



A Statistical Analysis of Factors Affecting Learning Strategies in a Flipped Classroom of English Language

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Abstract

Day by day the traditional classrooms are changing in to modern digital classrooms. Teacher needs to upgrade to technology and teach the students according to the demands of time. The flipped classroom is an innovative instructional model that converses the traditional teaching approach by providing instructional content outside the classroom and using classroom time for active learning. This study aims to statistically analyse the factors distressing students' learning strategies in a flipped classroom environment for English language learning. A pre-test and post-test experimental design was used to examine changes in learning strategies and language learning outcomes. Data were collected using structured questionnaires and objective achievement tests. Statistical tools such as mean, standard deviation, and paired t-test were used for analysis. The findings reveal that the flipped classroom approach significantly progresses students' strategies of learning, vocabulary development, including self-directed learning, reading comprehension and communicative skills in English. The study concludes that flipped learning is an effective method for boosting English language learning supported by proper instructional design and technological resources.

Keywords: *Flipped Classroom, English Language Learning, Learning Strategies*

1.Introduction

English language learning plays a vital role in academic achievement and professional development of students as well as teachers. Traditional English language classrooms often accentuate on teacher-centred instruction, which may limit students' active participation and independent, self-learning. Now a day the flipped classroom model has expanded attention as a learner-cantered approach which reassures students to occupy with learning materials before class and smear their knowledge during classroom activities.



Students access video lectures, reading materials and language exercises outside the flipped English classroom, using class time to be used for discussions, role-plays, grammar practice and collaborative activities. This approach supports the development of crucial learning strategies such as communication skills, self-regulation, collaboration and critical thinking.

Several aspects influence the effectiveness of learning strategies in a flipped English classroom, including access to technology, teacher facilitation, students' motivation, peer interaction and learning environment. Understanding these factors through statistical analysis will help educators design effective instructional strategies. Therefore, this study focuses on analysing the aspects affecting learning strategies in a flipped classroom for English language learning.

2. Research Design

In this research study an experimental research design used a Pre-test and Post-test Single Group Design to analyse the aspects affecting learning strategies in a flipped classroom of English language learning. In this design, a single group of students was selected and evaluated before and after the implementation of the flipped classroom approach. Primarily, a pre-test was administered to measure students' prevailing learning strategies and baseline performance in English language learning. This pre-test helped in finding students' learning habits, prior knowledge and preparedness before exposure to the flipped classroom model.

After the pre-test, the flipped classroom intervention was implemented for a specific period. During this phase, students were provided with English learning materials such as instructional audios, videos, vocabulary exercises, reading passages and grammar lessons to be studied outside the classroom. On next day classroom time was utilized for collaborative activities including group speaking exercises, discussions, role-plays, comprehension tasks and collaborative learning activities. The teacher acted as guide, a facilitator and feedback provider.

After the intervention period, a post-test was conducted using the same tools as the pre-test and measured changes in self-regulated learning skills, students' learning strategies, motivation and English language learning performance after experiencing the flipped classroom approach.



The difference between pre-test and post-test scores was statistically analysed to find out the effectiveness of the flipped classroom. Statistical techniques such as mean, standard deviation and paired t-test were used to test the significance of improvement in learning strategies and implementation of English language learning. This design enabled the researcher to directly compare students' performance before and after the intervention and to make it suitable for evaluating the impact of the flipped classroom on English language learning.

3. Sample

The sample for the present study consisted of H. R. Patel girls High school students enrolled in an English language subject. These students were selected to represent learners who were vigorously involved in classroom-based English instruction and were suitable for the application of the flipped classroom approach. The choice of high school students was suitable because they possess basic familiarity with digital learning tools and are skilful of independent learning, which is needed for flipped classroom learning.

4. Sample Size

A total of 20 high school students were selected as the sample for the study. This sample size was considered adequate for conducting an experimental study using a pre-test and post-test single group design. The size allowed for active implementation of the flipped classroom intervention and meaningful statistical analysis using techniques such as mean, standard deviation and paired *t*-test.

The selected sample included students with varying levels of academic backgrounds, English language proficiency, learning styles. This variety helped in obtaining consistent data on learning strategies and certified that the findings were not limited to a specific group of learners.

5. Sampling Technique

The study employed simple random sampling as the sampling technique. In this method, every student in the population had an equal chance of being selected for the study. A list of all eligible high school students enrolled in the English language subject was prepared and participants were randomly selected using a random selection method such as the lottery method.



6.Objectives of the Study

- To study the learning strategies of students in English language learning before implementing the flipped classroom
- To analyse students' learning strategies after the implementation of the flipped classroom
- To test the significance of improvement in learning strategies using statistical methods

7. Hypotheses

- There is no significant difference between the pre-test and post-test scores of students' learning strategies in a flipped classroom for English language learning.
- There is no improvement in English language learning after implementation of flipped classroom in English language classroom.

8. In class activities peer / individual activities

These activities are carefully made to promote deeper understanding, critical thinking and practical application of knowledge. In a flipped classroom learning model, in-classroom time is utilized into an active learning environment where students absorb in meaningful practice rather than passive listening. After acquiring basic conceptual knowledge through pre-class videos, readings or digital materials, students come in class and participate in a variety of individual and collaborative activities.

In the flipped classroom individual activities form the base of personalized learning. During class, students work independently on assignment such as quizzes, short writing assignments, comprehension exercises and reflective journals. These activities help learners to process information at their own pace and do learning. Individual tasks also enable teachers to closely examine each student's immediate feedback, progress and identify learning gaps. Through regular individual practice students develop self-regulated learning skills and confidence, as well as accuracy in language use in handling academic tasks independently.

8.1 Group Discussions

Group discussions play a vital role in indorsing collaborative learning and communication skills. After preparing before class, students engage in structured discussions in small groups on assigned topics, texts and problems. These discussions encourage learners to share ideas, ask questions at the same time clarify concepts through



peer interaction. Group discussions not only enhance speaking and listening skills but also foster critical thinking, reasoning and respect for different perceptions. In a flipped classroom it becomes a powerful tool for renovating theoretical knowledge into meaningful understanding.

8.2 Problem Solving Tasks

These are designed to help students use their knowledge to practical and intellectually challenging situations. These tasks may include correcting language errors, analysing texts, designing solutions and completing application-based exercises. Through problem-solving learners develop logical reasoning, decision-making skills and analytical thinking. Such tasks divert the focus from memorization to application, allowing students to use their knowledge creatively and effectively in day to day life.

8.3 Case studies

Case studies feed learners with opportunities to observe actual or simulated situations in detail. In a flipped classroom students analyse cases related to professional, social contexts, academic and discuss possible solutions. Case-based learning helps students to evaluate multiple viewpoints, understand complex situations and make informed judgments. With the help of case studies, learners develop higher-order thinking skills such as analysis, synthesis and evaluation which are essential for lifelong learning.

8.4 Role Play

It is an interactive activity that allows students to act out actual-life situations in a safe classroom environment. In a flipped learning context role play is used to practice communication, interpersonal skills and appropriate language use. Students may perform interviews, social conversations, classroom interactions, workplace scenarios. Role play decreases fear of making mistakes, improves fluency and pronunciation and develops comprehension by helping learners understand how language is used in different social contexts.

8.5 Hands on Activities

Hands-on activities emphasize learning by doing and direct practical involvement. These activities may include presentations, experiments, creating models, projects, producing written and spoken outputs and using digital tools. Hands-on learning act as bridge between theory and practice and increases student motivation and engagement. By



actively participating in tasks, learners learned concepts more effectively and develop practical and technical skills.

9. Post Class Activities

In the flipped classroom model of English language learning, post-class activities play a crucial role in reinforcing classroom learning and promoting independent, continuous practice. After participating in interactive in-class activities, students engage in structured post-class tasks that help consolidate knowledge, extend learning beyond the classroom, and encourage reflection on their own progress. These post-class activities are carefully designed to strengthen language skills, enhance learner autonomy, and ensure long-term retention of concepts.

9.1 Practice Assignments

Practice assignments form the core of post-class learning in the flipped classroom. These assignments may include grammar exercises, reading comprehension tasks, vocabulary practice, writing short essays, or revising class notes. Through regular practice, students reinforce the language structures and skills introduced during pre-class and in-class sessions. Practice assignments help learners develop accuracy, fluency, and consistency in language use. They also encourage disciplined study habits and provide teachers with evidence of individual progress and areas that require further support.

9.2 Online Discussions, Projects and Presentations

Online discussions, projects and presentations extend cooperative learning outside the physical classroom. By using learning management systems or online platforms students participate in discussion forums there they respond to questions, share opinions and interact with peers in English. These activities promote meaningful digital literacy, communication and teamwork. By engaging in online collaboration learners continue to develop critical thinking and communicative competence after classroom teaching.

9.3 Quizzes

Quizzes are an important tool for promoting thoughtful and self-directed learning. These quizzes allow students to evaluate their own understanding of grammar, vocabulary, LSRWC skills. Fast feedback from online quizzes helps learners identify their strengths and weaknesses and will adjust their study strategies accordingly.



9.4 Self-assessment

Self-assessment increases responsibility for learning, builds metacognitive awareness and supports personalized learning pathways. With the help of regular self-testing, students become more confident and independent learners.

10. Challenges to Flipped Classroom

The flipped classroom model in English language learning also faces several significant challenges that can affect its successful implementation. These challenges are related to technological access, learner readiness and the increased demands placed on teachers.

10.1 Limited access to technology

One major challenge is limited access to technology. The flipped classroom relies heavily on digital tools such as computers, smartphones, internet connectivity, and learning management systems for delivering pre-class instructional materials. However, not all students have equal access to these resources, especially in rural or economically disadvantaged contexts. Poor internet connectivity, lack of personal devices, and limited digital literacy can prevent students from watching instructional videos or completing online tasks before class. As a result, these students may come to class unprepared, which reduces their ability to participate effectively in in-class activities and increases educational inequality.

10.2 Students not preparing before class

Another serious challenge is that some students do not prepare before class. The success of the flipped classroom depends largely on students' responsibility to engage with pre-class materials. In English language learning, if students do not watch videos, read texts, or complete preparatory tasks, they may struggle to follow in-class discussions and activities. Lack of motivation, poor study habits, and unfamiliarity with self-directed learning can lead to low levels of pre-class preparation. This problem not only affects individual learning outcomes but also disrupts group activities, as unprepared students may slow down collaborative work and reduce the overall effectiveness of classroom interaction.

10.3 Time required to create resources

A next challenge is the time required to create instructional resources. Designing high-quality videos, interactive materials, quizzes and online tasks requires considerable



time, technical skill and pedagogical planning from teachers. For many teachers especially those with limited training heavy teaching loads, lack of technical support, creating and updating digital resources can be demanding and stressful.

11. Benefits of Flipped Classroom

1. Significant Improvement in Learning Strategies

Students demonstrated better planning, preparation, and participation in learning activities. They became more responsible for their learning, showing improvement in organizing study time, understanding lesson objectives, and applying learned concepts during classroom sessions.

2. Positive Influence of Technology-Supported Learning on Academic Performance

The use of technology-supported learning resources had a positive influence on students' academic performance. Students reported that technology-enabled learning helped them understand complex English grammar concepts, improve vocabulary and enhance reading comprehension.

3. Improvement in Self-Learning and Collaborative Strategies

Noticeable improvement in self-learning and collaborative learning strategies are found in flipped classroom. Students increasingly engaged with English learning materials such as videos, readings and exercises before coming to class. This helped them build confidence and clarity regarding lesson content. Collaborative strategies also improved as students actively take part in group discussions, peer learning activities and interactive tasks during daily classroom of English language. Students were more willing to share ideas, ask questions and help their peers to understand their problems.

4. Increased Student Engagement in Classroom Activities

The flipped classroom approach significantly increased student enrolments during classroom activities. Since students came to class prepared with prior knowledge they were more actively engaged in discussions, role-plays, debates and language practice activities.

12. Educational Implications

Following educational implication will be used.

1. Integration of Flipped Classrooms to Promote Active Learning

Teachers should integrate the flipped classroom approach into English language teaching to promote active learning among students. In a flipped classroom, students



engage with lesson content before coming to class, allowing classroom time to be used for interactive and student-centred activities such as group tasks, discussions, problem-solving exercises and role-plays. Teachers can design engaging pre-class materials such as reading passages, short instructional videos and vocabulary exercises, and plan classroom activities that enhance speaking, listening, reading, and writing skills.

2. Training Programs Focused on Developing Self-Learning Strategies

Teacher training and professional development programs should accentuate the development of self-learning strategies among students. Since the flipped classroom requires learners to study independently outside the classroom, students must be equipped with skills such as goal setting, time management, note-taking and self-evaluation.

3. Improvement of Digital Infrastructure in Educational Institutions

Educational institutions should expand their digital infrastructure to support the effective implementation of flipped classrooms. A strong digital infrastructure will increase the accessibility, flexibility and effectiveness of flipped classroom learning, ultimately leading to improved learning strategies and academic outcomes.

13. Findings

The analysis of pre-test and post-test data revealed several important findings regarding the impact of the flipped classroom approach on students' learning strategies in the English classroom.

- There is no significant difference between the pre-test and post-test scores of students' learning strategies in a flipped classroom for English language learning.

Test	Sample	Mean	Degrees of Freedom (df)	SD	Standard Error	Obtained t-value	Sample t-value and significance level (α)		Accepted /Rejected
Pre-test	20	7.0000	38	1.3700	0.355	4.5103	0.05	2.021	Rejected
Post test	20	8.6000		0.8000					

Result

The obtained t-value (4.5103) is much higher than the critical t-value (2.021). This means the difference observed is statistically significant. Because the t-value exceeds the critical value, the null hypothesis is rejected. This shows that there is significant



difference between the pre-test and post-test scores of students' learning strategies in a flipped classroom for English language learning.

The statistical analysis showed a significant improvement in students' learning strategies after the implementation of the flipped classroom in English language learning. The mean scores of the post-test were greater than those of the pre-test indicating that students adopted more effective learning strategies over time. The calculated *t*-value was higher than the table value at the 0.05 level of significance, leading to the rejection of the null hypothesis. This confirms that the flipped classroom had a positive impact on students' overall learning strategies.

- **There is no improvement in English language learning after implementation of flipped classroom in English language classroom.**

Test	Sample	Mean	Degrees of Freedom (df)	SD	Standard Error	Obtained t-value	Sample t-value and significance level (α)		Accepted /Rejected
Pre-test	20	5.15	38	1.01	0.287	11.16	0.05	2.021	Rejected
Post test	20	8.35		0.79					

Result

The obtained t-value (11.16) is much higher than the critical t-value (2.021). This means the difference observed is statistically significant. Because the t-value exceeds the critical value, the hypothesis is rejected. This shows that

The study highlights that successful implementation of flipped classrooms requires a combined effort from teachers, institutions and learners. By promoting active learning, developing self-learning strategies and strengthening digital infrastructure, educational stakeholders can create an effective learning ecosystem that supports modern English language teaching and learning.

14. Conclusion

The present research discloses that the flipped classroom approach has an optimistic and significant impact on students' learning strategies in English language learning. Statistical analysis of pre-test and post-test results indicates noticeable improvement in vocabulary development, self-directed learning, classroom participation and



communication skills. Factors such as student motivation, technological access, teacher guidance and peer collaboration play a dynamic role in enriching learning strategies. The study concludes that the flipped classroom is an effective and learner-centered approach for English language teaching and should be encouraged in modern educational settings to improve language proficiency and active learning of students.

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