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Mathematics teachers' perspectives on teaching by modeling and experiential learning

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Abstract

This study aims to survey how math teachers' approach to teaching-oriented to students' competency development in mathematics precisely determines teachers' perspectives on the meaning, usage, and difficulty of teaching by modeling and experiential learning. The participants consisted of 97 math teachers who were teaching at high schools in Ho Chi Minh City in Vietnam, and they had to answer a 12-question questionnaire on inter-subject teaching, modeling, and experiential learning. The questionnaires were analyzed before distributing to teachers and presented on two sides of an A4 sheet of paper. After the teacher answered the questionnaires, the survey sheets were collected, classified, and their choices were calculated using frequency and percentage. The results showed that most teachers recognized the role and significance of the teaching mentioned above methods. They also stated the reasons for not applying them regularly because they did not receive training and lacked related documents. One suggestion was to train teachers in the knowledge and skills to use these active teaching methods in math classes.

Keywords: perceptive, interdisciplinary teaching, teaching by modeling, experiential learning

1. INTRODUCTION

Mathematics is a science with many applications in life; the necessary knowledge and mathematics skills have helped people solve real-life problems systematically and accurately, contributing to promoting social development. Mathematics in high schools contributes to the formation and development of critical qualities, general competencies, and mathematical competencies. Also, the students can develop fundamental knowledge and skills and create opportunities for students to experience and apply mathematics in practice; to create a connection between mathematical ideas, between Mathematics and practice, and between Mathematics and other educational subjects and activities, especially Science, Natural Science, Physics, Chemistry, Biology, Technology, Informatics to implement STEM education. Math content is often logical, abstract, general. Therefore, to understand and learn Mathematics, high schools need to balance math programs to balance learning knowledge and apply knowledge to solving specific problems. In learning and applying mathematics, students can always use modern means of technology and teaching equipment, primarily electronic and portable computers, to support the performance process to explore, discover knowledge, solve math problems.

Therefore, the math skills should be formed and developed in students' mathematical competencies with the following elements: mathematical thinking and reasoning; mathematical modeling; solve math problems; communicate math; using math tools and facilities. Simultaneously, math contributes to students' formation and development of essential qualities and general competencies; it helps students initially identify their capabilities and strengths to orient and choose careers and train personality to become responsible workers and citizens.

In order to contribute to the comprehensive development of competencies and qualities of elementary students, in the process of teaching Mathematics, teachers need to organize learning activities for students (by individuals, couples, groups, or whole class) together with activities automatically comment and comment on your products or groups of friends, through which students can occupy the content knowledge, practice necessary skills. When students perform learning activities, they perform evaluation activities (observing, advising, guiding students, making comments). To organize students' learning activities effectively, teachers need to clearly define the objectives or requirements that need to be met and the lessons' content, then design them into learning activities and evaluation activities (comments, self-comment) for students to implement. Teachers organize math teaching activities together with assessment activities to contribute to forming and developing students' capacity. In math learning activities in class, teachers must be proactive, flexible, and creative during class, particularly in the teaching process. With their responsibilities, available capacities and professional enthusiasm, love for students, synchronous innovation of teaching methods in Mathematics in elementary schools will help students progress in learning Mathematics. Teachers can use some mathematics teaching methods to meet the above requirements, such as interdisciplinary teaching, modeling, and experiential teaching.

Vladimír Jehlička and Ondřej Rejsek (2018) illustrate the interdisciplinary relationship between mathematics and information and communication technology (ICT) that could be readily used in teaching these two subjects in elementary schools and junior high school. The described interdisciplinary teaching method promotes a better understanding of mathematical research and develops students' logical and critical thinking. Also, the need for the connection between mathematics and IT in teaching is noted through concrete examples. Attention focuses on decoding numbers between individual number systems and entering numbers into computer memory.

Author S. Ahmet Kiray (2012) develops an integrated scientific and mathematical model suitable for Turkish teachers' backgrounds. Dimensions of the model are given and are compared with previously developed models and the findings of previous studies on the subject. The model is called equilibrium, which reflects the importance of balance in the integration process. The equilibrium model includes five elements: content, skills, teaching-learning, emotional traits, measurement, and evaluation. The balanced model's goal is to keep the content and standards the same as their original values.

Author Hye Sun You (2017) describes the history of interdisciplinary education and current trends and sheds light on the conceptual framework and values that support interdisciplinary science teaching. Many educators have recognized the need for a significant paradigm shift towards interdisciplinary learning as embodied in scientific standards. Interdisciplinary learning in science is characterized as a view that integrates two or more disciplines into close connections to allow students to make appropriate connections and create meaningful connections. There is no doubt that the natural system's complexity and its respective scientific problems require an interdisciplinary understanding connected by many specialized backgrounds. The best way to learn and perceive real-world natural phenomena in science should be based on a practical interdisciplinary approach. Based on the fundamental theoretical basis for interdisciplinary teaching, this study proposes theoretical approaches to how teachers' integrated knowledge affects the practice of interdisciplinary teaching and learning. This study further emphasizes the need for appropriate professional development programs to promote interdisciplinary understanding across different sciences.

Applying the modeling method to teaching will have advantages such as: creating opportunities for students to solve practical topics, not merely solving math problems; supporting students to learn math in a way that motivates and has a passion for mathematics (Blum, 2009). Additionally, the mathematical model is a process of applying mathematical knowledge to new and strange situations. Therefore, when performing the tasks of mathematical modeling, students may encounter many difficulties such as no understand the problem posed by the actual situation; identifying assumptions, recording essential factors to establish mathematical models; has limited mathematical knowledge, chooses appropriate explanations as well as results (Bahmaei, 2011). Accordingly, it records that students' ability to solve math problems is closely related to modeling tasks (Fasni et al., 2017; Yuliani & Kusumah, 2018).

Furthermore, researchers Blum et al. (2009) also state a four-stage process for a modeling task: task understanding, modeling, using mathematics, explaining results. Meanwhile, Sekerák (2010) offers a more concise model with three steps: determining the model situation's starting point, building a mathematical model, and verifying the model built.

Besides, Ryanto et al. (2019) used the population growth context in modeling tasks to teach mathematics to elementary school students. They are introduced to modeling theory, and then they apply modeling work to solve problems. The experts on the prototype recorded this process; mainly, the students' explanations were also recorded to assess the study impact. Mathematical modeling tasks related to population growth contexts are valuable, practical, and useful.

The experiential activities increase the attractiveness of learning; in particular, they mainly help students get used to problems and real situations, then solve them and acquire knowledge more easily (Weinber et al., 2011; Davidvitch et al., 2014). Therefore, experiential education is an essential bridge between classroom teaching and its practical application. Besides, these activities promote positivity and creative thinking for students because they have to think for themselves. Therefore, the experiential activities will open up potentials and help students form their habits. This learning method does not impose on students but maximizes their creativity.

Moreover, experiential learning in the school is a bridge between the school, knowledge of subjects, and real-life in an organized way, with an orientation to actively contribute to the formation and strengthening of capacities, personality qualities for learners (Breunig, 2017; Waite, 2018). Through these activities, learners are nurtured and develop their emotional life, forming a will to motivate them to work and be active.

Research on the impact of experiential teaching on junior high school students' mathematical creativity in Kenya is done by the authors, Chesimet et al. (2016), in which 168 students were divided into control classes and practical classes. In the experimental group, the teacher uses the experiential learning method, while the control group is taught according to the usual method. Because of evaluating the experimental tasks' effectiveness, the math creativity test served as a test for both groups. Inference statistical tools were used to interpret the collected data. It is known that the experiential learning method has a significant influence on students' mathematical creativity. The study's findings are expected to help math teachers adjust their teaching strategies because they have identified experiential learning potential for students' mathematical creativity.

Garry Falloon (2019) researched using simulation to teach elementary students basic physics concepts as an experimental educational activity. The sample consists of 38 5-year-olds participating in simulation activities based on Kolb's experiential learning theory to explore the knowledge of circuits, electrical concepts, and functions of circuits. The results show that students have developed their knowledge of the above knowledge units. Furthermore, students can participate in reflective and transparent thinking activities, demonstrating high-level thinking processes. Some misconceptions of students have arisen and are corrected by teachers.

Objectives of the study

This study seeks to accomplish the following:

i) Survey the status of math teachers' approach to interdisciplinary teaching, modeling, and experiential teaching in Mathematics.
ii) Find out teachers' views on the application of modeling and experiential teaching in teaching Mathematics.

Research questions

This study seeks to answer two questions:

i) Do math teachers have access to teaching directions for student competency development, interdisciplinary teaching, modeling, and experiential learning?.
ii) How does the math teacher view the benefits, usage, and disadvantages of teaching by modeling and experiential learning?.

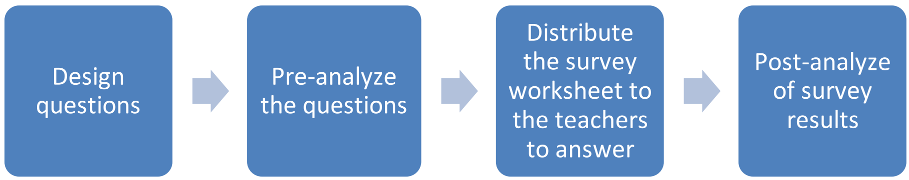
2. METHODOLOGY

2.1. Participants

The sample includes 97 math teachers teaching at high schools in Ho Chi Minh City, Vietnam. They have many years' experience in math teaching.

2.2. The process of the study

The research process is illustrated in the diagram below:



2.3. Instrument

The teacher survey tool includes 12 questions. The teacher survey tool includes 12 questions. These questions were analyzed before the teacher survey.

Questions 1:

Question 1 is given to determine teachers' level of attention in the orientation of student capacity development. The students' capacity development orientation level is an essential factor that governs teachers' learning and application activities towards teaching models towards student capacity development. Therefore, question 1 contributes to explain the current situation of teachers' approach to teaching, according to RME, interdisciplinary, modeling, and experiential teaching. Besides, this is the general orientation emphasized in the new general education program. We believe that question 1 can show the teacher's level of interest in the program's educational viewpoint and, at the same time, indicate the need for a teacher's approach to teaching towards student capacity development.

Questions 2, 3, 5, 6:

Questions 2, 3, 5, 6 are designed to survey training on RME theory, interdisciplinary teaching, teaching modeling, and teachers' teaching experience. This question is the basis for explaining and giving feedback on the teacher's understanding and application of modeling and experiential teaching. Simultaneously, along with question 1, it shows the level of meeting teachers' needs in teaching approach according to RME, interdisciplinary, modeling, and experiential teaching. They are thereby posing the problem of implementing the training and retraining of teachers to meet educational goals' new needs.

Question 4:

Question 4 is given to investigate combining problems in other disciplines and fields into exponential concept teaching. The options offered are of various subjects and fields from science - engineering to economics - society. Thereby, it is possible to evaluate the teacher's expanding scope of understanding exponential concepts concerning other disciplines and fields. From there, it shows the level of interest and ability to apply diverse fields and subjects to teach exponential concepts of teachers.

Questions 7, 8:

Questions 7 and 8 are given to investigate how teachers apply modeling and experiential teaching in Maths teaching practice. Teacher feedback in these two questions is considered about questions 1, 5, and 6 to see the impact of teacher teaching on awareness and training. Simultaneously, the extent of the teacher's application of modeling and experiential teaching to raise the need to enhance activities to help teachers approach modeling and experiential teaching, difficulties (raised in question 10) to encourage or support teachers to apply the two above models in math teaching.

Question 9:

Question 9 is given to survey teachers' perspectives on the benefits of teaching modeling and teaching experience in Mathematics. Teachers' learning and application in teaching may be higher if teachers are fully aware of these teaching models' benefits for teaching and learning math. On the contrary, it is necessary to apply modeling and experiential teaching in the right method and achieve efficiency to see these two teaching models (7, 8). Therefore, to realize the benefits of these teaching models, teachers need to approach, learn, and receive comprehensive training (questions 2, 3). From the response to this question, we can also comment on the teacher's understanding of modeling and experiential teaching and question the training's role—teachers' awareness of RME, interdisciplinary, modeling, and experiential teaching.

Question 10:

Question 10 examines teachers' perspectives on the difficulties encountered when organizing teaching and teaching experience in Mathematics. In particular, for the teachers who have applied modeling and experiential teaching (as surveyed in questions 7, 8), the response to question 10 shows the teachers' difficulties in my teaching practice. Simultaneously, if the teachers answer questions 7 and 8, 11, and 12, the direct effect of these difficulties on the practical application of teaching can be seen. This question is an essential practical basis for finding out measures to help teachers overcome difficulties in applying modeling and experiential teaching to teaching Mathematics.

Question 11:
Question 11 is designed to determine teachers' opinions about organizing teaching to train students' modeling capabilities. The ways are given to increase the role of training modeling capacity for the teaching system. From here, we can see the reality of teaching organization modeling in Mathematics of teachers. At the same time, it is possible to evaluate teachers' level of interest, understanding, and preparation investment for training modeling capacity for students. The teachers' response to this question emphasizes training and the difficulties (outlined in question 10) on the teachers' modeling teaching organization.

Question 12:
Question 12 aims to survey teachers' perspectives on suitable forms to organize students' experiential activities. In addition to showing a point of view on experimental teaching in general, the responses to this question also show the teachers' choice to consider the actual situation. It is related to applying the teachers' experience in various forms of organizing, demonstrating the teachers' knowledge, the role and effectiveness of the training, and the impact of difficulties (outlined in question 10) for experiential teaching.

2.4. Data collection and analysis
The survey questionnaires were distributed to 97 teachers and collected. The questions were grouped into question format for the convenience of analysis. The data were analyzed primarily qualitatively; however, frequency and percentages were also processed to illustrate the data's reliability further.

3. RESULTS AND DISCUSSION

3.1. Question 1: Are you interested in teaching according to the students' capacity development orientation?

Table 1. The statistics of answering questions 1

Choices	Not interested	Less interested	Normal	Interested	Very interested
Frecquency	4	3	22	49	19
Percentage	4.12%	3.09%	22.68%	50.52%	19.59%

Table 1 showed the level of interest of surveyed teachers in the development orientation of student capacity. In which, 19.59% of teachers were very interested, and 50.52% of teachers were interested in this orientation, accounting for a total of 70.11% of teachers. The number of teachers who did not care (4.12%) and had little interest (3.09%) in the orientation to develop student capacity accounts for 7.21% of the total. With the rate of 70.11% of the teachers interested in the orientation to develop learners' capacity, we thought this was a remarkable result. This result showed that most teachers participating in the survey needed to access and learn about capacity development teaching. The higher level of interest showed that the teacher had been mentally prepared to learn and apply teaching models to develop students' competencies. However, 7.21% of teachers were not interested and had little interest in this orientation, along with 22.68% of teachers gave neutral opinions. With the urgent need to prepare for the new general education program's student capacity development goal, it was believed that there should be measures to encourage and mobilize teachers to pay more attention to the orientation of capacity development for learners.

3.2. Questions 2, 3, 5, 6

Table 2. Statistics on the answers to questions 2, 3, 5, 6

Choices / Questions	No		Yes	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Q2	82	84.54%	15	15.46%
Q3	68	70.10%	29	29.90%
Q5	72	74.23%	25	25.77%
Q6	69	71.13%	28	28.87%

Table 2 showed the training situation on RME theory, interdisciplinary teaching, teaching modeling, and teachers' teaching experience. Accordingly, only 15.46% of teachers had been trained in practical math education theory (RME), 29.90% of teachers had been trained in interdisciplinary teaching, 25.77% of teachers trained in teaching modeling 28.87% of teachers trained in experimental teaching. So in all four questions above, most teachers who had not been trained were the majority and a remarkably high percentage (over 70%). As for practical education theory (RME), trained teachers' percentage was relatively low, only 15.46%, less than half of the remaining teaching models.

The fact that teachers had not been trained in RME, interdisciplinary, modeling and experiential teaching models would partly lead to a limitation in their understanding of those models, as well as the teacher applied in teaching (will be analyzed in detail in questions 7, 8, 9, 11, 12). Through a detailed analysis of the questionnaires, we found two issues as follows when comparing the responses in question 1 and questions 2, 3, 5, 6. First, many teachers expressed attention to the orientation of capacity development for learners but had not yet received training; Second, most teachers trained in some teaching models had expressed interest in developing learners' capacity. For the first problem, we found that among the teachers who were interested or very interested in the orientation to develop their capacity, only 50.00% (34/68 teachers) of the teachers had been trained a little in most of the four models listed above. Therefore, 50% of the teachers needed to learn more about the curriculum methodology so that they could develop the capacity of their learners.

For the second problem, we found an encouraging signal that among the teachers who had been trained in at least one of the four above teaching models, there were 80.43% (37/46 teachers). The teacher expressed the level of interest or was very interested in developing the capacity development of learners. Besides, 17/97 teachers, accounting for 17.52% of the total teachers who had not received any training in any of the above models and did not care, had little or neutral interest in the orientation of capacity development for learners. This response showed part of the training's role and effectiveness to the teachers' awareness of the orientation to develop learner capacity. It posed the problem of strengthening the training and retraining activities for teachers about the above teaching models to meet teachers' needs and aspirations in raising awareness, understanding, and applying teaching models to develop learners' competencies.

3.3. Question 4: When teaching exponential functions, you give examples in the following subjects and areas: (You can choose many answers)

Table 3. The statistics of answering question 4

Choices	**Physics**	**Chemistry**	**Biology**	**Archeology**
Frequency	40	31	40	14
%	41.24%	31.95%	41.24%	14.43%
Choices	**Sociology**	**Economy (Finance)**	**Economy (Business)**	**Technique**
Frequency	13	73	28	8
%	13.40%	75.26%	28.87%	8.25%

Question 4 examined the current situation of applying examples in other disciplines and teaching teachers' exponential concepts. Accordingly, Economics (Finance) accounted for 75.26%, which was the most applied field, followed by two subjects of Physics and Biology, with the rate of each subject is 41.24%. These were the areas and subjects with examples of exponential functions mentioned in the Algebra and Calculus 12 textbooks and workbooks and exam papers. Meanwhile, the fields with a low percentage were Archeology (14.43%), Sociology (13.40%), and Engineering (8.25%), with a vast difference from other fields and subjects. These fields were generally not too unfamiliar to teachers and students, but they were rarely mentioned in textbooks and exercise books.

Most teachers based on the forms of examples that had appeared in textbooks and exercise books to teach exponential and inaccessible concepts, expanding the scope of learning on various applications of exponentials in other disciplines and fields. This approach raised teachers' requirements to strengthen and expand the scope of learning about teaching topics in relationship with other disciplines and fields. Thereby, teachers could give diverse, interdisciplinary, and practical examples, creating a premise to apply modeling and experiential teaching in Mathematics.

Particularly in sociology, with the rate of only 13.40%, it was realized that this was an unexpected result because the population problem was one of the critical examples (along with the financial problem). They gave financial problems in textbooks, exercise books, as well as in exam questions. Also, they considered the relationship with the training in RME and interdisciplinary teaching (questions 2, 3); it was believed that the trained teachers tended to relate the concept of exponentials to many subjects, more fields. Specifically, the percentage of teachers who had used examples of at least three subjects and fields to teach exponential concepts out of 35 teachers who had been trained in the theory of practical mathematics education RME or teaching inter-subject was 21 teachers, accounting for 60.00%. Meanwhile, only 35.48% of untrained teachers said they used examples from at least three subjects and fields to teach exponential concepts (22/62 teachers).

3.4. Question 7, 8: How is the level of applying modeling teaching in Mathematics?
How is the level of experiential teaching applied in Mathematics?

Table 4. The statistics of answering questions 7, 8

	Never	**Seldom**	**Sometimes**	**Usually**	**Very Usually**
Question 7	17	38	35	7	0
	17.52%	39.18%	36.08%	7.22%	0.00%
Question 8	19	51	23	4	0
	19.59%	52.58%	23.71%	4.12%	0.00%

Questions 7 and 8 were given to investigate the application of teaching modeling and experimental teaching in teachers' mathematics. For question 7 on the problem of applying modeling teaching in Mathematics, 17.52% of teachers had never applied modeling teaching, and the majority of teachers said that they very little applied (accounting for 39, 18%) or sometimes applied to teaching (accounting for 36.08%). Regularly applying it accounts for 7.22%, a low rate than the total number, and no teacher often applied modeling teaching.

For question 8 about applying experiential teaching in Mathematics, the number of teachers who rarely applied accounts for 52.58%, and 19.59% of teachers had never applied experiential teaching. Only 4.12% of teachers said they regularly applied, and no teacher applied experiential learning in Mathematics very often. With the new general education program's view, modeling was one of the core mathematical competencies that needed to be developed for students, which required teachers to invest in content and methods of applying tissue visualization in teaching Mathematics. Additionally, experiential teaching was a critical content encouraged to be implemented throughout the mathematics curriculum's knowledge areas. However, with the relatively low application rate above, it was believed that it was necessary to have timely measures to encourage and support teachers in approaching, understanding, and applying modeling and experiential teaching experience effectively, often.

Based on comparing with the responses to question 1, it was found that teachers who were interested in the orientation of student capacity development had applied modeling teaching and teaching experience more often. According to statistics, out of 20 teachers who sometimes or often applied modeling and experiential teaching, 16 teachers (accounting for 80.00%) said they were interested or very interested in the orientation of capacity development of learners. Regarding the relationship between the training situation in modeling and teaching experience of teachers (questions 5, 6) with the level of application in teaching, it was reported that teachers who had been trained tend to apply it to teaching with a more frequent rate than untrained teachers. Specifically, out of 36 teachers who had been trained in modeling or experiential teaching, 15 teachers applied it to teach at an occasional or regular level, accounting for 41.67%. Meanwhile, out of 61 teachers who had not received modeling or experiential teaching training, only five teachers applied it to teach occasional or regular levels, only 8.20%. This result showed the vital role of training in the application level of teaching models of teachers.

3.5. Question 9: In your opinion, what benefits will modeling and experiential teaching in Mathematics be? (You can choose more than one option)

Table 5. The statistics of answering question 9

No.	Advantages	Frequency	%
1	Increase the practicality of lessons	84	86.60%
2	Increase students' ability to apply mathematical knowledge to solve problems	80	82.47%
3	Mitigate academic knowledge in mathematics	59	60.82%
4	Help form and develop the capacity for students: self-study; problem-solving; thinking and reasoning; communication; co-operate; calculate; modeling	72	74.22%
5	Help students understand more deeply	44	45.36%
6	Help students have a positive and proactive learning attitude	61	62.89%
7	Create a lively learning atmosphere, avoid boredom	67	69.07%
8	Create opportunities for teachers to improve their pedagogical knowledge and skills	39	40.21%
9	Other ideas...	0	0.00%

Question 9 was given to examine teachers' perceptions and perceptions of the benefits of teaching modeling and experimental teaching in Mathematics. The above data table showed that the views that we gave have most teachers agree; specifically, points 5 and 8 had more than 40% of teachers agreed, the rest of the views were from 60% to more than 80% of the teachers agreed. Accordingly, most teachers agreed with views 1 and 2 on the meaning of teaching modeling and teaching experience in Mathematics, accounting for 86.60% and 82.47%. Point 3 about the benefits of teaching modeling and experimental teaching in student capacity development was 74.22% of teachers agreed, the third-highest rate after two points of view 1 and 2. It was given that the formation and development of different types of competencies for students was the core benefit, the ultimate goal of applying modeling and experiential teaching in Mathematics. Many teachers had been aware of this issue, but the rate of 25.78% of teachers disagreed with point 3 showed that many teachers did not have an appropriate judgment on the role and relationship of teaching modeling and teaching experience for learners' competency development.

Besides, the majority of teachers agreed with the benefits of positive learning activities. Expressly, 62.89% of teachers agreed with point 6, and 69.07% agreed with point 7 on giving students a positive learning attitude and a festive learning atmosphere. However, only 45.36% of teachers thought modeling and experiential teaching helped students understand the lesson more deeply. It was believed this was an unexpectedly low result. The activities were organized adequately in modeling and experiential teaching to help students see how to form concepts, apply concepts, and apply the application scope in practice. That was, deepen students' understanding of concepts.

Only 40.21% of the teachers agreed with this point of view. The majority of teachers had yet to see the opportunity to improve their pedagogical knowledge and skills when applying modeling and experiential teaching. This result could be due to the following reasons: firstly, teachers had not had access to modeling and experiential teaching; Secondly, teachers had approached, but the method of approaching and applying the model was insufficient.

Regarding the relationship with the training or not (questions 2, 3), it was documented that the teachers who had been trained in teaching modeling and experiential teaching are more fully aware of the benefits of applying these models in teaching Mathematics. Although some teachers had not been trained on these issues but had positive and complete responses, it was believed that this was a sign that many teachers had paid attention, self-study, and had a need to approach and apply these teaching models. For the application in teaching, a remarkable result was revealed that many teachers agreed with most of the benefits of applying modeling and experiential teaching in Mathematics; however, teachers' level of the application was shallow. It was thought that teachers understood and awareness of the role of teaching with modeling and experiential teaching, but maybe due to lack of access to training or difficulties in content and methods of teaching these models, so the level of application in teaching was not high.

In short, in order to realize the more benefits of teaching modeling and experiential teaching, it was believed that teachers needed to learn carefully or be trained and applied regularly. From practice applying to teaching, teachers received feedback on the content, implementation methods, and the models' effectiveness, from which there were adjustments in the long term to achieve the best benefits. On the contrary, the awareness of the benefits of teaching modeling and experiential teaching in Mathematics would motivate teachers to learn and apply to teaching more actively and effectively.

3.6. Question 10: When organizing teaching, teaching experience in Mathematics, what difficulties do you face? (You can choose more than one option)

Table 6. The statistics of answering question 10

No.	Difficulties	Frequency	%
1	There is no time to invest in building a situation to organize the experience	74	76.29%
2	Fixed curriculum and teaching process	48	49.48%
3	Setting up a situation and solving it takes time	58	59.79%
4	It is challenging to build situations to organize experiential activities with Mathematics	47	48.45%
5	There are not many resources to design practical problems	39	40.21%
6	There are not many documents about teaching modeling and teaching experience	48	49.48%
7	It is difficult to control and manage the classroom	24	24.74%
8	The material foundations and teaching facilities are inadequate	47	48.45%
9	Students are not familiar with learning by participating in modeling and experience activities to acquire intricate knowledge.	45	46,39%

3.7. Question 11: To train the capacity of modeling for students, how have teachers organized teaching?

Table 7. The statistics of answering questions 11

No	Practice of teaching	Frequency	%
1	Guide students to solve exercises with practical content in textbooks and exercise books	64	65.98%
2	Guide students to solve exercises with practical content in textbooks and exercise books and add exercises to assit students see the application of mathematics in practice.	67	69.07%
3	Guide students to solve exercises with practical content in textbooks and exercise books and add more exercises in the direction of training modeling competencies	52	53.61%
4	Design a new system of exercises in the direction of training modeling capabilities	26	26.80%

Question 11 was designed to learn about how teachers organize teaching to train students' modeling capabilities. In the direction of gradually increasing the content of training modeling capacity in the system of exercises put into teaching, 65.98% of teachers organized by guiding students to solve exercises with practical content in the textbook and exercise book. 69.07% of teachers instructing students to solve exercises with valuable contents in textbooks and exercise textbooks also added exercises to help students see the application of mathematics in practice. The number of teachers who added more exercises in training modeling competencies and instructing students to solve exercises with practical content in textbooks, exercise textbooks accounts for 53.61%. However, only 26.80% of teachers said to design a new system of exercises in the direction of training modeling capacity, much lower than other organizing exercises. The above results showed that the difficulties (raised in question 10) about designing modeling situations and finding modeling references significantly affected teachers' teaching organization model modeling.

The problems with valuable contents in textbooks and exercise books were not enough to organize modeling teaching. On the other hand, though closely following the learned knowledge, the problems' contents were generally not diverse in fields and subjects, mostly simulating practical problems. From the table of data, it could be seen that the actual organization of modeling teaching in Mathematics of teachers mainly based on textbooks and exercise books, the design of problems according to the goal of developing model capacity Chemistry was not considered a central factor. Thereby, we had the basis for concluding that some teachers' level of interest, investigation, and preparation investment for students' training modeling competencies was not high.

Therefore, it was believed that to develop the modeling capacity for students, teachers needed to strengthen the exercises' role in modeling, based on supplementing and expanding the exercises in the textbook and exercise textbooks, exploring and designing new exercises, diversify the exercise system. Besides, it was necessary to strengthen the training and fostering of teachers on how to organize modeling teaching, and at the same time, overcome difficulties in content preparation in modeling teaching (in question 10).

3.8. Question 12: According to you, in the following forms, which form is suitable for organizing experiential activities for students?

Table 8. Statistics of answering questions 12

No	Forms	Frequency	%
1	Organize discussions	58	59.79%
2	Organize games	74	76.29%
3	Organize competitions (Learn Math history)	47	48.45%
4	Organize clubs	60	61.86%
5	Forum	19	19.59%
6	Exchange	15	15.46%
7	Interactive stage	13	13.40%

Question 12 showed the viewpoints of teachers about the appropriate forms to organize experiential activities for students. Accordingly, the form of organizing the game was agreed by most teachers (76.29%), the form of organizing clubs were selected by 61.86% of teachers, and 59.79% of teachers said that comment was an appropriate form. Many teachers also chose the form of organizing competitions (48.45%). Notably, the two forms of the forum (19.59%) and exchange (15.46%) and interactive theater (13.40%) had a relatively low percentage of teachers agreeing with other forms.

Teachers judged forms such as discussion organizations, games, clubs, and competitions to be more suitable for experimental teaching or more feasible. The forms of forums and exchanges and interactive theater had a lower rate of selection. It was believed that in addition to the factor of knowledge and method, the teachers had selected the forms of experimental activities based on the actual teaching situation and other organizational conditions. Based on considering the difficulties in teaching experience (in question 10), the reason was able that the organization of these forms was quite large, making it difficult to plan and difficult to control when conducting—being limited in terms of time in preparation and organization, as well as unfamiliar to the majority of students.

Forms of experiential learning contributed to developing different students' competencies, including qualities, general competencies, and mathematical competencies. Therefore, it was necessary to organize various experiential activities to stimulate the learning spirit and create the most conditions for students' capacity development. However, each form of learning had its advantages and disadvantages and was only suitable for specific content. Various experiential teaching forms needed to be selective and harmonious in terms of content and methods and were suitable for experimental conditions. It was believed that the training activities helped teachers access and master the content and methods of organizing teaching forms, and through practical experience, teachers would know how to select suitable organizational forms for clear goals.

4. CONCLUSION

Through the survey of teachers, some conclusions were drawn as follows:

Most teachers paid attention to the orientation of developing students' competency. This information was a premise to encourage teachers to learn about teaching methods towards competency and create favorable conditions for teacher training and training. The percentage of teachers who had been trained in the theory of practical mathematics education RME, interdisciplinary teaching, teaching modeling, and teaching experience in mathematics is generally not high. Many teachers were interested in teaching orientation to develop students' competencies but have not had the opportunity to approach training.

The scope of interdisciplinary combinations for exponential concepts of most teachers did not have the diversity of fields and subjects. Most teachers often gave examples of subjects such as Physics, Biology, and Economics (Finance). The field of Sociology with the relatively widespread population problem accounted for an unexpectedly low percentage. The degree of applying modeling teaching and teaching experience by most teachers was not regular. However, the teachers who had been trained in teaching modeling or teaching experience tended to apply in teaching more often about the training.

Most teachers were aware of the benefits of applying modeling and teaching experience in Mathematics. Teachers' awareness had a close relationship with whether the teacher had been trained or not and whether it was applied to regular teaching. Teachers who had been trained or regularly applied these models in teaching Math tended to realize the benefits of teaching modeling and teaching experience more fully. Through the survey, the difficulties were seen that teachers faced when applying modeling and experiential teaching in Mathematics, including obstacles in time, program layout, standard stages content, class organization, and students' ability to receive. Among them, there were difficulties that teachers could actively overcome, but there were still problems that required teachers to be trained, fostered, and invested in a long time to overcome.

Regarding the organization of modeling and experiential teaching, the survey showed the following results: Regarding modeling, the majority of teachers relied on real-life problems. The number of teachers investing in designing a new system of exercises in developing modeling capacity was not high in the textbooks and exercise books to train students' modeling capacity (26.80%). Regarding the forms of organizing experiential activities, in general, teachers had applied different forms in the organization of experiential activities; however, the forms had varying levels of choice. For example, the form of discussion, games, clubs, and competitions was judged by most teachers to be more suitable for experiential teaching. In contrast, the forms of forums and exchanges and interactive stages were due to many characteristics points on how and the organization's size had not considered many teachers' applications. Through the above results, it was believed that it was necessary to have measures to encourage teachers to learn about the orientation of developing student capacity, increase teacher training in knowledge as well as skills to apply teaching models such as RME, interdisciplinary teaching, teaching modeling, and experiential teaching in math teaching. Besides, it helped identify and overcome difficulties and limitations to create favorable conditions for teachers to apply regularly and practical results of those teaching models.

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