

DEVELOPMENT OF AN INSTRUCTIONAL PROCESS USING STERNBERG'S FOUR STEP MODEL AND HEURISTICS CONCEPT TO ENHANCE MATHEMATICAL REASONING AND PROBLEM-SOLVING ABILITIES OF SIXTH GRADE STUDENTS

***Miss. Nopharet Thammasaranyakun**
Ph.D. Student of Curriculum and Instruction Program
Thesis Advisor; Assoc. Prof. Pimpun Dachakupt, Ph.D.
Thesis Co-Advisor; Prof. Yurawat Kraimongkon Ph.D.
Chulalongkorn University, Bangkok, Thailand

Abstract

This research paper was aimed to explore the development research on account of the objective toward 1) develop learning and instruction development procedure by means of Sternberg technique and Heuristic concept so long as empower the logical reasonable competencies & mathematical resolution from 6 grade students 2) to evaluate the efficiency of learning and instruction by expert in which was included of appraisal of learning & instruction procedure technique efficiency from experimental & sampling group that was 6 grade students into Ban Nai Wieng school, Phrae province at approximately 2 classroom. It was divided into classroom of 18 students total at 36 students that was experimental group and controlling group of learning and controlling group in which was composed of 4 stages 1) the interaction with authentically contingency situation resolution 2) problem analysis resolution 3) feed back reflection resolution 4) application & implementation of processing & renewal resolution. Moreover, the research device was used from experimental operation in direction with mathematical logical reasoning of capability application form & mathematical resolution capability evaluation application form of mathematical means of information analysis implementation form, standard of deviation: S.D., T-test of statistical figure. research result was on procedure action toward development already no matter the teaching approach orientation by means of teaching development 4 stages of Sternberg's model and Heuristic theory. It was aimed to develop the competencies from logic reason paradigm & mathematics resolution into content throughout other level in progress

*Teacher, Ban Nai Wieng school, Muang district, Phrae province, Thailand 54000

e-mail Address nopares1@hotmail.com

Key words: INSTRUCTIONAL PROCESS, STERNBERG'SFOUR STEP MODEL, HEURISTICS CONCEPT, MATHEMATICAL REASONING, PROBLEM-SOLVING

Background

Equally important, education was one of the procedures toward human resource development in which was generated into culture heritage & being local wisdom instruction for society at large. In addition, mathematics was not important role just a key toward learning development perspective so as to learner thinking with a view toward logical reasoning application rapidly. Nevertheless, mathematics had been crucial function in direction with several disciplinary subject of the world at present times throughout globalization diversely; notwithstanding, it was transferred into high technological interdependency based society in line with one person had been depend on systematic thinking capability, critical thinking approach, analytical thinking, logical reasoning thinking, thoughtful resolution thinking and decision making. Its covered was emphasized on body of knowledge toward mathematical disciplinary competencies throughout learner learning paradigm. Moreover, learner had a potential capability of mathematical skill thinking including mathematical factor impact competencies in every day life in which was along way with fundamental studying for further studying level. Besides, mathematics was used into dairy life processing in respect with individual development skill & potential acceleration of complete human asset. It was triggered such as reasoning perception, reflective person, creative thinking person, steadily systematic thinking person, chronological ordering discipline person of planning scheme, performance responsibility assignment person and resolution solving person of capability. (Siriporn Thipkhong, B.E.2543) Many countries curriculum course was concentrated on absolute mathematics worldwide that internal citizen had a capability of mathematics with a view

toward the more potential empowerment skill; therefore, these countries had ever the higher thinking energy empowerment capability force also.

Coincidentally, teacher must design the learning management toward contingency situation determination or problem development so as to attain of learning's skill fundamental standard/mathematics process on 5 perspectives.

Accordingly, it was reflected into problem resolution and reasoning paradigm both skill competencies; on the other word, another procedure was very indispensable toward problem resolution & reasoning perception was defined with thinking process or reasoning scrutiny skill. It was taken place so long as consider the exit way to problem resolution throughout introduction component integral part such as observation from knowledge & traditional experiences and so on. Its cover was expression toward language exhibition display including speaking and written skill competencies and so long. Given this above reasons, the problem resolution skill had ever been involved with reasonable perception transaction in which was caused into thinking childhood evolution in direction with concrete level of reasoning paradigm till abstract level of reasoning paradigm. The reason logics linkage competencies skill had also been acquisition with other sciences or another disciplinary subject; consequently, problem resolution & reasoning perception skill had important role toward studying & learning development including thoughtful learning skill development. Accordingly, these skills had mentioned for problem resolution, reasoning logical paradigm skill. Due to this explanation, skill/procedure was one of the most important factor impact penetrations in line with problem resolution having related with reasoning expression behavior in terms of thinking procedure, reasonable scrutiny skill so as to consider & discover the problem resolution approach. It was continual dependency on account of fundamental component such as observation, knowledge & traditional experiences and so long. Certainly, it was behaved & expressed toward perception of language both speaking or written language because problem resolution & reasoning retrieval skill was taken place of children in respect with thinking evolution by means of logical reasoning from concrete level toward abstract level. Its cover was integrated of reasonable linkage relationship with a view toward other sciences or other disciplinary subjects. Consequently, problem resolution & reasoning paradigm was very important & indispensable toward learning & studying development progress including thinking evolutionary from learner's style of problem resolution eagerly. Besides, the appropriateness toward thinking development skill had ever been agreement of clause on account of reasonable person & problem resolution competencies by means of mathematics such as 4 styles' Sternberg model.

4 styles' stage Sternberg model was purpose toward pinpoint of teacher target on account of student learning for good thinker encompassed reaction both ask & answer question puzzle style between teacher & student each other having been get along well. Students had learned throughout saying words & methodology paradigm toward balanced analysis orientation, creativity approach & capable thinking potential empowerment skill so as to be equivalence from thinking activity. (Alice, Barbara and Celia, 1988) Besides, mind vision was from saying words interaction in which was contingency crisis on accordance with thinking development competencies. Afterward, consideration skill methodology had ever been pinpointed on how teacher taught no matter of had been interaction a conversation dialogue platform with others including other students throughout thinking encouragement impact. Style 4 methods' Sternberg had been explained problem strategy 4 stages in which were ordering of teaching & learning's student such as 1) Student Acquaintance with problem & puzzle 2) Retail group resolution discussion resolution 3) On during group resolution 4) Individual resolution. Accordingly, problem style had taken place with learner who had been necessary competencies of thinking resolution consideration so as to classify & select useful and compatible information efficiently. In addition, it was depended on update information along way with sudden problem taking place because knowledge & problem resolution might adapt & change with a view toward context & social environment that was crucial toward mathematics thinking resolution skill. (Sternberg, 1996)

Presently, modern learning style governance had ever motivated with learner's studying achievement result proliferation in which was very interesting on account of thinking development's student having been reasonable concept & mathematics resolution potential skill particularly Heuristics approach & orientation.

The mathematics teaching style was compatible throughout Heuristics orientation in which Floyd (Floyd, 2002: 1-4) had said that Heuristics thinking orientation in touch with decision making factor of students' problem resolution. Given these reasons, students could construct option & alternative choices in direction with independent problem resolution such as strategic formulation determination capability, technique, procedure and rules & regulations from studying. In addition,

Heuristics thinking approach had affected on self conceptual framework extension of students worldwide; therefore, they could control self thinking orientation capability so as to comprehend understanding & body of knowledge instruction alright. Moreover, researcher had implemented problem based teaching technique from Heuristics thinking of mathematics resolution from Krulik, S., and Rudnick, J. (Krulik, S., and Rudnick J., 1993) that was summarized into stages procedure in line with mathematics resolution 5 stages such as 1) reading tactics & problem thinking 2) finding tactics & planning 3) strategy selection tactics of problem resolution 4) answer discovery tactics 5) reflection method tactics & extension. In addition, Heuristics was involved with logical reasoning paradigm throughout mathematics from Krulik, S., and Rudnick, J. (Krulik, S., and Rudnick, J. (1993)) had a short summary & conclusion on accordance with logical reasoning stages for mathematics resolution teaching summary 5 stages such as 1) comprehension understanding tactics of problem 2) problem analysis tactics 3) problem resolution approach & reflection feedback 4) monitoring accountability approach tactics 5) feed back reflection tactics. Truly, Heuristics methodology approach was teaching style of assistance toward students' analysis between cause and result so as to comprehend leading toward capability of reasoning paradigm correctly & appropriately. It was on procedure toward principle & method obviously in direction with problem resolution procedure & stages of methodological framework toward studying so as to bring about satisfied outcomes. These were selective consideration deliberation on account of multiple diversifications into answer finding of problem resolution including the best alternative consideration of answer. Those were reasonable guide line having led toward reasonable people; consequently, students should desire leading approach of logics making in line with reasonable using of mathematics as follow.

Research Objectives

This research paper was aimed to develop learning & teaching methodology throughout 4 style stages of Sternberg & Heuristics concept so as to empower capability on account of logical reasonable perception & mathematics resolution from primary school students' level 6 as objectives follow.

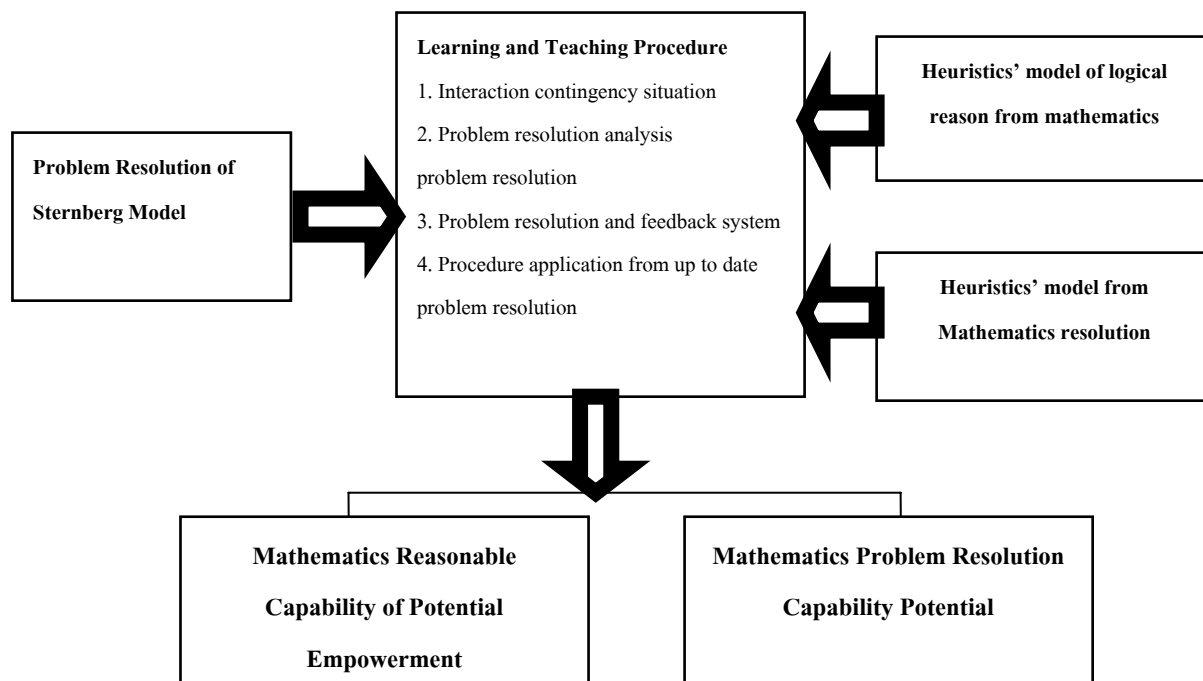
1. To develop learning & teaching procedure methodology throughout 4 style stages of Sternberg & Heuristics concept theory so as to instruct a capability of logical reasonable perception & problem resolution capability in terms of mathematics from primary school students' level 6.

2. To assess and appraisal learning technique procedure efficiency by means of expert & effectiveness appraisal from learning & teaching procedure by 4 stages style of Sternberg & Heuristics concept so as to build & empowerment the logical capability & mathematics problem resolution capability having been experimentalism with primary school students' level 6.

Research Methodology

Actually, research paper was aimed toward develop learning procedure and process stage by means of 4 stages of Sternberg's model & theory and Heuristics' concept model so as to empower the logical reason competencies and mathematics problem resolution from primary school level 6 in which was composed of 3 stages. It was followed of 1) learning development process 2) learning process procedure of experimental action 3) learning procedure of quality assessment & appraisal.

Learning & Teaching Conceptual Framework



Research Operational Equipment

1. Learning initiative syllabus from already development
2. Capability assessment application form toward mathematics reasonable logics paradigm & mathematics resolution potential capability on account of capability assessment form

According toward research conduct, this paper was on procedure in terms of learning & teaching development procedure tactics. Therefore, researcher had a research questionnaire of quasi-experimental research in which experimental sampling group and controlled group along way with pretest-posttest control group design. In addition, information analysis was on operation from means value, standard of deviation: S.D. and t-test result.

Qualitative Result Information Analysis

Coincidentally, qualitative information research accountability was involved with learning & teaching procedure and research equipment device throughout expertise. This research paper was aimed to implement learning & teaching technique development in direction with quality control monitoring such as teaching & learning perspective dimension. Its cover was such a concept & fundamental theory toward learning procedure development, learning & teaching component factor in which was composed of principle, objective of learning & teaching dimension and result assessment appraisal, learning result achievement example. It was along way with learning scheme initiative in respect with learning procedure development and capability assessment capability in terms of mathematics logical potential assessment form and mathematics resolution of capability assessment form. Also, quality control monitoring was related with learning & teaching procedure including research equipment by means of expertise officer. During this research operation, sampling experimental group was involved with sampling group from research equipment by means of expertise officer. It was operated with primary school students' level 6 along way with Ban Nai Wieng, Phrae province of educational area department, territory no.1 in which was on procedure for 40 hours, 10 weeks afterward sampling group was assessed into capability appraisal in terms of reasonable & logical interpretation including mathematics resolution from researcher instruction.

Result

Actually, research result was from learning & teaching procedure development throughout 4 styles of Sternberg's model and Heuristic theory so as to empower capability the logical reasonable capability & mathematics resolution from primary school students' level 6 at partial section as result follow:

1. Students had studied with learning procedure throughout 4 styles of Sternberg's model & Heuristics theory. It was found that mathematics learning achievement result at higher standard at least

rate ratio throughout educational academy department. It was such a higher than 75% of experimental scoring of all paper publication.

2. Students had ever learned with learning & teaching process throughout 4 stages of Sternberg's model and Heuristics theory. It was found that reasonable capability from mathematics resolution including mathematics solving paradigm. Later, post test conduct was higher than experimental group of pretest experiment operation at the statistical significant level at .05 figures.

3. Students had also studied with learning procedure by means of 4 stages of Sternberg's model & Heuristic theory in which was a capability on account of reasonable logic potential & mathematics resolution having been higher than ordinary studying group at the statistical significant level at .05 figures.

Accordingly, research result was on procedure action toward development already no matter the teaching approach orientation by means of teaching development 4 stages of Sternberg's model and Heuristic theory. It was aimed to develop the competencies from logic reason paradigm & mathematics resolution into content throughout other level in progress.

Discussion and Conclusion

In brief, learning & teaching development procedure was along way with 4 stages of Sternberg's model & Heuristic theory so as to empower the logical reason competencies & mathematics resolution from primary school student level 6 that had Discussion and Conclusion as follow.

1. Learning & teaching procedure technique was involved with learning development tactics in the level 6 primary students on account of reasonable people including authentically situation life resolution already.

2. There was an obligation toward learning & teaching development procedure in style of different forms so as to be appropriate content for learning development implementation in progress.

3. Mathematics teacher should bring learning procedure toward skill development and mathematics procedure so as to empower the capability in other aspect perspectives for other students in progress.

The results from the study research suggest some useful guidelines as the following.

For teaching and learning mathematics:

Although the instructional model is practical for mathematics instruction, the teachers should be aware of students' abilities to catch up with the planned activities. Their basic knowledge and learning experiences will be an importance factor affecting the transferring competencies.

For future research:

More studies mathematical reasoning and problem-solving should be conducted more in order to seek for model that can develop students' thinking abilities and empower student' learning for mathematical sense. This kind of research in the future should focus more on mathematical thoughts.

References

Thai Language Textbook

Science & Technology Teaching Acceleration Institutions. (B.E.2547). **Reasoning of Mathematics in the level of Primary school along way with fundamental educational course syllabus.** Bangkok: S.P.N. Press Publication.

Science & Technology Teaching Acceleration Institution. (B.E.2543). **Learning Standard and Learning Series Group of Science & Technology.** Bangkok: Science & Technology Teaching Acceleration Institution.

English Textbook

Carpenter, T.P. & Levi, L. (2000). **Developing Conceptions of Algebraic Reasoning in Primary Grades,** Retrieved July 22, from <http://www.wcer.edu/ncisla>.

Kaput, J.J.(2005). **Transforming algebra from an engine of inequity to an engine of mathematics Power by "Algerian" the K-12 curriculum.** Washington. D.C.: National Academic Press.

- Krulik, S. , and Rudnick, J. (1993). **Reasoning and Problem Solving. A Handbook for Elementary School Teachers**. Boston: Allyn and Bacon.
- National Council of Teachers of Mathematics. (1989). **Curriculum and Evaluation Standards for School Mathematics**. Reston, VA: The National Council of Teachers of Mathematics.