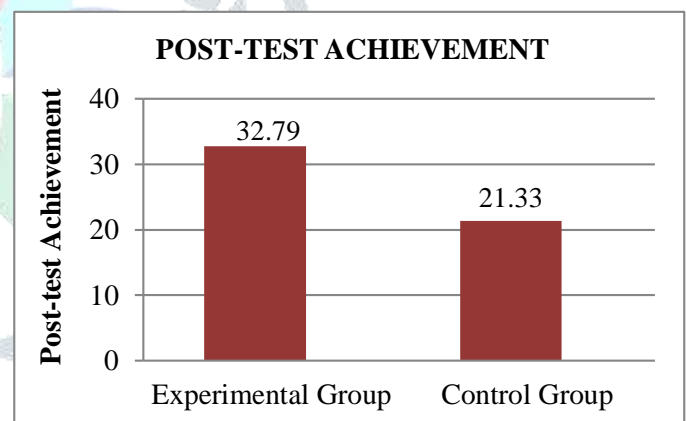
Table-2 showed that there was no significant difference in pre-test achievement score ( $t=0.596$ ,  $p>0.05$ ) between Experimental group (Flipped Classroom approach) and Control group (Conventional approach) among XI-standard students.

So the Null hypothesis ( $H_0$ ) was retained. This indicated that before the treatment both the experimental group and the control groups were equivalent.

**H<sub>0</sub>**. There is no significant difference in post-test achievement score among XI standard students taught through Flipped Classroom Approach and Conventional approach.

### Descriptive statistics:

Groups	Experimental Group (Flipped Classroom)	Control Group (Conventional Approach)
<b>N</b>	48	48
<b>Mean</b>	32.79	21.33
<b>SD</b>	7.047	5.829



**Figure-2:** Bar Diagram showing mean post-test achievement score in Experimental group and Control group

From the table-3 and figure-2 it is seen that there was a difference of mean post-test achievement score between experimental group (Flipped Classroom approach) and Control group (Conventional approach). So, Inferential statistics (independent sample t-test) was run to know whether the difference is significant or not.

**Inferential Statistics:** Independent sample t-test has been performed.

**Table-4**  
Independent sample t-test of post-test achievement scores between  
Experimental Group and Control Group

Instructional Approaches	Statistics			df	t	Sig. (p)
	N	Mean	SE			
Experimental Group	48	32.79	1.017	94	8.68*	0.00 (P<0.05)
Control Group	48	21.33	0.841			

\*sig. at 0.05 level,  $p < 0.05$

### Interpretation:

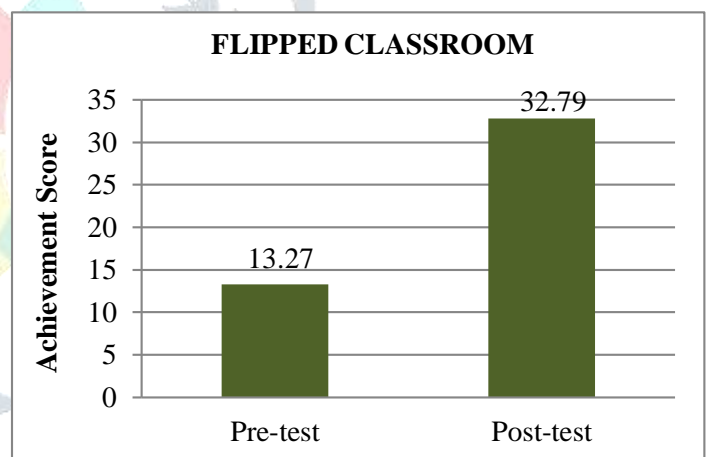
Table-4 showed that there exists significant difference in post-test achievement score ( $t=8.68$ ,  $p<0.05$ ) between Experimental group (Flipped Classroom approach) and Control group (Conventional approach) among XI-standard students.

So the Null hypothesis ( $H_02$ ) was rejected.

**H<sub>03</sub>.** There is no significant difference between pre-test and post-test achievement score of XI standard students taught through Flipped Classroom Approach.

### Descriptive statistics:

Descriptive Statistics	Flipped Classroom approach	
	Pre-test	Post-test
	<b>N</b>	48
<b>Mean</b>	13.27	32.79
<b>SD</b>	2.229	7.047



**Figure-3:** Bar Diagram showing mean pre-test and post-test achievement score in Experimental group

From the table-5 and figure-3 it is seen that there was a difference of mean pre-test achievement score and post-test achievement score in experimental group (Flipped Classroom approach). So, Inferential statistics (pair sample t-test) was run to know whether the difference is significant or not.

**Inferential Statistics:** Pair sample t-test has been performed.

Table-6  
Paired sample t-test for the equality of mean between pre-test and post-test achievement scores for Experimental Group

Achievement score	Statistics			df	t	Sig. (p)
	N	Mean	SE			
Pre-test	48	13.27	0.322	47	20.359*	0.00 (P<0.05)
Post-test	48	32.79	1.017			

\*sig. at 0.05 level,  $p < 0.05$

### Interpretation:

Table-6 showed that there exists significant difference between pre-test achievement and post-test achievement score ( $t=20.359$ ,  $p<0.05$ ) among XI-standard students taught through Flipped Classroom approach.

So the Null hypothesis ( $H_{03}$ ) was rejected.

### VI. MAJOR FINDINGS:

- ❑ There was no significant difference in pre-test score ( $t=0.596$ ,  $p>0.05$ ) among XI standard students in Experimental Group (Flipped Classroom approach) and Control group (Conventional approach).
- ❑ There exists significant difference in post-test scores ( $t= 8.68$ ,  $p<0.05$ ) among XI standard students in Experimental Group (Flipped Classroom approach) and Control group (Conventional approach).
- ❑ There exists significant difference between pre-test and post-test achievement scores ( $t=20.359$ ,  $p<0.05$ ) among XI-standard students taught through Flipped Classroom approach.

### VII. CONCLUSION:

In the modern technological era the teachers are always trying to adopt new innovative pedagogy in the field of education. This study gives a new direction towards new pedagogical tools in teaching-learning process in school education. The quality of teaching learning not only depends upon the ability and need of students but also depends on the innovative pedagogy adopted as according to the curriculum. Flipped classroom approach is very much popular at the post pandemic situation. The pandemic-COVID-19 shifted the traditional old pedagogy towards new innovative techno-pedagogy. Flipped classroom approach can fulfill the need of students and improve the academic achievement of students and maintain the quality of teaching-learning for the future generation.

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