Investigating the Use of Pre-Recorded Lecture Videos in Flipped Classroom Technologies on Students' Learning at Secondary Level

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Abstract

The study aims to investigate the use of pre-recorded lecture videos in flipped classroom technologies on students' learning at the secondary level. Traditional teacher-centered teaching has been replaced with learner-centered teaching models. Pre-recorded lectures center on personalized learning built with capturing and accelerating technological features like stop, record forward, play, and rewind. It allows personal control over the pace and direction of learning. A true-experimental pre-post-test design was conducted with 40 students of grade- X. A valid and reliable teacher-made pre-tests and post-tests were used as research instruments. The pre-test and post-test were constructed from the five selected grade -X-level chapters. The students were divided into two groups: an experimental flipped classroom group and a control group. The experimental group was taught via a flipped classroom for eight weeks, while the control group was taught via traditional strategy. The level of students' learning was measured after eight weeks using the SPSS software version. The results showed that students in the flipped classroom had shown significantly higher learning levels than students in the traditional group. The findings also showed that the use of flipped classroom technologies significantly affected students' learning at the secondary level. Moreover, the findings suggested that pre-recorded lecture videos positively facilitate learning and student engagement. Based on these findings, the researcher presented some recommendations.

Keywords: Flipped Learning, Active Learning, Self-Paced Learning, Student-Centered.

Introduction

This study aims to investigate the use of lecture videos in the secondary education context of the flipped classroom model. Language learners' autonomy is significantly impacted by creating and applying computer-based educational resources, such as information and communication technology (ICT) (Cueva & Inga, 2022). "Integrating ICTs in higher education, especially for English language teaching, is a top priority worldwide in the 21st century" (Maitlo et al., 2024). The growing use of instructional videos in flipped classrooms has changed how people teach and learn. Many academics agree that incorporating technology into language learning helps foreign

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language learners study more productively and successfully because it allows them to customize their learning to fit their schedules and pace (Habeb et al., 2022). Under the flipped classroom model, students switch from passive information recipients to active participants in the learning process. Angelo defines *profound learning* as "learning that endures and can be remembered and applied effectively even after the initial learning session." This is what it seeks to achieve. This method comprises introducing essential concepts, structure, and skills to students in advance through instructional videos or lectures that have been recorded (Ullah et al., 2020; Sadaf et al., 2024). As such, they can participate in a dynamic learning workshop in class (Alqarawi, 2023). In the flipped classroom paradigm, teachers adopt a coaching role and prioritise facilitation more than traditional lecturing. According to Hunt, Chalmers, and Macdonald, this change in responsibilities represents a departure from serving as the primary information source (the "sage on the stage") to serving as a helpful mentor (the "guide on the side") and most significantly, actively engaging with the students in the learning process (the "meddler in the middle") (Ruipérez-Valiente, Gomez et al. 2021).

Below is an outline of the remaining portion of this paper. It first clarifies the comparison between students' learning outcomes in flipped micro-lectures and traditional in-person lectures. We then review the findings, demonstrating how the experimental micro lecture group improved students' learning. In closing, this paper offers reflections on these results for future investigations.

Significance of the Study

This research study will be helpful for:

The transition from traditional face-to-face teaching to a combination of flipped classrooms and online instruction has led educators, parents, and students to acquire new insights. This shift holds importance for educators, as it helps assess flipped classrooms' effectiveness, highlighting strengths and weaknesses through well-defined and explicit instructions before online sessions. Furthermore, it proposes that teachers adopt a student-centric approach and dedicate their online teaching to engaging in discussions, debates, and other interactive learning opportunities. Additionally, it paves the way for future researchers to delve deeper into the perspectives of parents and students regarding the utilization of flipped classrooms.

Statement of the Problem

The problem statement is a clear and concise summary of the research problem, typically contained within one paragraph; its function is to identify the issue. Research problems emerge from gaps that can emerge from multiple potential resources, including new frontiers, new contexts, or disagreements within the existing literature (Ahmad et al., 2024; p.300).

 The educational landscape is undergoing swift transformations due to the dynamic changes in the world. The conventional notion of a physical classroom once considered the norm, now poses challenges for educators and students. Consequently, there has been a significant shift from the traditional learning setting within four walls to remote learning. In response to this shift, educators are implementing innovative approaches, such as the "flipped classroom," to enhance the learning experience. This study will address the topic of the Effect of Flipped classroom technologies on Students' Learning at the Secondary Level. It is crucial to determine whether it supports students on their educational journey. This is a challenging issue. Therefore, research is required to determine its effect on secondary school students.

Research Objectives
- To assess the effect of pre-recorded lecture videos in flipped classroom technologies on students' academic achievement at the secondary level.
- Based on the study's findings, recommendations will be made for using Pre-recorded Lecture Videos in flipped classroom technologies in secondary-level education.

Research Questions
1. How does using Pre-recorded lecture videos in flipped classroom technologies impact students' academic achievement compared to traditional classroom methods at the secondary level?
2. What recommendations can be made for educational institutions, policymakers, and educators on using pre-recorded lecture videos of flipped classroom technologies to enhance student learning outcomes at the secondary level?

Literature Review

Review of the literature summarizes and evaluates the text of writing of the definite theme and provides a framework to think about the possible consequence of innovative study. It also divulges what has previously been done by giving advanced concepts for new research. Moreover, it helps researchers replace their work in larger contexts to show better results from their research (Ahmad et al., 2024, p.3944).

Following is the literature review of the present study.

Education has significantly changed during the last several decades. Several developments have been there. We have it all, from active learning practices emphasizing a participatory approach to education to virtual classrooms that have brought schools into our homes(Singhal, Kumar et al. 2021). The emphasis has shifted from substance to concept. Both the demographics and the aim of education have changed. Academic accomplishment continues to be a key indicator of educational performance. However, the importance of fostering the transfer of learning to the workplace and skill development has gained a place in scholarly discussion today (Mumtaz et al., 2024; Shabbir et al., 2020; Zafar et al., 2023). The students served by today's schools range from those who are academically bright to those with special educational needs. Our responsibility as teachers has increased, and we are now expected to educate all types of students and support their success. It seems like a challenging project at first. As educators, we try to help our students reach their maximum potential. This requires helping students acquire the material and effectively apply the concepts. (Bingen et al. 2020). The evaluation of students' understanding may be influenced by how well they comprehended or performed in earlier batches. Because the starting point will be the same for the teacher and the learner, having the student rethink the concept rather than the instructor may be a helpful teaching strategy.

Bingen et al. (2020) and Sousa (2017) indicates that the flipped classroom is more adaptable and depends on the teacher's creativity in implementing flip learning to the situation and the students' ability (Algarni, 2021). Bingen et al. (2020) the teacher assigned pre-class tasks that the students were obligated to complete. This guarantees that students learn the material and prepare for the class (Bean & Melzer, 2021). To satisfy learners' needs, several mics created flipped classroom strategies based on learning objectives and the substance of the teaching materials. On the other hand, a few of the studies adopted or modified the Flipped Classroom Model created by additional researchers. Hu (2015) created a flipped class paradigm that challenges the established educational framework. The statistics showed that an effort to teach Chinese reading in an elementary school setting using the flipped classroom model was successful. Ahmad (2017) builds pedagogical

modules emphasizing reflective learning using Enfield's flipped classroom model. The study's results demonstrate the value of instructional modules in helping students link their knowledge and abilities.

Flipped classroom equipment as teachers must be required to put more effort into developing the procedures and tools for classroom activities (Luburić et al. 2019; Hoshang et al., 2021). The instructor must wisely choose and implement these interactive movies in the flipped classroom in addition to using them. The flipped classroom does not always focus on online videos. In addition, the instructor can substitute books, journals, or online simulations for the online videos (Rasheed et al., 2024). In his research paper, Fulton (2012) emphasizes using a single, well-known learning resource frequently used in classrooms to implement the flipped approach (Ekici 2021). In these situations, the instructor must first record the video lecture before using various video editing software to make the necessary changes. The teacher must make the video lesson engaging and straightforward so the students can understand and successfully deliver it (Mayer et al., 2020). The "principles of flipped classroom reflection and elect response" lecture, which focuses on expanding one's knowledge and utilizing video to link out-of-class instructional approaches with active learning, should also be kept to a minimum in length. Long videos could get boring for students (Furse & Ziegenfuss, 2020). TED-Education, YouTube, Khan Academy, and other freely accessible educational platforms are good sources of short video lectures for teachers who lack the time or resources to produce their own. (Harris 2020; Harrison 2020).

Previous Related Studies

In this international contextual study conducted in Hong Kong, Yang (2017) examined the use of a flipped classroom pedagogical style in English language classrooms. A sample size of 57 participants was selected to contribute to this qualitative and quantitative nature study. These students were selected from two different classes of two secondary schools and treated by two different teachers. The findings of this research showed that flipped classrooms positively affect students' performance in the classroom. Moreover, the study found that teachers considered the flipped classroom pedagogical style creative and helpful in grammar instruction.

Jensen et al. (2018) investigating pre-class strategies for content learning in a flipped classroom, the findings of this research showed that flipped classrooms positively affect students' performance in the classroom. Beatty et al. (2019) analyzed the usage of videos of flipped classrooms; for this research, a quantitative method was used to collect data. The questionnaire was used as a research tool for data collection. The questionnaire aimed at the questions, and the survey technique was used for data collection. This research showed that flipped classrooms positively affect students' performance in classrooms. Anjomshoaa et al. (2022) analyzed the effect of flipped classrooms on student learning outcomes. In this study, the researcher compare makes flipped classrooms with traditional classrooms and finds that flipped classrooms are more effective than traditional ones.

Instead of this research, no single research properly investigated the use of pre-recorded lecture videos in flipped classroom technologies on students' secondary-level learning. Consequently, the researcher finds this gap and makes an effort to fill this gap by using the following research methodology.

Conceptual Framework

The theoretical structure for analyzing how technology affects flipped classrooms at the secondary level is a complex structure built around three fundamental components supported by essential theories of education. The framework prioritizes the methodical incorporation of flipped classroom

technologies, including video lectures and internet resources, guaranteeing a thorough investigation of the elements influencing their efficiency. This comprises an analysis of technology accessibility, teacher proficiency in implementing these technologies, and coordinating flipped learning methods with the current curriculum.

Figure 1: Conceptual framework
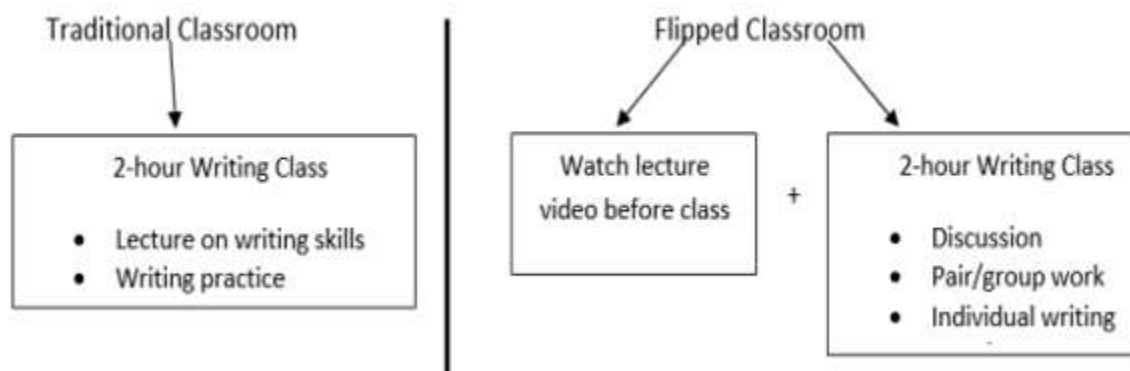
The framework also prioritizes recognizing the vital role that student participation and interaction play in the flipped classroom model. It seeks to understand how students use recorded materials outside of the classroom, participate in in-person activities, and communicate with teachers when they need more help or clarification (Herreid & Schiller, 2013). This feature draws attention to elements such as student motivation, the standard of active engagement, and the efficiency of cooperative teamwork (Tucker, 2012).

Finally, the conceptual framework broadens its purview to assess the broader effects of flipped classroom technology adoption on education. This includes evaluating academic performance, developing critical thinking abilities, and promoting a deep comprehension of the material. The assessment approach combines qualitative indicators, such as student feedback from surveys or interviews, with quantitative assessments, such as results from standardized tests (Saichaie, 2020). This framework's broad application is grounded in education theories, specifically constructivism and technology-enhanced learning theories. Within a flipped learning environment, constructivism (Jonassen, 1991) provides an understanding of how students actively construct knowledge, and theories of technology-enhanced learning (Siemens, 2005) offer guidance on using technology to enhance the learning process. This theoretical underpinning strengthens the framework and makes it easier to thoroughly analyse the possible impacts of flipped classrooms on students' academic experiences and accomplishments in the context of secondary education.

Research Methodology

"The research methodology is the procedure the researchers use to gather data to resolve investigation problems. The research design comprises the whole procedure which is conducted research" (Ahmad et al., 2022, p.524). The study was experimental. It was conducted using a true experimental pretest and posttest control group design. It was conducted on a single independent variable (flipped classroom technologies and one main dependent variable, student's student'

learning). The Independent variable (flipped classroom technologies) was manipulated, and its effect was measured on the dependent variable.

Participants

The population is defined as a set of individuals or data or items from which a statistical sample is taken for data collection (Rasheed et al., 2024; Jalbani et al., 2023). The participants of this study were secondary school students. Forty (40) students of grade X were selected randomly. These 40 students were divided into two equal groups of 20 each with the help of random sampling. The twenty were the experimental group, and the twenty were the control group.

Experimental Process

The flipped classroom model was used in this experiment for eight weeks, and the method was applied to the experimental group only. In contrast, the control group was taught conventionally. A pretest was given to the students of both experimental and control groups at the commencement of the experiment eight weeks later; the posttest was given to the experimental and control groups. In designing the activities within an eight-week lesson plan, the course's scope, objectives and outcomes have been considered. Some of the practical tools and environments in the related literature have been identified to improve the efficiency and effectiveness of the experiment. These environments and tools have been used to develop the course contents. The tool used in this study is the flipped classroom technologies with which the experimental group would interact in ways such as pre-recorded video lectures and interactive online activities. The control group would adopt the standard traditional teaching approach.

Activities in a Flipped Classroom

These are some exercises that can be used in a flipped classroom. When the material is incorporated into this model, students can actively engage with the content, work together with classmates, and fully understand the subjects. The flipped classroom approach makes instruction more participatory and application-focused, which fosters critical thinking skills and increases student engagement.

Make pre-recorded videos presenting important ideas or subjects for use in the classroom.

1. Give the students these videos to watch before class on a homework assignment. As a result, they can comprehend the fundamental material independently and are ready to participate in more in-depth discussions and activities during class time.
2. *Internet Conversations:* Encourage student discussion using online discussion boards or other platforms. Give students challenging questions or prompts that pertain to the material covered in the pre-class and motivate them to answer and have meaningful conversations with their peers. This encourages critical thinking and group learning.
3. *Case Studies and Problem-Solving Exercises:* Assign case studies or problem-solving exercises from real-world situations as homework before class. Pupils can work together in class to discuss their strategies, exchange ideas, and come up with solutions after completing the case analysis or problem-solving independently at home.
4. *Practical Experiments or Models:* Give students access to virtual labs or simulations to study scientific concepts, carry out experiments, or participate in interactive simulations when not in class. Students can compare and debate their results in class and address any queries or doubts that may have come up during their experiments.

5. *Project-based learning:* Give students assignments that require them to conduct research, interact with the material, and apply what they have learned to solve real-world issues. In order to foster peer feedback and collaboration, students can work on their projects independently at home before presenting their results or deliverables in class.
6. *Flipped Worksheets or Quizzes:* Make worksheets or quizzes that students can take on their own before class to gauge how well they understand the material covered beforehand. To ensure understanding and address any unanswered questions, review the answers as a class, clear up any misunderstandings, and have deeper discussions.
7. *Collaborative Group Activities:* Use class time to engage in cooperative group activities like roleplays, debates, puzzles, or group projects. These exercises encourage collaboration, critical thinking, and the application of learning.

Data Collection

Both groups took a pretest to assess their initial knowledge before the experiment began. After the experiment, both groups took identical post-tests, to test their understanding and performance under the researcher's supervision; a post-t post-test was distributed to the control and experimental groups in this public school. Everyone had enough time allocated to them. The researcher gave clear instructions regarding the questions. Additionally, they were asked to attempt the test honestly—multiple-choice questions.

Validity and Reliability

To ensure the validity of the pretest and posttest instruments, a panel of experts in education and content-specific experts reviewed the tests to assess their alignment with the learning objectives and the reliability of the questions. Additionally, a pilot study was conducted with a small sample of students to evaluate the clarity and appropriateness of the questions. Based on the feedback received, necessary revisions were made to improve the validity and reliability of the tests. The reliability of the test was measured through SPSS v-28. It was measured as 0.78, which is considered reasonable by the experts.

Data Analysis

After the data was collected, the researcher processed and arranged the collected data and created a data sheet. The researcher performed data analysis via relevant tests and formulas such as t-test frequency mean Score, percentage, standard deviation and value of significance, among others. In this study, the dependent variable was students' scores in response to the flipped classroom learning technique control group so that a clear comparison could be made. Statistical analysis will be conducted to compare the learning results of the two groups. The most popular statistical methods include t-tests, ANOVA, and regression analysis. The objectives of the debate will be achieved using SPSS-23. Rao et al. (2023) stated that to maintain fairness in the analysis, this statistical data analysis software is considered practical quantitative data analysis software; the data will be questioned using appropriate numerical formulas such as density, percentage and mean rate utilizing t-test and ANOVA. The results will be presented as percentages and mean scores. Drawing the summary and determining suggestions will follow after data analysis.

Data Analysis and Data Interpretation

Data is analyzed in the tables below.

Table 1: Comparison of Pretest (Control Group & Experimental Group)

Pre-Test	N	Mean	Std Deviation	Std Error Mean
Scores CG	20	21.9000	7.86655	1.75904
Exp G	20	26.5200	5.09773	1.13989

This table presents the results of a pre-test conducted on two groups: a control group (CG) and an experimental group (Exp G). The number 'N' indicates that there are 20 participants in each of the CG and Exp G. The 'Mean' represents the average score from each group, with CG scoring 21.9 and Exp G scoring higher at 26.52. The 'Standard Deviation' shows the variance from the mean score. The CG displayed a higher variance of 7.86655, contrasting with Exp G, which showed a lower variance of 5.09773. This suggests that the scores of Exp G were more closely clustered around the mean as compared to CG. The 'Standard Error of Mean' further supports this, as it reflects how spread out the scores are from the mean. With CG having a standard error mean of 1.75904 and Exp G reporting 1.13939, the scores within Exp G are closer to their mean compared to CG, which means that there is no significant difference between the traditional and flipped classroom technologies on students' learning in Urdu subject.

Table 2: Comparison of Post-test (Control Group & Experimental Group)

Post-test	N	Mean	Std Deviation	Std Error Mean
Scores CG	20	25.7500	4.19116	0.93717
Exp G	20	44.0000	1.77705	0.39736

The table provides descriptive statistics for two groups, the Control Group (CG) and the Experimental Group (Exp G), with both groups having a size of 20. The CG has an average score of 25.75, with a standard deviation, a measure of variation, of 4.19116. This higher standard deviation implies more variability in scores within the CG. The group's standard error of the mean, an estimate of uncertainty in the mean, stands at 0.93717. In comparison, Exp G demonstrates higher performance with an average score of 44. The group displays less score variability, with a standard deviation of 1.77705. The standard error of the mean for the Exp G is 0.39736, which is lower than that of the CG. This data suggests that the Exp G not only has higher scores on average but also shows less variability about the CG.

Discussion of the Findings

The pre-test results for the study, encompassing the control group (CG) and experimental group (Exp G), reveal distinct initial performance metrics. Both groups consisted of 20 participants, marked as 'N'. The control group's mean score was 21.9000, in contrast to the experimental group, which had a notably higher mean score of 26.5200. This difference in means suggests a disparity in baseline proficiency levels between the two groups. The control group exhibited a standard deviation of 7.86655 in terms of score dispersion, indicating a more comprehensive range of scores among its participants. On the other hand, the experimental group had a more condensed score distribution, as evidenced by a lower standard deviation of 5.09773.

Furthermore, the standard error mean for the control group was 1.75904, compared to a more minor standard error mean of 1.13989 in the experimental group, implying no consistency in the experimental group's scores. These findings collectively indicate that the experimental group

scored on average before any experimental intervention and demonstrated more homogeneity in their performance than the control group. However, the statistical significance of these differences would require additional analysis using appropriate statistical tests. This study finding indicated that the use of flipped classroom technologies significantly affected students' learning at the secondary level.

The statistical analysis of the study, encompassing a Levene's test for equality of variances and a t-test for mean differences between the Control Group (CG) and Experimental Group (Exp G), reveals vital findings: the Control Group (CG) and the Experimental Group (Exp G), with both groups having a size of 20. The CG has an average score of 25.75, with a standard deviation, a measure of variation, of 4.19116. In comparison, experimental group demonstrates higher performance with an average score of 44. The group displays less score variability, with a standard deviation of 1.77705. This data suggests that the experimental group not only has higher scores on average but also shows less variability about the CG. Initially, there was a noteworthy increase in the post-test scores of the experimental group when contrasted with the control group. This implies that students engaged in the flipped classroom intervention attained superior knowledge and skill acquisition levels compared to their conventional classroom counterparts.

Some of the results of the present study match with the results of some previous studies as Yang (2017) examined the use of flipped classroom pedagogical style in English language classrooms at secondary schools and found that teachers considered the flipped classroom pedagogical style to be creative and helpful in the instruction of grammar. Similarly, the results of this study also revealed the positive effects of the flipped classroom style of instruction. Moreover, some of the results of the present study match and differ from the previous studies (Jensen et al., 2018; Beatty et al., 2019; Anjomshoaa et al., 2022). Overall, the results of the present study make it valuable research.

Conclusion

Based on the results obtained from the current investigation of flipped classroom technologies' effects on students' secondary-level learning, the positive effects and advantages associated with this instructional approach. The positive outcomes became evident after the treatment, demonstrating the effectiveness of the flipped classroom model in facilitating language acquisition. It can be inferred that the beneficial effects of flipped classroom technologies on students' learning at the secondary level are the incorporation of pre-class materials, such as interactive platforms, online videos, and digital resources, enhanced students' understanding and retention of the material, enabling them to participate fully in meaningful class discussions and activities.

Flipped lectures assess component skills and provide opportunities for evaluating, applying, and discussing previously acquired knowledge (Raine & Gretton, 2017). The findings also highlight how important it is to provide individualized instruction to satisfy the different needs of each student. Pre-class assessments and instructional method adaptations allow teachers to customize their methods to each student's specific learning needs and preferences, resulting in a more effective and individualized learning experience. The specific topic has been minimized or undervalued, and incorporating the flipped classroom model into the educational framework results in a higher caliber of learning for the students.

Policymakers and educators should consider these findings. Educators should contemplate incorporating flipped classroom technologies into their instructional strategies to enhance student engagement and promote active learning. Policymakers can support educators adopting flipped

classroom technologies by providing the necessary tools and training for integration and professional development. It is essential to acknowledge the constraints of this study, including the relatively short intervention period and the applicability of findings to a specific geographic region. Future research endeavors could explore the enduring impacts of flipped classroom technologies, delving into their influence across diverse subject areas and student demographics. In conclusion, the study's findings contribute valuable insights, affirming the growing research on flipped classroom technologies' effects in secondary education. Embracing innovative pedagogical approaches such as flipped classrooms empowers educators to cater to diverse learning needs, fostering a more dynamic and engaging learning atmosphere (2010).

Recommendations

The findings of the present research study, entitled "investigating the use of pre-recorded lecture videos in flipped classroom technologies on students' learning at the secondary level," are beneficial in the educational field. They will equally aid the professionals and scholars of this field and the other departments. This research will prove valuable for future researchers and scholars conducting their research.

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