THE IMPACT OF TEACHING METHODOLOGIES IN MATHEMATICS EDUCATION ON STUDENTS AT ASSUMPTION COLLEGE (ENGLISH PROGRAM)

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Abstract: This research was conducted to explore the methods used in educating students in mathematics. The intention of this research is to take a close look at the method that would be most effective and also attract student's interest in mathematics. The sample of this study includes 89 students from Assumption College who are currently in grade 9. The students were divided into the experimental group and the control group and various different teaching methodologies were used. In order to support teachers in creating effective instructions, the instructional models created cover a wide range of instructional goals. These instructional models support teachers in determining how to use the new teaching approaches and also when to use them. The instructional model being used in this research has four categories which are reasoning, reorganizing, remembering and relating. One of the most often used methods in this research was cooperative learning which fosters relating skills, where students work in groups. It is expected that students are more interested and perform better in mathematics. Surveys were also done on the students to ask for their viewpoint of how teaching impacts them. This will also support in understanding what students are interested in. Further research may be done exploring into the other methods that could be used and also testing it on other group students to check whether the result matches.

Introduction

Education, the source of knowledge, has become the most influential aspect of our lives. Education begins the minute an infant opens his/her eyes to see the world. Then learning happens through simple actions and simple words. As we grow, education involves going to school, socializing with friends, participating in various activities in school and many others. School is the time where children develop the basic skills of living and learning the different environment and relationships that they may encounter in life. The school period for a child is one of the most knowledgeable periods of their lives. While in college, we learn through experiments, researches where we begin to reason out why things are the way they are. As an adult, we are educated through the work we do or during the process of pursuing our career. Therefore, our life is an active process of learning and educating ourselves.

One area of education that we often encounter through our lives is mathematical calculation, beginning with simple addition & subtraction and then moving on to more complex algebraic equations and differentiation & integration, and later to finance and accountings. We are also doing so kind of calculation whether it is calculating how much money we have or which product is cheaper. Therefore, being fluent with the basics of mathematics can support us in effectively living our lives.

Since the very beginning of mathematical education, importance was given to how the subject was being delivered to the student. Mathematics is not about memorization or merely understanding, it requires the students to get a concept and perform in solving problems. However, mathematics today has taken a huge turn from being about problem solving to memorization. Students find it difficult to understand the concept and solve problems, so they give up and survive the school year barely passing in mathematics. Students often think that Math doesn't make any sense. A math professor at Morehouse College said, "I think when students say math doesn't make sense; it just kind of hurts me because nothing makes more sense than mathematics. Everything fits together beautifully and logically and so in some sense if it doesn't make sense, somewhere we have failed to help you see why it makes sense."(Bullock) Since education is not about the teacher but it is about the students, the research is going to explore into the teaching methods that makes a difference.

Education has taken a new shape in today's world. Moving away from direct instruction and memorization, other teaching methodologies have been introduced and are now being used in the classroom. Instructional models are designed for different purposes. Some are created to have students think critically, while others are created to help students learn in a collaborative manner. However, the instructional method used in a classroom depends both on the content as well as the teacher's thinking (Lasley II & Matczynski & Rowley, 2002). Therefore, teachers also play an important role in the teaching- learning process. In order to support teachers in creating effective instructions, the instructional models created cover a wide range of instructional goals. These instructional models support teachers in determining how to use the new teaching approaches and also when to use them. The instructional model being used in this research, based on the work of Hanson, Silver, and Strong (1986), Joyce and Weil (1986, 1992) and Joyce, Weil and Calhoun (2000), has four categories which are reasoning, reorganizing, remembering and relating.

The reasoning category consists of teaching methodologies that allow the students to think in order to process information and create hypothesis and find solution. It allows the students to get involved in critical thinking and problem solving. The main teaching models that fall under reasoning are concept attainment and inquiry. Concept attainment, based on the work of Jerome Bruner et al. (1959) is created to have student create

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concept through positive and negative examples. The students are able to define the concept and also understand the important characteristics of the concept. While the inquiry method of teaching, based on the work of Richard Suchman (1962), has students create questions, hypothesis and theories that they find a solution to. It supports students to have critical thinking and students become more skilled in problem solving.

The reorganizing models involve teaching methodologies that have students apply their knowledge on new situation. It this process, students develop their intellectual skill and learn hoe to apply their idea and knowledge. The teaching methodologies include concept formation and synetics. Concept formation, created by Hilda Taba (1971), helps the students to organize and make connections between various concept and data. Students will be able to create hypothesis, group data based on their similarities, and also label the different categories of information. Synetics, created by William Gordon (1961) allows students to use their imagination as a tool to solve problem. Students are able to explore and be creative.

The remembering skills allow students to acquire information and remember it through practice. This model emphasize on the retention of knowledge rather than creating or analysis. The instructional design involves mnemonics and direct instruction. Mnemonic, based on the work of Pressley, Levin and Delaney (1982) and Lorayne and Lucas (1966) involves having students memorize ideas and acquire information. Students are able to remember both low level information as well as complex information. Direct instruction, based on the work of Anderson, Evertson, and Brophy (1979), Good and Grouws (1979), Hunter (1984), and Rosenshine (1983), helps students learn basic skills and pieces of information. Direct instruction involves step by step sequences of teaching to help the students remember facts.

The model that supports relating skill allows students to develop their understanding of themselves and others and also their communication skills. This model involves student in group process approach and team-oriented skills, developing students in relating with others as well as the topic. The instructional model that supports relating skills includes cooperative learning and oral discussion. Cooperative learning, created by Slavin (1980, 1987) and Johnson, Johnson, Holubec, and Roy (1984), supports students to develop team work and students get an opportunity to experience working with others in cognitive task situation. Students also get an opportunity to develop their leadership skills, cultural diversity and effective communication with other group member. While oral discussion helps teachers check students understanding and it also creates interaction within the classroom.

These models of teaching and learning have been applied to different field of education. Subjects like Science, English and Math, for all of these teachers can select from one or more models and apply it in the classroom. It is always effective to use several teaching methodologies in one classroom creating a variety and holding on to the attention of the student.

Mathematics classroom is often based on direct instruction where students learn from what the teacher is saying and teaching. The teacher presents a formula or a method to solve a math problem and then students individually try it through practicing. There is less use of inquiry and imagination of the students and also less emphasis on team work and interactive skills. Therefore, moving from the traditional way of teaching mathematics, this research is aimed at bringing in other different models of teaching mathematics and applying them in the classroom. This is to create more student-centered learning, involvement and interest. The research is looking at what teaching method would be most effective in capturing student's interest in mathematics and at the same time lift their performance and score. The main model being implemented in this research will include a combination of cooperative learning inquiry as well as direct instruction.

The research will narrow its scope down to a school in Thailand called Assumption College. Assumption College is one of the most prestigious schools in Thailand. It was founded in 1877 and is now in the 125th year of providing education to Thai students. Assumption College is located on the Chareon Krung road next to the Chao Praya River. It is a boy's school. It also consists of the English Program. Assumption College opened the English Program (**EP**) in the academic year 2002 as a selective program for the students who want to learn and enhance their English skills.(…Reference wat) We introduced it at the junior high school level, and now we have EP Mathayom Suksa 1-6 completing the program. The research will base its findings on the English program students studying in the Mathayom 3 level which is equivalent to grade 9.

The research objectives are: 1. To compare the teaching methods used in mathematics. 2. To determine the impact of the different teaching methods in mathematics on student learning. 3. To determine the teaching methods that creates effectiveness in student's achievement.

Based on the above specified teaching model, this research aims at exploring into teaching method that may shift student's point of view about mathematics. Taking a close look at teaching methodologies that would inspire the students to learn Mathematics; the researcher will be able to gather information about the student's perspective and interest as well. Student's perception is very important for this research as it is about creating an inspiring environment for students to learn. Therefore, it is very important to understand what the students think. Therefore, this research will explore into the methodologies that would inspire the students to learn and perform well in mathematics.

Method

Participants

One group of participants was studied, students (population: 500 students of Assumption College English Program, sample: 89 students studying in Mathayom 3 or grade 9) in Assumption College, English Program who were divided into two groups:

- Control group: participants that had the usual teaching using direct instruction, 47 students from section 2 and 3 of grade 9.
- Experimental group: participants that received the treatment of new instructional methods that involves group work and cooperative learning, 42 students from section 1 and 4 of grade 9.

Instrument

In this research, the two main instrument used were questionnaire and observation. The observation was done on the students who received the treatment of the new instructional methods involving group work and cooperative learning. The questionnaire was created in order to understand the students respond to the different teaching methodologies used on them. The questions in the survey were created based on the following teaching models, based on the work of Hanson, Silver, and Strong (1986), Joyce and Weil (1986, 1992) and Joyce, Weil and Calhoun (2000):

- Models that foster Reasoning skills: (2 items)
  - Concept Attainment
  - Inquiry
- Models that foster Reorganizing skills: (3 items)
  - Concept Formation
  - Synetics
- Models that foster Remembering skills: (3 items)
  - Direct Instruction
  - Mnemonics
- Models that foster Relating skills: (3 items)
  - Cooperative Learning
  - Oral Discussion

The questionnaire also asked the students for their opinion on the class environment. The questions focused on the different environment that fosters or may not foster learning. All the questions were rated ranging from 1-4, where 1 referred to strongly disagree, 2 disagree, 3 agree and 4 strongly agree.

Procedure

Observation: In the first part of the experiment, students were first divided into the control group and experimental group. The Mathayom 3 class consists of 4 different sections, section1 and 4 were assigned as experimental group and section 2 and 3 were assigned as control group. The control group was taught using the teaching method that the teacher uses all the time. The students sat in rows and the teacher used direct instruction and note taking in most of the lessons. The experimental group was subjected to different teaching styles and models including cooperative learning, group discussion, inquiry, direct instruction. The students sat in groups of 3-4 students during every class and also received their score as a group. This experiment was carried out during the second half of their first semester after the students have taken their mid-semester examination. The Experimental Group student's behaviors were observed and the test scores between terms were compared.

Survey: After the instrument has been checked for its validity by three experts, the questionnaire was given to the two groups of students: the experimental group and the control group. The students filled out the questionnaire after the experimental period. The collected data will provide information on student's viewpoint on the teaching methodologies that suits the students and foster their learning.

Results

As the students in the experimental group were subjected to cooperative learning, they began every lesson with getting into groups. The groups were assigned by the teacher where each group had students with varied intelligence level. Some of the observations are as follow:

- When the students were assigned their groups, there was resistance and dislikes among members of certain group. This impacted how the students learned together as they did not like the group they were assigned to. This was seen also in the result their created together as a group. The students that weren't satisfied with their group members did not produce good work or did very little work when they were assigned.
- The students in each group were asked to create their own scoring sheet, where they set the way they can receive points. A sample of the scoring sheet is provided in the Appendix. This created group work to be fun and competitive as every time the group members do something good they get a plus point or if a member did something inappropriate in class he may earn a negative point for his group. This kept students motivated and involved their attention to perform.
- Some students did not put in effort into the group work or even their own work as it was being done by the smarter students.
- During certain task where random students would be selected to talk in front of the class or show the work on the board, the group members were determined that everyone in their group were able to perform the task.
- There were also side talking where students who had nothing to do, or the work was being done by 1 or 2 person in the group, would talk among themselves and cause ineffectiveness and disruption.
- The class was slow and disruptive and sometimes ineffective as the teacher had to focus her attention on classroom management.
- There was a lot of getting adjusted to the new way of teaching and learning. Students

experienced excitement sometimes whiles sometimes it was upsetting to be in groups.

- The students were related, the smarter student's took it on as their responsibility to support the slower students. Team work and family was created within each group.

The above observations were made during the classes of the students that worked with cooperative learning. There are a few drawbacks that require improvement and strategy. However, the results of the students will be compared in order to make further conclusion of this research.

Conclusion

Looking at the observations made during the experimental classes, the students did make an effort to work together in groups and get related to each other. Results were created to a certain level, and there was a lot of getting adjusted to the new way of teaching and learning. Students experienced excitement sometimes whiles sometimes it was upsetting to be in groups.

This research was based on the different teaching methods that may create a math classroom to be more interesting and effective. However, this research faced certain limitations while carrying out the experiment. The difference in the student's intelligence, ability and English skills is one of the draw back in involving students in activities and supporting them to get along well with other students in their groups. The difference in the amount of time spent on each class due to the school activities and interruptions also caused a major impact on effectively producing the required results. The interruptions impacted student's interest and ability to effectively produce results.

Further research can be done to see if other class level produces the same result. Taking other aspects of teaching and learning into account, research can be done to deepen the impact of new teaching methods on mathematics education. The researcher can also implement other teaching methods to a greater extend, producing wide range of results. Henceforth, creating math to be a subject worth learning.

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