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Developing Model of Mathematic Instructional for Enhancing Sustainability Analysis Thinking and Achievement of Secondary Education in 10th Grade Students'

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Abstract:- Concepts mathematic about the relationship between various features In the research aimed for developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement. Research was conducted to model of mathematic instructional on the factors including process of organizing the presentation activities, social systems, response principles, and system used to supported. Mathematical analysis process of important for learning management to effectiveness.

Keywords:- *Model of Mathematic Instructional, Enhancing Sustainability Analysis Thinking, Students' Achievement*.

I. INTRODUCTION

Mathematics learning is logical reasoning with systems and formalities through analytical thinking process from problems in various situations. An emphasis on the development of quality and complete learners to physical, mental, intellectual, and emotional. Thai's basic education management in mathematics learning to focuses on the thinking process and analytical skills from the problems in the situation that occur, as well as can be applied to changes in the globalization era of dynamically effective. [1] The development of mathematical skills is learning to know, learning to be able and practical, including the learning skills and the ability to think critically of students for building the knowledge. Model of mathematical learning management to quality and meet to the objectives of the curriculum, from organizing learning processes that focus on the practice of thinking process skills, management and coping situations as well as applying the knowledge to prevented and solving the problems, organizing activities for the students' to learn of real experience by practicing for learning achievement and knowledgeable. [2] Analysis thinking process there is one form of thinking used to look at problems by considering the problem into 3 levels which are the events, patterns of behavior, and systems structure. When to phenomena and problem situations occur, consider creating an understanding of that situation to what are the underlying causes of the situation. [3] Then consider how the underlying cause factors are connected and linked in a rational manner. [4] Which the mathematical analytical thinking process was related to the student's academic achievement with developing model of mathematic instructional for enhancing analytical thinking process, therefore, the studying and developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement in a study to focus on four mains were developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement, studying efficiency of used to mathematic instructional for enhancing sustainability analysis thinking and achievement according to specified criteria 80/80, studying the analytical thinking process and mathematics learning achievement into instructional, include studying a satisfaction to mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education in 10th grade students' of Chumphaesuksa school, Thailand.

II. LITERATURE REVIEW

- *Teaching Model and Teaching Methods*

The teaching model will consist of many factors including teaching objective, students, the nature of the subject matter, technology and materials that can be used, and the characteristics of teachers. Teaching technique is the used of strategies and strategies through selection and decision making. [5] Formulation of teaching techniques must consider important factors in terms of subject matter, students' nature, learning nature and learning of each the students with differences and readiness, the persistence and knowledge transfer. Learning will be valuable to the students only, when the learning is persistent with students and can be traced to learning other things. Reinforcement helps to persist and transfer learning. [6] Select appropriate teaching strategies will be effective teaching were classifying the key characteristics that define the situation of the course, concepts about the relationship between various features, developing the appropriate analytical skills to transfer the selected strategies, and the pursuit of meaningful and reliable feedback in the form of empirical data and effective conclusions. There are teaching operation model that has been organized systematically consistent with the theories and principles of learning management that can help learners learn according to their goals.

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➢ *Instructional to Students' Behavior*

Teaching and learning to focus on the behavior that the learners, it is very important that teachers have to consider the learning psychology that influences learning. The development of the teaching and learning process is at the heart of the problem. How to teach the most effective, and enable each student to learn and develop as much as possible according to their potential. [7] In which the development of the learning process to requires planning for organizing learning activities and promoting teaching and learning management to maximize benefits.

➢ *Enhancing Sustainability Analysis Thinking*

The thinking is the search for meaning from the use of intellect and understanding with the introduction of new knowledge combined with existing knowledge or experience to find answers to create new knowledge. [8] Analytical thinking It mind sets conditions by being open-minded. Which will help to get a reasonable and realistic conclusion throughout the working a cognitive system for leading the behaviors of responds and situation.

III. METHODOLOGY

➢ *Type of Research*

In methodology that is classroom action research. In objective aimed for developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement, studying efficiency of used to mathematic instructional for enhancing sustainability analysis thinking and achievement according to specified criteria 80/80, studying the analytical thinking process and mathematics learning achievement into instructional, include studying a satisfaction to mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education in 10^{th} grade students' of Chumphaesuksa school, Thailand.

➢ *Samples Methods*

The sample methods were the mathematic instructional teachers and the experts of 20 persons into key informant for developing model, and secondary education in 10^{th} grade students' of 106 students in Chumphaesuksa school, Thailand by learning management. The participants of the sample they all were purposive sampling.

➢ *Inquiry Methods*

The respondents were asked to respond into data collection of instrument in developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement. ***Step1 analyzed:*** to study documentary and in-depth interview with instructional teachers and the experts of 20 persons by interview questionnaire in a structure questionnaire for creating and developing model of mathematic instructional to analyzed and synthesize components of model factors. ***Step 2 evaluating model:*** bringing the developed model for 11 experts to evaluate by using the semi-structured evaluation scale of 5 rating scales in order to study the suitability of the model. ***Step 3 using and conclusions:*** bringing a model of mathematic instructional to learning management with secondary education in 10^{th} grade students' of 106 students in 2^{sd} learning units, namely exponential function and logarithmic function, and analytic geometry and conic sections for studying efficiency to model of mathematic instructional according to specified criteria 80/80, studying the analytical thinking process by the systematic thinking process analysis in 4 aspects which are defining issues, sub-factor analysis, finding the relationship between sub-factors, synthesis of problem circuits, which is the 4 choice type by comparing between pre-study scores and post-study scores, and mathematics learning achievement of testing achievement by comparing between pre-study scores and post-study scores, include studying a satisfaction by using the semi-structured questionnaire of 5 rating scales in order to the data.

➢ *Data Analysis*

The data analysis was descriptive statistics, percentage, mean average, standard deviation, and t-test.

IV. RESEARCH FINDINGS

The developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education, 10^{th} grade students' in Chumphaesuksa school, Thailand of the finding were followed:

➢ Model of mathematic instructional on the factors including process of organizing the presentation activities in 6^{th} steps, social systems, response principles, and system used to supported to shown on figure 1.

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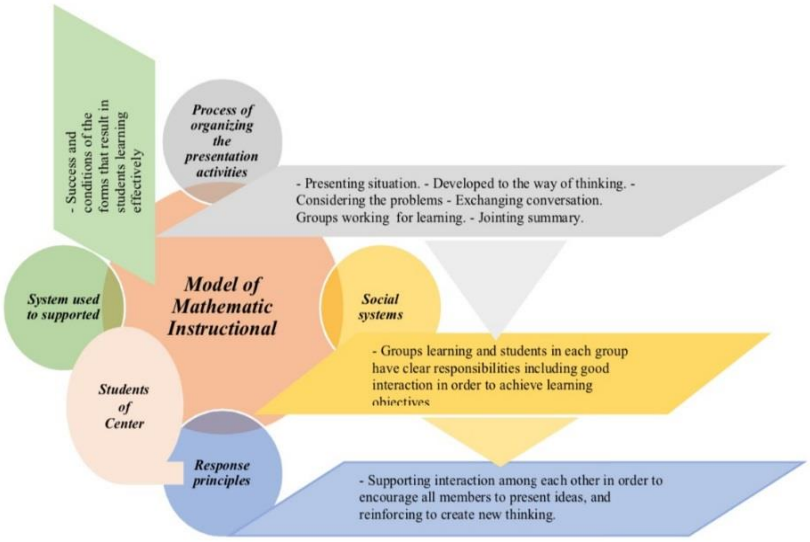

Fig 1:- Model of mathematic instructional on the factors

A. Process of Organizing the Presentation Activities

(1) presenting situation that is the problem which caused the conflict of the problem in order to stimulate and motivate of students have thought, (2) developed to the way of thinking to encourage students to search for information to respond to intellectual conflicts of reasonable answers, and is a response with information for bring it to mind mapping, (3) considering the problems to encourage students to have experience by thinking and learning by themselves, able to identify and identify the cause factors, write relationships between factors that can be designed. As well as writing the circuit causing the problem, (4) exchanging conversation is to encourage students to talk and share knowledge with friends in small groups for each person to have the opportunity to present their work of thinking to friends, and help each other to express their opinions in order to find a conclusion which is the resolution of the group, (5) groups working for learning to encourage students to present their group thinking to a large group meeting, each sub-group will have to send a representative to report the conclusion and the results of the subgroup. Which will help create a new dimension of perspective, (6) jointing summary is a discussion and summary of both the content and concepts obtained from the results of the idea. A academic results that students have discovered, it is correct and confident that in the future students are able to learn by themselves.

B. Social Systems

The teachers must be preparing the situation and questions as well as problem-solving methods, that will be used for students to practice skills**.** Is a creating experience for students by having to learn together as a group, each person has responsibility, good interaction in order to achieve learning goals. By using social skills and group work processes.

C. Response Principles

During the activities, teaching and learning must try to promote interaction of each other within the group, and encouraging all members to express their opinions and courage to speak and do what will benefit the members of the group. Teachers will provide support to help when needed, and provide continuous reinforcement.

D. System Used to Supported

Must prepare questions and prepare teaching materials to be ready and sufficient**,** creating a good learning atmosphere together.

And a level to suitability of the model of mathematic instructional in 4th aspects including principles and clarifying model of mathematic instructional, reason and importance on model of mathematic instructional, concepts can be used as a base for development, and factors to model of mathematic instructional to shown on table 1.

Suitability	**levels**		**Meaning**
	Mean	Stand.	
1. Principles and clarifying model of mathematic instructional	4. 55	0.45	Most
2. Reason and importance on model of mathematic instructional	4.53	0.47	Most
3. Concepts can be used as a base for development	4.57	0.43	Most
4. Factors to model of mathematic instructional	4.58	0.42	Most
Totals	**4.56**	**0.44**	**Most**

Table 1:- Mean, Stand., and suitability level (n=11)

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A level to suitability of the model of mathematic instructional in 4th aspects including principles and clarifying model of mathematic instructional, reason and importance on model of mathematic instructional, concepts can be used as a base for development, and factors to model of mathematic instructional of most levels (Mean=4.56). Which the highest mean as factors to model of mathematic instructional (Mean=4.58, Stand =0.42), inferior as concepts can be used as a base for development (Mean=4.57), and principles and clarifying model of mathematic instructional (Mean=4.55), respectively.

- Efficiency to model of mathematic instructional to shown on table 2.

Scores	Students' numbers	Full scores	Total scores	Efficiency
During study scores (E_1)	106	60	5,438	85.50
After study scores (E_2)	106	40	3,774	89.00

Table 2:- Scoring efficiency to model of mathematic instructional (n=106)

The Scoring Efficiency to model of mathematic instructional into learning management with secondary education in 10th grade students' of learning units, namely exponential function and logarithmic function, and analytic geometry and conic sections had the efficiency lesson equal to 85.50/ 89.00.

- Analytical thinking process and mathematics learning achievement into instructional were followed;
- Scoring analytical thinking process by comparing between pre-study scores and post-study scores to shown on table 3.

Scores	Students' numbers	Mean	Stand.	t	p
Before scores	106	14.03	0.95	16.56*	.05
After scores	106	17.18	0.98		

*$p < .05$.

Table 3:- Scoring analytical thinking process of mean, stand., and t-test (n=106)

Scoring analytical thinking process by comparing between pre-study scores and post-study scores was concluded that posttest scores were significantly higher than pretest scores of significant level at .05 levels.

- Scoring mathematics learning achievement to shown on table 4.

Scores	Students' numbers	Mean	Stand.	t	p
Before scores	106	26.00	0.65	19.90*	.05
After scores	106	35.60	0.74		

*$p < .05$.

Table 4:- Scoring mathematics learning achievement of mean, stand., and t-test (n=106)

Scoring mathematics learning achievement by comparing between pre-study scores and post-study scores was concluded that posttest scores were significantly higher than pretest scores of significant level at .05 levels.

- Level of satisfaction to mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education in 10th grade students' on 4th aspects were efficiency of model, knowledge contents, applying in learning management, and enhancing sustainability analysis thinking and achievement to shown on table 5.

Satisfaction	***levels***		***Meaning***
	Mean	*Stand.*	
1. Efficiency of model	4. 65	0.35	Most
2. Knowledge contents	4.67	0.33	Most
3. Applying in learning management	4.73	0.27	Most
4. Enhancing analysis thinking and achievement	4.76	0.24	Most
Totals	**4.70**	**0.30**	**Most**

Table 5:- Mean, Stand., and satisfaction level (n=106)

Level of satisfaction to mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education in 10th grade students' on 4th aspects were efficiency of model, knowledge contents, applying in learning management, and enhancing sustainability analysis thinking and achievement of most levels (Mean=4.70). Which the highest mean as enhancing sustainability analysis thinking and achievement (Mean=4.76), inferior as applying in learning management (Mean=4.73), and knowledge contents (Mean=4.67), respectively.

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V. DISCUSSION

Developing model of mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education in 10th grade students' on the factors including process of organizing the presentation activities, social systems, response principles, and system used to supported. Suitability of the model at level of most levels. Efficiency using model of mathematic instructional had the efficiency lesson equal to 85.50/ 89.00. Mathematical analysis process and learning achievement of students was concluded that posttest scores were significantly higher than pretest scores of significant level at .05 levels. Satisfaction with used to model of mathematic instructional at level of most levels. Also, in creating and developing the model, there is a systematic development process under the framework of study to basic information, create a teaching model for quality and use it systematically, can be implemented and Promoting efficient management of mathematics. Myers, B. E., & Dyer, J. E. [6] teaching and learning curriculum that is suitable knowledge and content to help the learners to learn according to objectives. By allowing students to respond to what they have learned And able to check one's own learning. Simsek, P., & Kabapinar, F. [8] the principles of constructing must take into consideration the learners and the creators should know what level of the learners (e.g., social foundations, learning ability, original experience of the learners). The development has studied documents related to various factors that have influenced the development of teaching to be effective and effective, including the steps for teaching from explaining the course content, the purpose of teaching and learning development and behavioral objectives. Nasrudin, H., & Azizah, U. [7] the development and analysis of the content prepared appropriately resulting in the learners can learn by themselves from the content that is true and stable. In formulation of concepts and objectives that clearly indicate the importance of learning, aiming for the learners to gain knowledge based on behavioral objectives, can be observed and measured for resulting in higher students' knowledge.

VI. CONCLUSION

Model of mathematic instructional for enhancing sustainability analysis thinking and achievement of secondary education, 10th grade students' on the factors were ***process of organizing the presentation activities;*** (1) presenting situation that is the problem which caused the conflict of the problem in order to stimulate, (2) developed to the way of thinking to encourage students, and is a response with information for bring it to mind mapping, (3) considering the problems to encourage students to have experience by thinking, (4) exchanging conversation is to encourage students to talk and share knowledge, (5) groups working for learning to encourage students to present their group thinking to a large group meeting, , (6) jointing summary is a discussion and summary of both the content and concepts obtained from the results of the idea, ***social systems;*** the teachers must be preparing the situation and questions as well as problem-solving methods, ***response principles;*** during the activities, teaching and learning must try to promote interaction each other within the group, ***system used to supported;*** must prepare questions and prepare teaching materials to be ready and sufficient**,** creating a good learning atmosphere together. Suitability of the model at level of most levels. Efficiency using model of mathematic instructional had the efficiency lesson equal to 85.50/ 89.00. Mathematical analysis process and learning achievement of students was concluded that posttest scores were significantly higher than pretest scores of significant level at .05 levels. Satisfaction with used to model of mathematic instructional at level of most levels. Which to mathematical analysis process is important for learning management to students of effectiveness.

REFERENCES

[1]. Thai's Basic Education Commission. 2016. A guidebook for evaluation of student-centered assessments. Bangkok: Office.
[2]. Office of the Education Council, Ministry of Education. 2017. Policy and strategy development of education Quality. Bangkok, Thailand: Ministry of Education. The office.
[3]. Suwit Munkham. 2005. Analytical Teaching Strategies. Bangkok: Print Limited Partnership.
[4]. Pimphun Dekupt. 2007. Self Thinking Process and Intellectual Structure. Bangkok: Success Media.
[5]. Pathumwan Somri. 2010. Model of Learning Management by Integrating Sufficiency Economy Philosophy in Secondary Schools. Thesis. Maha Sarakham: Maha Sarakham University.
[6]. Myers, B. E., & Dyer, J. E. 2006. Effects of investigative laboratory instruction on content knowledge and science process skill achievement across learning styles. Journal of Agricultural Education, 47(4), p. 52-63.
[7]. Nasrudin, H., & Azizah, U. 2010. Improvement thinking skills and scientific attitude using the implementation of "group- investigation cooperative learning" contextual oriented at acid, base and salt topic in junior high school. Proceedings of the 4th International Conference on Teacher Education; Join Conference UPI & UPSI Bandung, Indonesia, 2010 (8-10 November), p. 763-772.
[8]. Simsek, P., & Kabapinar, F. 2010. The effects of inquiry-based learning on elementary students conceptual understanding of matter, sciences process skills and sciences attitudes. Procedia Social and Behavioral Sciences, 2(2010), p. 1190-1194.