

## The Model of Analytical Thinking Skill Training Process

<sup>1</sup>Sudjit Montaku, <sup>2</sup>Paiboon Kaittikomol and <sup>2</sup>Pairoaj Tiranathanakul

<sup>1</sup>Learning Innovation in Technology Program,

<sup>2</sup>Media Arts and Media Technology Program,

Faculty of Industrial Education and Technology,

King Mongkut's University of Technology, Thonburi, Bangkok, Thailand

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**Abstract:** Critical thinking skills are most important. Because critical thinking is a fundamental to the operation in all matters. The purpose of this research on the Model of Analytical Thinking Skill Training Process were to develop the model and to assess the quality of the model. The model was developed by three steps: model development; model validation and model evaluation. The techniques used to develop analytical thinking skills were D-M-I-H (Differentiation, Mining, Integration and Hierarchy) with activated coaching. The content in the model was related to Sternberg's Theory: the ability of analytical thinking skills. The model was employed with 5 steps in the classroom situation: warm up, demonstrate the skill, step by step coaching, full step coaching and evaluation. The experts in the field evaluated the model with mean 4.33 (full scores ) and SD 17. The model of analytical thinking skill training process will help develop critical thinking skills of the people to the higher level.

**Key words:** Analytical thinking skill, educational method, learning achievement, training process, demonstrate, Thailand

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### INTRODUCTION

The education in Thailand has been conducted by the Ministry of Education by determining the educational reformation scope to improve the educational operation and solve or reduce the former problems. The educational quality was also developed towards the needed goals. The level of quality and educational standards were potentially raised for self-development towards good life quality including developing the country and living happily in the society with 4 aspects of educational reformation: school and educational institution reformation; teacher and educational personnel reformation; curriculum and teaching learning process reformation and educational administration system reformation (Ministry of Education, 2010).

In the year 1999, there was a National Education Act in 2002, there were a National Education Act B.E. and Amendments (Second National Education Act). One of the important parts was focused on the quality of education especially the quality of learners (Office of the National Education Commission in 2003). The management of learning focused on learners was from the fundamental belief that the important educational goal

was on the learning of the learners as stated in the National Education Act in 1999 (NEA) of Thailand. That was the law determined to solve educational problems section 24. The learning process was to facilitate the learners thinking skill process especially analytical thinking skills (Chaowakeeratipong, 2002).

It was found that the Thai student achievement continuously lowered every year. For instance, in the year 2009 the scores of the Ordinary National Educational Test (O-Net) of 5 subjects: Thai, Social Studies, English, Mathematics and Science. The student in grade 12 had the average scores <50% from all over the country. The results could be from the lack of intention in doing the test and the examination questions were analytical thinking oriented while the learners were familiar with multiple choice examination questions or elective response examination (The Office for National Education Standards and Quality Assessment (Public Organization in 2010).

It was found that the results of an Aptitude test on the Thai language and thinking (GAT 1) and (GAT 2) of 891 1st year students at Muban Chom Bueng Rajbhat University in semester 1 in the year 2010 were <50% and the level of quality needed the improvement.

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**Corresponding Author:** Sudjit Montaku, Department of Learning Innovation in Technology Program,  
Faculty of Industrial Education and Technology, King Mongkut's University of Technology,  
Thonburi, Bangkok, Thailand

**Objectives:**

- To develop the Model of Analytical Thinking Skill Training Process
- To assess the quality of the Model of Analytical Thinking Skill Training Process

**Literature**

**Analytical thinking:** An analysis meant to examine and to break information into parts by identifying motives or causes, making inferences and finding evidence to support generalizations (Bloom, 1969).

An analysis meant to classify the elements of something into parts in order to find what it was made from and how such elements were related. Besides, the analytical thinking meant the ability to classify such factors of something and to find the reasonable relation among those elements in order to find the real causes of happening things (Chaowakeeratipong, 2002).

Analytical thinking is the abstract separation of a whole into its constituent parts in order to study the parts and their relations (Farex Inc., 2010). Furthermore, bloom taxonomy defined the analytical thinking in the words as follows: analyze, arrange, connect, divine, separate, order, breakdown, correlate, diagram, discriminate, focus, illustrate, infer, outline, prioritize, subdivide and point out (Larry and Annette, 2010).

In conclusion, analytical thinking meant the thinking of separation into constituent parts based on reasons, principles, functions or contextual condition including the ability to organize groups in relation to different items, to put the items in order of the importance.

**Content of analytical thinking:** An analysis could be classified into 3 small parts (Bloom, 1969):

- Analysis of elements meant to classify what was important or necessary or had the most roles and which one was the cause or the result
- Analysis of relationships meant the search for the sub relationship of the stories or evidence and how they were related, consistent or contrary
- Analysis of organizational principles meant the search for the structure of system or matter of stories and different actions and to see how they were related

**MATERIALS AND METHODS**

Synthetic model had the following steps:

**Analysis:**

- Study, search and analyze related document, text, academic article, research and journals both in the country and foreign countries
- Construct the body of knowledge in developing thinking skill and analytical thinking skill from document analysis in order to construct the semi structure interview

**Research study:** The researcher conducted the research by adding 3 related topics.

**Student interview:** The samples of the university students were interviewed on the concepts of analytic thinking skill training process by 7 university instructors. The samples were purposive sampling.

**Data analysis:** Data analysis was to analyze the qualitative interview data in the descriptive characteristics of data.

**Synthetic Model:** The research used the data from document analysis, research results and interview data to construct the Analytic Thinking Skill Training Process Model. Find the accuracy and appropriateness of the model by student interview to confirm the analytic thinking skill training process with these 4 parts:

- Construct the instrument such as semi structure interview to collect data from the experts
- Check the accuracy with confirming model by the in-depth interview expert samples of 5 university instructors through purposive sampling
- Analyze data
- Revise the model as suggested by experts

**Evaluate the Model of Analytical Thinking Skill Training Process:**

- Construct the instrument such as the questionnaire on opinions of analytical thinking skill training process to collect data from the experts
- Distribute questionnaire to 9 sampling instructors by purposive sampling
- Analyze data

**RESULTS AND DISCUSSION**

The result of analytical thinking skill training process development. The Model of Analytical Thinking Skill Training Process was shown in Fig. 1. D-M-I-H process

Table 1: Criteria for quality levels of analytical thinking

Criteria	Quality levels				
	Fail (0)	Improve (1)	Fair (2)	Good (3)	Excellent (4)
The right outcome from D-M-I-H process	Could not do	Differentiation	Differentiation+ Mining	Differentiation+ Ming +Integration	Differentiation+Mining+ Integration+Hierarchy

Table 2: The frequency of student opinions towards appropriateness, possibility, accuracy and application of analytical thinking skill training process

Analytical thinking skill training process	Opinions of five educators							
	Appropriateness		Possibility		Accuracy		Application	
	Appropriate	Inappropriate	Possible	Impossible	Accurate	In accurate	Useful	Disadvantage
Warm up	5	-	5	-	5	-	5	-
Demonstrate the skill (D-M-I-H process)	5	-	5	-	5	-	5	-
Step by step coaching (D-M-I-H process, Flexible practice, Scaffold)	5	-	5	-	5	-	5	-
Full step coaching (D-M-I-H process, Flexible practice, Scaffold)	5	-	5	-	5	-	5	-
Evaluation	5	-	5	-	5	-	5	-

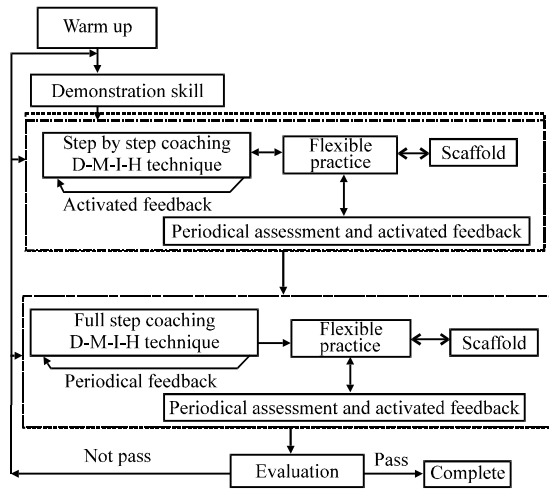


Fig. 1: The Model of Analytical Thinking Skill Training Process

(Differentiation, Mining, Integration and Hierarchy) was used for the evaluation. Each item in the activities was based on rubric scoring with 5 levels: fail, improve, fair, good and excellent. For the passing criteria, the learners had to get good level. The details of the quality level were as follows (Table 1).

From Table 2, it was found that all 5 educators agreed on all aspects in every process. For the interview of those 5 educators, it was concluded that such a process was an innovation because it was synthesized from teaching theory, learning theory, training theory, thinking training theory evaluation and measurement theory, graphic presentation theory and D-M-I-H theory including research and the result of the interview into the new Model of Analytical Thinking Training Process.

## CONCLUSION

According to the Model of Analytical Thinking Skill Training Process, the learners spent time for training and doing the most by themselves. The learners were given periodical feedback so that they would know whether they did correctly or incorrectly. The instructor also explained and provided additional information for better understanding. During the training, the instructor supervised and followed up the learners for advice all the time. The activated coaching practice was used to encourage the learners to think as having a coach. The learners would be aware of analytical thinking skill training and reduced boredom during training. The learners were given several items on exercises with various content situations in order to do so many times of training that they could gain higher skills with the support of learners as Scaffold. When the learners doubted or needed additional information or reinforced the understanding in training in accordance with Explicit Teaching Model. That was the training by conducting guided practice and providing feedback and corrections.

In the warm up step, the experts' evaluation revealed that the relevance was in the high level. It made the learners interested, intensively trained and had good attitudes towards training as Missouri Teaching (Good and Grouws, 1977). In this step, the warm-up activities were used to review former lessons, encourage interest and readiness.

In the step of advising by demonstrating the skill from the experts' evaluation, it was found that the relevance was in high level in accordance with Hunter's Model of Teaching. In the sub step, the instructor presented in the form of modeling.

In the advising training through step by step coaching, the experts' evaluation revealed that the relevance was in high level in accordance with the process of Explicit Teaching Model by dividing the topics owing to the level of difficulty.

In the training by full step coaching, the experts' evaluation revealed that the relevance was in high level in accordance with the process of Explicit Teaching Model. The learners were provided training by assignment independent practice. The instructor would give learners feedback and correction after the end of activities.

For the analytical thinking skill development with activity process technique based on the process of D-M-I-H (Differentiate, Mining, Integration and Hierarchy) evaluated by the experts, it was found that the relevance was in high level. It was in accordance with the constructivist learning process. Besides, the learning with mind mapping was used as the instrument in operating the analytical thinking skill training based on analytical thinking principles in Sternberg and Bloom Theories integrated with Bloom's Analytical Thinking Principles.

The Model of Analytical Thinking Skill Training Process presented in this research, therefore could be considered as one teaching model in Thailand and could be used in solving the problems of analytical thinking skill for thai students nowadays and in the future.

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