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Pre-Reading Motivation in a Flipped Classroom: A Case Study of Gifted Science and Mathematics Students in Thailand

Surakrai Nantaburom*

Kamnoetvidya Science Academy, Rayong, 21210 Thailand

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Abstract

The flipped classroom method often encounters the issue of students not preparing themselves before class. The objectives of this research are to determine how to encourage gifted science and mathematics students to read a book before social studies classes and to understand their motivation to do so. This study employs a pre-experimental design, specifically a one-group pre-posttest experimental design. Data were collected using questionnaires and interviews. Quantitative data analysis involved t-tests and descriptive statistics, while qualitative data were analyzed through content analysis.

The findings revealed that, after students were assigned specific tasks to complete before class, their pre-class reading scores significantly increased at the .05 level of statistical significance. Qualitative data indicated that extrinsic motivation, particularly through marking and grading, plays a crucial role in promoting pre-class reading, whereas intrinsic motivation had a lesser influence. Schools and teachers can further support both extrinsic and intrinsic motivations beneficial to pre-class reading through strategies such as group quizzes, learning guidelines, providing adequate free time, and creating conducive learning spaces for preparation.

Introduction

This study delves into the paradigm of learning for the twenty-first century, necessitating an educational shift towards flexible, effective, and student-centered pedagogies that address the complexities of the global landscape. Emphasizing the principles of personalization, participation, and productivity, Saavedra and Opfer (2012) and Scott (2015) advocate for mastering twenty-first-century skills through pedagogical transformation. Active learning emerges as a pivotal methodology, facilitating cognitive development and fostering students' behavioral and affective domains

through engaging activities (Michel, Cater, & Varela, 2009; Prince, 2004). In this context, the flipped classroom model presents an innovative approach that flips traditional classroom dynamics, enabling pre-class study at home and in-class active learning. It empowers students to participate actively in their learning process, thus cultivating critical skills required for success in the twenty-first century. As the study unfolds, a flipped classroom with an online learning context has a significant role in students' motivation and perspectives. Unraveling these factors holds the potential to enhance

* Corresponding Author
e-mail: surakrai.n@kvis.ac.th

class management, promote in-class activities, and enrich learning experiences to foster the development of essential twenty-first-century skills (Xiu & Thompson, 2020; Heiner, Banet, & Wieman, 2014; Vallin & Akesson, 2012).

Students must prepare for class through self-study, including completing specific readings before class begins. While the flipped classroom offers promising benefits, it has been found that these classrooms face challenges in motivating students to engage in pre-class reading, particularly in Social Studies courses. The question is: which teaching technique most effectively encourages students to complete pre-class readings to support the flipped classroom model in Social Studies classes within a Science and Mathematics school context? To assess the impact of the flipped classroom model, this research scrutinizes students' perceptions, learning performance, and attitudes toward the approach. Expectancy and value beliefs, measured through adapted subscales from the motivated strategies for learning questionnaire, offer insights into students' motivational characteristics. The study's findings reveal that students exhibit similar motivation patterns in flipped classrooms as in traditional or online settings, displaying positive attitudes towards the approach. Self-efficacy emerges as a significant predictor of both academic achievement and perceptions of the flipped classroom. While the flipped classroom appears promising, there is a need for further research to eliminate confounding variables and establish cause-and-effect relationships. As a researcher and instructor seeking to adopt this approach, practical recommendations include implementing pre-class activities tied to course credits to reinforce students' commitment to course preparation. It is essential to acknowledge that excessive online materials might induce fatigue and reluctance among students, necessitating a carefully balanced utilization of resources (Tolley, Johnson, & Koszalka, 2012; Graham & Weiner, 1996). Some teaching technique interventions could increase students' motivation to read before class in flipped classrooms, and this study aims to test which interventions are most effective and how they help students. Overall, this research contributes to enhancing pedagogical practices by shedding light on the relationship between motivation and the flipped classroom, paving the way for continued exploration and refinement of this approach to cater to diverse student needs and bolster learning outcomes.

Research question

What are the most effective teaching techniques that motivate gifted and talented students in a Science and Mathematics high school to prepare readings for the flipped classroom before Social Studies classes?

Objective

To compare students' reading habits before and after implementing various teaching techniques for the flipped classroom.

Research scope

This study was conducted under the following parameters:

1. Participants: Senior high school students in a boarding Science and Mathematics school.

2. Course: Social Studies

3. Research Variables:

Independent Variable: Teaching techniques, including:

3.1 Provided study materials.

3.2 Assigned worksheets with graded scores.

3.3 Quizzes before class begins with graded scores.

Dependent Variable: Students' pre-class reading habits.

Research methodology

1. The case study

This research was conducted in a Science and Mathematics senior high school in Thailand. The subjects of the case study were senior high school students enrolled in Social Studies courses in the school during the same academic year.

1.1 Subjects of study

1.1.1 Selection criteria:

(1) Currently enrolled students in the Boarding Science and Mathematics School at the senior high school level.

(2) Students currently enrolled in a Social Studies course.

(3) Volunteers willing to participate in the study.

1.1.2 Definition and selection:

Students who passed the school admission test and were currently studying in the Science and Mathematics School. They are defined as gifted and talented. The case study subjects were selected as follows:

(1) Subjects were selected using a purposive sampling method, involving 71 students

in Grade 10 enrolled in Social Studies courses. These students were new to the flipped classroom model and fit the research condition focusing on motivation in flipped classrooms.

(2) For the interview session, the subjects were the same group as above, with data collected from 18 volunteer students willing to provide additional information.

2. Research design

This study used a pre-experimental design, specifically a one-group pre-test post-test methodology. The experimental group was subjected to various teaching techniques, and students' motivation was assessed using questionnaires before and after the intervention to collect quantitative data (as shown in Table 1). Following this, qualitative data was gathered through interviews with volunteers.

Table 1 Classroom action research experimental design

Group	Experiment			
	E	O ₁	X ₁	O ₂

The symbols in the Table 1 are

E: Experimental group.

O₁: Questionnaire 1 data collecting.,

X₁: Teaching techniques in which students were given tasks to complete before class., the periods of using each teaching technique were 3 times (once a week) and for 9 weeks in total.

O₂: Questionnaire 2 data collecting.,

3. Course description

Social Studies courses used in this research were Civic Duty 3 course, and Civic Duty 4 course (pre-requisite course) which both are compulsory courses for every student to enroll in the same academic year.

4. Research instruments

4.1 Social Studies courses which were Civic Duty 3 and 4 courses including lesson plans and course materials.

4.2 Teaching technique materials including:

4.2.1 Study materials to study included textbooks, readings, and video clips.

4.2.2 Worksheets.

4.2.3 Quizzes before class started.

For the given study materials technique, it was not graded or marked but all the worksheets and quizzes were graded and had marking scores.

4.3 Pre and post questionnaires.

4.4 Semi-structured interview questions.

5. Data collection

Quantitative data was collected by questionnaire from 71 students. Qualitative data was collected by interviewing 18 volunteer students. After the student participants were selected, they were given a questionnaire. Following the implementation of the teaching techniques for the flipped classroom, the same questionnaire was administered again to collect data. The questionnaires were distributed in an online format. Finally, 18 volunteer students were given another questionnaire and interviewed using the semi-structured interview questions.

6. Data analysis

Quantitative data were analyzed by using a t-test dependent sample and descriptive statistics. The qualitative data were analyzed by content analysis method.

Result

1. Results from quantitative data

Students answered the questionnaires before and after using teaching techniques to cultivate and analyze data. The research results can be described as follows.

General Information of Student Subjects

The subjects who answered the questionnaire were 71 students in grade 10 from four classes (classes 1-4). Classes 1-3 each consisted of 18 students (25% each), while class 4 consisted of 17 students (23.9%). Students were given questionnaires to assess their reading habits before and after the intervention, which involved tasks assigned before class. The results, analyzed using a t-test, are presented in Table 2.

The example questions of this data collection questionnaire were:

“Did you recently study before class while you are studying in this school?”

“After the assignments are given, which are graded, do you study before class?”

Table 2 Results from the t-test dependent sample (n = 71)

Score	Mean	SD	SE	W	p
Pretest	2.3857	1.0886	0.909		
Post-test	2.7714	0.9036	1.089	827*	.004

* The Wilcoxon rank test (W) was used for where a violation of an assumption of normality (Shapiro – Wilk = 0.924, p = .001)

The table shows participant responses before and after implementing teaching techniques that assigned tasks to complete before class. Before the intervention,

the mean score for students' pre-class reading was 2.3857 with a standard deviation (S.D.) of 1.0886. After the intervention, the mean score increased to 2.7714 with an S.D. of 0.9036. The paired sample t-test results indicated a low p-value, suggesting a violation of the assumption of normality. Consequently, the Wilcoxon rank test was applied. The test results showed that students read more before class after being assigned tasks, with a statistical significance at the .05 level.

After the experiment, students were given questionnaires to inquire about how they read before class after they were given tasks to do before class.

Table 3 depicts the result using descriptive statistics and applied criteria as follows

The percentage from 2.36 – 3.00 means High

The percentage from 1.68 – 2.35 means Moderate

The percentage from 1.00 – 1.67 means Low

Table 3 Results from the questionnaire on reading before class and which task influenced participants to read before class the most (n = 71)

Question	Percentage	Agreement level
Please give an order of factors that influenced you to study before class respectively from the agreement.		
1. Provided study materials	1.66	Low
2. Being assigned a worksheet and marking the score/grade	2.04	Moderate
3. Having a quiz before class begins and marking the score/grade	2.56	High

The questions in Table 3 used a rating scale of 1 to 5, from strongly disagree to strongly agree. The percentage of students' responses was analyzed based on their ratings. The table displays factors influencing pre-class study, ranked by participant agreement levels. Notably, 56% of students highly ranked having a pre-class quiz with a grade, underscoring its motivational role. 29% moderately ranked assigned worksheets, while only 15% highly rated provided study materials. This emphasizes the importance of quizzes and graded assessments for pre-class study motivation and suggests exploring strategies to enhance the effectiveness of study material provision. The factor that influences students to read before class. After participants answered the questionnaire then the descriptive statistic was applied. The results are revealed as data in Tables 4 and 5.

Table 4 Results from the questionnaire regarding factors that influence participants to read before class (n = 71)

Question	Frequency	Percentage
Which factors most influence you to study before class?		
1. Score/grade	26	36.6
2. Better understanding the lessons	6	8.5
3. Having enough time	17	23.9
4. Interesting materials	8	11.3
5. Beloved Subject(s)/course(s)	10	14.1
6. Subject(s)/course(s) that you don't understand	4	5.6
Total	71	100.0

Table 4 displays factors influencing pre-class study, showing frequencies and percentages. “Score/grade” had the highest frequency (36.6%), indicating significant motivation. “Having enough time” accounted for 23.9%, “Beloved Subject(s)/course(s)” 14.1%, and “Interesting materials” 11.3%, highlighting their roles. “Better understanding the lessons” was reported by 8.5%, while “Subject(s)/course(s) that you don't understand” accounted for 5.6%. The findings stress the importance of grading, time availability, material appeal, and personal interest in motivating pre-class study, emphasizing the need for target strategies for improvement.

Table 5 Results from the questionnaire to Yes/No answers in questions 1 – 4 (n = 18)

Question	Frequency		Percentage	
	Yes	No	Yes	No
1. Does giving pre-class quizzes as assignments encourage students to read before class?	15	3	83.3	16.7
2. Is giving pre-class quizzes as assignments more effective in encouraging reading before class compared to other methods such as simply telling students to read or assigning worksheets before class?	14	4	77.8	22.2
3. Do you prefer taking quizzes as individual work rather than group work?	18	0	100.0	0
4. Do you like to do quizzes as group work because you can manage your reading such as swap turns in reading.	7	11	38.9	61.1

Table 5 provides insights into the responses related to the effectiveness of pre-class quizzes in promoting pre-reading. When asked if pre-class quizzes encourage reading, 83.3% agreed. Additionally, 77.8% found pre-class quizzes more effective than other methods. In terms of quiz format, all respondents preferred individual work, but 38.9% acknowledged the

advantage of group work in managing reading through activities like turn-swapping. These results underscore the positive influence of pre-class quizzes on pre-reading and the preference for individual quiz formats.

Students' habits of reading before class results. Students answered the questionnaire, and the descriptive statistic was applied. The results are shown as data in Table 6.

1) The data about yes/no questions about students' habits of reading before class

Table 6 Results from the questionnaire in the yes/no questions on students' reading before class habit (n = 18)

Question	Frequency		Percentage	
	Yes	No	Yes	No
1. D 1 If a teacher does not force you to read before class, will you do it before class?	13	58	18.3	81.7
2. If you have enough time to study before class, will you do it before class?	55	16	77.5	22.5
3. Studying before class makes you understand lessons better.	68	3	95.8	4.2
4. In the future, will you tend to read before class more often than recently?	60	11	84.5	15.5

As shown in Table 6, the responses regarding pre-class study habits are summarized. When asked if they would study without teacher compulsion, 81.7% of students preferred not to, while 18.3% would. However, 77.5% indicated they would study when they have enough time. A significant 95.8% believed that pre-class study improves understanding. Looking ahead, 84.5% intended to study more often, suggesting potential improvements in pre-class study habits. These results underscore the impact of teacher compulsion, time availability, perceived learning benefits, and future intentions on students' engagement in pre-class studying.

2) Data on Students' Preferred Reading Locations Before Class. The results from the questionnaire, specifically addressing the opinions on agreement with question 5, "If you have to read before class or complete pre-reading assignments, where do you prefer to do so the most?" are shown in Table 7 below.

Table 7 Results from question 5: Preferred place where students read (n = 18)

	Strongly disagree	Disagree	Agree	Strongly agree
In my room in a dormitory	1	0	4	13
Library	3	7	4	4
Learning Space in Learning Building	9	9	0	0
Learning space center in dormitory	12	6	0	0
Vacant classroom	9	5	3	1
Mean	6.8	5.4	2.2	3.6

Table 7 reveals preferences for locations to complete pre-reading assignments before class. Most respondents (13) strongly preferred reading in their dormitory rooms, favoring private and comfortable settings. The library ranked second, with mixed opinions-7 disagreed, 4 agreed, and 4 strongly agreed, indicating varying perceptions of its suitability. Regarding school-based learning spaces, the learning building and dormitory center garnered mostly negative responses, while vacant classrooms were popular. Nine strongly disagreed, five disagreed, three agreed, and one strongly agreed with using vacant classrooms, likely due to their quiet and spacious nature.

3) Results from the questionnaire to question 6. "What method do you like when you read?"

Table 8 Results from question 6 students prefer method to read (n = 18)

	Strongly disagree	Disagree	Agree	Strongly agree
Read alone	0	0	3	15
Read with friends	7	11	0	0
Read alone and then discuss with friends later	1	4	9	4
Mean	2.66	5	4	6.33

Regarding methods on how students prefer to read the results showed that reading alone was the preferred method, while three agreed, and the majority, 33 in total, strongly agreed. Conversely, for reading with friends, 18 participants disagreed, 11 strongly disagreed, and none agreed with this idea. Lastly, for reading alone and then discussing with friends later, one strongly disagreed, four disagreed, and 13 agreed, mirroring the number of participants who favored reading alone.

2. Results from qualitative data

The questions 1 and 2 consisted of the following.

"Does giving pre-class quizzes as assignments encourage students to do pre-reading or read before class?"

"Is giving pre-class quizzes as assignments more effective in encouraging pre-reading or reading before class compared to other methods such as simply telling students to read or assigning worksheets before class? What is the reason for your responses?". The results are shown in Table 9.

Table 9 Results of qualitative data from questions 1 – 2 of the interview.

Result	Examples of Quote Answer (English translation)
Scoring motivates students to read before class because students are very serious about their grades.	<i>Because quizzes are tangible and have scoring and marking obviously, making students realize that reading is important more than just reading or completing the worksheet.</i> <i>Because the quiz has been scored and marked forcing the student to read before class to gain that score. For me, not only quiz is important but also reading for lesson understanding is important too. I usually read and make short notes for my midterm and final tests to decrease my reading loads for tests.</i> <i>It depends on the person, if they want to read, they will do it.</i> <i>Because quizzes have scores and markings if you want to have a high total score you have to read. I think everyone wants good scores.</i> <i>Reminding upcoming quizzes motivates students to be keen on scoring, and it is better than just telling them to read.</i> <i>You cannot find answers during the quiz from sources, so you have to read them before doing the quiz.</i> <i>Reading or completing worksheets before class, I think is similarly important in learning. Moreover, completing a worksheet may give better results because you do it with friends and can discuss it during work. However, group work will gain the best result when students can work with their best friends because we can discuss freely. Managing to make a group has an important role in working. In this case, we have 4 best friends, but the limit of a group member is 3 people, so one person has to leave best friends to work with less close. The discussion will be less effective.</i> <i>Informed upcoming quizzes which helps students be enthusiastically active more than usual for gaining a good score from quizzes. Students, therefore, read and prepare themselves before class.</i> <i>Students here are crazy in grades and scores.</i> <i>If you don't read, you can't perform well on a quiz.</i> <i>Nearly every university admission test, I have to pay attention to it.</i> <i>Multiple-choice quizzes make me feel like playing a game and sometimes do not have my attention much. However, having marking scores from quizzes is attractive to do more than other activities.</i> <i>Doing quizzes is score acquiring therefore students have to read before class for a good grade.</i> <i>Quizzes directly affect GPA and it affects university admission. If you have a lower GPA, you will have less chance to pass the admission tests and can study at university. It will affect university studying and working in the future, as well as the people around you in the future.</i>
Making a better understanding of the lessons	<i>Reading before class gives a better understanding during studying in class and having more time to do activities.</i>
Increasing reading demands	<i>The quiz makes me want to read.</i> <i>Making more attention to reading.</i>

From Table 9, the insights garnered from the table's data demonstrate that scoring and marking in quizzes play a vital role in motivating students to engage in pre-class reading. The tangible nature of quizzes, coupled with reminders about upcoming assessments, the inability to access external sources during quizzes, and the desire for favorable scores, all contribute to the motivation for pre-class reading. Collaborative work and discussions further enhance comprehension, while the emphasis on grades and scores underscores the significance of reading for academic achievement.

Pre-class reading not only aids in a better understanding of the lessons but also facilitates active participation during classroom sessions. These findings shed light on the multifaceted impact of scoring and assessment on students' reading habits, emphasizing the need for continued exploration and implementation of effective strategies to promote pre-class reading practices.

Questions 2.2 and the results are as follows.

“What is your opinion on completing quizzes as group work? Do you prefer it or not? Please explain your reasoning.”. The results are shown in Table 10.

Table 10 Results of qualitative data from question 2.2 of the interview.

Result	Examples of Quote Answer (English translation)
Students can share duties and responsibilities in their work, as well as share their abilities and skills which they can do best with friends.	<i>I like it because if we forget some content, our friends can help us. Besides, we can separate duties or responsibilities to work such as one can type information and another one read for typing.</i> <i>I like it because we can help each other, such as at some point that we forget, friends can help to fill that gap.</i> <i>I like group work because If I do it alone, nobody will help me in correcting or checking the wrong things.</i> <i>I like group work because sometimes we miss some content or misunderstanding, but friends can help us.</i> <i>Doing quizzes as group work makes me confident knowing that if I forget something, my friends can help with that. Also, when I have a tight schedule, we can separate reading tasks to help each other.</i> <i>I like it because doing quizzes as a group makes me more confident because I have support to work even though that answer will be wrong or incomplete at least we know that we are not wrong alone.</i>

Table 10 (Continue)

Result	Examples of Quote Answer (English translation)
Students can help each other and improve work from discussion ideas.	<i>I like group work because we are good at different aspects. Surely, all members read the same thing they will talk, and discuss before having answers. It is like parallel checking that we understand the same thing from what we read or not. Moreover, we can forget something from reading, although our friends can help us to recall that.</i> <i>It's like having more confidence when I have to do the quiz and my friends agree that the answer means we are correct. However, when we disagree, we can discuss it.</i> <i>Having better answers after discussion (with friends).</i> <i>I like it because we can brainstorm and share ideas, and it makes me feel relaxed more. Nevertheless, sometimes when we do not agree on the same answer, it makes it hard to choose the answer.</i> <i>I like it because it is available for discussion, and it leads to the best choice of answers.</i> <i>It depends on the case, personally, I like individual work in the memory test but when it is the analysis test because we can share and support the idea to be more perfect.</i>

From the results as shown in Table 10, group work offers numerous benefits for students in terms of shared responsibilities, collaborative learning, and improved outcomes. By sharing duties and leveraging individual strengths, students can effectively divide tasks and enhance productivity. Additionally, group work provides a platform for mutual assistance, allowing peers to fill knowledge gaps and reinforce understanding through discussions. The opportunity to consult with others and engage in enjoyable activities like interactive quizzes fosters confidence and encourages the exploration of different perspectives. Moreover, group work promotes idea-sharing, brainstorming, and a relaxed learning atmosphere. While it can present challenges in reaching

a consensus on certain answers, the process of discussion and evaluation leads to the selection of the most appropriate solutions. Overall, the versatility of group work empowers students to collaborate, learn from one another, and achieve better outcomes through a collective exchange of ideas and support.

Questions 2.3 and the results were as follows.

“In Social Studies courses, do you believe that pre-reading assignments in the form of quizzes before class, followed by class activities or lectures using the flipped classroom model, leads to a better understanding of the lesson than reviewing and reading after class? Please provide reasons for your opinion.” The results are presented in Table 11.

Table 11 Results of qualitative data for question 2.3 from the interview.

Result	Examples of Quote Answer (English translation)
Reading before class and flipped classrooms are better than reviewing the lesson after learning.	<i>Reading before class makes better learning because we know before the lesson in the class what we are going to learn such as the teacher will teach something like this.... It makes us know before and then when the teacher teaches more, we understand more too. It is like we have grounded knowledge. However, sometimes the very complex and difficult content to read can cause missing some content too.</i> <i>Reading before class is better because it is like grounding for lessons in the class and easier to understand the lesson. Better because we studied the lesson before by reading.</i> <i>It's pretty helpful. Reading before class makes a better understanding of the content and saves time but sometimes reading is very difficult to read which makes me feel like a lecture is better than reading before class.</i> <i>Yes, because read it before.</i> <i>Good, if I can understand the reading before, it will help me understand what teachers teach better.</i> <i>Having a better understanding because of reviews before class. And, then I can capture the other details in a lesson in class.</i> <i>It helps me learn better because studying in the classroom, like reviewing lessons again after pre-reading, makes a better understanding. Also, if I have questions, I can ask them in that class immediately.</i> <i>Yes, because social studies courses contain tons of content. If we can read or review before studying in class, we can better remember and understand the contents of class. If we do not read before class, sometimes we don't understand lessons, and if we don't have enough time to study after the lesson, we can ignore that lesson for all.</i> <i>Flipped Classroom helps us to learn better because when we read before class and then we already have some parts of knowledge. Therefore, when we join in-classroom activities or outside-the-classroom activities we can ask questions to the teacher or discuss knowledge with the teacher effectively. For example, the teacher tells us this thing is better but what we read is different, so we can ask or discuss it. This way is better than an ordinary classroom. We have no idea or knowledge before class, then we cannot realize what facts and opinions are or cannot exchange knowledge or discuss, just only receive knowledge. This original way quite not support and stimulate students to think.</i>

Table 11 (Continue)

Result	Examples of Quote Answer (English translation)
It depends on context such as content, courses, or friends.	<i>It depends on the situation or timing when we are reading for quizzes. For example, if I started reading immediately after being assigned, I could forget some content to do quizzes, so this is the same as I did not read before doing quizzes. I think that compulsory reading before class to do quizzes makes me depressed compared to general reading or reading for the big test.</i> <i>It depends on the contents; some contents can be understood from reading, but others cannot.</i> <i>I like an ordinary classroom rather than a flipped classroom because a flipped classroom motivates the same pattern repeatedly which causes less motivation in reading before class. A normal classroom is more relaxed because we learned already and then we know the scope of reading, increasing reading time. It increases my willingness to read by that.</i>
It is no different.	<i>There are quite no differences. Even if I read before class, I have to learn from the teacher in class, and then I read after that again.</i>
Reading or reviewing after learning is better.	<i>I like reading after class because I already know the classroom, and I can top up the knowledge from that by reading after that myself. Importantly, good time management is crucial.</i>

From the results shown in Table 11, based on the collected data and corresponding quotations, the effectiveness of reading strategies before or after class appears to be context-dependent and subject to individual preferences. While some students argue that reading before class enhances their understanding by providing a groundwork of knowledge prior to classroom instruction, others assert that reviewing after learning in class allows them to consolidate and supplement their understanding. Additionally, the preference for an ordinary classroom setting over a flipped classroom model is expressed, as it affords a more relaxed

environment and increased motivation for post-class reading. Furthermore, the significance of good time management is acknowledged as a crucial factor in optimizing the benefits of reading before or after class. These findings suggest that the choice between pre-class or post-class reading should be tailored to the specific content, course requirements, and individual learning styles to maximize academic outcomes.

Question 2.4 and results were as follows.

“ *What would aid or help in your ability to effectively read before class, and how can the school improve to facilitate this?*”. The results are shown in Table 12.

Table 12 Results of qualitative data for question 2.4 from the interview.

Result	Quote Answer (English translation)
The school can help by introducing and guiding, learning assistants, and giving more learning materials to assist students learning.	<i>Should introduce the content to read for prereading for better understanding of content because some words or language are difficult to read.</i> <i>I want an overall brief before giving any reading assignment, letting us know what we are going to read.</i> <i>Classify the difficulty of reading. If it is very difficult to read for students, it should be learned in class is better. On the other hand, if the reading is simply to understand, it is better for pre-reading.</i> <i>The proportion of reading should not be too long because it affects other homework. Furthermore, questions in quizzes should not be more specific, they should give a description in general or overall. This is because it is hard to make students understand new content that has never been faced before, so giving an overview of the whole content to lead students to activities is probably better.</i> <i>The given book is difficult to read, it should be given an overview before reading, and then it should have a summary in the class.</i> <i>Do not give too many reading pages because the book is very difficult to read. Students should have more free time to do other things.</i>
Students want more learning spaces and private zones to study. Also, the school should provide more free time to students rather than having a lot of school activities.	<i>Stay alone in the room. Having plenty of time and summary. If it's possible, I want a more private zone for reading more than this and it has to be silent.</i> <i>I want access to stay in the dormitory all the time because reading in the library, especially on Wednesday is very difficult to read. The library has too many students, making it difficult to read, but I cannot be allowed to read in the dorm during school time.</i> <i>Choose a book or reading which easy to understand for students, which is not translated books or books that use a lot of unfamiliar vocabulary.</i> <i>1. Good books which have good and cover all important contents. I don't like the current book in the Geography course because its contents are too scattered and lack some points, but it has good graphics. And I like physical books more than reading on the Internet.</i> <i>2. Intrinsic and extrinsic motivations such as read with friends.</i>

Table 12 (Continue).

Result	Quote Answer (English translation)
	3. Place and time because sometimes we don't have time and place to read. Silence makes reading more effective. Proper place, atmosphere, and time management of each course for reading, understanding, and crystalizing contents that are like catalyzing for good reading, so the school should provide proper places for reading in many places in the school for reading convenience. I want more free time from studies and activities or having special marking and scoring or grading. Having too much homework is a problem. Give more sleep time and cancel the morning assembly. Free time. The proper amount of time.

From the results presented in Table 12, the data and quotations suggest ways schools can support students in their learning process. Recommendations include guiding pre-reading, providing brief overviews, classifying reading difficulty, balancing reading length, and offering general quiz questions. Students also seek more learning spaces, private zones, and free time. They value silence, privacy, easy-to-understand materials, comprehensive books, intrinsic/extrinsic motivations, proper time/place management, and reduced workload. Schools should accommodate these needs to optimize learning experiences and academic well-being.

Conclusion

The quantitative analysis yielded significant findings, indicating that students who were given tasks showed a significant increase in pre-class reading according to the statistical data. Regarding pre-class study habits, 79% of respondents showed a positive inclination towards pre-class preparation. Participants strongly agreed with studying learning materials provided by teachers and completing assigned worksheets before class (77%), while the agreement level dropped to 41% for pre-class quizzes without considering scores or grades. Notably, 89% of respondents recognized the influence of interesting materials on their decision to study before class, emphasizing the importance of engaging resources. Factors influencing pre-class study ranked having a quiz before class and grading it as high influencers (56%), while assigned worksheets had a moderate influence (29%), and teacher-provided study materials were considered low influencers (15%). These findings underscore the significance of incorporating quizzes and graded assessments to promote pre-class study.

The qualitative data provided insights into students' perspectives, showing that scoring and marking in quizzes played a crucial role in motivating pre-class

reading. Collaborative group work enhanced comprehension, participation, and productivity, with students benefiting from shared responsibilities and mutual assistance. The interactive and relaxed learning atmosphere in group settings fostered confidence and exploration of diverse perspectives. Despite challenges, the process of discussion and evaluation resulted in the selection of appropriate solutions. These findings highlight the multifaceted impact of scoring and group work in promoting pre-class study habits and call for effective strategies to encourage pre-class reading practices. Group work's versatility was evident in fostering collaboration, knowledge exchange, and improved outcomes through a collective effort.

Discussion

The key results of this study show that students in the age of senior high school level in this specific context had less intrinsic motivation to read before class which is the main component of a flipped classroom although when the interventions were assigned that made the extrinsic motivation increase significantly to read before class than before. Culturally, Chung (2021) researched Thai university students navigating classroom participation within their cultural framework and highlighted the significance of cultural sensitivity in educational settings that might affect high school students in flipped classrooms as well. Adolescents experience a decline in academic intrinsic motivation due to insufficient satisfaction of their needs for autonomy, competence, and relatedness in school environments (Gnambs & Hanfstingl, 2016). This decline is attributed to the overwhelming demands of with learning and academic competition within the school and cultural context. The extrinsic motivation that motivates students to read before class showed that marking and grading has major influences which means students are concerned

with academic achievement more than self-improvement (reading without being forced). Older adolescents' learning motivation is influenced by their personality orientation, with task-based students focusing on learning pleasure and self-development, and self-based students focusing on performance and achieving respect (Nikitskaya, 2022) and, adolescents' motivation in learning is influenced by their achievement and social goals, which can be improved through effective teaching strategies (Çelçima, 2015). It can be said that this study result was supported by the achievement goal theory which holds facts, with students' personal goals strongly influenced by the goal structures in their learning environments, with educational level and world region moderating some of these relations (Bardach, Oczlon, Pietschnig, & Lüftenegger, 2020). However, the limitation of this study was the subject of the study itself which is within the specific context of a boarding senior science and mathematics schools with social studies courses. Students of different ages, backgrounds, and contexts could have a variety of motivations so applying this study to different contexts should be considered. Flipped classrooms may not fit all learning contexts such as learning support deficiency and lack of personal space and free time as well as it probably causes higher stress and decrease students' satisfaction in learning (Alten, Phielix, Janssen, & Kester, 2019).

The use of learning technologies, especially multimedia, provides varied facilities for students' learning that are not possible with other media. Pedagogical literature has proved that individuals have different learning styles. The flipped classroom is a pedagogical approach which means that activities that have traditionally taken place inside the classroom take place outside the classroom and vice versa. The flipped classroom environment ensures that students become more active participants compared with the traditional classroom (Uzunboyulu & Karagozlu, 2015). The results revealed that a majority of the students had a positive attitude towards the flipped classroom, the use of video, and online learning management as supporting tools. Positive attitudes toward the flipped classroom were strongly correlated with perceptions of increased motivation, engagement, learning, and effectiveness (Nouri, 2016). Furthermore, a comprehensive flipped learning initiative from 2013 to 2015 was conducted to identify trends and contents in the flipped classroom approach. The analysis found that various fields were practiced in the flipped classroom approach, and some

technology tools were used as the online platform for its practice. Positive impacts on students' learning activities, such as achievement, motivation, engagement, and interaction, were observed as a result of the flipped classroom implementation. However, challenges were also identified, including video quality and instructor training, which require further attention from researchers and educators to optimize the flipped classroom experience (Zainuddin & Halili, 2016).

Moreover, another study explored the relationship between motivation and students' perspectives, learning performance, and use of online course materials in flipped classrooms. The results suggested that students have similar motivation patterns regarding their learning performance in flipped classrooms as in traditional or online classrooms. Self-efficacy was a significant predictor of both students' academic achievement and perceptions of the flipped classroom. While students had positive attitudes towards the flipped model, some indicated neutral attitudes towards taking another class taught in a flipped format. The study recommended that instructors set up pre-class activities related to course credits to reinforce students' effort spent on course preparation and cautioned against overwhelming students with a large number of online materials to prevent fatigue. Further research is needed to explore the effectiveness of the flipped classroom approach and its impact on student learning outcomes, particularly among students with low self-efficacy beliefs or overall motivation (Xiu & Thompson, 2020).

Limitations

This study was conducted in a special science and mathematics education environment within a boarding school for senior high school students. The unique circumstances of the study, including the constant presence of students on campus, may limit the generalizability of the findings to regular educational settings. Caution should be exercised when applying the implications, considering the context-specific nature and inherent limitations of the study.

Suggestions

Pedagogical Implication and Suggestions

1) Design Engaging Materials: Teachers should focus on developing and providing learning materials that are interesting, relevant, and appealing to students. This can include a variety of formats such as videos, articles, case studies, or interactive online resources.

2) Incorporate Graded Assessments: Teachers can integrate quizzes and other graded assessments as part of pre-class activities. This can serve as a motivation for students to engage in pre-class study and provide them with feedback on their understanding of the material.

3) Concerning other aspects: Schools should provide a proper amount of all activities to make sure that students can learn and spend their life properly to their age, too many assignments and tests can lead to fatigue, soreness, and less motivation to read and learn.

Further Pedagogical Research Implication

1) Long-Term Impact: Conduct longitudinal studies to explore the long-term effects of pre-class study habits on students' academic performance and learning outcomes. This can help determine the sustainability and effectiveness of pre-class study practices.

2) Intervention Studies: Carry out intervention studies to assess the impact of specific interventions aimed at promoting pre-class study habits. Comparing different approaches, such as providing incentives or implementing targeted interventions for specific subjects or courses, can provide insights into effective strategies.

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Consent Declaration

This research has obtained informed consent from all participants.

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