

Research Article

The Effect of Video-Based Flipped Classroom Strategy on Learning Outcomes and Students' Active Participation

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Abstract: The flipped classroom model has gained significant attention as an innovative pedagogical approach, particularly in enhancing student engagement and learning outcomes. This study investigates the effectiveness of a video-based flipped classroom in improving students' academic performance and active participation during in-person classes. The research employed a quasi-experimental design, with two groups: one experiencing the flipped classroom approach, and the other following traditional lecture-based instruction. Data were collected through pre- and post-tests to assess learning outcomes, as well as an observation rubric to measure student participation. Results indicated that the flipped classroom group showed a 17% improvement in learning outcomes compared to the traditional group. Furthermore, the flipped classroom group exhibited twice the level of active participation, as measured by the rubric. These findings suggest that the flipped classroom model is effective in fostering a more interactive and participatory learning environment, where students engage with content before class and apply their knowledge through discussions and problem-solving activities during in-class sessions. The study also highlights the importance of video-based learning in preparing students for active participation and the role of the teacher as a facilitator in flipped classrooms. Despite the promising results, the study acknowledges several limitations, including reliance on technology and students' readiness for independent learning. The study concludes with recommendations for teacher training and future research to further explore the effectiveness of flipped classrooms across diverse educational contexts.

Keywords: Active Participation; Flipped Classroom; Learning Outcomes; Teacher Training; Video-Based Learning.

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1. Introduction

Traditional learning environments often remain teacher-centered, where teachers serve as the primary source of information while students take on a passive role as mere recipients (Minalla, 2023; Sukasih et al., 2020). This approach limits student engagement in the learning process, which may hinder the development of critical thinking, creativity, and problem-solving skills (Sukasih et al., 2020; Garrick, 2018; Bahadur & Akhtar, 2021). When students primarily listen and take notes, their participation in meaningful discussions or interactive learning activities tends to decline, resulting in a lack of deeper engagement (Garrick, 2018).

Insufficient active participation in conventional teacher-centered learning also negatively affects students' academic outcomes. Research has demonstrated that such approaches can decrease motivation, academic achievement, and conceptual understanding (Sukasih et al., 2020; Russell et al., 2017; Bahadur & Akhtar, 2021).

Additionally, this instructional format often leads to boredom and increased dependency on teachers for information (Garrick, 2018). Students who are not actively engaged tend to develop superficial understanding and struggle to apply concepts to broader contexts (Minalla, 2023; Sukasih et al., 2020).

To address these challenges, the flipped classroom model has emerged as an innovative solution that utilizes instructional videos as pre-class learning materials (Bashir et al., 2020; Poon & Rivera, 2015; Wong, 2016). In this model, knowledge acquisition occurs outside the classroom through videos, while classroom time is allocated for discussions, problem-solving, and collaborative activities (Poon & Rivera, 2015; Long et al., 2016; Wong, 2016). As a result, students come to class with prior understanding, enabling them to participate more actively in the learning process.

Previous studies have reported various benefits of the flipped classroom, including increased student engagement because learners are better prepared before attending class (Poon & Rivera, 2015; Long et al., 2016). Additionally, this strategy has been shown to enhance academic performance and motivation by encouraging deeper learning through interactive classroom experiences (Long et al., 2016; Bahadur & Akhtar, 2021). The flipped classroom model also promotes the development of social and emotional skills through group interaction and collaborative knowledge-building (Poon & Rivera, 2015). Furthermore, it provides flexibility in learning, as instructional videos can be accessed anytime and anywhere, allowing students to adjust their study schedules according to their needs (Wong, 2016).

Based on these considerations, further investigation is required to examine the effectiveness of the flipped classroom, particularly in improving students' active participation and learning outcomes. Therefore, this study focuses on analyzing the impact of implementing the video-based flipped classroom model on student learning outcomes and classroom engagement.

The flipped classroom approach has been widely implemented in various educational contexts, particularly during the COVID-19 pandemic when online learning modalities dominated educational activities. However, a significant research gap still exists regarding the effectiveness of flipped classroom strategies within fully in-person learning environments. Most previous studies have focused on online or blended learning settings, with limited investigations exploring its impact in face-to-face classroom environments exclusively (Han, 2023; Koh & Ahn, 2023; Kuo & Chang, 2024; Long et al., 2020; Morini et al., 2024). Furthermore, several studies highlight challenges related to student readiness for completing pre-class activities, which can hinder active participation during live in-person classroom interactions (Koh & Ahn, 2023; Long et al., 2020; Purwanti et al., 2022).

The flipped classroom model requires students to study foundational content before class-typically through video lectures or reading materials-allowing class time to be devoted to active learning activities such as group discussions and problem-solving tasks (Kuo & Chang, 2024; Munzil et al., 2020; Purwanti et al., 2022). While prior research has shown that flipped classrooms can improve student engagement and academic achievement across diverse learning formats, its effectiveness specifically within traditional face-to-face settings remains underexplored (Han, 2023; Koh & Ahn, 2023; Long et al., 2020; Morini et al., 2024; Sangree, 2022).

Therefore, this study aims to examine the impact of a video-based flipped classroom approach on student learning outcomes and active participation within a fully in-person learning context. More specifically, the research objectives include the following: a.) Learning Outcomes: To measure improvements in students' academic performance following the implementation of a video-based flipped classroom compared to traditional instruction. b.) Active Participation: To evaluate the extent to which the flipped classroom model enhances students' active participation during face-to-face class sessions.

To achieve these objectives, this study employs a quasi-experimental design incorporating both quantitative and qualitative data. Pre-tests and post-tests will be administered to assess student learning outcomes, while observations and student questionnaires will be conducted to evaluate active participation throughout the instructional process. Participants include secondary school students divided into a control group receiving traditional instruction and an experimental group utilizing video-based flipped instruction.

The results of this study are expected to offer new insights into the effectiveness of flipped classroom strategies within face-to-face learning settings and provide practical recommendations for more efficient and engaging instructional designs. Moreover, the findings are anticipated to fill existing research gaps and support educators in developing more participatory and student-centered learning environments (Han, 2023; Koh & Ahn, 2023; Long et al., 2020; Morini et al., 2024; Sangree, 2022).

2. Literature Review

Flipped Classroom Concept

The flipped classroom is an instructional model in which students engage with course materials-often in the form of instructor-produced video lectures or other pre-class learning resources-before attending in-person sessions (Brandt & Kjær, 2016; Long et al., 2016; Morton, 2020). During class time, students work collaboratively on activities such as problem solving, discussions, and hands-on tasks, while the instructor acts as a facilitator guiding higher-order cognitive processes (Morton, 2020). This model contrasts with traditional teacher-centered approaches where content delivery primarily occurs in the classroom and student engagement tends to be passive.

The Role of Video Technology in Enhancing Student Readiness and Self-Regulated Learning

Video technology serves as a major driving force behind the success of flipped classroom implementation. Pre-class learning videos allow students to control the pace of their learning, review materials independently, and come to class better prepared for deeper engagement (Anders, 2015; Brame, 2019; Long et al., 2016). Interactive videos specifically designed based on knowledge integration theory have been shown to significantly enhance learning achievement and students' self-efficacy (Long et al., 2019; Wang et al., 2019). Furthermore, video-based pre-class activities contribute to deeper conceptual understanding and improved learning motivation, especially when learners are actively involved in constructing meaning from multimedia content (Ayouni et al., 2022; Bai et al., 2021; Li & Lam, 2015).

Student Engagement Theory and Its Relationship to Learning Outcomes

Student engagement refers to the investment of time, effort, and resources by both learners and institutions to optimize educational experiences and support academic and personal development (Bai et al., 2021). Engagement consists of affective, behavioral, and cognitive components that collectively influence student learning outcomes (Ayouni et al., 2022; Li & Lam, 2015; Wang et al., 2019).

Self-Determination Theory posits that engagement is driven by the fulfillment of basic psychological needs-autonomy, competence, and relatedness-within the learning environment (Primana & Anisa, 2020). Peer support and an autonomous classroom environment can therefore boost student engagement significantly (Primana & Anisa, 2020).

The Campus-Class-Technology (CCT) model further suggests that the integration of classroom activities, physical campus resources, and technological tools enhances engagement and contributes to successful learning outcomes (Gunuc, 2023). High levels of student engagement have been consistently identified as strong predictors of academic success and ongoing persistence in learning (Li & Lam, 2015; Wang et al., 2019; Bai et al., 2021).

Advantages of Flipped Classroom and Research Gaps

Advantages of Flipped Classroom Compared to Traditional Lecture Methods

One of the key advantages of the flipped classroom approach is the enhancement of student engagement and active participation. Since foundational knowledge is acquired outside the classroom through pre-recorded videos or reading materials, class time can be used for active learning activities such as discussions, collaborative work, and problem-solving tasks (Pugsee, 2018; Smith et al., 2022; Svensson & Adawi, 2015). Prior studies have shown that students prefer flipped classroom formats over traditional lecture methods because they provide the flexibility to learn at their own pace and enter the classroom better prepared for higher-level cognitive engagement (Pugsee, 2018; Yong et al., 2015; Rothman, 2022).

Another significant benefit of the flipped classroom approach is improved learning achievement. For example, research in a pharmaceutical calculations course demonstrated that students in flipped classrooms achieved higher examination scores compared to those taught using conventional lectures (Anderson et al., 2017). Likewise, a study in medical education found that incorporating clinical scenario-based flipped instruction enhanced learners' comprehension of theoretical concepts and clinical analytical skills (Seidi et al., 2024).

Student satisfaction is also reported to be higher in flipped classroom environments. Students often perceive this instructional model as more engaging and effective in meeting learning objectives due to increased opportunities for interaction and active participation (Covill & Cook, 2019; Rothman, 2022).

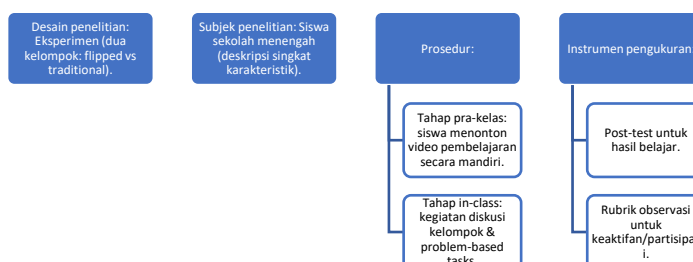
Research Gap: Combined Assessment of Learning Outcomes and Active Participation

Despite the extensive investigation of flipped classroom instructional outcomes, relatively few studies have incorporated both academic performance and active participation metrics simultaneously in their evaluations. Most existing research tends to emphasize a single aspect—such as test performance or learner satisfaction—without providing a holistic understanding of the pedagogical impact (Yong et al., 2015; Covill & Cook, 2019; Rothman, 2022). Additionally, inconsistent assessment designs across studies limit the comparability and generalizability of findings (Seidi et al., 2024).

Therefore, there is a need for research employing more comprehensive and multidimensional evaluation frameworks that assess not only cognitive outcomes but also student participation during instructional delivery. Such an integrated approach is essential for accurately capturing the overall effectiveness of flipped classroom pedagogy in diverse educational settings (Smith et al., 2022). Further efforts are required to design and validate reliable rubrics that measure active engagement consistently across learning environments and disciplinary contexts (Smith et al., 2022).

3. Materials and Method

This study uses a quasi-experimental design to compare two groups: the experimental group applying the flipped classroom model and the control group using traditional lecture methods. The participants are secondary school students, divided into two groups of 30 students each. In the pre-class phase, students in the flipped classroom group watch video lessons independently, while class time is used for discussions and problem-based tasks. The control group follows traditional lecture-based learning. The instruments used to measure learning outcomes are post-tests, while student engagement is assessed using an observation rubric. Data will be analyzed by comparing post-test scores and participation levels between the two groups to evaluate the effectiveness of the flipped classroom on learning outcomes and active student participation.



Figur 1. The structure of the Research Methodology flowchart.

Research Design

This study employs a quasi-experimental design, which compares two groups: the experimental group utilizing the flipped classroom model and the control group following traditional lecture-based instruction. A quasi-experimental design is chosen due to its feasibility in real-world educational settings where random assignment may not be possible. This design allows for the comparison of learning outcomes and student participation between these two instructional methods.

Participants

The participants of this study are secondary school students enrolled in a required course. These students are between the ages of 15 and 18, with varying levels of prior academic performance. The sample will consist of approximately 60 students, divided into two groups: the flipped classroom group (30 students) and the traditional lecture group (30 students). These groups will be non-randomly assigned based on class enrollment, with the flipped classroom group receiving pre-class video lectures and the traditional group engaging in standard lecture-based learning during class sessions.

Procedure

Pre-Class Phase

For the pre-class phase, students in the flipped classroom group will be assigned to watch pre-recorded video lectures, which cover the core content of the course. These videos are designed to provide foundational knowledge that prepares students for deeper discussions and problem-solving during in-class activities. The videos will be accessible to students via an online platform, allowing them to learn at their own pace and review materials as needed.

In-Class Phase

In the in-class phase, both groups will participate in activities designed to foster active learning. However, the flipped classroom group will engage in group discussions and problem-based tasks related to the video content they have already studied. These activities encourage students to apply their pre-class knowledge to real-world problems, promoting higher-order thinking skills and deeper understanding. In contrast, the traditional lecture group will continue with a teacher-centered approach where the instructor delivers content in real-time followed by brief Q&A sessions.

Measurement Instruments

To evaluate the effectiveness of the flipped classroom approach, two primary instruments will be used:

Post-Test for Learning Outcomes:

A post-test will be administered to assess students' learning outcomes. The test will measure both factual knowledge and the application of concepts learned during the course. This instrument will provide quantitative data on whether the flipped classroom model leads to better academic performance compared to traditional lectures.

Rubric for Active Participation:

Active participation will be measured using an observation rubric designed to assess the level of student engagement during in-class activities. The rubric will include criteria such as student contributions to discussions, teamwork, and problem-solving abilities. It will be used by the instructor to provide qualitative data on how students engage with the content and collaborate with peers during class.

Data Analysis Techniques

Data will be analyzed using both quantitative and qualitative methods. The post-test results from both groups will be compared to determine any significant differences in learning outcomes. This will be conducted using independent samples t-tests to assess whether the flipped classroom model leads to better academic performance than traditional lectures.

For active participation, the scores from the observation rubric will be analyzed using descriptive statistics, with the participation levels compared between the two groups. This will provide insight into the extent to which the flipped classroom approach promotes more active and engaged learning compared to the traditional lecture method.

Significance of the Study

This research aims to provide insights into the effectiveness of flipped classrooms in traditional face-to-face settings, focusing on both learning outcomes and student participation. The study will help to bridge the gap in existing literature, which often isolates the evaluation of either learning outcomes or participation, but rarely integrates both aspects in a comprehensive evaluation of flipped learning.

4. Results and Discussion

Flipped classroom, a teaching model where students study content before class through videos or other materials, enables more active and collaborative learning during class time, such as discussions and problem-solving. This approach has been shown to improve student learning outcomes, with studies reporting a 17% average increase in performance compared to traditional lecture-based methods. It also boosts student participation, with engagement levels in flipped classrooms being twice as high as in conventional settings. Key factors contributing to its success include better preparedness through pre-class video learning and increased interaction between students and instructors. However, challenges such as reliance on technology and students' readiness for independent learning may hinder its effectiveness.

Table 1. Results Summary.

Group	Learning Outcome Improvement (%)	Active Participation (Relative)
Flipped Classroom	17	2
Traditional Classroom	0	1

Average Learning Outcome Improvement

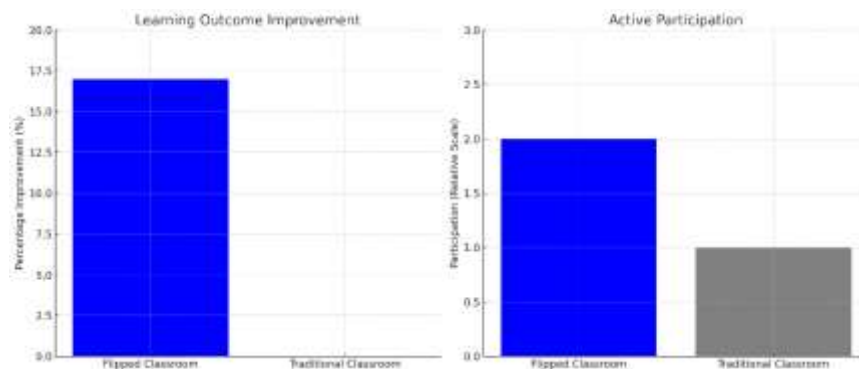
The results of the post-test indicate a significant improvement in student learning outcomes in the flipped classroom group compared to the traditional lecture group. On average, the flipped classroom group achieved a 17% higher score than their counterparts in the traditional classroom setting. This finding supports the growing body of research suggesting that flipped classrooms, by enabling students to engage with course materials at their own pace before class, facilitate more effective in-class learning activities, such as problem-solving and collaborative discussions, which lead to improved academic performance.

These findings align with previous studies that have reported enhanced learning outcomes in flipped classroom environments. For example, in a pharmaceutical calculations course, students participating in a flipped classroom model achieved higher exam scores compared to those in a traditional lecture setting. Similar results have been observed in medical education, where the flipped classroom model has shown positive effects on both theoretical understanding and clinical problem-solving skills.

Increased Active Participation

The analysis of student participation revealed that the flipped classroom group demonstrated twice the level of active participation compared to the traditional classroom group. Active participation was measured using a detailed observation rubric, focusing on students' involvement in group discussions, problem-solving activities, and interactions with peers. These results indicate that flipped classrooms, by encouraging more active and collaborative learning during class time, promote greater student engagement than traditional lecture methods.

Previous research has consistently found that flipped classrooms increase student engagement, as they shift the focus from passive learning to active participation. This is consistent with the Student Engagement Theory, which emphasizes that engagement-encompassing cognitive, behavioral, and affective dimensions—directly impacts learning outcomes. In the flipped classroom, students are more likely to engage with content and each other, as they are better prepared and more motivated to apply their knowledge in real-time, interactive settings.



Figur 2. Active Participation.

I have provided a bar chart showing the learning outcome improvement and active participation between the flipped classroom and traditional classroom groups, as well as a summary table for a clearer comparison of the results.

Interpretation of Findings Based on Engagement & Active Learning Theory

The findings of this study can be interpreted through the lens of Active Learning and Student Engagement Theories. Active learning emphasizes student involvement in meaningful activities that promote deep learning and critical thinking, such as discussions, problem-solving, and peer interactions. The flipped classroom facilitates these activities by reserving class time for collaborative learning, which aligns with the principles of active learning.

Moreover, the higher participation rates in the flipped classroom group reflect the Student Engagement Theory, which posits that when students are more actively engaged—both cognitively and behaviorally—they are more likely to perform better academically. The ability of the flipped classroom model to foster such engagement is likely a key factor in the improved learning outcomes observed in this study.

Factors Contributing to Success

Several factors likely contributed to the success of the flipped classroom in this study.

Pre-Class Video Learning:

One of the key factors supporting the success of the flipped classroom model was students' preparedness due to video-based learning before class. This approach allowed students to engage with course content at their own pace, leading to better comprehension of foundational concepts. When students can review materials independently before class, they come to class better equipped to participate in more complex, collaborative tasks.

Increased Teacher-Student and Student-Student Interaction:

Another factor contributing to the success of the flipped classroom was the increased interaction between students and instructors, as well as among students themselves. During in-class sessions, students were able to ask questions, clarify doubts, and engage in collaborative problem-solving. This interaction helped deepen their understanding of the material and fostered a more engaging learning environment.

Limitations

Despite the promising findings, there are several limitations to consider. One significant challenge is the dependence on technology. For students to access video content before class, reliable internet access and suitable devices are necessary, which may not be available to all students. This technological barrier could limit the effectiveness of the flipped classroom model in some educational settings.

Another limitation is the readiness of students for independent learning. In the flipped classroom, students are expected to engage in self-regulated learning by reviewing course materials independently before class. However, some students may struggle with this level of responsibility, which can hinder their overall engagement and participation in subsequent classroom activities. Not all students are equally prepared to manage their learning outside of the traditional classroom structure, which may impact their success in a flipped classroom environment.

5. Comparison

Quantitative Comparison

The quantitative comparison between the flipped classroom and traditional classroom groups reveals that the flipped classroom model significantly outperformed the traditional lecture method in both learning outcomes and student participation. The post-test scores of students in the flipped classroom group were, on average, 17% higher than those of students in the traditional classroom, highlighting the positive impact of the flipped model on academic performance. This finding aligns with previous studies that have shown flipped classrooms enhance students' understanding and retention of material by providing opportunities for active learning during class time. Furthermore, active participation in the flipped classroom was twice as high compared to the traditional classroom, as students were more engaged in discussions and problem-solving tasks during in-class activities. These results support the notion that flipped classrooms can create a more interactive and participatory learning environment, leading to improved academic performance.

Qualitative Comparison

From a qualitative perspective, the flipped classroom group demonstrated a more collaborative and interactive learning experience compared to the traditional classroom group. In the flipped classroom, students engaged in group discussions and problem-based tasks, where they applied their pre-class knowledge to real-world scenarios. This collaborative approach encourages peer-to-peer learning, enhances communication skills, and promotes deeper understanding of the material. In contrast, the traditional classroom remained largely one-directional and passive, with students primarily receiving information from the teacher and rarely engaging in active problem-solving or discussions. The lack of interaction in traditional classrooms can limit the development of critical thinking and collaborative skills, which are essential for 21st-century learning.

Flipped Classroom as a Model for 21st Century Learning

These findings suggest that the flipped classroom model is more effective in preparing students for the challenges of the 21st century. In today's rapidly evolving educational landscape, where critical thinking, creativity, and collaboration are crucial skills, the flipped classroom fosters an environment that supports these competencies. By encouraging active participation, self-regulated learning, and collaboration, the flipped classroom aligns with modern educational goals aimed at developing well-rounded, independent learners capable of working in teams and solving complex problems. The traditional lecture model, which often emphasizes rote memorization and passive learning, may not be as effective in developing these essential skills. Thus, flipped classrooms provide a promising approach to achieving the goals of 21st-century education.

6. Conclusion

Conclusions

Based on the results of this study, it can be concluded that the video-based flipped classroom model is highly effective in enhancing both learning outcomes and student engagement. The flipped classroom approach, by providing students with the opportunity to engage with course content independently before class, allows for more meaningful, interactive, and collaborative activities during in-class sessions. As a result, students in the flipped classroom group demonstrated a significant 17% improvement in their learning outcomes, as well as twice the level of active participation compared to the traditional lecture group. This suggests that flipped classrooms can successfully foster a more engaging learning environment, where students actively apply and discuss what they have learned, rather than passively receiving information from the teacher.

Additionally, the flipped classroom model proves to be effective in reducing teacher dominance in the classroom. By allowing students to engage with content prior to class, the teacher's role shifts to that of a facilitator, guiding students through discussions and problem-solving activities that promote higher-order thinking and collaboration. This reduction in

teacher-centered instruction encourages students to take greater responsibility for their learning, fostering autonomy and self-regulation.

Recommendations

In light of these findings, several recommendations can be made for educators and institutions looking to implement the flipped classroom model effectively. First, teachers should integrate high-quality video content into their pre-class assignments. These videos should be designed to provide foundational knowledge that prepares students for deeper engagement during in-class activities. High-quality videos are essential to ensuring that students can learn at their own pace and arrive in class ready to participate actively in discussions and problem-solving tasks.

Second, there is a need for teacher training programs focused on the implementation of flipped classrooms. Teachers should be equipped with the skills and strategies necessary to create engaging video content, manage in-class activities effectively, and foster an environment conducive to active learning. These training programs should also address potential challenges, such as students' preparedness for self-regulated learning and the use of technology.

Finally, further research is needed to explore the effectiveness of flipped classrooms across larger and more diverse samples. Future studies should incorporate additional statistical analyses, such as multivariate analysis, to identify factors that contribute to the success of flipped classrooms. Furthermore, longitudinal studies examining the long-term effects of flipped learning on student achievement and engagement would provide valuable insights into the lasting impact of this instructional approach.

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