Applying Multiple Intelligences theory in teaching math in the final grades of primary schools in Vietnam

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ABSTRACT: *Recently, Vietnam has undergone a strong transformation from the knowledge-centered to the capacity development-oriented teaching approach. In the capacity development-oriented teaching approach, individuals' strengths and weaknesses are specially focused on. In order to maximize the students' strengths and overcome their weaknesses, the utilization of the theory of Multiple Intelligences (MI) of the American psychologist Gardner in teaching is the most appropriate. MI theory suggests that any individual possesses one of the eight types of intelligence: linguistic intelligence, logical-mathematical intelligence, visual-spatial intelligence, bodily-kinesthetic intelligence, musical intelligence, interpersonal intelligence, intrapersonal intelligence, naturalistic intelligence. Teachers need to arouse every student's passion and excitement; teachers need to have encouraging activities to maximize students' ability. In this article, we focus on researching the role of teachers, offering a variety of assessment forms, as well as illustrating examples of applying MI theory in teaching primary mathematics. Specifically, we also provide methods to develop MI. This article surveyed 83 students, 23 teachers about the utilization of MI theory in teaching. The article also investigated the case study of 8 students having different highly developed intelligences. Through experimental investigation, data processing, the result shows that MI teaching method has more obvious advantages than the traditional teaching ones. MI teaching is one of the best methods to help develop the strengths of students.*

KEYWORDS: **Theory of Multiple Intelligences, capacity development, elementary math, description table, process.**

➔ Received 20/02/2021 ➔ Revised manuscript received 20/3/2021 ➔ Accepted 24/3/2021.

1. Introduction

1.1. Research on MI in the world

In 1983, after a long period of research, Howard Gardner proposed a new theory called the theory of Multiple Intelligences. MI theory suggested that any individual can have one or many types of intelligence. He identified eight types of intelligence: verbal-linguistic intelligence, musical intelligence, logical-mathematical intelligence, visual-spatial intelligence, bodily-kinesthetic intelligence, intrapersonal intelligence, interpersonal intelligence, and naturalistic intelligence (cited from Gardner, 2011).

Following Gardner, a number of researchers advanced and extended the MI theory of Gardner. Armstrong is the most significant contributor after Gardner. Armstrong elaborated and perfected the theoretical basis of MI theory. Armstrong believed that schools should develop the strengths of students. Every student should have his or her own learning and developing method, depending on their own intelligences (Armstrong, 2011). Through valuable experiences when applying MI theory in teaching at St. Louis' New City, Hoerr indicated that this theory had a great impact on teaching students with different abilities, skin colors, nationalities, and cultures. The development of students' intelligences took a long time and the results were good (Hoerr, 2000). Wahl (1997) suggested activities designed to attract students with reward points when answering correctly. The activities were combined into 14 integrated topics, which helped students and teachers have an overall uninterrupted view of the learned knowledge. He provided a rich resource of diverse learning methods for diverse individual intelligences

(Wahl, 1997).

There are five core functions influencing learning skills. They are intelligence quotient, focus factor, decision-making ability, creative quotient, and cognitive capacity intelligence. Especially in India, linguistic intelligence is most focused. The authors found that the utilization of MI theory in teaching showed a difference between experimental and control groups. The experimental group all increased their intelligence quotient and other core functions (Nanda et al., 2018). An article investigating the effects of MI theory in teaching English in Iran stated that a student could have eight types of intelligence. The authors found that all students developed many types of intelligence, the most developing of which was linguistic intelligence (Gohar & Sadeghi, 2018).

There are four key points of MI theory. First, each person possesses all eight intelligences. Second, the intelligences can be developed. Everyone has the capacity to develop their eight segments of intelligence to the greatest extent. Third, the intelligences work together in a complex mechanism, and always interact with one another. Fourth, there are many ways to be intelligent within each category. In addition, the authors emphasized that all eight types of intelligence were developed through foreign language teaching and learning. In other words, MI theory has a strong connection with foreign language teaching and learning. If students have musical intelligence, we can teach them through English songs. If students have bodily-kinesthetic intelligence, we can teach them through sports activities and body movements in English. If students have interpersonal intelligence, we can give them academic English assignments which need time to study and research. If students have intrapersonal intelligence, we can organize group learning to promote their communication skills. If students have naturalistic intelligence, we can organize English lessons about nature (Derakhshan & Faribi, 2015)

Each person has seven ways of processing information independently corresponding to the seven segments of intelligence they possess. Each person, whether an adult or a child aged from 4 to 5, has both certain strengths and weaknesses. Different levels of intelligence require different methods of training, treating, testing, and evaluating (Gardner & Hatch, 1990). A study of Australian University showed that knowledge acquisition was closely related to age, gender, and learning environment. Specifically, the study showed a relationship between different types of intelligence of students and learned knowledge with a scale of two factors, namely motivation and learning experience. There was a significant difference between students' intelligence and their age, but admittedly, all students had intelligence (Hajhashemi et al., 2018)

Shearer (2018) outlined five key principles for teaching and educational curricula to promote academic achievement. They are: culture matters, every brain is unique-activate strengths, know-thyself, embodied cognition/ emotional rudder, and making it mean something. When studying the connection between MI and L2 writing skills in educational curricula in Spain, the study authors suggested that the integration of different types of intelligence if properly applied in teaching delivered better performance on L2 learning (García & Sánchez, 2017).

Each student has unique characteristics of demonstrating their most highly developed intelligences in various learning activities. Teachers need to pay attention to these unique characteristics when designing teaching and learning activities, organizing and performing tasks, and giving assignments properly to help students develop strengths via their most highly developed intelligences, thereby acquiring mathematics knowledge in the easiest way (Martin, 1999)

1.2. Research on MI in Vietnam

Recently in Vietnam, there have been plenty of works mentioning the utilization of MI theory in teaching subjects in general and math in particular. In order to develop the intelligences of students, teaching methods require fundamental innovations from conception to implementation procedures, and techniques, etc. on the basis of combining multi-methods, multi-information, multi-senses, multi-media, multi-forms into

learning activities corresponding to students' intelligences (Tran, 2010). Each intelligence type is equally important and valuable. The responsibilities of educators and parents are to provoke potential and facilitate the development corresponding to their abilities and interests. MI classrooms require teachers to flexibly change methods and skillfully switch from teaching verbally to teaching visually, musically, bodily, and communicatively (Tran & Dang, 2013). In an article on learning and teaching literature to grade 3rd students, the author introduced the concept of creative competence and showed writing essays displaying typical creativity and characteristic of the writers. He offered the creative competence method; this was tested at primary schools, junior high schools, senior high schools, and received good feedback (Vu, 2020).

MI theory points out each individual can develop his or her intelligence to an adequate level of competency within the "intelligence range". Especially, this level can change (either increase or decrease) based on their individual practice. In other words, Gardner's MI theory reveals that intelligences are not only available but are subject to change, based on each individual's learning efforts and practice. Each person possesses all eight intelligences, some of which are more highly developed. Also, according to Gardner, schools often evaluate only 2 types of intelligence, namely verbal-linguistic intelligence and logical-mathematical intelligence. Thus, such a traditional educational environment virtually ignored students who were inclined to learn musically, bodily, visually, communicatively, etc. Several students would learn better if they had their strengths and abilities developed accordingly (Nguyen, 2018).

The method's purpose is to design an MI teaching plan step by step, guide teachers on how to organize the teaching of 4th grade math through MI contracts between teacher and students, and provide steps to properly support students based on individual intelligences (Nguyen, 2017). When conducting overall research in theoretical issues about MI teaching, the research author proposed some methods of applying MI theory to 10th grade math teaching. He pointed out a number of manifestations of intelligence types of students specializing in math when teaching high school specialized math. Furthermore, he proposed MI-oriented teaching strategies for high school specialized math, and 3 measure groups, comprising 6 pedagogical MI teaching measures to foster multiple intelligences of students specializing in Math in Vietnam (Tran, 2018).

In Vietnam, there are plenty of studies on 4th grade math. In one book, the author solved math problems in many different ways. The problems solved in these different ways were diverse and suitable for many types of students, whether ordinary or specialized (Tran, 2005). Meanwhile, another book developed geometric thinking in the 4th and 5th grades. Each geometric problem was analyzed, explored, and given a diagram to solve by the author (Nguyen, 1996).

Although there have been some studies on the utilization of MI theory in teaching math, in Vietnam, so far, there has not been any work applying MI theory in teaching math in the final grades of primary schools. This is why we choose to study this issue.

2. Methodology

2.1. Types of intelligence

The following table describes eight types of student intelligences in teaching and learning.

Table 1: Eight types of student intelligences

Intelligence type	Characteristics
Verbal-linguistic intelligence	- Writes better than average for age - Has a good memory for words when reading, listening or writing - Easily expresses thoughts through both talking and writing - Is able to verbally explain and persuade people, and fluently tell stories - Enjoys writing diaries, prose, and poems - Enjoys reading books and stories

Intelligence type	Characteristics
	- Enjoys listening to radio - Is able to score high in literature, history, and social subjects
Logical-mathematical intelligence	- Is able to evaluate, reason logically and have plans to solve a problem. - Enjoys working with numbers and has an ability to do the mental calculations - Has passion for discovering science, and doing experiments - Asks reasoning questions - Enjoys working on logic games or brainteasers such as chess and intellectual quizzes - Enjoys putting things in categories, hierarchies, or rational and creative patterns - Has passion for math and natural subjects
Visual-spatial intelligence	- Is able to memorize and acquire knowledge via images and diagrams whether illustrated or drawn from imagination - Enjoys reading books and newspapers that are heavily illustrated - Enjoys playing jigsaw puzzles, mazes, and other visual puzzles, etc. - Enjoys dreaming, and fantasizing about things - Enjoys sharing opinions via pictures, diagrams, etc. - Doodles when thinking - Is sensitive to colors - Is able to draw, and see clear visual images in space - Enjoys art activities
Bodily-kinesthetic intelligence	- Excels in one or more sports - Moves, twitches, or fidgets while seated for a long time in one spot - Is able to mimic other people's postures and gestures - Is able to remember longer if allowed to move body parts - Tends to use body to express ideas - Shows skill in a craft or model building
Musical intelligence	- Enjoys singing, listening to music, and playing musical instruments - Tends to instinctively sing or tap rhythmically when working - Has a good memory for rhythms, sounds - Is able to compose music
Interpersonal intelligence	- Enjoys socializing with peers - Make friends easily and has many friends - Enjoys participating in school and class group activities - Is able to generate lively discussions and engage people to join in group work - Is always confident - Prefers working with others to working alone, and is willing to help other people - Is able to capture and understand other people's emotions, and encourage them
Intrapersonal intelligence	- Has a realistic sense of your strengths and weaknesses - Prefers working alone to working with others - Is able to learn from his or her failures and successes in life - Has private hobbies or passions that he or she doesn't talk much about - Displays a strong sense of independence and personality - Has high self-esteem
Naturalistic intelligence	- Enjoys learning about nature, and animals. - Likes field trips in nature, to the zoo, or to the museum - Shows sensitivity to objects of nature (such as curiosity, interest, etc.). - Enjoys raising animals, planting trees and taking care of them.

(Gardner, 1987)

2.2. Relevant issue on the utilization of MI theory in teaching math

2.2.1. The role of teachers in the utilization of MI theory in teaching math

In MI teaching, the role of teachers is extremely pivotal. Teachers are instructors, organizers, and also participants with students. Teachers need to have different teaching approaches for different students with different strengths and weaknesses.

For students with logical-mathematical intelligence, teachers must design teaching contents based on numbers, calculations, math concepts, etc. Teachers must create materials in a way that students can think, reason, solve and handle math problems either by themselves or with a little help from teachers. For students with visual-spatial intelligence, teachers need to make teaching contents by making tables, drawing pictures, mind maps, and dealing with picture observing. For students with intrapersonal intelligence, teachers design teaching contents to help students discuss, cooperate, debate and help each other during the process of acquiring knowledge. For students with interpersonal intelligence, teachers must design teaching contents that can touch the breadth and depth of knowledge. Students need time to reflect and express personal feelings. The teaching content helps students have their own strategies and plans for development. For students with naturalistic intelligence, teachers must integrate natural topics, animals, and real situations in nature into teaching contents so that students can be interested in and focus on the topics given. The experience of outdoor teaching and sightseeing also helps students develop positives, creativity, personal experience, and interaction with the environment. It is worth noting that teachers can implement teaching methods either separately or integrally to develop the most highly developed intelligences of students.

2.2.2. Teaching must be consistent with student academic ability

Teachers are those who flexibly implement teaching contents. For excellent students, teachers employ more difficult approaches. For average good and good students, teachers employ moderate approaches. For weak and poor students, teachers need to increase the practice of basic skills and design teaching contents with vivid visuals and easy to absorb. Especially, teachers need to integrate daily life experiences into teaching. This helps engage students. Students will find that math is not dry or impractical. On the contrary, seeing a lot of practical applications will make students see the necessity of learning math. Finally, teachers are those who flexibly choose knowledge for individual or group of students accordingly. Teachers need to flexibly devise different creative teaching methods and techniques for different types of students. Einstein said "Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid" (Kelly, 2004).

2.2.3. Creating many different forms of assessment in the utilization of MI theory in teaching

Assessment is an important element of the teaching process. A common practice to assess student's learning progress is to use classified tests based on high, medium, and low levels. The forms of testing also vary such as essays, multiple-choice, practice, etc. The teaching assessment results based on the current mass teaching method still have several limitations: limiting the rich and complex life of a child into a series of scores, percentages or rankings, creating stress and negative impacts on the child's performance. The creation of assessment norms such as excellent, good, average, or weak leads to academic failure in some students, put pressure on teachers to narrow the curriculum to what the tests require, too much focus on scores, treat all students in the same way (giving scores monotonously), view teaching and assessment as two separate (disconnected) activities, the fact that a few students with certain strengths (suitable for the assessment) benefit. Therefore, many students have excellent academic results but still cannot perform well in other areas of life.

Armstrong suggested "evaluating effectiveness is part of good teaching. If you only adjust the contents and change the current teaching methods without changing the assessment method, you will not take full advantage of the utilization of MI theory in the teaching. Therefore, if applying MI theory in teaching, teachers have to use different ways to assess students' learning outcomes" (Armstrong, 2011).

MI theory favors the use of personal intelligence profiles. Teachers develop different materials

for different types of intelligence accordingly. Armstrong introduced a "Sixty-four multiple intelligence assessment contexts" table, in which students have a good chance of demonstrating their mastery of a particular subject in a variety of ways. A number of evaluation tools which are offered by many schools such as anecdote records; audiotapes and discs; videotapes; photos; student magazines; unofficial tests; student interviews; standardized tests and evaluation; student records of their academic results and progress via graphs (function graphs); multiple intelligence profiles, etc. must be diverse and flexible when designing tools and formats to measure and evaluate students' learning outcomes (Nguyen, 2019).

2.3. Teaching objectives and requirements to expect in 4th-grade Math

4th-Grade Math is to help students know: how to read, write, compare, and practice addition, subtraction, multiplication, and division of natural numbers and simple fractions, how to use units taught such as tonne, hundredweight, yen (a Vietnamese unit of measurement, 1 yen is equal to 10 kilos), second, century, etc. in calculating and measuring, how to identify some geometric figure elements (acute angles, obtuse angles, straight angles, perpendicular lines, parallel lines, parallelograms), know how to calculate the area of a parallelogram, and know how to solve practical mathematics problems up to 3 steps. Teaching 4th Grade Math is to help students learn the following contents.

First, in terms of numbers and arithmetic, students need to be able to: identify some key features of the sequence of natural numbers, know how to read, write, and compare natural numbers, know how to do addition and subtraction of natural numbers, do multiplying and division of natural numbers up to 3 digits (products do not exceed more than 6 digits), know how to divide a 6-digit natural number by a 3-digit natural number (mainly a 2-digit number), know to find an unknown element of a calculation (with or without parentheses) and an expression containing one, two, or three digits, know how to apply the commutative and associative properties of addition and multiplication, know how to multiply a sum by a number to calculate in the most convenient way, know how to do mental calculations within 10 times, 100 times, 1000 times multiplication table, etc., and 10 times, 100 times, 1000 times table division facts, etc., multiply any two-digit number by 11, know how to recognize if a number is divisible by 2, 3, 4, 5, 6, 7, 8, 9, basically know how to recognize fractions (via visual images), know how to read and write fractions, know basic properties of fractions, know how to reduce, reduce to the same denominator, and compare two fractions, know how to add, subtract, multiply and divide two fractions in simple form (denominators do not exceed 100). Secondly, in terms of measurement, students need to know the relationship among tonne, hundredweight, yen (a Vietnamese unit of measurement, 1 yen is equal to 10 kilos) and kilogram, among seconds, minutes, and hours, among days, hours, years and centuries, know how to convert common measurement units in specific situations when applying in solving practical problems. Thirdly, in terms of geometric figure elements, students need to identify a sharp angle, an obtuse angle, a straight angle; two straight lines, two parallel lines, know how to distinguish between a rectangular and a square when knowing the side lengths, know how to calculate the perimeter and area of a parallelogram, a rhombus. Fourthly, in terms of statistics and scale, students need to know and identify (at a simple level) the data on column charts, know some of the practical applications of the scale of maps. Fifthly, on solving word problems, students need to know how to summarize the problem by taking brief notes or drawing diagrams, know how to solve and present solutions with problems up to three steps such as finding the arithmetic mean, finding two numbers when knowing the sum and difference of them, finding two numbers when knowing the sum (or difference) and the ratio of them. Sixth, in terms of language and thinking development, and student personality formation, students need to be developed (to the appropriate extent) the ability to analyze, synthesize, generalize and concretize, know how to express comments, rules, properties, etc. in a language (verbally and in writing) in a general form, and keep on

practicing the virtues of diligence, carefulness, confidence, honesty, and a sense of responsibility (The Ministry of Education and Training of Vietnam, 2018).

2.4. Examples of teaching some 4th Grade Math materials applying MI theory in Vietnam

2.4.1. Teaching method to develop verbal-linguistic intelligence

a. The activities of developing verbal-linguistic intelligence

Teachers organize activities for students to read lessons and texts to understand the content in written language and spoken language. Teachers give presentations, explain and discuss with students. Especially, teachers teach math knowledge via easy-to-remember rhyming sentences to help students understand the solving problems. Students listen and understand the problem. Students re-interpret in their own words. Teachers encourage students to write their ideas and share them with others. The students' ideas can be a problem, an interesting story, a math quiz or an application of math in life. These ideas are written by students in their own words. Teachers, after reading them, should encourage and commend the good and unique solutions. Students will feel valued and be motivated to achieve their full potential.

b. The illustrated example of developing verbal-linguistic intelligence

Example 1

The organizing committee needs to choose 2 out of 26 people to participate in the "X game show" on a TV channel. How many choices can we make?

This problem can allow teachers to help students develop verbal-linguistic intelligence. Students in this case are trained in both math and daily life language. Teachers develop verbal-linguistic intelligence by giving the "distinctive linguistic" solution as follows (Nguyen, 2011):

Teacher: There are two methods to find the number of choices. *Method 1*, there are 26 choices for the 1st person. After choosing the 1st person, 25 people are left, so there are 25 choices for the 2nd person. How many ways to choose?

Student: There are 25 x 26 ways to choose.

Teacher: But the choice of the two people AB is the same as BA, so how many real choices are there?

Student: There are $\frac{25 \times 26}{2}$ choices.

Teacher: *Method 2,* If there are only 2 people, there is 1 choice. If there is another 3rd person, there are additional choices with this 3rd person. We have to choose one of the two people previously mentioned to compete against this 3rd person, thereby having 2 more choices now, etc. If there is another 26th person, there are additional choices with this 26th person. We have to choose one of the 25 people previously mentioned to compete against this 26th person, thereby having 25 more choices now. Therefore, how many choices are there?

Student: There are $1 + 2 + 3 + ... + 24 + 25$ choices

Teacher: As the results of the two methods are the same. Compare these results:

$$1 + 2 + 3 + .. + 24 + 25 = \frac{25 \times 26}{2} = 325.$$

2.4.2. Teaching method to develop logical-mathematical intelligence

a. The activities of developing logical-mathematical intelligence

Teachers organize learning activities to help students foster calculating skills, and provide opportunities to practice and predict in problem-solving and to apply logic to solve math problems. Students are welcomed to seek and explore new solutions. This method engages students to have an interest in learning and a passion for scientific research.

b. The illustrated examples of developing logical-mathematical intelligence

Example 2

There are 32 ducks and dogs in the yard. There is a total of 100 legs. How many ducks are there? How many dogs are there?

Teachers can provide this explanation to arouse student's interest in learning.

Teacher: If we take fewer ducks, we have more dogs, thus the number of legs will increase. On the contrary, if we take more ducks, the

number of dogs will decrease, so how will the number of legs be?

Student: The number of legs will decrease.

Teacher: Each column of a comparison section consists of 3 rows of numbers (each row displays the number of ducks, dogs, legs respectively) called: upper-row, mid-row (dividing the total number of ducks), lower-row. Note: the upper half of the section includes the upper row and the mid-row; the lower half of the section includes the mid-row and the lower-row (see the Table). We make the table as follows:

+ Arrange the number of ducks (the first cell of the lower row displays the number of ducks) in ascending direction.

+ Divide the total number of ducks in half; if at the mid-row, the total number of legs is greater than 100, take the upper half and vice versa.

After four comparisons we find out that the number of ducks is 14 and the number of dogs is 18 as shown.

Table 2: The number of ducks and dogs

Comparison	No. of ducks	No. of dogs	No. of legs
1st	32	0	64
	16	16	96
	0	32	128
2nd	16	16	96
	8	24	112
	0	32	128
3rd	16	16	96
	12	20	104
	8	24	112
4th	16	16	96
	14	18	100
	12	20	104

2.4.3. Teaching method to develop visual-spatial intelligence

a. The activities of developing visual-spatial intelligence

Teachers use drawings, pictures, diagrams, tables, etc. to convey or illustrate a unit of math knowledge content, and train students to observe and recognize the characteristics of the problem. Teachers represent mathematical objects, concepts, relationships, and mathematical properties with drawings, maps, mind maps to synthesize, and summarize the learned questions, exercises, and knowledge. Teachers organize activities for students to measure, draw pictures, etc. to help students recreate spatial symbols, arrange them, create new images, and find out new ideas.

Teachers use pictures to illustrate what to teach. Students will remember formulas and knowledge more deeply via images.

b. The illustrated examples of developing visual-spatial intelligence

Example 3

Find the sum of $1+3+5+...+23+25$.

Display 1, 3, 5, ..., 23, 25 as 1 square, 3 squares, 5 squares, … 23 squares, 25 squares respectively as in the picture,

The sum of $1+3+5+...+23+25$ is the sum of the total number of colored squares in an overall big square with side length 13.

Thus:

$1+3+5+...+23+25=13\times 13=169$.

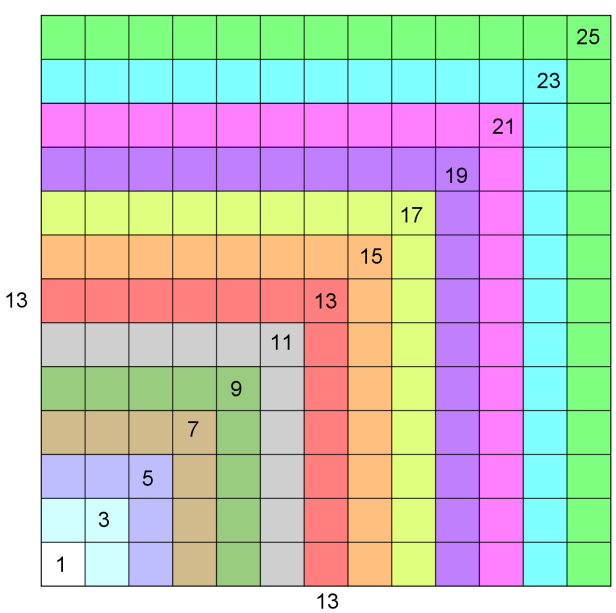

Figure 1: Sum of odd numbers

Teachers use metaphorical visuals to compare this content, knowledge, idea with other contents, knowledge, ideas. Using metaphorical visuals helps students connect what is being learned with real life. Students match their learned knowledge with images.

2.4.4. Teaching method to develop intrapersonal intelligence

a. The activities of developing intrapersonal intelligence

With teaching methods to develop intrapersonal intelligence, students need to share with peers. Students bring their ideas to class (by raising their hands) and answer their friends' questions or discuss with other students. Discussion time can be very short or long based on the problem raised by the teacher. Teachers must be very delicate in handling their ideas. Teachers need to let students see that their opinions are heard and considered even though they may be not accurate. In addition, teachers must manage students well to avoid some students taking advantage of the discussion time to have private chats. This strategy can also be applied in self-tutoring (Hoang, 2017).

Teachers organize learning activities in the form of pairs or groups. Teachers use teaching techniques to create opportunities for students to help each other, assign good students to tutor weak students. Teaching activities are conducted by teachers by grouping, assigning tasks and guiding students on how to study in groups. Members of the same groups have the same number, discussing the learning content. Teachers divide students into groups of 3 to 8, which makes learning most effective. Team members work together to perform a task assigned by the teacher. The best way in group work is to assign tasks to every member of the group; this can make students have a sense of responsibility and help assign tasks corresponding to every student's strengths. Collaborative learning groups are particularly suitable for MI teaching as these groups can be deliberately formed in a way that each group includes all types of intelligence. In addition, collaborative learning groups give students excellent opportunities to practice as a member of society in the future (Hoang, 2017).

Organizing classroom games is a fun way for students to become familiar with social activities. They can talk, debate, learn skills and the topic content of the game. These games are easy to conduct; teachers select the topic, then choose the game type (maybe based on well-known TV game shows). Facilitators and supplementary materials are diverse and can be created either manually or technologically, etc. (Hoang, 2017).

b. The illustrated example of developing intrapersonal intelligence

Example 4

Pairing

- Put the number cards and picture cards upside down into 2 groups.

- Play in the group: When it is someone's turn, he or she takes 1 card from each group, if they match (the number on the number card is equal to the sum of items on the picture card), he or she keeps it, otherwise, returns it upside down.

- The game is over when all cards are taken. The winner is the person with the most card pairs.

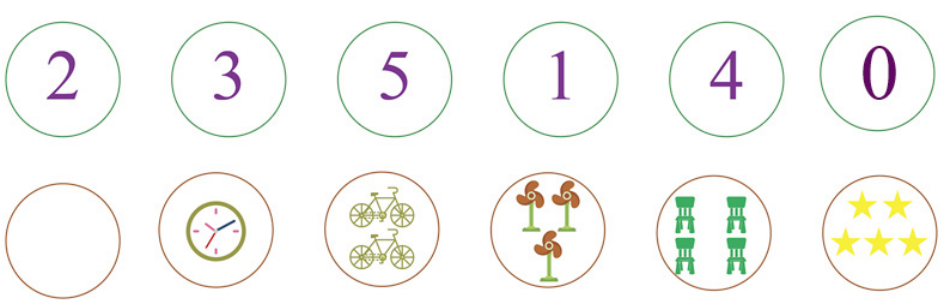

Figure 2: Game of numbers

Students can cooperate with teachers for self-assessment and self-adjustment. Debates among student groups might spark off where the solution results do not reach a consensus. Teachers will note down and offer the final answer. Thus, through group activities, students acquire cooperation and communication skills such as listening to and persuading other people, helping and respecting each other, having a sense of responsibility for the assigned work, etc.

2.4.5. Teaching method to develop interpersonal intelligence

a. The activities of developing interpersonal intelligence

Teachers organize individual activities and stimulate positives, self-discipline, self-management, self-study, and self-discovery of knowledge. Teachers assign proper tasks to each individual, help students plan their learning schedule daily, monthly, annually. Teachers help students self-recall and self-test knowledge, etc.

When teaching, teachers should leave some time for students to self-reflect. Self-reflection time is necessary for them to "digest" the learned information or connect the information with their own experience. This self-reflection time is also an opportunity for students to stay active and be ready to move on to the next activity. Teachers should use this tactic right after teaching difficult lessons or the curriculum focus. Teachers can use background music to stimulate students to think. In addition, based on circumstances, teachers can combine this activity with the "discuss with peers" activity to harmoniously turn it into an activity both introspective and communicative (Hoang, 2014).

b. The illustrated examples of developing interpersonal intelligence

Example 5

Tell students the following story: "The house"

An old carpenter is going to retire. He tells the contractor about his plan to quit his job and live a more leisurely life with his family. […] Even if your life were only one day, that day should be lived in a kind and meaningful way. "Life is a work of your own, your life tomorrow will be the result of the choices you make today" (Hoang, 2014).

2.4.6. Teaching method to develop naturalistic 2.4.6. Teaching method to develop naturalistic intelligence

a. The activities of developing naturalistic intelligence

Teachers associate questions, examples, and exercises having geometrical knowledge with the life of the natural world; teachers give examples of the learned animals and plants. Students will learn how to respect nature and live in harmony with it.

b. The illustrated example of developing naturalistic intelligence

Example 6

The first tree has 6 apples. The second tree has 4 more apples than the first one. The third tree has 4 more apples than the second one. What is the total number of apples of 3 trees.

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2.4.7. Teaching method to develop bodily-kinesthetic intelligence

a. The activities of developing bodily-kinesthetic intelligence

Teachers organize physical activities such as holding something, doing experiments, making illustrations, etc. To do this, teachers need to prepare materials, tools and equipment, or ask students to prepare them in advance so that students can have practical class afterward. This teaching method usually takes more time than traditional methods (Hoang, 2014).

b. The illustrated example of developing bodily-kinesthetic intelligence

Example 7

Teachers have students practice cutting Chung cakes (square glutinous rice cakes) to help review their knowledge of fractions. Materials and tools to prepare are Chung cakes and knives. Teachers divide the class into groups, asking the groups to divide Chung cakes into an equal portion and take out a certain number of portions.

2.4.8. Teaching method to develop musical intelligence

Teachers select the core part of the lesson and together with students create rhymes for that content. Sometimes they are merely rhythmic ways of speaking words, not necessarily beautiful lyrics with the right music. In addition, to make it more lively, teachers can add background music or tap rhythmically with rulers, clap hands, etc. (Hoang, 2017).

3. Results

We conducted experiments on 95 students at a primary in Ho Chi Minh city. With the consent of the Board of Education, we studied the academic results of students of Class Four 2 and Class Four 3, and found that the general level of Math in both classes is equivalent. On that basis, we proposed to conduct experiments on Class Four 2 and took Class Four 3 as the control class.

The implementation of teaching took place in 12 periods, including 8 Arithmetic periods, covering lessons on "Diagrams, Fractions" and 4 Geometry periods, covering lessons on "Acute Angles, Obtuse Angles, Straight Angles, Two Perpendicular Lines, Parallelograms, Area of Parallelogram".

- In Experimental class: the teacher applied MI theory in teaching, using strategies, measures and lesson plans presented in Section 2 of this article.

- In Control class: the teacher made lesson plans and delivered lessons as usual, and did not apply the same measures as in Experimental class.

During the teaching process of both classes, some issues were examined as follows:

- Students' learning attitudes are observed in class to see if they are engaged, active and interested in participating in the activities organized by the teacher, and if there are many students actively joining in lessons, or putting questions to teachers.

- Students' notebooks are checked at the beginning of the class to see if they complete the homework given by the teacher, and to evaluate their level of completion (to see if they put in a great deal of effort or just did only the minimum).

- Students' awareness of learning and their participation in-class activities are examined to find out if they have any changes in thinking.

After teaching experimentally, we conducted controlled tests including both classroom tests and homework assignments to evaluate learning outcomes. We had the students do the same 45-minute test (including both Arithmetic and Geometry).

3.1. Qualitative assessment

The experimental results initially showed that when applying MI in teaching, most students were engaged in every lesson. They actively participated in learning activities and contributed ideas. Students were interested in diverse math activities and their associations with life. After the lessons, students had an elated spirit, showing their love for math. Many students found out the right learning method for themselves and applied it effectively.

The knowledge taught when applying MI theory in teaching was mild, not focusing too much on theory, but the students understood the lessons and memorized knowledge well. The cognitive difficulties of students were significantly reduced, forming a different style of thinking which was unprecedented.

3.2. Quantitative assessment

Through assessment tests, we carried out the statistics, calculations and obtained the following table of data of Experimental Class (Class Four 2 - 41 students) and Control class (Class Four 3 - 42 students).

Table 2: Experimental and Control Class

Class Score	EC (Experimental: No. of students and ratio (%)	CC (Control): No. of students and ratio (%)
0	0 (0%)	0 (0%)
1	0 (0%)	0 (0%)
2	0 (0%)	0 (0%)

Class Score	EC (Experimental: No. of students and ratio (%)	CC (Control): No. of students and ratio (%)
3	4 (9.76%)	6 (14.29%)
4	5 (12.20%)	6 (14.29%)
5	0 (0%)	1 (2.38%)
6	8 (19.51%)	9 (21.42%)
7	8 (19.51%)	7 (16.67%)
8	7 (17.07%)	6 (14.29%)
9	6 (14.63%)	6 (14.29%)
10	3 (7.32%)	1 (2.38%)

In addition, we distributed questionnaires to 23 primary school teachers in Ho Chi Minh City to investigate the necessity of applying MI theory in teaching and the difficulties of applying MI theory in the teaching.

In answer to the question about the necessity of applying MI theory in teaching, we acquired the data as follows Figure 3.

Looking at the chart, we can see the majority of teachers (78%) stated applying MI in teaching is necessary; 13% of teachers hesitated to confirm whether it is necessary or unnecessary as they have not extensively investigated MI theory; 9% of teachers suggested that applying MI theory in teaching is unnecessary as they are afraid of difficulties and innovation.

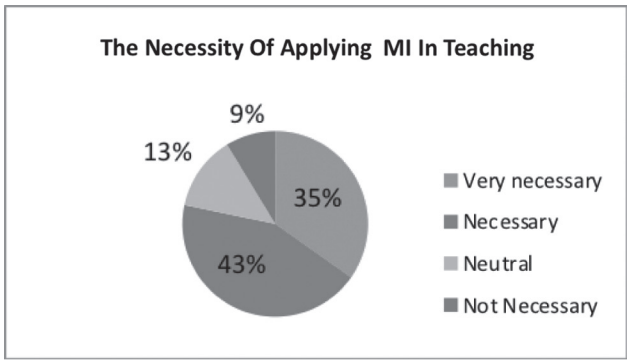

Figure 3: The Necessity of MI theory

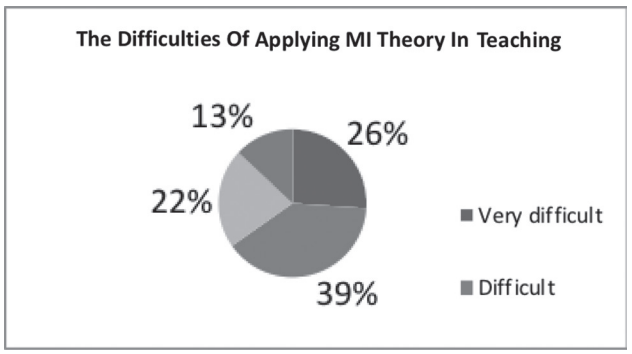

Figure 4: The Difficulty of MI theory

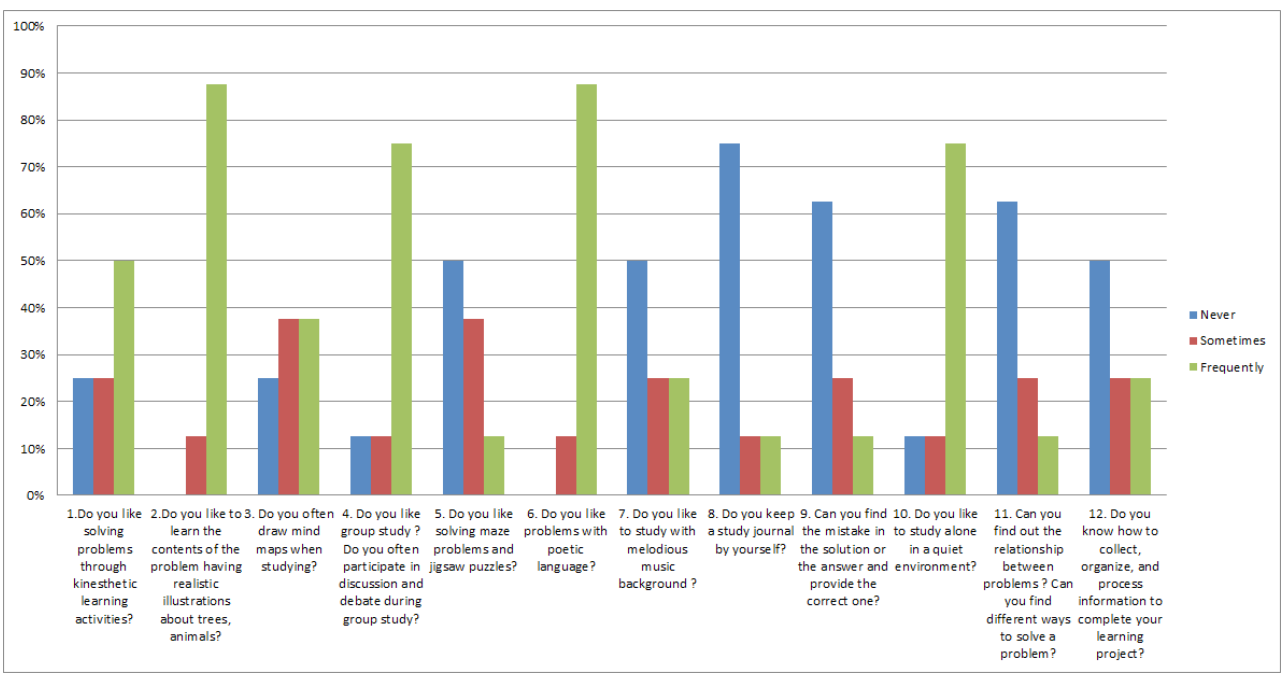

Figure 5: Case study

In answer to the question about the difficulties of applying MI theory in teaching, we acquired the data as follows Figure 4.

Looking at the chart, we can see the majority of teachers (65%) stated applying MI in teaching is difficult and very difficult; 22% of teachers, who teach well, supposed that this teaching is somewhat difficult. 13% of teachers, who teach excellent, supposed that this teaching is simple. That is the reason why they stated that this teaching is not difficult.

This article also researched the case study of 8 students having different highly developed intelligences through investigation questions. Through experimental investigation, data processing, the result showed that MI teaching is one of the best methods to help develop the strengths of students.

Hence, it can be seen that MI teaching helps students develop their strengths, facilitate the cultivation of their ability to think, and especially, help them acquire knowledge through their most highly developed intelligences. Some teachers who are older, afraid of innovation will find it difficult to apply MI theory in their teaching. This is probably due to the fact that MI teaching focuses on individual students, thereby taking more time, effort and money for teachers compared to traditional teaching.

4. Conclusion

This article has presented specific teaching methods corresponding to eight types of intelligence given by Gardner. We also give some points of view of MI theory and provided MI empirical analysis and evaluation. The new results of our research introduced ways of teaching applying MI theory to specific individuals in Vietnam, defined the role of teachers in MI teaching, investigated, evaluated pedagogical experiments, used qualitative and quantitative analysis methods to draw advantages and disadvantages of the utilization of MI in the final grades of primary schools. It will help teachers in Vietnam have specific teaching methods corresponding to specific types of student's most highly developed intelligence. MI teaching has many outstanding advantages, helping students to personalize their learning better than the traditional one. This method develops the individuals' strengths and restricts their weaknesses. By the concrete examples on the eight types of intelligence such as linguistic, logical-mathematical, visual-spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalistic intelligence, we hope that this method is effective in performing in realistic. In this method, teachers need to have encouraging activities to maximize students' abilities. By the qualitative and quantitative assessment, the findings show that MI teaching is one of the best methods to help develop the strengths of students.

Acknowledgments

We thank Mrs. Nguyen Thi Thanh Tuyen for reading and improving this article.

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