# DOES FLIPPED CLASSROOM IMPACT THE SCIENCE ACHIEVEMENT OF STUDENTS FROM DIFFERENT SOCIOECONOMIC BACKGROUNDS?

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**Abstract-**

In the current educational landscape, various innovative teaching methods are used to enhance learning outcomes. Among them, the flipped classroom occupies a significant place due to its focus on learner engagement and independent learning. The present study, conducted in the Darbhanga district of Bihar, investigates the impact of the flipped classroom on the science achievement of secondary school students belonging to different socioeconomic backgrounds. The study adopted a pre-experimental one-shot case design. Two schools with two sections of class IX were selected conveniently, and one section from each school was randomly assigned to the flipped classroom method. A self-constructed science achievement test was administered after the intervention.

Findings revealed that students with above-average socioeconomic status scored a mean of 39, those with average socioeconomic status scored 33, and below-average students scored 26 when taught through the flipped classroom. Under the lecture method, above-average students scored 31, average students 34, and below-average students 28. A t-test comparing the above-average socioeconomic group taught through both methods yielded a t-value of 1.922, which was not significant at the 0.05 level. This indicates that the flipped classroom did not significantly improve the science achievement of above-average socioeconomic status students.

The study concludes that in the Indian context—especially in Bihar—students accustomed to teacher-centered methods face challenges in adapting to the flipped classroom model due to lack of resources, digital limitations, and low self-regulated learning habits.

**Keywords:** Science Achievement, Socioeconomic Status, Flipped Classroom, Teaching Methods.

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## Introduction-

There are many advantages to incorporating technology into the classroom, as it makes it easier for educators to employ different methodologies that allow students to learn more effectively, acquire various skills beyond the subject content, and become engaged in the learning process. For the last few years, the flipped classroom has in a trend that has had a great impact on schools, colleges, and universities for all subjects and disciplines. The idea of the flipped classroom emerged in 1993 by researcher Alison King, called "From sage on the stage to guide on the side," while the work did not call for the use of "flipping" classroom. It used class time to give meaning and information to students to learn. For this assertion, King's work is often considered the foundation for flipped classroom model. The phrase 'flipped learning' came into general use in the early mid-2000s when it was popularized by Chemistry teachers Jon Bergman and Aaron Sams (Bergman & Sams, 2012). High profile publications in The New York Times (Fitzpatrick, 2012); the Chronicle of Higher Education (Berrett, 2012); and science (Mazur, 2009); In essence, "flipping the classroom" means that students gain first exposure to new material outside of class, usually via reading related material, seeing videos, and then use class time to do the hard work of assimilating that knowledge, perhaps through problem-solving, discussion or debates etc. Flipped learning involves exposing students to instructional content—through videos, audio clips, or text—before class, while classroom time is dedicated to deeper engagement such as discussion, problem-solving, and collaborative activities. According to the Flipped Learning Network (2014), it is a pedagogical approach that transforms the group learning space into an active and interactive environment.

In the traditional method, lower levels of learning, like remembering and understanding, are completed in the classroom, while students leave the higher level of learning, which is completed at home. In flipped classroom learning process, the roles are reversed. Students can complete the lower level of cognitive work before the class, and when they come to class, they are busy with the higher level of cognitive work.

## Definitions of Flipped Classroom-

According to **Bishop and Verleger (2013**), flipped classroom is a student-centered learning method consisting of two parts with interactive learning activities during lesson and individual teaching based directly on computer of lesson.

**Mull (2012)** defined it as a model that provides students prepare themselves for the lesson by watching videos, listening podcasts and reading articles. According to **Milman (2012),** it is an approach aims the efficiency of lessons by transferring knowledge to students via videos and vodcasts as well as by discussions, group works and applications during the course.

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## Knowledge Gap-

Various studies were conducted regarding the pedagogy of science to identify the knowledge gap. Some of them were reviewed and concluded as follows.

**Khan Azkia (2019)** the effect of socio-economic status on the teaching effectiveness in the achievement of physical science secondary school students taught through CAM and TM and it can be concluded that teaching effectiveness in the achievement of a high socio-economic status group was found to be higher than in the low socio-economic status group of male physical science secondary school students taught through the concept attainment model and traditional method but in case of female physical science secondary school students nearly similar high and low socio-economic status group taught through concept attainment model and traditional method.

**Farid Nabila (2023)** compared the achievement of students of high and low socio- economic status taught through smart classroom conventional methods of teaching in mathematics and found that there was no significant difference in the influence of smart classroom teaching in comparison to conventional teaching method on the achievement of level of students belonging to high and low socio-economic status in mathematics at junior high school level. both have equal influence.

**Rao Manikya Gollapudi (2019)** study the difference between different socio-economic strata of the students about achievement in science at the secondary school level and concluded that achievement in science of upper-class family background of students is better than that of lower-middle-class, upper lower-class class, and lower-class family background students.

## Significance of the study-

In current times, various methods in trends help achieve a higher level of learning. However, the flipped classroom has a unique place in teaching methods. This research study signifies the importance of learning its own pace. Students are responsible for his/her learning. Many other conventional methods are more focused on content knowledge, rote and the learning process of learning. But this teaching method actively involves the students. How students learn by using different learning materials at home. What is the best way they used audio, videos, and text content, etc., to help students engage in making a concept? This method flipped classroom helps to achieve a higher level of learning at any time when students are free and different resources. In this study, it is interesting to eye the performance and achievement of students when they are taught by flipped classroom.

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## Need of the Study-

There are many new methods in trends, so we also need to see who performs better. Therefore, the researcher conducted a study in which the researcher taught by flipped classroom at secondary level students they have diverse socio-economic backgrounds. In school education, students belong to various socio-economic backgrounds, and it is seen that those students belonging to lower socio-economic status, which has low achievement, health issues, low digital literacy, engage in odd jobs, etc. In that situation, it is very interesting to know the effect of flipped classroom on students has different socio-economic statuses. These specific reasons and situations prompted the researcher to choose such a topic for the study. The proposed study will provide logical evidence on the science achievement of students have divergent socio-economic backgrounds taught by flipped classroom. This type of study gives the logical evidence about flipped classroom and promotes this type of teaching method in rural areas where generally students belong to below-average and lower economic status. The findings of the study will ascertain the issue of flipped classroom in science teaching at the school level students who socio socioeconomically unequal. The results of the study will promote the flipped classroom methods and how effectively it used in socio-economic free classroom situations. It also popularizes science education through the use of learning materials and learn at their own pace. It also promoted the flipped classroom, those students engage in odd jobs and somehow financially support their family

## Research question-

Does flipped classroom affect the science achievement of students?

## Statement of the study-

Does flipped classroom impact the science achievement of students from different socioeconomic backgrounds?

## Objectives of the study-

1- To know the science achievement of students belonging to different levels of socio-economic status who are taught by flipped classroom.
2- To know the science achievement of students belonging to different levels of socio-economic status who are taught by lecture method.
3- To compare the science achievement of students who belong to Above above-average category of socio-economic status who were taught by flipped classroom and lecture method.

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## Hypothesis of the study-

1- There is no significant difference between the science achievement of students who belong to the above-average category of socio-economic status who were taught by flipped classroom and lecture method

## Variables of the study-

**Independent variable-** methods of teaching (Flipped classroom and Lecture method), socioeconomic status,

**Dependent variable-** Science achievement.

## Operational definitions-

**Flipped classroom-**it is a reversal of the traditional method. Before the actual class, teachers provide learning material in the form of text and videos to the students. And in the classroom, conduct group discussions as a guide or facilitator.

**Science Achievement -** Science achievement refers to obtaining a score on the science achievement test.

**Socio-economic status-** the status of an individual's position in their society according to economic and social factors.

## Design of the Study

**Research Design-**

Pre-experimental, one-shot case study design.

**Population-**

All secondary school students in Darbhanga district.

**Sample-**

Two conveniently selected schools with two sections of class IX. One section from each school was randomly selected. All present students in those sections formed the sample.

**Tools-**

1.  Self-constructed Science Achievement Test (60 items)

2.  Standardized SES scale by Upadhyay & Saxena

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## Construction of experimental research-

Researcher has conveniently selected two schools that have two sections in the IXth class. Sections have been randomly selected for the flipped classroom, and all the present students of the selected sections were sampled for this study. Before taking the class, a pre-test was conducted in a selected section. In a flipped classroom, learning materials, such as videos and text, are given to learners one day in advance, and they are instructed to study at home with the help of these materials. The next day, they come with any doubts, questions, or queries they may have to ask the teachers. Videos were provided by WhatsApp numbers of the student's family members, and texts were provided one day before in the form of hard copies related to topics such as "Fundamental unit of life: Cell, Tissue, Diversity in living organism, and Why do we fall ill?" During the treatment process, in a classroom differentiation activity researcher conducted group discussion and quiz competition to clear their doubts and queries. After completion of the treatment, the researcher conducted the post-test of science achievement and compared the scores of science achievement of students belonging to different levels of socio-economic status.

## Analysis of Data-
The inferential method was used.

## Statistical techniques-
 To interpret the data, suitable statistical techniques, mean, percentage, S.D., and t-test, were used.

## Analysis and Interpretation of Data-
1- To analyze the objective to know the science achievement of students belonging to different levels of socio-economic status who were taught by a flipped classroom mean was used.

**Table-1**

| Level of Socio-Economic Status | Average Score of Science Achievement |
|---|---|
| Above Average | 39 |
| Average | 33 |
| Below Average | 26 |

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## Interpretation-

Table 1 shows the mean score of science achievement of students belonging to different socio-economic statuses. Students are under the above-average category of socio-economic status had scored 39, average level of socio-economic status students scored 33, and socio-economically below average students scored 26.

2- To analyze the objective to know the science achievement of students who belong to different levels of socio-economic status who were taught by lecture method, the mean was used.
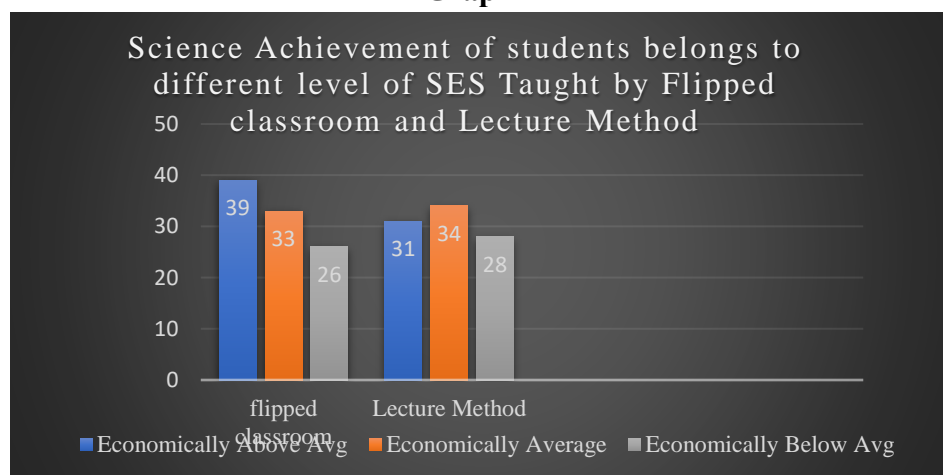
**Table-2**

**Science Achievement of students belongs to different levels of socio-economic status**

| Level of socio-economic status | Average Score of Science Achievement |
|---|---|
| Above Average | 31 |
| Average | 34 |
| Below Average | 28 |

## Interpretation-

Table 2 shows the mean score of science achievement of students belonging to different socio-economic statuses. Students are under the above-average category of socio-economic status had scored 31, socio-economically average students scored an average of 34 in science achievement, and those in the below-average category of socio-economic status had an average score of science achievement is 28 who were taught by the lecture method.

**Graph-1**



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3- To analyze the objective to compare the science achievement of students who belong to the above-average category of socio-economic status who were taught by flipped classroom and lecture method t-test was used.

**Table-3**

| t-Test: Two-Sample Assuming Unequal Variances | | |
|---|---|---|
| | | |
| | _46_ | _41_ |
| Mean | 37.8 | 27.66666667 |
| Variance | 111.7 | 16.33333333 |
| Observations | 5 | 3 |
| Hypothesized Mean Difference | 0 | |
| df | 6 | |
| t Stat | 1.922434139 | |
| P(T<=t) one-tail | 0.051459097 | |
| t Critical one-tail | 1.943180281 | |
| P(T<=t) two-tail | 0.102918194 | |
| t Critical two-tail | 2.446911851 | |

**Table-4**

| Variable | Methods of teaching | Number of students | Mean | Df | P-value | T Stat | Result |
|---|---|---|---|---|---|---|---|
| Science Achievement | Flipped Classroom | 6 | 39 | 6 | 0.102 | 1.922 | NS |
| | Lecture Method | 4 | 31 | | | | |

**Interpretation-**

Table -4 shows that the science achievement of those students who are above-average level of socio-economic status is taught through flipped classroom and lecture method. The mean of science achievement for those taught through flipped classroom is 39, and for those taught through

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the lecture method is 31. The t-stat value is 1.922, which is less than the critical value of 2.446 at the 0.05 level. This explains the null hypothesis, "There is no significant difference between the achievement of students who belong to the above average category of socio-economic status who were taught by the flipped classroom and lecture method." was accepted, which means flipped classroom does not affect the economically above average level students.

## Findings-

The finding of the first objective, to know the science achievement of students who belong to different levels of socio-economic status who were taught by flipped classroom, the mean score of students is under the above-average category of socio-economic status, had scored 39, the average level of socio-economic students scored 33, and socio-economically below average students scored 26. Finding of second objective, to know the science achievement of students belongs to different level of socio-economic status who taught by lecture method- the mean of students is under the above-average category of socio-economic status had scored 31, socio-economically average students scored the mean of 34 in science achievement, and those in the below-average category of socio-economic status had a mean of science achievement is 28. Finding of third objective, to compare the science achievement of students who belong to Above average category of socio-economic status who were taught by flipped classroom and lecture method- the mean of above above-average students who were taught by flipped classroom is 39 and they who are taught by lecture method is 31, respectively, and the t-value is 1.922 at 0.05 level is not significant.

## Conclusions-

Science Education develops ability, reasoning, curiosity, creativity, positive attitude, logical thinking, acceptance of the ups and downs of life, problem-solving approach, and these abilities beautify or refine the personality of students. Science education enhances the understanding of students, constructs the scientific knowledge, expands the scientific literacy, and makes them responsible citizens. Inventions and discoveries are essential for the progress of society and for making life so easy. So, there is a need to focus on science education. Science education is that type of education which improves the logical & rational thinking in human beings. Science achievement means students have sound knowledge of science, better scientific skills, good performance in the science subject, and sophisticated marks in science according to their class level. present study "Does flipped classroom impact the science achievement of students from different socioeconomic backgrounds"? In this study, after analysis of raw data, we conclude that mean science achievement of socio-economically above-average students who are taught by flipped classroom method is greater than those who are taught by lecture method. The hypothesis-

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There is no significant difference between the achievement of students who belong to above above-average category of socio-economic status who were taught by the flipped classroom and lecture method was accepted. As the value explains that the science achievement of above above-average category of socio-economic status who were taught by the flipped classroom and lecture method has no significant difference. It means the science achievement of students belongs to above above-average category who were taught by flipped classroom is equal performing than of those who were taught by lecture method.

## Discussions-

The present study, "Does flipped classroom impact the science achievement of students from different socioeconomic backgrounds"? shows that the mean of science achievement of the above-average category taught by the flipped classroom is greater than that taught by the lecture method. The null hypothesis "There is no significant difference between the achievement of students who belong to the above average category of socio-economic status who were taught by the flipped classroom and lecture method" was accepted, but flipped classroom was not much more effective on science achievement at different levels of socio-economic status. During the treatment researcher observed that on the first day, students were highly motivated, but gradually they lost their motivation. Because in a flipped classroom, the learning materials were provided in text and video form, most of the students did not see the video at home, and some of the students did not read the learning material at home. It may be that the reason for the flipped classroom is not working on a scientific attitude. It is seen that not all students don't mean they belong to which socio-economic status is taught the private tuitions, so it also reduces the difference in science achievement of students who are taught by the flipped classroom and lecture method. Some of the students belong to above average category of socio-economic status they used their mobile and most of the students either it belongs to above average, average and below average category of socio-economic status they share their parents WhatsApp number to share the video and learning material so they don't watch video timely and study the learning material so slowly lose their motivation towards flipped classroom. In this context, students are habituated to teacher-centered methods, the chalk and duster method, lecture method, etc. So, they face some genuine problems in adopting this new way of learning, and it has also been observed that Indian society, particularly rural areas, is still lacking all the required facilities and a conducive environment to adopt this method.

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