

The Application of the Model “Flipped Classroom” on Mathematics Teaching to Develop Primary Students’ Self-learning Ability in Vietnam

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Abstract The article’s purpose is to study the application of reversed-class model in mathematical education to develop self-studying (autodidactic) ability of primary students in Vietnam, based on the analysis of the nature and characteristics of reversed-class model, and the relationship in mathematical autodidactic ability between primary-school and reversed-class students to analyze the impacts of reverse-class model to the development of self-studying ability for primary students in Vietnam. At the same time, from actual survey results on the use of reverse-class model in teaching of mathematics for primary students in three regions such as North, Central and South regions, the article has illustrated the application of reversed-class model to develop mathematical autodidactic ability for students in some localities in Vietnam. The research results elucidated the use of reversed-class model in math education which has contributed to develop self-studying capacity for primary students in Vietnam.

Keywords: *flipped classroom, self-learning, mathematics teaching*

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1. Introduction

From the years BC, an educator named Socrates (469-339 BC) had a perspective of education in which has stated clearly about the role of self-study: "education must help people to assert themselves". According to him, in the process of teaching, the teachers must create for their learners to think and study by themselves and need to help them self-detect their mistakes and overcome from these mistakes [1].

In the eighteenth and nineteenth centuries, many scientists have studied deeply on the intellectual development, positive, independence and creativity of students in teaching and studying process such as Jan Jac Rousseau (1712-1778), Johann Heinrich Pestalozzi (1746-1827), Adolf Distervers (1790- 1866), Konstantin Dmitrievich Usinxki (1824-1870). The authors mentioned the roles of the school and the teachers in the organization and self-study training for learners [2].

Some other authors not only confirmed the great role of self-learning activities such as X.P.Baranov, Iilina. TA, I.F Kharlamop [3] but also concerned about organizing activities to enhance the autodidactic effect of learners. The author named Rubakin.NA [4] had emphasized “education for proper learning motivation is a basic condition for students to become positive and active in

their own learning. The authors named X.G.Luconhin and B.P.Exipop studied and offered the necessary self-studying skills to ensure that the students achieve high results. Among the self-studying skills, these authors especially emphasized the role and significance of reading skills which is considered as the most important in the self-study activities.

The author I.F Kharlamop researched into self-study based on finding methods to promote active learning of students by strengthening the research, working with books and learning materials, carrying out training through mentioning issues, improving the work of self-study and innovating the way to test as well as evaluate.

Currently, the authors have studied the proposal about organizational activities aimed at improving the effect of self-study and educating the proper learning motivation which is the basic condition for students to determine positively the learners’ self-study skill. Those affirm that self-study have an essential meaning and tremendous influence to the learning of students in the teaching process, especially, the self-study is the decisive factor for the lifelong learning trend of each individual in modern society.

In Vietnam, there were a lot of educators interested in the study of autodidactic problems such as the typical works by Nguyen Canh Toan [5,6,7] that researched deeply on self-study, the role of self-study and self-study training.

The book “*Methods of traditional and innovational teaching*” by Thai Duy Tuyen published in 2008 attracted

the attention of the readers, because the author has exposed a lot of important theoretical content concerning about the problem of fostering self-learning capability for students [8]. An author named Nguyen Canh Toan announced a research in his book "*Self-education - self-learning - self-study*" which has given self-study methods of students so that each student would not feel that learning is like a burden, and it is ensured that universities and colleges train human resources to meet the development of the society.

Some studies in the process of implementing the thesis topic about self-study such as the thesis "*The measures to organize learning activities outside the class*" by Pham Hong Quang [9], the topic "*The measures to organize self-study activities in education for students from Universities of Education*" by Nguyen Thi Tinh [10], the thesis of the author Nguyen Thi Bich Hanh titled "*The measures to complete self-studying skill in pedagogics for students from Universities of Education according to the point of interactive pedagogy*" [11]; the thesis named "*Formation and development on self-study ability for students of Mathematics pedagogy in college system*" by Le Hien Duong [12], the thesis of the author Duong Huy Can on "*Strengthening self-study for chemistry students at pedagogical universities by the method of self-study with module guide*" [13], and Nguyen Thi Thanh Hong studied on "*Educational self-learning for undergraduate students through e-learning*" [14]. The authors researched on self-study as well as role and the way to renovate and develop self-study of the learners.

The studies of self-study from the authors in the world and Vietnam have focused on confirming the role and significance of self-study in human life and proposed some measures and techniques on self-study, forming the motivation and skills for self-learning as well as some methods for self-studying in specific subjects at pedagogical universities and high schools for students and pupils that have made important and positive contributions in theory and practice. Self-studying ability is one of the important capacities to be incorporated into the general education in Vietnam at the present and to be considered as individual value of every person which is a typical value on human in the 21st century. However, there is no study of adequate, systematic on using of information technology in the development of self-learning ability for students as well as of every citizen. During the 4.0 industrial revolution at the present, information technology has changed many conceptions and educational models. Personalized learning is self-learning, and the learning process is seen as an ecological environment that is self-taught in the interactive positive relationship with the environment. The process is the support of information technology that has created new educational models and different values. One of the typical models of education is directly related to the study that is the reversed-class.

Information technology is a tool provided invaluable support for the work of innovative methods of teaching and development of self-studying ability, and the use of technology combined with methods traditional teaching (blended learning) are increasing popularly in the world. The article aims to propose combining teaching with the application of information technology, especially applying inversion-class model in mathematics education

to develop self-study ability of primary pupils in Vietnam. To be able to make recommendations, the authors seek answers to the following research questions:

1. Why can people apply reversed-class model to develop mathematical self-learning ability of primary students in Vietnam?

2. How to apply the reversed-class model to develop self-learning ability of primary students in Vietnam?

To achieve the research objectives, we will present the work and results of this research on reversed-classroom model as well as the application of this model in the education of the international and Vietnam authors. On this basis, the author of the article introduces the research content and new achieved results.

Teaching courses in the combination with information technology to promote learning outside the classroom is a popular model especially in the undergraduate (Garrison and Kanuka, 2004) [15], (Ark, 2012; Berette, 2012; Blake, 2011) [16,17,18]. The team of authors including Means, Toyama, Murphy, Jones, Bakia (2010) [19] have 46 experimental researches in the context of high schools and the universities in the United States and concluded that this teaching model bringing the effective learning, especially in the process of self-learning by students. This result also shows the combined teaching model have created a real learning environment (deep learning), learning the meaning (meaningful learning) as well as the development of critical thinking and advanced learning, it also created a work environment of independence and self control control of learning such as Garrison and Kanuka (2004) have confirmed. Therefore, with the combination with the traditional classroom, the studying results of the students has the difference which is due to the student's self-study ability at this stage in combination with critical thinking from which help students know how to self-study.

Flipped Classroom or some documents using the term reversed-class [20] or inverted-class [21] is one of the forms of learning (blended-learning/b-learning) (Strayer, 2012) that are interested attention in recent years many countries in the world especially in the USA [22]. Two authors Barbara Walvoord and Virginia Johnson Anderson in the book named "Effective Reading: a tool for learning and assessment" published in 1998 [23] has proposed evaluating learning stars for effective learning and stimulate learning initiative. Active learning is the high level of learning, characterized by self-study is an active learner.

In the 1990s, Eric Mazur and Balkanski (NewsRx Health, 2012) [24] used the model known as Peer Instruction (mutual learning). In the field of education in economy, 2000, Maureen Lage, Glenn Platt, and Michael Treglia [25] also published teaching under this model in the Journal of Economic Education through Flipped Classroom- a door leading to the creation for learning complete environment "when they noticed that the traditional way of teaching does not suit some styles of learners.

In 2004, Salman Khan began to record his lectures into videos that are then put onto YouTube. From that Salman Khan founded the Khan Academy, until now has about 3,250 free lectures by tape on various subjects such as Mathematics, chemistry, politics which is put onto the site. Through this site the teachers (GV) has exploited rich

resources to the application class teaching model of reverse [26].

Brame (2013) [27], for the flipped classroom, learners will have to work on their own prior lectures through reading materials, summarizing materials, listening to lectures through supportive media such as video tapes, PowerPoint presentations, and online documentation. Lectures become homework that learners must prepare before class. The entire schooltime will be devoted to solving exercises, applying lecture theory to problem solving, group discussion to build understanding under the guidance of the teacher; instead of lecturing, in the classroom the teacher acts as a facilitator, which can help students solve difficult points in the new lesson.

According to Barbara and Anderson (1998), McDaniel and Caverly (2010) [28], as opposed to the traditional classroom, this classroom model is for learners of information processing, with the support of teachers and friends. Most recently at a scientific conference on "flipped classroom", Bergmann et al. (2012) [29] has reinvented the problem of the nature of the "flipped classroom" model. According to these authors, the important feature of this model is the increased contact and interaction between teachers and students, and between the students; and the combination of direct teaching and learning through knowledge building, creating the opportunity to personalize the educational process, rather than substituting a teacher with a video tape.

Gardner's (2012) [30] study in agricultural economics at Tennessee State University shows that students are very satisfied with the way they teach; Students find that learning this model can help them better understand the lesson, but research does not find a link between student perceptions and learning outcomes. Strayer (2012) [20] compares this model with the traditional class for 51 American students in different fields. The research shows that the involved students are more dynamic with the cooperative study methods than those who are in the flipped class; in addition, they are more aware of self-studying. Similarly, Frederickson et al (2005) [31] shows the research result relating to 16 post-graduate students who are majoring in Psychology at University College London, the research also shows that the learners can develop themselves; particularly, they can improve their self-awareness about the studying process as well as the cooperative learning environment basing on this model.

Thus, the flipped classroom is a combined teaching model, so theoretically, this model is based on the theory of active learning (active learning). Combined learning involves self-learning at different levels, such as exploiting technology for self-study, exploiting the organic relationship between self-learning and reversing classes that create a positive learning environment, Individual self-learning combines interacting with others, creating open learning spaces (learning anywhere, anytime). This model also helps to create an environment that promotes academic autonomy, as learners have the opportunity to learn at their own pace and become responsible for building knowledge rather than waiting for communication from teachers.

In Vietnam, the application of the flipped classroom model in teaching has not been sufficiently studied by many scientists. Recent researches include:

In 2014, Nguyen Van Loi with the topic of "Flipped Classroom – the Learning Model of Direct and Online Combination" [20], the paper shows that the combined teaching model is becoming increasingly popular. Made in the USA and some other countries in the world. Based on that, the author said that it is possible to apply this model of teaching in the context of university in Vietnam when the conditions of facilities are better. To apply successfully this model, it is important to design activities that engage learners and engage learners in a learning community. In addition, when applying this teaching model, applicators need scientific skepticism, collecting evidence to evaluate its effectiveness. The model of direct and online combined teaching through flipped classroom contributes to the development of self-learning society, enabling learners to learn lifelong learning - the key to success.

Nguyen Quoc Khanh (2016) studied the problem of "the organization of the flipped classroom: teaching computer architecture with the support of online systems" [32], published in the Journal of Educational Equipment No. 127, in March 2016, the article proposed the process of teaching architecture in the classroom in the form of flipped classroom model, through the effectiveness of teaching from that process author of the article that the model of class organization reversed With the help of the online learning system, there are some positive signs: Students are proactive in their studies because they are regularly assessed and the results of the assessment affect the interests of the students. So the idea to go to school is not. This model combines the self-study and the assessment of students through their self-study, thereby contributing to improving the quality of teaching.

The authors Nguyen Hoai Nam and Vu Thai Giang (2017), with their work on "Model of Inverted Classroom in Fostering Information Technology Skills for Pedagogical Students" [21], have shown that teaching The reversible classroom model allows learners to access lectures and learning resources outside of class time, thereby enhancing the active participation of learners during key classroom hours, contributing to self learning development. In particular, the authors have analyzed the advantages, limitations, and challenges of the reversed class model, suggesting a 4-step flipped classroom model for fostering public ability. Information technology for pedagogical students. This 4-step process also corresponds to the four steps of the self-study process: Rearrange the study plan of the subject and resources in accordance with the learner's cognitive level; Designing for student self-study activities to prepare for classroom activities; Design teaching for learning activities in class; Designing, evaluating and collecting feedback from learners.

In 2017, the two authors Nguyen Quoc Vu and Le Thi Minh Thanh with the article "Applying the flipped classroom model to teach digital technology to develop creative thoughts for students" [33]. Studies and survey results show that the application of flipped classroom teaching to digital subjects not only stimulates student learning, enhances student achievement but also helps students develop. creative thinking ability. Research shows that the model also contributes to the development of self-learning ability, which is manifested through the student's interest in learning, which is one of the manifestations of self-learning ability.

Overview of research works of international and Vietnamese authors, we see that the research is focused on students, graduate students without research on the subject of students learn. In particular, there has been no published research on the use of the flipped classroom model in mathematical education to develop the self-learning ability of primary students in Vietnam. In the following study, we will present the results of applying the flipped classroom model in mathematical education to develop the self-learning ability of primary school pupils in Vietnam (including field surveys and proposed measures to organize teaching).

The results of the above researches on self-learning and reversed-class model can affirm that: the reverse class is a new teaching model which fully exploited to the application of information technology that is not only a tool but also as a component of the self-study process bringing the new efficiency differences of learning for pupils and students. In particular, primary students get acquainted with the mathematical knowledge, experience mathematics through reversed-class model will create opportunities and create a positive interactive environment that support students learning math and overcome the difficulties in the process of self-learning mathematics.

2. Content

With the observation and in-depth analysis of the features of the flipped classroom model as well as the self-study scores of primary students and the relationship between students. At the same time, based on the survey, we present the following research results:

2.1. The Nature of the Flipped Classroom Model

With the traditional classroom model, learners listen to lectures, then do hands-on exercises at class or at home to process information and acquire knowledge. Thus, with the traditional teaching method: 90% of lecture time and 10% of time in class. A class will begin with the teacher preparing the lecture and the student prepares for the homework session. The new lesson will be taught during class hours and a little extra time will be devoted to classroom exercises. Most of the lectures and lectures are about 90% of the time, while the remaining 10% are classroom and classroom training for both teachers and students. Conversely, for reversed classes, learners will have to work on their own prior lectures through reading material, watching videos, listening to lectures through supportive media such as video tapes, PowerPoint presentations, and tapping resources on the network. Classroom assignments, problem solving, problem solving, and group discussions will be provided to build understanding with the support of the teacher [34]. This is a great environment for students to interact, be active in class, be able to develop teamwork skills, curiosity, creativity with questions, and control and guidance. student's closer teacher. This is the transformation of the activities in the class into the class and vice versa. This activity can be summarized as presented in Table 1.

Table 1. Convergence between traditional classroom and flipped classroom

Types	Inside classroom	Outside classroom
<i>Traditional Classroom</i>	Lectures/Lesson	Practical Exercises
<i>Flipped Classroom</i>	Practical Exercises	Video for Lectures

Thus, the nature of the flipped classroom model is geared towards activating the learning of learners in order to update, improve knowledge from the inherent knowledge of students to knowledge to occupy. The important feature of this model is the increased contact and interaction between the teacher and the students, and between the students, the combination of direct teaching and learning through knowledge building, *creating opportunities for the personalized during the learning process and a learning environment as an ecosystem, teaching is combined with technology to help learners actively learn and interact with objects* rather than a change of the teachers with tape recordings.

2.2. Characteristics of the Flipped Classroom Model

- Students control their own learning, adjust their learning progress accordingly, and they can stop/watch the video and discuss it with their friends.
 - Students spend more time in class to solve learning situations, exploit and deepen their knowledge in interesting ways through interactive activities.
 - Students receive appropriate support from the teacher during class hours.
 - The personalization of student learning. (Students do a variety of exercises, look for materials to answer questions from teachers when working at home with video content.)
- The characteristics of the flipped classroom model are the manifestations of self-directed learning, thus providing an opportunity to develop students' self-learning abilities.

2.3. Self-study Relationship with the Flipped Classroom

2.3.1. Characteristics of Self-study

The process of self-study of students is carried out in a three-period cycle: (1) self-study; (2) self-expression; (3) self-control, self-regulation:

(1) *Self-study*: The learner is self-exploring, observing, describing, self-explaining, self-discovering, solving problems, finding new knowledge (new for students only) and creating The original product or the raw product is personal.

(2) *Self-expression*: The learner demonstrates himself or herself in writing, verbally, in role playing situations, in self-presentation of his or her original personal knowledge or product. Represented by interaction, exchange, dialogue, communication with friends and teachers, creating a social product of the classroom community.

(3) *self-control, self-regulation*: After self-expression through the cooperation with you and the teacher, after the teacher concludes and the learner self-examination, self-assessment of the original product Self-correcting, self-adjusting into scientific products (knowledge).

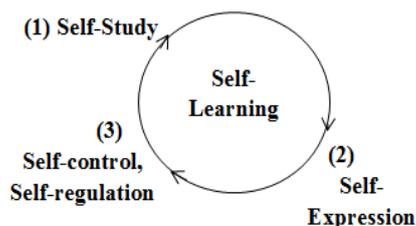


Figure 1. The Cycle of Student Self-Learning

Self-study \Rightarrow self-expression \Rightarrow self-control, self-regulation is also a way to detect problems, solve problems and resolve the problems of scientific research.

2.3.2. The Relationship between Self-learning and the Flipped Classroom

The relationship between self-learning and the flipped classroom of primary students is the interference of three components: Characteristics of primary students - Characteristics of self-learning - Characteristics of primary Mathematics.

(1) Characteristics of primary students: Primary school age in Vietnam is from 6 to 14 years old, so primary students have no learning experience, with limited knowledge, skills, easy to change, hyperactive can easily lead to psychological barriers: being afraid to study Maths. Thus, to remove that psychological barrier, forming habits and the need for self-study for primary students, teachers must choose teaching methods to stimulate curiosity, to explore and learn new things in primary students. Teachers can do the following:

- Provide students with the necessary knowledge and skills.
- Create peace of mind for students by:
 - + In turn, suggesting students conduct a series of activities to achieve results.
 - + Timely showing the initial successes (though very small).
 - + Pointing out the difficulties that students have overcome.
 - + Timely explanations for students or suggestions for students to self-discover errors in the process of self-study.
- \Rightarrow Raising the pride of the products that students participate in the building to make them more confident and gradually remove the barriers, initially scare.

(2). Characteristics of self-learning: The core of student learning is their self-learning (self-learning). Self-awareness of the motives of purpose, measures of learning, deep understanding that oneself is the subject of the activities should themselves be the organizers, directions, specification of the learning process. The basic task of students is to solve their own learning tasks; Improve the learning actions to learn how to learn and learn effectively. It has the task of self-examination and self-assessment of learning outcomes.

With the characteristics of the primary students analyzed above, it is easy to recognize that primary students find it difficult to maintain their self-study routine, often encountering difficulties, obstacles, and the tendency to seek out support when having difficulties. To overcome these difficulties, the teacher needs to have the following solutions:

- Select the teaching model so students have flexibility in learning time and space. Therefore, when applying the

flipped classroom model in mathematics instruction for primary students, there are many advantages to developing self-learning ability for students as follows:

+ *The flipped classroom model creates open learning space:* The flipped classroom model is a form of teaching organization that combines classroom teaching and classroom learning; during class time and after class. The teacher's lectures are held outside of class time in the form of self-study, self-study and during class time for students to discuss, debate and summarize the knowledge, skills from the lesson. During the preparation period, students conduct their own individual research at any time that suits them, anywhere (library, home, on-campus,...) and interact with the learning object through learning materials, lectures, the Internet ...

+ *The flipped classroom model actively explore the activities of learning and research of students:* Learning in the classroom model reversed, students are not only encouraged but also created many opportunities to actively Exploring and exploring learning problems by letting the students take initiative and independently study a problem then present, discuss and debate in order to deepen and broaden the knowledge.

- The content of the course is open and focused on the individualization of student learning and research. The teaching must be directed towards the individual student, enabling the student to select the appropriate learning task (personalized design in self-study), attention should be paid to the content, subject for learners' ages. The teachers set the context for students to escape the textbook to gain knowledge from the practice; This is aimed at teaching mathematics to solve practical problems, to practice skills associated with practical tasks.

- Create a self-learning environment for students by: Designing information technology systems for management, teaching and evaluating the effectiveness of self-learning. Developing a variety of learning resources in line with the psychological characteristics of primary students. Create an open learning environment.

(3). Characteristics of Primary Maths: The skills of mathematics in primary school are formed primarily by practice, practice, and are regularly reviewed, strengthened, developed, applied in learning and in life. Primary mathematics is structured systematically with some abstract and logical content, so it is difficult for students to acquire knowledge. Therefore, the teaching process requires teachers to use a visual model combining the application of a variety of knowledge circuits to assist students in the acquisition of knowledge.

From the analysis, it is possible to summarize the characteristics of self-learning mathematics of primary students through [Figure 2](#).

2.3.3. Characteristics of Teaching Primary Mathematics

The most important part of teaching math in primary school is to teach students how to learn, how to learn by themselves. However, how to shape self-learning math for primary students is a big challenge for all teachers. Based on the viewpoint of the activity, the student's self-efficacy in mathematics should be shaped in the student's mind: Confidence, joy, and the will to form students' habits and self-learning needs ([Figure 3](#)).

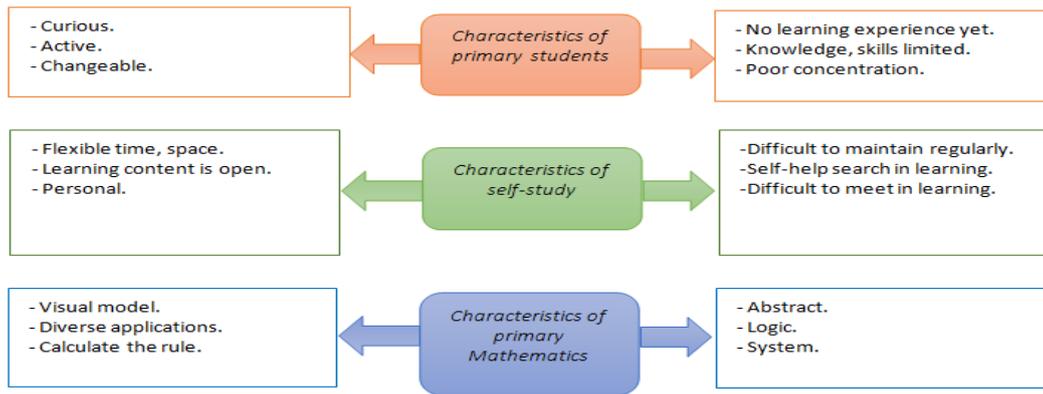


Figure 2. Characteristics of self-learning Mathematics in primary students

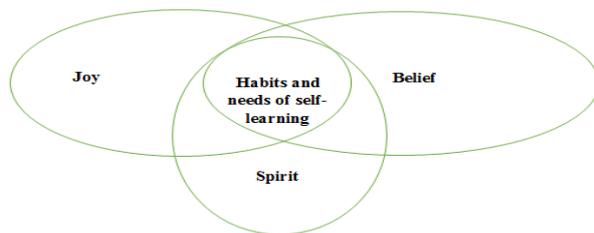


Figure 3. The ways to build the habits and needs of self-study

The habits and needs for self-learning of primary students in Mathematics are reflected in the following characteristics: Self-learners are not passive, dependent on the context; Learners actively explore the appropriate elements of the context for self-study success; Self-learner is willing to learn and determined to overcome obstacles; Self-learners maintain their interest and belief in success; Learners choose to study by themselves and persistently pursue their studies. From the above characteristics, the self-learning ability of primary students is shown as follows:

- Students could control their own learning.
- Students actively create opportunities for themselves to acquire knowledge, form mathematical skills.
- Students identify goals for themselves and provide opportunities for learning.
- Students have a self-concept and self-learning needs.

The above expressions are important criteria in the development of students' self-study ability in the study of mathematics in primary school. Teaching mathematics in primary schools with an overarching goal is to: Become familiar with mathematical thinking based on conceptual description, not conceptual definition [35].

2.4. The Impact of the Flipped Classroom Model on the Development of Self-learning Ability in Primary Students in Vietnam

Organizing classroom learning in reverse is an effective option. A study in the USA shows that students spend more time studying at home to meet the demand for a reversible classroom model. Developmental psychologist Patricia Greenfield has noted that outside of regular classroom hours, students learn a great deal of self-study from home [36]. Reversing classes are a combination of many learning approaches to achieve the learning goals of the student.

With the flipped classroom model, time in the classroom is for students to interact to create skills through experiential learning from the subject. Through the analysis of the nature and characteristics of the flipped classroom model and the manifestations of students' self-learning ability, we found that the flipped classroom model influenced the development of students' self-learning ability in primary school in Vietnam. In this model, the activities of teachers and students are carried out in a sequential manner as follows:

Stage 1: Before classroom:

- Teachers' activities:

- + Analyze lesson objectives to select appropriate teaching methods and methods for teaching in the model of flipped classroom. Identify goals to develop specific student competencies that correspond to the content of the unit.
- + Create a video lecture and guide students to explore the lessons online.

- Students' activities:

- + To study the objectives of the course on knowledge and skills, on the basis of which define the ability to form and develop themselves.
- + Self-study, self-study video lectures of teachers at home or anywhere (on campus, on the library, over the Internet...) and prepares the practice in class. Reversed learning is directed toward the learner, rather than the student-directed teacher, who now actively studies the video lectures to formulate their own ideas, questions around the content, and before coming to class have the knowledge around the concept involved.

At this stage, students will develop elements of self-directed learning that are: Self-paced and individualized learning plans developed during the learning process to meet the teacher's expectations. On the basis of self-study plan, students must select and use the self-study methods and techniques in self-study. In addition to providing resources for self-directed video tutorials, students need to know how to find, synthesize, and exploit diverse resources at the library, the internet. Particularly, the skills of applying information technology to the learning process, self-learning and fostering are developed.

Stage 2: During school time:

- **Teachers' activities:** Educate students to deepen their knowledge by guiding students to do their homework, finding out what they have learned, finding the best ways to do it, Students use a system of discussion questions, exchanges, teacher-student interaction, and student-student interaction.

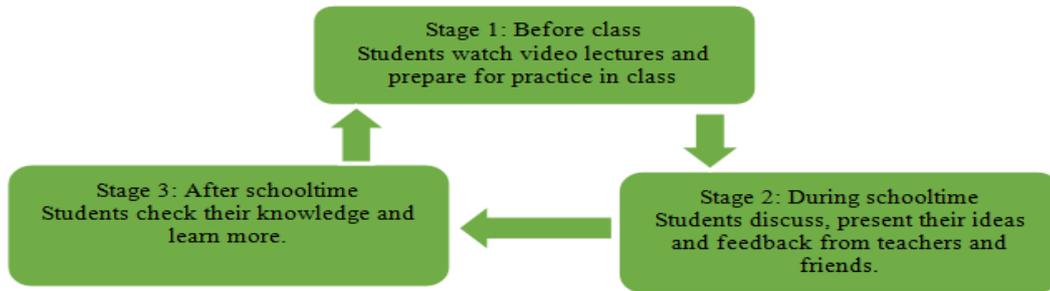


Figure 4. The stages of student learning in a flipped classroom model

- **Students' activities:** Students practice the application of key concepts, along with feedback from teachers and students through learning methods: Experiential Learning: Students do the exercises, handling learning situations; Interactive learning methods: Students work together to discuss problems and deepen their knowledge; Distinct learning methods: Students point out their ideas, present their ideas, etc. These methods are well suited to the practice and development of higher-order thinking. Therefore, through the flipped classroom model, students can develop their necessary competencies such as communication, teamwork, IT application and self-study.

Stage 3: After school time:

- **Teachers' activities:** At the end of class, if the content on the class is not complete, the teacher will guide and answer student questions over the internet.

- **Students' activities:** Students re-check their knowledge learned during class and expand their self-study, while students evaluate themselves in learning activities and self-study to draw strengths, weakness of the self and planning training. If the content on the class is not complete, the teacher will guide and answer the questions of students online; students can expand their knowledge by continuing to study the material over the internet, through books in the library...

After the third stage, the teacher moves on to stage 1 to create a new lecture video or to add an old lecture video that matches the current level of acceptance of the current lesson. Students also transitioned to the first stage to study the teacher's new video lecture.

It is possible to summarize the teaching stages in the flipped classroom model as presented in Figure 4.

By analyzing the performance of teachers and students through the learning stages of the reversed class model, the model has influenced the components of the self-learning ability of primary students. The process can be concretized as showed in Figure 5.

2.5. Applying the Flipped Classroom Model in Teaching Mathematics to Develop the Self-learning Ability of Primary Students in Vietnam

2.5.1. Current Status of Applying the Flipped Classroom Model in Teaching Mathematics In Vietnam Today

In this section we present the survey results of primary teachers in primary schools in Hanoi, Ninh Thuan, Dong Thap (representing 3 regions in North - Central - South of Vietnam). Survey Description:

- a) **Purpose of the survey:** A primary teacher's perception of the reversal paradigm, the advantages and disadvantages of using a reversible classroom model in mathematics education for primary school students. Vietnam. From that, find the correlation between the reversed class model and the development of self-learning math for primary students.

b) The ways of implementation

- Survey 161 primary teachers (23 teachers in Hanoi, 87 teachers in Ninh Thuan, 51 teachers in Dong Thap).
- Data processing and assessment of survey results.

c) Survey results are as follows:

- *Teachers' perception of the flipped classroom model:* The survey results show that many primary teachers did not correctly understand the flipped classroom model, only 60.9% of primary school teachers surveyed full, deep in the reverse class model. Teacher perceptions in the North - Central - South of Vietnam are also different (Figure 6).

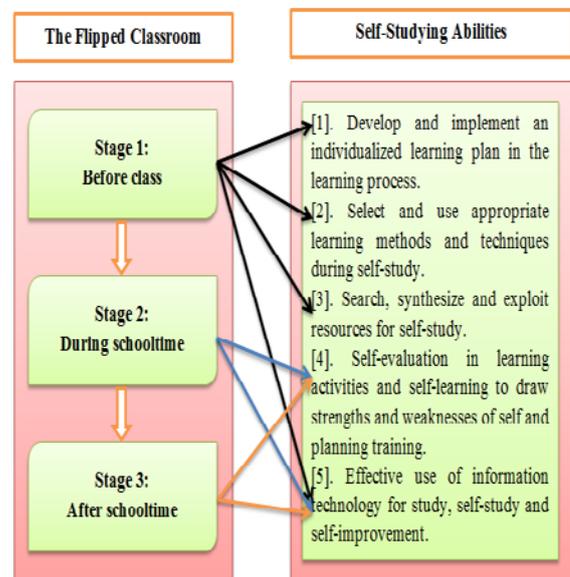


Figure 5. The effect of the flipped classroom models the components of self-learning abilities

The graph shows that the correct perceptions of the reversed class model of teachers in Hanoi are much higher than teachers in Ninh Thuan and Dong Thap. This is understandable, because Hanoi is the capital of Vietnam, where the quality of education is good, teachers are constantly updated and have access to advanced teaching methods and models. Through workshops, seminars ... more than teachers in the Central of Vietnam (Ninh Thuan)

and South of Vietnam (Dong Thap) are two low-lying areas of education in Vietnam.

- *Teacher's assessment of the advantages and disadvantages of using the flipped classroom model in teaching mathematics is shown in Table 2.*

The advantages of using the flipped classroom model in teaching are highly appreciated by teachers over 70%. Teacher assessment results show that the model facilitates teachers to use a variety of methods of activating learner activity to facilitate the development of self-learning skills for students through the following: Learners can use a variety of methods to activate learner activity (83.2%); Lectures can be re-used easily, especially students can listen, watch several times until comprehension (78.9%); Students are given the right way, time and place to study (75.8%); Students actively present their personal ideas, argue, interact with teachers and students to find out for themselves (72.1%). The teacher's assessment is absolutely correct, because using the flipped classroom model in teaching, students are developing self-learning capabilities through activities: students are practicing the application of concepts, build knowledge and skills through positive learning methods: Experiential Learning: Students do exercises, deal with learning situations; Interactive Learning: Students work together to discuss the problem and deepen their knowledge of the lesson; Distinct learning methods: Students express their views, present their personal opinions, etc. These methods are well suited to the practice and development of higher-order thinking. By doing this, students are expected to develop the necessary competencies: communication skills, teamwork skills, especially self-learning abilities (Table 3).

In addition to the advantages teachers also find it difficult to use the flipped classroom model in teaching. However, the level of difficulty assessed by teachers is not great. The biggest difficulty is that teachers spend a lot of

time preparing lectures (47,8%), but in the long run teachers can save time when reusing the lecture many times. Infrastructure (computer, software ...) is limited (45.3%); Computer literacy of students is weak (44.1%). These difficulties can be overcome, as now the primary schools in Vietnam gradually improve the investment in computer systems, software for teaching and students are increasingly accessible with the information technology.

- *Teachers' assessment of the correlation between the reversed classroom model and the development of self-learning mathematics for primary students:* Self-efficacy is one of the ten core competencies of the Universal Education Program General information issued by the Ministry of Education and Training of Vietnam. The survey found that 96.3% of teachers said it was necessary to develop their self-study ability. Because self-learning is the very important energy that students must have, since self-education is the key to the 21st century, a century of lifelong learning, social learning. Self-learning ability can be learned for life.

We ask the following questions: According to teachers to develop self-learning ability for primary school students in teaching mathematics, the teacher should:

- + Organize for students to follow the Experimental Method (Students do exercises, deal with learning situations).
- + Organize for students to study in an interactive learning style. (Students work together to discuss the problem and deepen the lesson.)
- + Organizing students to study in the method of studying the division (Student's point of view, presentation of personal opinion).
- + Organize for students to study by traditional learning methods (teaching lecturers, recording games).

The results are showed in Table 4.

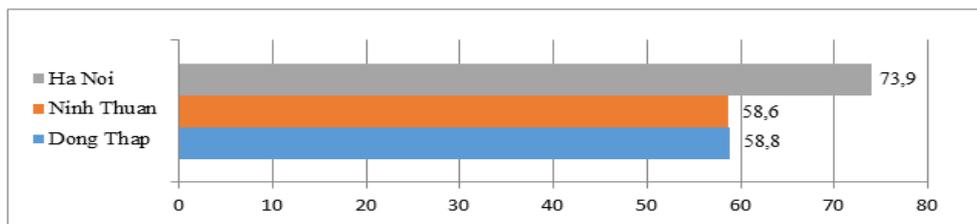


Figure 6. Teachers' perceptions regarding the flipped classroom model

Table 2. Teacher's assessment of the advantages of the flipped classroom model

NO	Advantages	Number	Rate %
1	Students are given a choice of how, when, and where they study.	102	75,8 %
2	Teachers are flexible in evaluating, evaluating, and evaluating results.	90	70,1 %
3	Teachers can use a variety of methods to activate learner activity.	104	83,2 %
4	Students actively present their personal ideas, argue, interact with teachers and students to find out for themselves.	96	72,1 %
5	Lectures can be re-used easily, especially students can listen, watch several times until comprehension.	97	78,9 %

Table 3. Teachers' Evaluation of Difficulties in applying the flipped classroom model in teaching

NO	Advantages	Number	Rate %
1	Teacher takes a lot of time to prepare the lesson	77	47,8%
2	Teacher's limited computer skills	61	37,9%
3	Weak student computer skills.	71	44,1%
4	The design of learning content for E-Learning, the preparation of resources and learning materials, the efforts of teachers to invest in content is great.	58	36,0%
5	Facilities (computer, software ...) are limited	73	45,3%
6	Parents are not interested in their self-study.	65	40,4%

Table 4. Teacher Evaluation of Teaching Methods to Develop Students' Self-Learning Ability

No	Comments	Number	Rate %
1	Organize your student learning experience.	137	85,1 %
2	Organize for students to learn in an interactive learning environment.	142	88, 2%
3	Organize for students to learn in a Distributed Learning Approach.	103	64,0%
4	Organize for students to learn in a traditional learning style.	0	0%

To develop self-learning skills for students requires the teacher to create in the learner the habit and self-learning needs. According to the survey of primary teachers surveyed, in order to form the habit and the need for self-learning mathematics for the students, in the teaching process, the teacher must coordinate teaching methods in the direction of enhancing students to do exercises, dealing with learning situations; interactive learning; discussing the problem and deepening the knowledge of the lesson; presenting personal opinion. This coincides with the nature and characteristics of the flipped classroom model. Because, applying the flipped classroom model in mathematical education, learners form their knowledge through teaching methods: Experiences; Interactive; Personalized. This is the process of developing self-learning ability for primary students.

2.5.2. Piloting the Flipped Classroom Model in Math Education for Primary Students to Develop the Self-learning Ability of Primary School Students in Vietnam

To concretize this content, the author conducted the experiment "Mathematics area" Mathematics class 4 in the

flipped classroom model in the direction of developing self-learning ability for students. The lectures were conducted in 2 primary schools in Cao Lanh city - Dong Thap province: Ly Tu Trong Primary School and Le Quy Don Primary School (Table 5).

2.5.3. Evaluate the Results of the Flipped Classroom Model Test

Through the two test periods, we found that the flipped classroom model provided the opportunity to contribute to the development of self-learning math skills for primary school students in Vietnam in all three stages: Before - during - After school in class. However, within the framework of the article we do not explicitly present quantitative assessments but only summarize the results of the survey of students and teachers after participating in learning, teaching this model. to demonstrate the effectiveness of the flipped classroom model in developing students' self-learning math skills.

2.5.3.1. Evaluation of qualitative results

Through exchanging and talking directly with students and teachers about this model, we obtained the following results:

- The flipped classroom model creates a flexible learning environment. Students are offered the right way, time and place to study. Teachers are flexible in evaluating, evaluating, and evaluating results.
- Time spent on more students in the classroom should be able to use many methods to actively motivate student activities such as group work, problem solving, experiential, interactive, personalized ... for research. deeper.

Table 5. Steps to plan teaching activities for the lesson "Area of the parallelogram" in the flipped classroom model

Stages of the flipped classroom model	Teaching activities		Elements of self-learning are developed
	Teachers' activities	Students' activities	
Stage 1: Before class	- Teachers guide students to explore the lesson plan "Equatorial Area" on the Internet through the youtube site: https://www.youtube.com/watch?v=rIEqZ1ZLgq8 . - Provide a system of questions to elicit the student. + Q1: What is the character of ABCD? + Question 2: What is the shape of the picture? + Question 3: How has the cut image been grafted? + Question 4: The area of ABCD parallelogram and the shape was cut, how to join together? Draw formula and rules for calculating the parallelogram and memorization.	Study at home, watch online tutorials, review tutorials in conjunction with math textbook 4 (p. 103) to answer questions asked by the teacher.	- Develop and implement an individualized learning plan in the learning process. - Select and use appropriate learning methods and techniques in the process of self-study. - Search, synthesize and exploit resources for self-study. - Effective use of information technology for study, self-study and self-improvement.
Stage 2: During schooltime	Review and evaluate the student's home study results through the following activities: - Ask the students to answer the four questions asked by the teacher in the first stage. - Ask students to present their self-knowledge through self-study at home via lesson plans on the Internet. - Students discuss and exchange their knowledge with friends. Discuss, argue to find out, solve the contents do not understand. - Apply the practical knowledge to the exercises 1,2,3 in the textbook. - Teachers focus on the content of the unit and assess student achievement.	- Answer the teacher's suggested questions. - Listen, take notes. - Discuss, use known knowledge to solve problems 1,2,3 in textbooks. Record the focus of the lesson.	-Self-evaluation in learning activities and self-learning to draw strengths and weaknesses of self and planning training. - Effective use of information technology for study, self-study and self-improvement.
Stage 3: After schooltime	Interpreting students' inquiries over the Internet.	Check the knowledge learned during class and learn more. Identify your abilities and plan your training.	- Self-evaluation in learning activities and self-learning to draw strengths and weaknesses of self and planning training. - Effective use of information technology for study, self-study and self-improvement.

- The content of teaching is designed by the teacher in order to help students can study outside the classroom clearly and clearly.

- Students are interested in learning in a reversed classroom model. Particularly during the school hours students actively present their personal ideas, argue, interact with teachers and friends to find out the knowledge for themselves.

- With this model, thanks to the storage facilities of information technology, lectures can be reused easily, especially students can listen, watch repeatedly until the lesson. Thus, this model provides an equal opportunity for receiving information. Slow learners have more opportunities to digest knowledge. Students do not have to worry about the pressure to complete the assignment because they have more time to discuss and do the class work.

With these qualitative assessments, it is possible to confirm that the reversed class model contributes to develop the self-learning ability of Vietnamese students in mathematical education. By the way, the advantages of this model are the manifestations of self-efficacy.

2.5.3.2. Evaluation of quantitative results:

The subject of the test consists of the experimental class in the reverse class and the traditional teaching method (Table 6).

After the end of class, we conducted the experimental and control classes of 02 primary schools taking the test for quality assessment: Assessment on the ability to acquire knowledge, evaluation the ability to apply knowledge, evaluation of practical skills of students in the

experimental and control classes. The tests were evaluated on a scale of 10. The results are presented in Table 7.

The results of the tests in accordance with the Circular 22 in Vietnam are showed in Table 8.

A graph that compares the level of completion of a student's test between the experimental and control classes (Figure 7).

Results in the graph indicate that the percentage of students who successfully completed the experimental work (30.8%) was higher than the control (16.2%). In addition, the percentage of students scoring 7.8 was also higher than the control (51.3% and 32.5%). This result demonstrates that in order to achieve a satisfactory completion level, students must have the ability to self-study to be able to pass the test.

As a result of qualitative and quantitative assessment, the use of the flipped classroom model in teaching has been effective in developing the self-learning ability of primary students in Vietnam. This model contributes to the positive emotion of the student; improve the quality, results of learning math in primary school.

However, this model has limitations: Teachers take a lot of time to prepare lectures for posting. But in the long run, teachers can save time when using lectures repeatedly. Another limitation is technology equality between students, which may be a barrier to student learning, lack of access to technology. This can be overcome when students are instructed in the basic skills to use the materials online, and at the same time many primary schools in Vietnam now provide students with further opportunities. Access to computers and the internet.

Table 6. Number of students in the experimental class and control class

No	Experimental classroom			Compared classroom			Note
	Grade	Number	School	Grade	Number	School	
1	4/1	38	Ly Tu Trong	4/2	37	Ly Tu Trong	
2	4/2	40	Le Quy Don	4/1	39	Le Quy Don	
Total	2	78		2	76		

Table 7. Test results of the experimental and control classes

Test	Classroom	Number of students	Scores									
			1	2	3	4	5	6	7	8	9	10
No.1	Experimental	78	0	0	0	0	1	11	19	25	13	9
	Compared	76	0	0	0	0	7	19	21	16	8	5
No. 2	Experimental	78	0	0	0	0	2	13	13	26	16	8
	Compared	76	0	0	0	0	7	17	22	18	9	3
No. 3	Experimental	78	0	0	0	0	3	9	17	23	17	9
	Compared	76	0	0	0	0	8	17	26	13	10	2
Total	Experimental	234	0	0	0	0	6	33	49	74	46	26
	Compared	228	0	0	0	0	22	53	69	47	27	10

Table 8. Placement results under the Circular No.22

Group	Total of lessons	Level		Note
		Well-done (9 – 10 scores)	Good (5 – 8 scores)	
Experimental	234	30,8 %	69,2%	
Compared	228	16,2 %	83,8%	

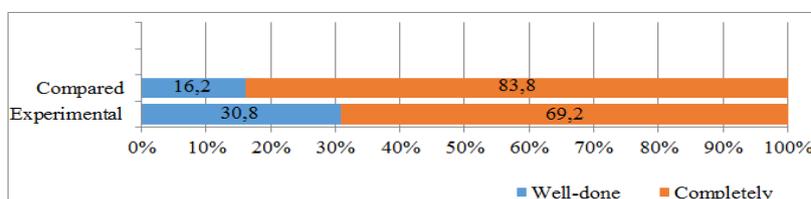


Figure 7. Level of completing student's test between the experimental class and the control class

Despite the limitations, the advantages that the paradigm of the reverse paradigm brings is undeniable. Based on the psychological characteristics, cognitive level, the self-learning ability of primary students, and the specificity of the subject, this model can apply to all or part of the subject matter. The model has transformed the teacher's role from teaching to teaching, managing to creating a dynamic, flexible and enjoyable learning environment for students, and providing opportunities for students. Development of self-learning ability contributes to improving the quality of mathematics instruction for primary school pupils in Vietnam.

3. Conclusion

The nature of the flipped classroom model is the process of combining the results of traditional teaching methods as well as computer-based teaching. In reverse learning, students actively control their self-study, can pause, rewind, watch video and discuss with their friends. Instead of sitting and listening to the teacher lecture, students spend more time exchanging activities. By increasing the amount of practice time in the classroom, students develop their exchange skills, thinking skills. Students are regularly assessed by teachers, should know what their knowledge is lacking and weak and what to add themselves in the process of self-study. By personalization, reverse learning has opened the real opportunity for learning of all subjects. Self-learning will increase students' independence and better academic skills, which are important skills in the 4.0 technology revolution.

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