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Teachers' Perspectives on the Flipped Classroom Model

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(Research Article)

Abstract

This study aims to examine mathematics teachers' views on the flipped classroom model. In this context, the teachers included in the study were first provided with information about the model; subsequently, their perspectives were explored in depth through targeted interview questions. The study was conducted using an embedded case study design, one of the qualitative research methods. The participants consisted of 10 primary and middle school mathematics teachers working in public and private schools. The teachers were selected using the convenience sampling method, which is a type of purposive sampling. Data were collected through interviews, and the content obtained was analyzed using descriptive analysis, a commonly employed method in qualitative data analysis. The interview questions consisted of eight open-ended questions, arranged from general to specific. The analysis process was organized under eight thematic categories in line with the research questions. Some of the teachers reported that they consciously or unconsciously implemented the flipped classroom model in their lessons. They emphasized that the model could enhance students' readiness levels, self-confidence, motivation, and retention of learning. However, they also noted that ineffective implementation of the model may lead to misconceptions and the development of various prejudices. Additionally, the teachers stated that the flipped classroom model may yield more efficient outcomes particularly at the middle school level and in geometry topics.

Keywords: Descriptive Analysis, Flipped Classroom Model, Mathematics Teacher, Teacher's Perspective

INTRODUCTION

Technology is defined as a phenomenon that encompasses continually evolving and transforming knowledge and skills, enabling the development of tools and methods designed to meet individuals' needs. Technological advancements bring significant changes and innovations to many areas of life, including education systems; consequently, they pave the way for new approaches and learning models within instructional processes. One such model is the flipped classroom. The flipped classroom approach is regarded not only as an alternative

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learning method but also as an innovative practice that seeks to transform traditional instructional patterns (Fulton, 2012; Kaya, 2018). The model aims for students to independently learn the theoretical aspects of the content prior to class and to engage in practice-based activities during class to foster meaningful and lasting learning experiences (Karaca & Ocak, 2017). In other words, the flipped classroom model is grounded in the reversal of the traditional roles of in-class instruction and homework (Bolat, 2016; Fulton, 2012; Bergmann & Sams, 2012). Within this approach, students acquire fundamental content—often through video materials—outside the classroom, while in-class time is dedicated to activities that promote higher-order cognitive skills (Bergmann & Sams, 2012). The model encourages students to take a more active role in their learning and increases their sense of individual responsibility. Moreover, by restructuring traditional homework practices, it expands the time available for in-class activities, thereby allowing students to participate more actively in lessons (Gençer, 2015; Sams & Bergmann, 2013). Pre-class preparation supports students in becoming more ready for in-class learning (McLaughlin et al., 2016) and contributes to reducing cognitive load by shifting part of the instructional content to before the lesson (Kirschner et al., 2018; Love et al., 2015). In the enriched classroom environment, concepts are explored in greater depth, and a student-centered learning atmosphere is fostered through problem-solving tasks, interactive group work, and formative assessment practices (Flipped Learning Network [FLN], 2014; Lo & Hew, 2020). Flipped classroom practices enable teachers to reach each student more effectively, while allowing learners to progress at their own pace and revisit the content as needed. Consequently, a learning culture characterized by exploration, interaction, and active participation becomes embedded within the classroom (Bergmann & Sams, 2012; McLaughlin et al., 2016; Voss & Kostka, 2019).

Theoretical Framework

The flipped classroom model is grounded in a learning design informed by the cognitive and social dimensions of the constructivist approach (Fraga & Harmon, 2014). Constructivism, which initially offered theoretical explanations about how individuals learn, has evolved over time into a comprehensive learning approach that focuses on how learners construct knowledge (Erdem & Demirel, 2002). The mathematics curriculum emphasizes the goal of cultivating individuals who "generate knowledge, use it functionally in daily life, solve problems, think critically, demonstrate initiative and perseverance, possess strong communication skills, empathize, and contribute to society" (Ministry of National Education [MoNE], 2018). In fostering these competencies in students, the constructivist learning approach plays a decisive role in the development of mathematics curricula. When integrated with constructivist learning principles, the flipped classroom model holds the potential to make in-class time more efficient, encourage students to take responsibility for their own learning, and enhance the quality of mathematics instruction by strengthening the teacher's role as a facilitator. Additionally, the model offers teachers opportunities for one-on-one interaction with students and for closely monitoring the learning process. For these reasons, raising mathematics teachers' awareness of the flipped classroom model and examining their views regarding its implementation in their lessons are considered essential.

In recent years, the flipped classroom model has attracted increasing attention and is now widely preferred across various educational levels, particularly in the fields of education and engineering (Bolat, 2016; Muir, 2017). The literature contains numerous studies examining the implementation of the flipped learning approach in mathematics education, many of which report that the model yields positive and effective outcomes (Adams & Dove, 2018; Güç, 2017; Kaya, 2018; Muir, 2017; Özdemir, 2016). In a flipped classroom environment, the aim is to reduce time constraints and, when necessary, create additional time to support students' active participation in the lesson (Bergmann & Sams, 2012). While students learn the essential knowledge and competencies required for the course outside the classroom—primarily through technological tools—in-class time is dedicated to application, problem-solving, and activities that promote higher-order cognitive skills (Fulton, 2012; Strayer, 2012). This organization significantly reduces dependency on time and place, allowing a larger portion of class time to be allocated to instructional activities (Grover & Stovval, 2013; LaFee, 2013). The accessibility of the model for students from diverse socioeconomic backgrounds and various geographical regions positions the flipped classroom as more advantageous compared with other learning models (Johnson & Renner, 2012). This advantage largely stems from the fact that course content and learning materials are made available to students in digital formats. Students can complete their preliminary learning by utilizing digital resources before coming to school, and teachers can review student feedback beforehand to make necessary instructional adjustments. As a result, unclear points or conceptual gaps can be addressed more effectively in the classroom. Students access fundamental information through video lectures, presentations, and other digital materials outside the classroom, while inside the classroom they have opportunities to reinforce, deepen, and transform this knowledge into higher-level skills (Çakır, 2017; Fulton, 2012). Moreover, the flipped learning model enables students to plan and manage their out-of-class study time more effectively (LaFee, 2013). This, in turn, allows teachers to better utilize students' readiness levels during class and devote more time to the teaching process.

Purpose of the Study

The flipped classroom model, despite its numerous advantages, also presents certain limitations. The model's emphasis on out-of-class activities may gradually weaken the central role of school and classroom environments in the learning process (Kaya, 2018). Additionally, misconceptions or misunderstandings that may arise during students' individual learning processes can develop more easily due to the shift of teacher guidance outside the classroom (Johnson & Renner, 2012; Miller, 2012; Moravec et al., 2010; Sams & Bergmann, 2013; Strayer, 2012). Students may not receive immediate feedback when they encounter difficulties, which can negatively affect their learning. Furthermore, insufficient technical infrastructure or limited access to digital materials may hinder students' ability to complete assigned tasks (Turan & Göktaş). Moreover, processes such as preparing course content, creating videos, and organizing digital materials may increase teachers' workload. Considering both the advantages and disadvantages of the model, many teachers intentionally or unintentionally implement flipped classroom practices in their lessons. This situation raises important questions regarding how teachers use the model, the challenges they face, and what improvements are needed for more effective implementation. Therefore, systematically presenting teachers' experiences

with the model is essential. The limited number of studies focusing specifically on mathematics teachers further underscores the need to examine their perspectives. In this context, the primary aim of the present study is to determine the views of elementary mathematics teachers regarding the flipped classroom model. In line with this aim, the study first seeks to identify whether participants have heard of or implemented the model, and then to explore their thoughts about it in depth. Accordingly, the research seeks to answer the main question: "What are mathematics teachers' views regarding the flipped classroom model?" and the following sub-questions:

1. To what extent do mathematics teachers incorporate the flipped classroom model into their instructional practices?
2. According to mathematics teachers, what are the advantages and disadvantages of the flipped classroom model?
3. How do mathematics teachers believe this model affects students' motivation?
4. What measures do mathematics teachers take to ensure the effective functioning of this model, and how do they verify students' readiness?
5. According to mathematics teachers, for which grade levels and topics is the flipped classroom model more suitable?

METHOD

Research Design

This study is a qualitative research design employing an embedded single-case study approach, aimed at determining elementary school mathematics teachers' views on the flipped classroom model. Case studies allow for an in-depth examination of a particular phenomenon or situation by focusing on individuals and groups. Yıldırım and Şimşek (2008) define the primary purpose of case studies as "revealing the outcomes related to a specific case through a holistic approach." Since the present study involves multiple units of analysis—namely, elementary and middle school mathematics teachers who have and have not experienced the flipped classroom model—it was conducted in accordance with an embedded single-case study design (Yıldırım & Şimşek, 2008). Within this context, the specific case of this research is the in-depth exploration and detailed examination of mathematics teachers' views on the flipped classroom model, regardless of whether they have prior experience with the model.

Participants

The sample of this study consisted of 10 elementary and middle school mathematics teachers working in public and private institutions in a province in eastern Turkey. The teachers were selected using the convenience sampling method, which is a type of purposive sampling. Convenience sampling allows participants to be chosen from accessible and practicable units due to logistical constraints (Yıldırım & Şimşek, 2008). The participants work in middle-level schools from a socio-economic background. While some teachers have experience with the flipped classroom model, others have not. However, even those without prior experience were aware of the model's existence, which was a key factor in their participation in the study. To

ensure confidentiality, the teachers were assigned codes such as T1, T2, and so on. Some demographic information regarding these teachers is presented below:

Table 1. *Demographic information of the participating teachers*

Code	Gender	Years of experience	Institution type	Teaching levels	Flipped classroom user/not user
T1	Male	6 years	Public	Primary School	User
T2	Female	11 years	Public	Primary School	Not user
T3	Female	4 years	Public	Middle School	User
T4	Male	8 years	Public	Middle School	User
T5	Male	12 years	Public	Middle School	User
T6	Male	3 years	Private	Middle School	Not user
T7	Male	13 years	Public	Primary School	Not user
T8	Male	11 years	Private	Middle School	User
T9	Male	21 years	Private	Middle School	Not user
T10	Female	10 years	Public	Primary School	User

Data Collection Instruments

In this study, an interview form was used as the data collection instrument (Appendix 1). During the interviews conducted using the interview form, the researchers collected information about the participants' feelings, thoughts, and experiences through pre-prepared questions. In order to obtain information regarding the participants' perspectives, interests, opinions, and tendencies toward the flipped classroom model, a draft interview form was developed based on a review of the relevant literature. The form was structured with open-ended questions, arranged from general to specific, and covered topics such as the use of the flipped classroom model in classrooms, its advantages and disadvantages, its effects on student motivation, and the ways it is implemented in instructional settings. The prepared questions were reviewed by subject-matter experts, and after the necessary revisions, an interview form consisting of eight questions was finalized. The interviews were conducted face-to-face, and the questions in the interview form were presented to the participants. In accordance with the principle of voluntary participation, the responses were audio-recorded. Each interview lasted approximately 2 to 10 minutes per participant.

Data Analysis

In this study, mathematics teachers' views on the flipped classroom model were analyzed using the descriptive analysis method. Accordingly, the responses provided by the teachers to each research question were examined, systematically coded, and presented in categorized form.

Validity and Reliability

To ensure the validity and reliability of the data collection process, several measures were taken. First, the semi-structured interview questions were developed based on a comprehensive review of the relevant literature to ensure content validity. The interview protocol was then examined by field experts, and revisions were made in line with their feedback to enhance clarity, relevance, and appropriateness of the questions. This expert review process contributed to the credibility of the instrument. Additionally, the use of open-ended questions allowed

participants to express their views in depth, thereby increasing the richness and authenticity of the data. All interviews were conducted face-to-face using the same interview protocol to ensure consistency across participants. The interviews were audio-recorded with participants' consent, which minimized data loss and supported the dependability of the findings. Furthermore, direct quotations from participants were used during data analysis to strengthen the confirmability of the results.

FINDINGS

This study aimed to reveal teachers' perspectives on the flipped classroom model. The findings provide insights into what the flipped learning model entails, whether it is implemented, its advantages and disadvantages, its impact on student motivation, and the grade levels and topics for which it can be used. These findings are presented below in accordance with each research question:

Teachers' responses to the question*, "Do you use the flipped classroom model in your lessons?"*, are presented in Table 2.

Table 2. *Teachers' use of the flipped classroom model*

Categories	Teacher codes
Using it without knowing the name	T8, T4
Using it	T5, T10
Not using it	T6, T7, T2, T9
Using it for specific topics	T1, T3

Four teachers reported that they do not use the flipped classroom model, two indicated that they do use it, two stated that they use it unknowingly, and two reported using it for specific topics. This suggests that many teachers implement the flipped classroom model in their lessons, either consciously or unconsciously. While most teachers provided brief responses such as "I use it" or "I do not use it" regarding the concept of the flipped classroom model, Teacher T9 gave the following detailed response:

> *T9: "I believe that due to the problems in our country's education system, the overall quality of education has significantly declined, and therefore, the flipped classroom model cannot be effectively implemented."*

Teachers' responses to the question, *"What do you consider to be the advantages of the flipped classroom model?"*, are presented in Table 3.

Table 3. *Teachers' perspectives on the advantages of the flipped classroom model*

Categories	Teacher codes
Provides opportunities for more problem-solving	T1, T4, T9
Increases students' self-confidence	T1, T6, T10
Saves time	T3, T7, T10
Ensures students come prepared	T2, T4, T7, T8, T9
Allows deeper understanding of important topics	T4, T5
Makes it easier to identify where students struggle	T3, T4, T6

When asked about the advantages of the flipped classroom model, teachers generally highlighted responses such as increased opportunities for problem-solving, time savings, enhanced self-confidence, and deeper learning. Among these, the most frequently mentioned advantage was "ensures students come prepared." Specifically, three teachers noted that the model "provides opportunities for more problem-solving," "increases students' self-confidence," "saves time," and "makes it easier to identify where students struggle," while two teachers emphasized that it "allows deeper understanding of important topics." Excerpts from the teachers' responses are presented below:

> *T1: "It provides opportunities for problem-solving, and when students are able to catch up on their own, it also increases their self-confidence."*
>
> *T4: "Students come prepared, time is saved, important topics can be explored in depth, it becomes clear where students struggle, and more time is available to review different types of questions."*

Teachers' responses to the question, *"What do you consider to be the disadvantages of the flipped classroom model?"*, are presented in Table 4.

Table 4. *Teachers' perspectives on the disadvantages of the flipped classroom model*

Categories	**Teacher codes**
Causes misconceptions	T1, T3, T7
Students may not study	T6
Time-consuming	T5, T9
May lead to misconceptions or biases if students do not understand	T4, T8, T10
May cause student distraction	T2

When asked about the disadvantages and shortcomings of the flipped classroom model, most teachers indicated that it could lead to misconceptions and biases. In addition, two teachers emphasized that the model can be time-consuming, while others noted that students might not study or could experience distraction. Excerpts from the teachers' responses are presented below:

> *T6: "Students do not study beforehand because they may feel unmotivated and reluctant. This could be due to the disconnect between their real-life experiences and the lessons. Since many of the topics learned are not used in real life, students' motivation decreases."*
>
> *T7: "Students may develop misconceptions. If a student learns something incorrectly, it takes time to correct that knowledge."*

Teachers' responses to the question, *"How do you think the flipped classroom model affects students' motivation in mathematics lessons?"*, are presented in Table 5.

Table 5. *Teachers' perspectives on how the flipped classroom model affects motivation*

Categories	Teacher codes
Increases self-confidence	T1, T6, T5, T10
Decreases self-confidence	T1, T5
Enhances active participation	T2, T10
Increases motivation	T4, T8
Promotes long-term learning	T7
Stimulates curiosity	T3, T9

When asked how the flipped classroom model affects student motivation, most teachers responded that "it increases the self-confidence of students with higher cognitive levels." Two teachers expressed a negative perspective, noting that it may negatively affect the self-confidence of students with lower cognitive levels. Other teachers indicated that the flipped classroom model can enhance active participation, increase motivation, promote long-term learning, and stimulate curiosity.

T9: "It definitely has a positive effect. Being prepared beforehand means questions arise in the mind."

T6: "Of course, I think it can be excellent for a class with certain ideals and that is already motivated. Questions can even be given before the lesson starts. Curiosity can be increased."

T5: "Having questions arise in the mind stimulates curiosity."

T10: "Learning independently leads to long-term retention."

T1: "While it increases the self-confidence of students with higher cognitive levels, it may decrease the self-confidence of students with lower cognitive levels."

Teachers' responses to the question, *"What measures do you take to ensure that students come prepared to class when using the flipped classroom model?"*, are presented in Table 6.

Table 6. *Teachers' measures related to the flipped classroom model*

Categories	Teacher codes
I ask them to watch videos on the topic	T6, T7
I ensure they access the same resource	T3
I ask them to conduct research on the topic	T4

When asked what measures they take to ensure students come prepared to class when implementing the flipped classroom model, two teachers stated that they ask students to watch videos on the topic, one teacher emphasized using the same resource, and another teacher suggested that conducting research on the topic could be effective.

T2:"I would give them time to watch the videos."

T3: "I ensure that students access the same resource. It is very important for their learning that they work from the same source."

Teachers' responses to the question, *"How do you ensure that students are prepared when using the flipped classroom model?"*, are presented in Table 7.

Table 7. *Teachers' perspectives on ensuring students' preparedness in the flipped classroom model*

Categories	Teacher codes
I observe students' level of participation in the lesson	T1, T4, T6, T8, T10
I ask for the materials they have used as documentation	T9, T10
I ask questions	T1, T2, T3, T5, T6, T7

When asked how they determine whether students are prepared when implementing the flipped classroom model, most teachers stated that they prefer to ask questions and observe students' level of participation in the lesson, while two teachers indicated that they request the materials used by students as documentation. Excerpts from the teachers' responses are presented below:

> *T6: "We cannot attend to each student individually in class. Instead of checking one by one if X or Y is prepared, it can be determined by asking simple questions randomly across the class. If the student we ask does not know, another student can immediately respond, which helps us understand students' motivation."*
>
> *T10: "I observe students' level of participation in the lesson, such as the number of raised hands."*
>
> *T9: "I request the work they have completed as documentation."*
>
> *T3: "I ask questions; this way, it becomes clear whether they have come prepared to the lesson."*
>
> *T4: "I check the materials they use, such as handouts, and observe students' willingness to participate in the lesson."*

Teachers' responses to the question, "At which grade levels do you think the flipped classroom model can be used?", are presented in Table 8.

Table 8. *Teachers' perspectives on appropriate grade levels for the flipped classroom model*

Categories	Teacher codes
Can be implemented in 6th and 7th grades	T2, T3, T7, T10
Can be implemented in middle-level classes	T1, T5
Can be implemented at all grade levels	T4, T6
Can be implemented with students preparing for university entrance exams (YKS)	T8
Can be implemented at the high school level	T3, T7, T9

When asked at which grade levels the flipped classroom model can be more easily implemented, four teachers indicated that 6th and 7th grades are suitable, while three teachers suggested it could be more effective at the high school level. Other teachers stated that it can be applied in middle grades or at all levels. One teacher uniquely noted that it could be effective for students preparing for the university entrance exam (YKS). Excerpts from the teachers' responses are presented below:

T9: "Generally at the secondary education level, because for secondary students, accessing cognitive knowledge on their own leads to more lasting learning."

T7: "I think 5th-grade students are still at the primary level. It is more appropriate to implement it from the 6th grade onward."

T3: "It is more suitable for 7th and 8th grades and high school levels, because the likelihood of developing misconceptions is lower."

Teachers' responses to the question, *"In your opinion, for which topics in mathematics is the flipped classroom model more suitable?"*, are presented in Table 9.

Table 9. *Teachers' perspectives on topics suitable for the flipped classroom model*

Categories	**Teacher Codes**
Can be used in the areas of geometry and measurement	T1, T2, T3, T4
Can be used in a small portion of certain topics	T6
Can be used in most topics	T5, T10
Can be used in data analysis and research	T7
Can be used in AYT (Advanced Placement Test) topics	T8
Can be used in all topics	T9

When asked about the topics in which the flipped classroom model can be more easily implemented, four teachers indicated that it could be suitable for geometry and measurement topics. The other teachers did not focus on a specific topic and stated that the model could be effective in most topics. Excerpts from the teachers' responses are presented below:

T6: "The teacher should act specifically here, providing a micro-level goal rather than focusing on the entire topic. The interesting part of the topic can be given, and students can be asked to study it."

T2: "In geometric solids, for topics such as different perspectives of shapes."

T3: "I would use it for topics containing knowledge, such as quadratic equations, polynomials, and geometry."

T4: "It can be used in geometry topics that involve visual elements and drawing."

DISCUSSION and CONCLUSION

Teachers expressed varying views regarding their use of the flipped classroom model. Some indicated that they applied the model without knowing its formal name, while others stated that they did not use it at all, noting that the current education system does not provide sufficient opportunities for its implementation. Erbil and Kocabaş (2019) observed in their study that the majority of teachers lacked knowledge about the model, whereas Arslanhan et al. (2022) reported that teachers were not fully familiar with it. In contrast, Türk and Ev-Çimen (2022) found that most teacher candidates were knowledgeable about the model. The novelty of the model and teachers' familiarity with traditional methods may be among the reasons for its limited use. On the other hand, the familiarity of newly appointed teachers with the model may indicate that a recently introduced learning approach is beginning to find a place in instruction.

Additionally, limited resources and students' insufficient cognitive levels are considered other factors that may prevent the model from being implemented, even if it is known.

Teachers indicated that the flipped classroom model has both advantages and disadvantages. Among the advantages, increases in students' self-confidence, time savings, improved preparedness, and support for deep learning were highlighted. Conversely, disadvantages included the potential for increased misconceptions and biases, the time-consuming nature of the process, and student attention difficulties. Interestingly, teachers did not explicitly mention the model's advantage of allowing more time for in-class activities. In a study by Cukurbasi and Kıyıcı (2018), the educational benefits of the flipped classroom model were detailed, emphasizing that teachers could cover more content in lessons, lesson planning would become easier, and the ability to rewatch video materials would reduce the need for repetitive instruction. The same study also noted that an increased workload and students' failure to perform as expected could decrease the model's effectiveness. Similarly, other research highlighted that the flipped classroom model requires more time and effort compared to traditional methods (Mutlu & Aydın, 2018; Yıldırım et al., 2018). Numerous studies in the literature point to similar advantages and disadvantages, revealing both the strengths and weaknesses of the model (Karamuk-Eskiköy & Kaban, 2023; Kocabatmaz, 2016; Yılmaz & Gök, 2024).

When examining the impact of the flipped classroom model on student motivation, most teachers indicated that it could increase students' interest and curiosity; however, it was noted that the model might have a negative effect on students with lower cognitive levels. In their study, Gökçen and Kadıoğlu (2020) argued that students' motivation to learn mathematics would increase when instructional videos are carefully designed and students use technology effectively to learn the topics. Similarly, Kocabatmaz (2016) emphasized that features of the flipped classroom model—such as providing unlimited opportunities for repetition, enhancing learning retention, accommodating individual differences, offering access to resources and materials, reinforcing learning through hands-on activities, addressing learning gaps, and strengthening student-instructor communication—have positive effects on students' motivation.

Teachers' views on the appropriate grade levels and topics for implementing the flipped classroom model vary. Some teachers suggested that the model can be applied across all grade levels, while others argued that it is more suitable for secondary education. This variation can be explained by differences in topic difficulty and students' readiness to adopt the model. Gökçen and Kadıoğlu (2020) posited that applying the model to younger students may lead to boredom, and therefore, more positive outcomes are likely with older students. A review of the literature indicates that 7th-grade students are most commonly targeted for mathematics instruction using this model (Leo, 2017; Güc, 2017; Akdeniz, 2019; Bulut, 2019). In contrast, Mutlu and Aydın (2018), in a study with science teachers, suggested that the model could also be suitable for younger grade levels. Gökçen and Kadıoğlu (2020) further proposed that the flipped classroom model is particularly effective for topics that students encounter for the first time, such as fractions, rational numbers, data analysis, and geometry. This view has been supported by multiple studies in the literature (Bolatlı, 2018; Güc, 2017; Koç-Deniz, 2019;

Leo, 2017; Wiley, 2015). On the other hand, Şen (2022) highlighted that the model may not be equally effective for all topics.

As a distinct finding, teachers indicated that recommending resources to students could serve as an effective measure to facilitate the more appropriate implementation of the flipped classroom model. In ensuring students' preparedness for class, strategies such as asking questions, monitoring participation levels, and reviewing students' completed work were highlighted. Just as students' preparedness is crucial, teachers taking these preventive measures is considered a fundamental factor for the effective functioning of the model. Additionally, teachers emphasized that providing resource recommendations in advance could further enhance the successful application of the flipped classroom model, and monitoring students' readiness through questions, participation tracking, and work review is essential to support this process.

Recommendations

The following suggestions can be considered for the implementation of the flipped classroom model:

- Learning materials should be tailored to students' individual needs. These materials should be concise, clear, engaging, and accessible to all students.
- Communication channels and technological infrastructure should be strengthened, and necessary precautions should be taken to ensure smooth implementation.
- When preparing implementation plans, potential disadvantages for both teachers and students should be considered, and various assessment methods should be employed to measure how much and what students have learned.
- Future research could examine the impact of the model on 21st-century skills.

Ethics Declaration

An ethical approval was not obtained for the study.

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Appendix 1.

1. Do you use the flipped classroom model in your mathematics lessons?
2. What do you think are the advantages of the flipped classroom model?
3. What do you think are the disadvantages of the flipped classroom model?
4. In your opinion, how does this model affect students' motivation in mathematics classes?
5. When implementing the flipped classroom model, what types of strategies do you use to ensure that students come to class prepared?
6. When using the flipped classroom model, how do you verify that students have come to class prepared?
7. At which grade levels do you think this model can be implemented?
8. For which mathematics topics do you think this model is more suitable?