# EFFECTIVENESS OF FLIPPED CLASSROOM STRATEGIES ON ENHANCING LEARNING PERFORMANCE OF CHEMISTRY AMONG XI STANDARD STUDENTS

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***ABSTRACT***

The purpose of the present study was to find out the effectiveness of Flipped Classroom Strategies on academic achievement of Chemistry among XI standard students. The main objectives were (i) to find out the level of gain scores of Control group students (ii) to find out the level of gain scores of Experimental group students (iii) to find out the significant difference in the Control group and the Experimental group students in the Objective-wise Pre-tests (iv) to find out the significant difference in the Control group and the Experimental group students in the Objective-wise Post - tests. Experimental method was adapted in the present study. Students from XI standard studying Chemistry as a subject formed the samples of the present study. Two equivalent groups of Control group and Experimental group were formed. The Control group was taught with traditional lecture method. The Experimental group was taught using Flipped classroom strategies model of teaching. Pre – test and Post – test was conducted. The data were analyzed using percentage analysis, mean, SD and t – test. The findings indicated that (i) the level of gain scores of control group students was moderate (ii) the level of gain scores of Experimental group students was moderate (iii) No significant difference exist between the Control group and the Experimental group in the learning objective-wise Pre-tests (iv) Significant difference exist between the Control group and the Experimental group in the learning Objective-wise Post-tests.

**Key words: Flipped classroom strategies, Control group, Experimental group, Chemistry, Gain score.**

## INTRODUCTION

Flipped Classroom strategies, is a new pedagogical model introduced by Chemistry teachers J. Bergmann and A. Sams, Woodland Park High School, Colorado, Chemistry teachers where they flipped their classes using Podcasting. In this blended learning method, face – to – face interaction is mixed with independent study using technology [1]. Flipping the classroom involves delivering the lecture content in the form of pre recorded videos at home. The students will be instructed to view the video content at home in advance before they attend the classroom session. Students can review, rewind and pause the video lecture and can learn at their preferred learning style and own pace. The in – class time engagements of the students in many of the activities such as discussion, quiz, test, laboratory method, demonstration of experiments, etc, make them to get involved in learning when compared to the traditional method. The flipped classes were a successful way to engage students on a deeper level and increased the students' curiosity. This help to improve their academic achievement and thereby the future career of learners. Flipped learning assets the students with the competencies required for the 21st century skills and become effective in quality enhancement of today's learning environment [2].

### Need and Significance of the Study

In this scenario of 21st century, learning by traditional methods will not make the students to acquire the necessary skills they need to compete in the techno based society. Students need to acquire more skills in addition to knowledge and understanding. Students need to apply the learned knowledge in their practical life. But the traditional lecture methods could not able to fulfill such requirements of today's learners. Mere book readings and reflection of teachers thinking will not aid much for meaningful learning to happen among the learner's of 21st century. In such scenario, a new pedagogical model known as the Flipped Classroom Strategies is emerged as a boon. In Flipping, the teachers will play the role of a guide rather than reflecting the content of the text book along with their own conceptions. Flipping allows the students to learn at their own individual pace and make them to be more accountable for their learning. The discussions and the problem solving activities with peers in the Flipped classroom facilitates deepen the understanding of the students in the content taught. Thus the students thinking will be stimulated and learning will become a meaningful task. Flipping will make Chemistry learning easier and interesting. Chemistry involves more abstract concepts and students find it difficult to understand the content when learnt using traditional method. The visual content in Flipping will make the students learning concrete, increases the retention and stimulate higher order thinking. The investigator wants to verify the effectiveness of Flipped classroom strategies on Chemistry learning of students and hence this study is carried out.

### Review of Related Literature

**Danker, Brenda[3] (2015)** explored the impact of flipped classrooms on student learning and achievement. This project used two Flipped Classroom approaches to stimulate deep learning in large classrooms during the teaching of a film module as part of a Diploma in Performing Arts course at Sunway University, Malaysia. Data was gathered from questionnaires and interviews with the students and with the teacher's reflective journals. The findings indicated that the flipped classrooms were able to remodel large lecture classes into active-learning classes. It supports individualized learning for the students through technology incorporated lessons. The study concluded that flipped classrooms were more effective for students' achievement.

**Hung, Hsiu – Ting[4] (2015)** studied the possible impacts of Flipping the classroom. The main objective of the study was to determine the impact of flipping on English language learners' Academic Performance, learning attitudes and students' participation levels. Quasi experimental design was used. Three different formats for Flip teaching were examined in this study. Data were analyzed using mean, SD and t – test. The results indicated that the structured and semi structured Flip lessons were more effective instructional designs than the Non Flip lessons. Flipped models imitated the students to develop better attitudes toward their learning.

**METHOD**

The present study adapted Experimental method as it was suitable for attaining the objectives of the present study. Students from a selected school studying Chemistry as a subject were selected as the samples. The students were divided in to two groups as Control group and Experimental group. Flipped classroom strategies for Eleventh standard chemistry, state board syllabus in the selected topics were prepared by the investigator. The topics selected for the study were based on the diagnostic test conducted. The developed strategies were validated by the investigator with the guidance of experts. The Experimental group was taught Chemistry using Flipped Classroom Strategies. The content videos were distributed in online as well as in the CD – ROM for the students to view the lecture content at home before class. During in class time strategies of discussion, quiz, problem solving etc were applied. The Control group was taught the same topics using traditional method. The tools used were Pre - test and Post – test Achievement test in Chemistry. The tools were constructed and validated by the researcher. Pre - test and post – test were conducted. The duration of the test was 1 hour. The collected data were scored according to the scoring procedure. The statistical procedures mean, SD and t – tests were used [5]. The results were tabulated and interpreted. The results were interpreted at 0. 05 level of significance [6]. Based on the results the findings of the study were reported.

**TABLE 1**
**EXPERIMENTAL DESIGN**

| Group | Pre Experimental Process | Experimental Process | Post Experimental Process |
|---|---|---|---|
| **Control Group** | Pre-test (Achievement Test in Chemistry) | Conventional Lecture method of teaching | Post-test (Achievement Test in Chemistry) |
| **Experimental Group** | Pre-test (Achievement Test in Chemistry) | Flipped Classroom Strategies model of teaching | Post-test (Achievement Test in Chemistry) |

**Population**

The population of the present study involves Eleventh Standard students studying Chemistry as a subject.

**Sample**

The study conducted on a sample of Eleventh standard students studying Chemistry as a subject in a selected school.

**Tool**

Pre achievement test and post achievement test in Chemistry constructed and standardized by the investigator were used as the tools to measure the effectiveness of Flipped Classroom strategies.

**Statistics Used**

Percentage analysis, Mean, SD and t – test were used as the statistical procedures to analyze the collected data.

**RESULTS AND DISCUSSION**

**Hypothesis 1:** To find out the level of gain scores of Control group students.

**TABLE 2**

**LEVEL OF GAIN SCORES OF CONTROL GROUP STUDENTS**

| Low | | Moderate | | High | |
|---|---|---|---|---|---|
| Count | % | Count | % | Count | % |
| 5 | 15.2 | 23 | 69.7 | 5 | 15.2 |

The table 2 indicated that 15.2% of the Control group students have low level of the gain scores. 69.7% of Control group students have moderate level of the gain scores. 15.2% of control group students have high level of the gain scores.

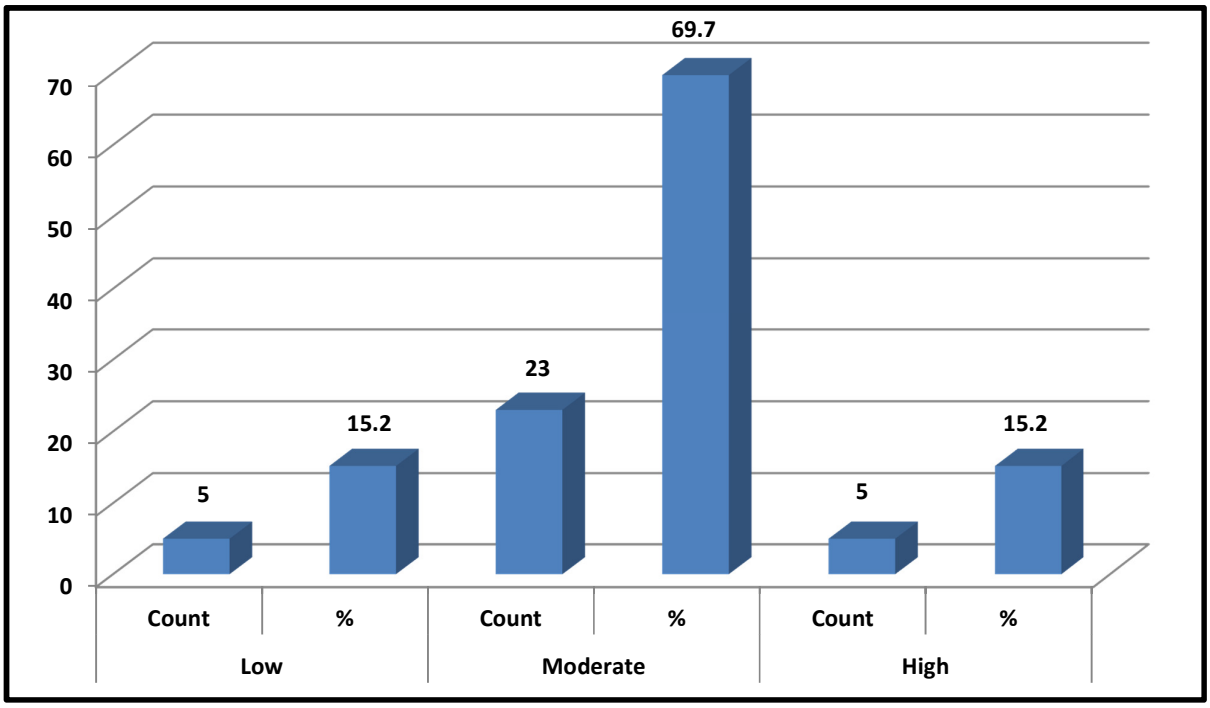


**Fig. 1: LEVEL OF GAIN SCORES OF CONTROL GROUP STUDENTS**

**Hypothesis 2:** To find out the level of gain scores of Experimental group students.

**TABLE 3**

**LEVEL OF GAIN SCORES OF EXPERIMENTAL GROUP STUDENTS**

| Low | | Moderate | | High | |
|---|---|---|---|---|---|
| Count | % | Count | % | Count | % |
| 7 | 21.2 | 20 | 60.6 | 6 | 18.2 |

The table 3 indicated that 21.2% of the Experimental group students have low level of the gain scores. 60.6% of Experimental group students have moderate level of the gain scores. 18.2% of Experimental students have high level of the gain scores.

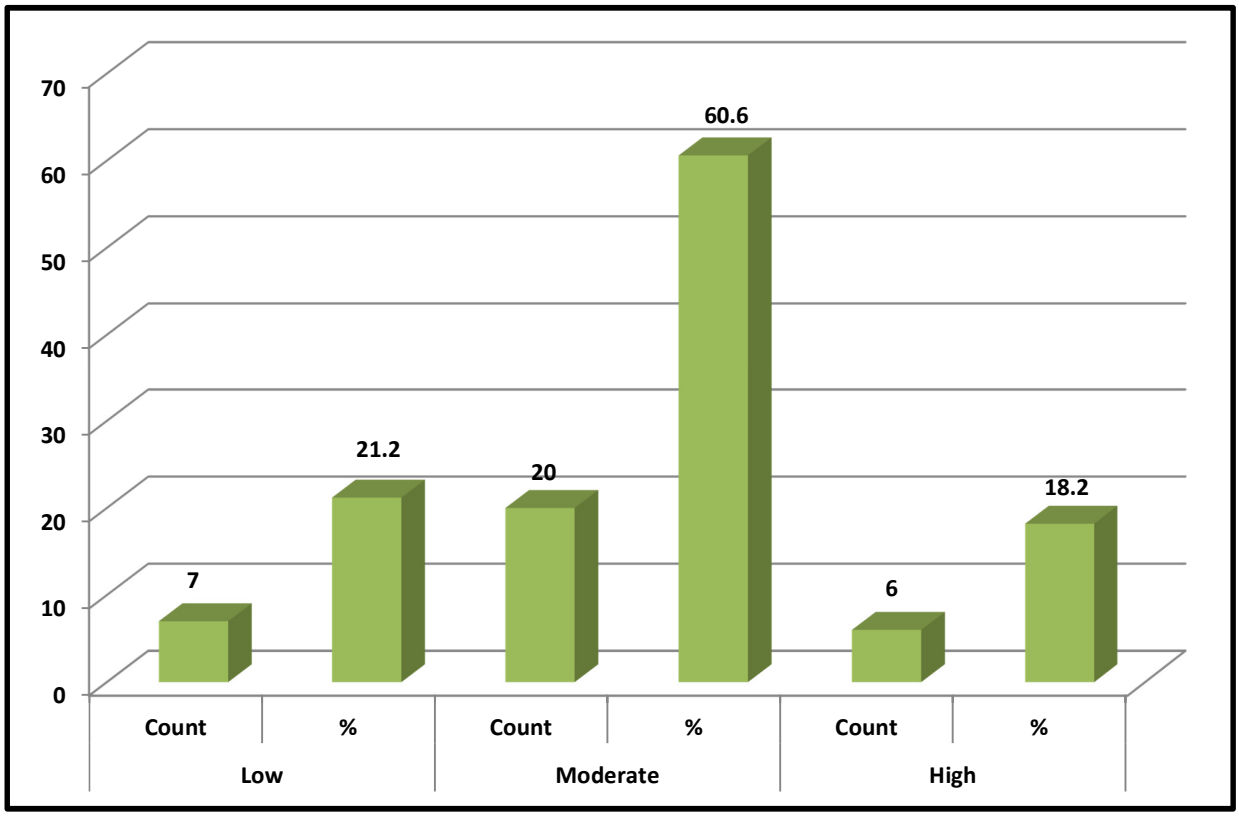


**Fig. 2: LEVEL OF GAIN SCORES OF EXPERIMENTAL GROUP STUDENTS**

**Hypothesis 3:** No significant difference between the Control group and the Experimental group students in the Objectives wise viz. Knowledge, understanding, application and skill Pre-tests.

**TABLE 4**
**DIFFERENCE BETWEEN CONTROL GROUP AND EXPERIMENTAL GROUP WITH RESPECT TO PRE TESTS OBJECTIVE-WISE**

| Control group | | Experimental group | | 't' value | 'P' value |
|---|---|---|---|---|---|
| Mean | S.D | Mean | S.D | | |
| 9.70 | 2.789 | 10.12 | 3.569 | 0.490 | 0.627 Not significant |
| 8.55 | 3.093 | 9.45 | 3.251 | 1.107 | 0.277 Not Significant |
| 7.15 | 3.001 | 7.03 | 2.555 | 0.176 | 0.862 Not Significant |
| 5.58 | 2.818 | 5.27 | 2.169 | 0.438 | 0.664 Not Significant |

The level of significance was 0.05. The table 4 indicated that all the obtained 'p' values are greater than 0.05. The results indicated that there is no significant difference exists between the Control group and the Experimental group in the objective-wise Pre tests. The results indicated that, the performance of both the Control group and the Experimental group was equal in the objective wise Pre tests.

The Mean scores of Control group student's Pre tests in the objectives of Knowledge, Understanding, Application and Skill and the Experimental group student's Pre – tests in the objectives of Knowledge, Understanding, Application and Skill, indicated that both the Control group students and the Experimental group students performed equally in objective wise Pre tests.

**Hypothesis 4:** No significant difference between the Control group and the Experimental group in the Objective wise viz. knowledge, understanding, application and skill Post-tests.

**TABLE 5**
**DIFFERENCE BETWEEN THE CONTROL GROUP AND EXPERIMENTAL GROUP WITH RESPECT TO POST TESTS OBJECTIVE-WISE**

| Control group | | Experimental group | | 't' value | 'P' value |
|---|---|---|---|---|---|
| Mean | S.D | Mean | S.D | | |
| 11.21 | 3.426 | 16.30 | 3.540 | 5.575 | 0.000 Significant |
| 9.88 | 3.389 | 16.12 | 5.195 | 5.425 | 0.000 Significant |
| 8.30 | 3.283 | 14.00 | 4.153 | 5.549 | 0.000 Significant |
| 7.21 | 3.426 | 11.27 | 2.684 | 4.701 | 0.000 Significant |

The level of significance is 0.05. The table 5 indicated that all the obtained 'p' values are less than 0.05. It was inferred that significant difference exist between the Control group and the Experimental group in the Post test objective-wise. Also, it is further interpreted that the Experimental group students performed better than the Control group students in post test objective wise.

The Mean scores of Control group students' Post – tests in the objectives of Knowledge, Understanding, Application and Skill and the Experimental group students' Post – tests in the objectives of Knowledge, Understanding, Application and Skill, indicated that the Experimental group students performed better than the Control group students in objective wise Post – tests.

**Findings**

The results indicated that,

(i) The level of gain scores of Control group students is moderate.
(ii) The level of gain scores of Experimental group students is moderate.
(iii) No significant difference exists between the Control group and the Experimental group in the objective-wise Pre tests.
(iv) Significant difference exists between the Control group and the Experimental group in the Post – test objective-wise.

## CONCLUSION

The findings established that the Flipped Classroom Strategies were more effective than the traditional method of teaching. The monotony of the traditional method involves only the teachers to be more active and the students' participation in learning will be minimal. This traditional environment of learning will not be much successful as the psychological maxim of learning by doing is not fulfilled. But, Flipped classroom strategies involve both the learners and teachers to be actively involved in the teaching learning process. In the present study the results indicated that there was significant difference exists in the objective wise post test scores but no significant difference exists with respect to the objective wise pre test scores. Thus it is concluded that that Flipped classroom strategies were more effective than the traditional method of learning - teaching the subject Chemistry.

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