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Study Of Flipped Learning And Academic Achievement Among Teacher Trainees

Dr. Md. Mahmood Alam
(Associate Professor & Principal)
MANUU College of Teacher Education, Asansol -713301(W.B.)

Abstract

"Learning is a two-step process...First, you must have some transfer of information; second, you must make sense of that information by connecting it to your own experiences and organizing the information in your brain"(- Eric Mazur, professor of physics at Harvard University). A flipped class model is structured around the idea where the typical elements of lecture and homework are reversed. The flipped classroom approach allows students to learn at their own pace and gives instructors a way to create applied learning opportunities. The objectives of the present paper are to investigate effect of flipped learning on academic achievement of teacher trainees. 100 teacher trainees were selected from a Teacher Training Institute for the research in hand. 50% teacher trainees were randomly assigned as the control group and the 50% as the experimental group. A randomized Post-test control group design adapted and finally achievement test conducted. The researcher selected a topic from "Psychology of Learner and Learning" to conduct -- a flipped class with selfprepared audio, video, digital slideshows (e.g. Power Point), e-content and teacher/student online communication. The in-class activities were performed using the online tool Kahoot to create effective classroom interaction. The result of the study revealed that flipped learning technique is more effective in comparison to traditional methods in enhancing the overall academic achievement of teacher trainees. Further most of the teacher trainees perceived that the flipped classroom approach is supportive in nature regarding academic enhancement.

Keywords: Flipped Classroom, Academic Achievement, Pedagogy, Trainee Teachers

Introduction

The flipped classroom exemplifies a teaching method that turns the typical educational environment upside down. Instead of presenting new content in class and assigning exercises as homework, the flipped classroom approach encourages students to access new material independently, often through video lectures or digital modules, and reserves in-person class time for discussions, problem-solving, and practice. The core purpose of this model is to promote student-centered learning or provide students with a say in the decisions and direction of their learning. Flipped classroom allows students to engage with new material at their own pace, granting them the time and flexibility to absorb knowledge that aligns with their learning style. In a flipped classroom, educators typically curate or create digital resources such as video lectures, interactive activities, or reading materials that students can access before class. Once in class, teachers guide students through active, often collaborative, exercises that allow them to apply what they have learned. These activities might include: (a)

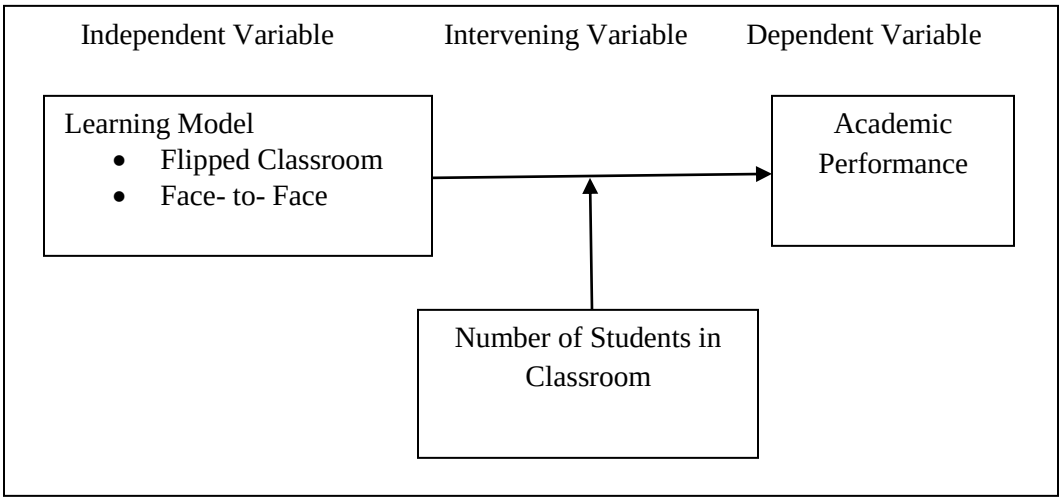
Discussions (b) Problem-solving exercises (c) Projects (d) Presentations etc. While it's a relatively new teaching method, there's evidence to suggest flipped classrooms keep students more engaged in the learning process and see better learning outcomes. Instead of a classroom lecture followed by homework, flipped classrooms bring the hands-on learning to the classroom in order to:

- Engage students in active learning
- Develop relationships with teachers and peers
- Build connections and use higher-order thinking skills

The increasing development of digital technologies and their application in education facilitates new learning ecologies that offer students new web-based learning opportunities and resources. This rapid spread of interactive technologies has facilitated the adoption of innovative approaches in higher education that help to promote collaborative learning, exploration, and research in online networked learning environments. It is in this context that alternative approaches to teacher-centered instruction have arisen and made a breakthrough in tertiary education. In this line, the development of innovative student-centered approaches has encouraged teachers to rethink educational processes to shift the focus from them to the students, facilitate student participation, develop practical thinking, and improve digital skills (Wright, 2011). Technology-driven models, such as the flipped classroom, which provides students with direct access to video lectures, slides, and other teaching resources on online educational platforms, have gradually gained visibility and relevance (Bergmann and Sams, 2012). This discussion-oriented approach has accelerated well-structured independent learning, allowing teachers to provide feedback and assistance through innovative resources and learning management systems (LMS) in parallel with the implementation of collaborative problem-solving activities and group discussions in face-to-face lessons (López et al., 2016).

The term flipping in Flipped Classroom is used to define the interchange of homework and classroom activities (Ash, 2012). The flipped classroom concept was first used and practiced by Jonathan Bergmann and Aaron Sams working at University of Northern Colorado (Talbert, 2012; 1). These two chemistry educators realized that students need teachers more while they are doing their homework. After that, this method started to be noticed (Bergman and Sams, 2012). Flipped classroom model is a part of a broad educational movement which covers the blended learning, inquiry based learning and other educational approaches and the tools that integrate flexible, efficient learners (Johnson, Becker, Estrada and Freeman, 2014). Flipped classroom model provide an environment which include Project based or real world practices for learners in order to learn the subject better at class time. The learner realizes learning watching course videos, listening podcasts, reaching e-books and meeting with peers online instead of getting information presentation from teacher at class time. Learners can reach to these broad sources any time they needed. So that, the teacher can spend more time to interact with each individual. The main goal is to provide learners a more authentic learning (Johnson, Becker, Estrada and Freeman, 2014). The flipped classroom model approach was first seen under the name of inverted classroom in the study of a group of professors at Miami University (Lage et al., 2000; 30-43). Flipped (inverted) classroom which is defined as changing the place of classroom practices and out of class practices (Lage, Platt, & Treglia, 2000) is a popular pedagogical approach.

Studies on the impacts of the FC Model on student performance and learning outcomes show that the FC approach enhances student's learning performance (Janotha, 2016; Sun & Wu, 2016; Zengin, 2017; Zhonggen & Wang, 2016), produces enhanced learning outcomes (Chen Hsieh, Wu, & Marek, 2017; Gillispie, 2016; Smallhorn, 2017). Although most of the research suggests that the FC Model positively impacts students' learning, there are also studies which have not revealed anticipated positive effects. For example, Smallhorn (2017) did not find an observable increase in students' academic achievement. The following diagram shows the relationship among variables in flipped classroom model.



Conceptual Framework

Flipped Learning: Concept and Definitions

Flipped learning is a pedagogical approach in which direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter. Simply speaking flipped learning is defined as "school work at home and home work at school," Bergmann and Sams (2012) defined flipped learning as an instructional strategy "where work that was traditionally done in the class is now done at home, and what was traditionally homework is now completed in class" (p. 13).Operationally flipped learning is defined as a contemporary method wherein the instructor presents the content material of the concern for the students in several forms along with recorded lectures, movies, and digital readings so that scholars can evaluate such substances and recognize the statistics before attending the classroom.

Teacher Trainees: Concept and Definitions

Teacher trainees are students engaged in a teacher training program in order to receive a teaching certificate satisfying degree requirements of theory and field experience. Teacher trainees are student teachers, who practice teaching at the designated schools and are supervised by teachers and mentors. They are also called in this article as prospective teachers. Operationally defined teacher trainees are students who are pursuing a Bachelor of Education. In the present study, first year B. Ed. teacher trainees were selected from Bijoy Pal Memorial B.Ed. College affiliated to Baba Saheb Ambedkar Education University (BSAEU), Paschim Burdwan (W. B.).

Academic Achievement: Concept and Definitions

Academic achievement refers the extent to which a student, teacher, or institution has achieved their set educational targets. It is measured through examinations or continuous assessments. Good (1959) defines academic achievement as the knowledge attained or skill developed in the school subjects, usually designated by test scores or marks assigned by the teachers. Operationally defined academic achievement is the extent of learning outcome which B. Ed. teacher trainees have achieved during the training programme.

Review of related literatures

Buhl - Wiggers et al. (2023) carried out a study on the insights on a flipped classroom on academic achievement. The study was conducted on a first - year undergraduate macroeconomics course with 415 students. A comparison between students in the flipped model, and those in traditional classrooms, revealed that the treatment had a statistically insignificant effect on the students' academic performance.

Hussain et al. (2023) assessed the effectiveness of flipped class room strategy on student performance. A comprehensive literature review was conducted, utilizing both qualitative and quantitative research studies on

the flipped classroom approach. The review encompasses a diverse range of academic disciplines and educational levels, providing a comprehensive analysis of the strategy's effectiveness in various contexts. The findings of this review indicate that the flipped classroom strategy has a positive impact on student performance.

Liang Yu et al. (2023) investigated impacts of the flipped classroom on student performance and problem solving skills in secondary school chemistry courses. A two-stage experiment was conducted with the flipped classroom group including 46 students (20 males and 26 females) and the non-flipped classroom group consisting of 50 students (30 males and 20 females). Both groups were taught by the same chemistry teacher. t -tests showed that the flipped classroom significantly improved student academic performance compared to the non-flipped classroom.

Masadeh (2021) conducted a study on the effectiveness of flipped classroom on the academic performance of university undergraduates. The quasi - experimental approach was used and three achievement post - tests were carried out. Participants were (32) students divided into control and experimental group. The results showed that there was a significant difference between students' achievement mean scores in the second post - tests in favor of students who learnt the course content using flipped classroom.

Ikwuka & Okoye (2021) studied differential effects of flipped classroom and gender on Nigerian Federal Universities CEP students' academic achievement in basic methodology. The design of the study was quasi experimental design involving 2x2 factorial design while two-stage sampling procedure of purposive and simple random sampling techniques were used to select two departments out of fifteen departments in the Faculties of Education of the two selected universities from South-East and South-South. The sample was 74 third year CEP students drawn from two intact classes. Data collected was analyzed using mean while Analysis of Covariance (ANCOVA) was used to test the hypotheses. The result further revealed that both male and female students in the experimental group improved in their achievement in Basic methodology, however, male students achieved slightly better than the female students after the treatment.

Shao and Liu (2021) investigated the effect of the flipped classroom on students' performance via meta - analysis using predefined eligibility criteria for screening literature. 63 experimental articles were included in the meta - analysis. The results indicated that the flipped classroom could improve students' academic performance.

Strelan et al. (2020) did a study on the flipped classroom: A meta - analysis of 198 studies on effects on student performance across disciplines and education levels. Out of this number, 174 studies were conducted at the tertiary level, 21 in secondary schools while 3 were carried out in primary schools. The study involved 33, 678 students. The findings indicated that the flipped classroom model had a moderate positive effect on students' performance regardless of the discipline.

Talan and Gulsecen (2019) studied the effects of a flipped classroom on students' achievements, academic engagement and satisfaction levels. Selected students were divided into control and experimental group. It was found that the scores for the students in the experimental groups with regard to academic achievement and engagement were higher than the scores for those in the control group and the differences between the groups were statistically significant.

Cabi (2018) determined the effect of the flipped classroom model on students' academic performance. The students in the experimental group were taught using the Flipped Classroom (FC) Model four weeks, while the lessons in the control group were carried out through traditional face - to - face learning. Both groups were administered a test before and after the teaching. The results showed that there were statistically non-significant differences between the scores of the two groups.

Didem and Özdemir (2018) examined the effect of a flipped classroom model on students' academic achievement, self - directed learning readiness, and motivation. The participants of this study were 66 students studying in two different classes in the Faculty of Education at Ahi Evran University (Turkey). One class was

designated as an experimental group and the other one was the control group. The experimental group was exposed to the flipped classroom model and a classical blended learning method was applied to the control group. An achievement test, a self - directed learning readiness and a motivation scale were used to collect data. Study findings showed that there was a significant difference between groups in terms of academic achievement and motivation.

Significance of the study

Flipped learning is an appropriate learning approach for the 21st century learners. It empowers teachers to promote individualized learning and saves instructional time. It is an innovative strategy to improve quality teaching, critical thinking skills, self-learning, communication and collaboration skills among students. It provides adequate exposure by sharing learning resources with students in advance, before actual classroom teaching-learning process. This process provides students ample time to prepare the concerned topics before the actual classroom lecture. It gives a space to explore and experiment. Also to practice, analyze and develop detailed and complete knowledge on a given topic. In simple words, students get proper exposure before the classroom and do problem solving, critical thinking, analyzing, and synthesizing in a classroom. Thus, incorporating flipped learning makes quality teaching possible. The study is significant as it provides empirical insights into the effectiveness of flipped learning and address academic performance disparities. The findings may be used by educational policy makers, and institutions in designing more effective learning models which may solve the problems relating to academic achievement.

Objectives

1. To compare the effectiveness of flipped class model and traditional method on academic achievement of total teacher trainees.
2. To compare the effectiveness of flipped class model and traditional method across Gender and Medium of Instructions followed for teacher trainees.

Hypotheses

Literatures review helps in formulating below hypotheses for their testing and verifications.

H_1: There is no significant difference in academic achievement of teacher trainees in flipped learning and traditional learning method.

H_2: There is no significant difference in academic achievement of male and female teacher trainees in flipped learning and traditional learning method.

H_3: There is no significant difference in academic achievement of Bengali and English medium teacher trainees in flipped learning and traditional learning method.

Delimitations of the research

1. Research is confined to B.Ed. teacher trainees.
2. Study is delimited to flipped class model as independent variable.
3. Study is delimited to academic achievement as dependent variables.
4. Research is confined to gender and selected medium of instructions as moderate variables

Methodology

This section is consisted of collection of sample and choosing of appropriate tools. The nature of the study entails experimental method to be employed here.

Sample

The sample of the study consisted of 100 teacher trainees both males and females studying in B.Ed. Ist semester. This sample is selected using simple random sampling technique from Bijoy Pal Memorial B.Ed. College affiliated to Baba Saheb Ambedkar Education University (BSAEU), Paschim Burdwan (W. B.).

Tools Used

Researcher made achievement test was employed to assess the students' achievement in the subject "Contemporary Indian Education" which is being taught in B.Ed. Ist semester. Scoring was done manual method by giving suitable weightage to all learning outcomes. Five categories were decided to evaluate the answers; all the elements were given equal importance.

Procedure of data collection

The research tool was administered to the B.Ed. Ist sem. teacher trainees with the prior permission of the institution. Teacher trainees were clearly instructed while completing the achievement test.

Analysis of the data

The data was analyzed in light of objectives of the study. Certain descriptive and inferential statistics were used in order to describe the nature and distribution of the scores obtained on various tests. Mean, Standard Deviation and't'- test were employed to analyze the data. Testing of hypotheses was performed to check the significance of the difference between the experimental (Flipped Classroom) and control (Traditional/ Conventional) group.

Results and discussion

1. Computation of 't- value' for variables, "flipped learning and traditional learning" for total sample. 't- value' for chosen variables are computed and the result is presented below in the table .

H_1: There is no significant difference in academic achievement of teacher trainees in flipped learning and traditional learning method.

Table No.1: Comparison of Mean between Flipped Learning and Traditional Learning

Variables	N	M	σ	t-value
Flipped Learning	50	23.23	3.34	6.11 (0.01)
Traditional Learning	50	18.64	4.14	

M_n^S and σ_n^S of teacher trainees on the variables, flipped learning and traditional learning, are 23.23 & 3.34 and 18.64 & 4.14 respectively. The computed t – value is found to be 6.11 which are significant at 0.01 levels favouring teacher trainees instructing through flipped learning. This difference may be accounted to opportunities to experience and practice in a more flexible, student-centered environment. This result is corroborated by the research findings of Liang Yu et al. (2023) and Masadeh (2021). Thus the null hypothesis H_1 is rejected. The new hypothesis in the light of the finding is reframed as, "There is significant difference in academic achievement of teacher trainees in flipped learning and traditional learning method".

2. Computation of‘t- value’ for variables, “flipped learning and traditional learning” across gender. ‘t- values’ for chosen constructs across gender are computed and the result is presented below in the table.

H_2: There is no significant difference in academic achievement of male and female teacher trainees in flipped learning and traditional learning method.

Table No. 2: Comparison of Means between Flipped Learning and Traditional Learning across Gender

Variables	Gender							t - value
	Male (48)			t - value	Female (52)			
	N_1	M_1	σ_1		N_2	M_2	σ_2	
Flipped Learning	24	22.08	3.17	5.60 (.01)	25	18.36	3.78	1.99 (0.05)
Traditional Learning	24	16.73	3.44		27	16.31	3.61	

The above table presents means and S.Ds of teacher trainees on the variables under study for male and female. Means and S.Ds of male teacher trainees on the variables, flipped learning and traditional learning are 22.08 & 3.17 and 16.73 & 3.44 respectively. The computed t – value is found to be 5.60 which are significant at 0.01 levels favouring male teacher trainees instructing through flipped learning. Similarly, the computed t-value for females undergoing instruction through flipped learning and traditional learning is found to be significant at 0.05 level of significance favouring former. The result revealed that both male and female students in the flipped learning group improved in their achievement in “Contemporary Indian Education”, however, male students achieved slightly better than the female students after the treatment. Based on this, flipped classroom stands as an effective alternative teaching method to enhance students’ academic achievement in Basic methodology. This difference may be due to male teachers’ experience in effective implementation of flipped learning, influencing students' perception and, consequently, enhancement of academic performance. This result is supported by the research finding of Ikwuka & Okoye (2021). Thus the null hypothesis H_2 is rejected. The new hypothesis in the light of the finding is reframed as, “there is significant difference in academic achievement of male and female teacher trainees in flipped learning and traditional learning method.

H_3: There is no significant difference in academic achievement of Bengali and English medium teacher trainees in flipped learning and traditional learning method.

Table No. 3: Comparison of Means between Flipped Learning and Traditional Learning across Medium of Instruction

Variables	Medium of Instruction							t - value
	English (50)			t - value	Bengali (50)			
	N_1	M_1	σ_1		N_2	M_2	σ_2	
Flipped Learning	24	18.81	4.28	3.22 (0.01)	25	21.19	3.11	5.52 (.01)
Traditional Learning	26	15.25	3.51		25	16.61	3.33	

Above table reveals that the obtained t-values for teachers trainees instructed through English and Bengali medium following flipped learning method is found to be 3.22 and 5.52 significant at 0.01 level of significance. Thus, it can safely be concluded that academic achievement of teacher trainees, irrespective of medium of instruction, improves in comparison to traditional learning for both the groups when they are instructed through flipped learning method. Thus the null hypothesis H_3 is rejected. The new hypothesis in the light of the finding is reframed as, "There is significant difference in academic achievement of Bengali and English medium teacher trainees in flipped learning and traditional learning method.

Recommendations

From the findings, the study recommended that universities should consider adopting a blended learning model that combines the strengths of both flipped classroom and traditional face - to - face learning. This approach allows students to benefit from the accessibility and flexibility of flipped learning while also enjoying the interactive and collaborative elements of face - to - face learning. Universities should design courses that strategically use flipped learning for content delivery and face - to - face sessions for activities that require critical thinking, peer interaction, and in - depth discussion. This would ensure a balanced learning experience that caters to various learning needs and preferences. To fully capitalize on the advantages of flipped learning, universities should ensure that all students have access to the necessary technological resources. These includes providing access to reliable internet, digital devices, and learning platforms where instructional materials can be accessed.

Conclusion

The main purpose of this study is to investigate the impacts of the flipped learning model on teacher trainees' academic achievements. To this end, two study groups namely: an experimental group including students learning through flipped learning method, and a control group including participants taught through traditional learning method. Before the treatment, a common test was conducted to both the groups to know the level of understanding of the subject under investigation. t-test was used to know the differences in academic level of both the groups. It was found out that there were no statistically significant differences between the groups. Afterwards treatment was given for one month to an experimental group and control group was taught through traditional method. t-value was again calculated. It was noted that the use of flipped method had a significant

effect on the teacher trainees' achievement in the subject of study. Accordingly it is recommended for the institution to take the appropriate steps for adopting flipped learning methods in the course of study.

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