

MODEL ATI (APTITUDE TREATMENT AND INTERACTION) & QAIT (QUALITY, APPROPRIATENESS, INCENTIVE, TIME) IN MATHEMATICS EDUCATION

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Abstract

QAIT learning and ATI model focus more on the adjustment of learning with diverse student characteristics, to meet the needs of different students. Furthermore, the best lesson would not be successful if students are not motivated to learn it or not provided sufficient time to enable all students to learn. Students have the power of comprehension, absorptive, thinking power and intelligence of unequal power between one student and another student in a classroom. Therefore, how to educate and learn the students actually vary depending on the level of intelligence of each student. But what happens during this is a uniformity of procedure of learning in every classroom, as if all students have the characteristics and motivations of the uniform. In fact, the characteristics, motivation, every student was very different, so I taught him was to be diverse. Especially in mathematics, learning mathematics, learning or teaching and learning activities in this lesson is different from other lessons. This is because mathematics, including lesson that is difficult when compared to other lessons. This paper will discuss QAIT Learning Model (Quality, Appropriateness, Incentive, Time) and ATI (Aptitude Treatment and Interaction) in Mathematics Education. Model approach and Aptitude Treatment Interaction (ATI) is a learning model that can serve students' individual differences, that is tailor treatment / treatment (teaching method) with the characteristics and motivation of students. In application, it emphasis more on the provision of treatment (treatment) that differ in learning, based on the characteristics of each group of students (high, medium, low). Model ATI will be effective when combined with QAIT model, because this QAIT model will consider time spent on the students to learn in relation to the amount of time they need to learn. The time needed is a product orientation and ability to learn, time is actually used depends on the time clock is available for learning, quality teaching and student persistence.

Key words: *Models of Learning ATI (Aptitude Treatment and Interaction) and model QAIT (Quality, Appropriateness, Incentive, Time)*

A. Preliminary

Characteristics of students in the classroom are as diverse or different, they differ in levels of performance, speed of learning and learning styles. They differ in ethnicity, culture, social class and language within the family. They differ in gender. Some gifted in one area or more. These differences and others may have important implications for teaching, curriculum and school policies and practices. The diversity of students and their meanings are important issues in education, educators must understand some of the most important ways in which students are different and some ways in which educators especially teachers can receive, accommodate and appreciate the diversity of students in learning. In the face of diverse students in the classroom teacher can not be uniform in their own learning. For that Slavin necessary "adjustment of teaching to the needs of each individual" is an important thing to be practiced in the practice of teacher learning (Slavin, 2008: 132). Candiasa opinion "even if a single factor theory and the theory of two factors allow the uniform process of learning, but it would be better if individuals with intelligence and different learning styles have different learning services." In fact, continued Candiasa, pemberagaman learning due to differences in intelligence gained after Thurstone described the intelligence and giftedness (aptitude) to some factors known capabilities with multiple factors

(multiple factors), namely verbal ability (verbal comprehension), numeracy (number), the ability of geometric (spatial relations), word fluency (Word Fluency), memory (memory), and reasoning (reasoning).

Furthermore, the demands of the diversity of learning more visible again on the theory of multiple intelligences (multiple intelligence) from Gardner. The theory of multiple intelligences states that human intelligence and giftedness consists of seven semi-autonomous components, namely intelligence of music (musical intelligence), kecerdasan body-kinesthetic (bodily-kinesthetic intelligence), logical-mathematical intelligence (logical-mathematical intelligence), intelligence space (spatial intelligence), interpersonal intelligence (interpersonal intelligence), and intrapersonal intelligence (intrapersonal intelligence). Well, in order to obtain the optimal learning, different intelligences should get a different service learning.

The term aptitude in this paper is also known for its intelligence. Intelligence can be defined as a general aptitude for learning or an ability to learn and use the knowledge or skills (Slavin, 2008: 163). Snyterman and Rothman (1987) defines that intelligence is the ability to deal with abstrasi, to solve problems, and to learn. The biggest problems arise when we ask whether there is something called a general talent? (Sternberg, 2003). Many people appear very good at calculus but can write a good essay or make a good painting if they depended on it. In addition to intelligence, according to Candiasa, cognitive style is also quite strong influence on the learning process. As stated by Witkin which distinguish individuals based on the individual's cognitive style

Field independent individuals tend to think the analysis, reorganized the teaching materials according to their own interests, to formulate their own learning goals internally and prefer the internal motivation. On the other hand, field dependent individuals tend to think globally, following the structure of learning material is, following the existing learning goals and prefer the external motivation, of field independent and field dependent individuals.

Other psychological symptoms that can distinguish the individual in the learning process is learning style. Searching intelligence interaction treatment appropriate student learning styles needs to be done, some studies have found positive effects for programs that tailor instruction to individual learning styles (Dunn, Beaudrey, 1998)

The ability of the early participants should also receive consideration in the learning process. Initial capability is strongly influenced by individual experience in interacting with their environment. Therefore, differences in environment can lead to differences in initial ability. Initial ability differences lead to differences in the ability to elaborate on new information to build cognitive structures. By looking at the differences were apparently in the individualization of learning are also required in order to obtain optimal learning results. When we see the principles of mathematics learning is also necessary to understand the development of mathematics students individually. Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it properly. (NCTM, 2000: 20). To achieve high-quality mathematics education teachers should: (1) understand deeply the mathematics they teach, (2) understand how students learn mathematics, including the development of mathematics to know individual students, (3) selecting the tasks and strategies will improve the quality of the learning process. The task of teachers is to encourage students to think, ask questions, solve problems, and mendiskusikan ideas, strategies, and completion of students (NCTM, 2000: 18). Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge. (NCTM, 2000: 20).

Mathematical learning requires not only skill but also requires skill count to think and reason mathematically to solve new problems and learn new ideas that will confront students a period to be dating. Hudodo Herman explained that mathematical thinking is a mental activity, which in the process, always using the abstraction or the process to conclude the same things from a number of different objects or situations and generalizations (Herman Hudoyo, 1999).

Therefore, teachers are expected to create a learning atmosphere that enables students to understand and master the subject matter together. This can be done by selecting the learning model, method or strategy. Model ATI approach allows the creation of a conducive learning atmosphere. (Treatment) that match the abilities of students, carried out optimally and effectively to improve learning outcomes.

In the model approach ATI, all students are given preferential treatment based on their respective capabilities, so that in the presence of the different treatment of academic achievement / student learning outcomes will increase. This means that, academic achievement / learning outcomes obtained by students is influenced by the conditions of learning which was developed by classroom teachers in the form of treatment (treatment) special. Thus it is implicit that the more suitable treatment or method of learning (treatment) applied by teachers with different abilities (aptitude) then the optimal student learning outcomes are achieved. To create effective learning, in implementing the ATI model, psychology experts offer an effective teaching model, this model explains the most important characteristics of high-quality lessons and how they are connecting with one another to improve the quality of learning. The model in question is a model QAIT (Quality, Appropriateness, Incentive, Time).

QAIT model which consists of four elements, namely the quality of teaching, teaching the proper level, incentives and time. These four elements must be adequate. No matter how high the quality of teaching, students will not learn a lesson if they do not have the ability or prior information required, if they do not have the motivation, or if they do not have the time they need to learn these lessons. On the other hand teaching *kalaumutu* low, there will be no difference how *banyakpun* known to students, how they are motivated or how much time they have. In this paper two models will be integrated ATI and QAIT, in the sense in implementing models of ATI for the achievement of effective teaching required QAIT model.

B. Discussion

1. Aptitude Treatment and Interaction (ATI) in Mathematics Education

Aptitude Treatment and Interaction (ATI) is an approach that seeks and finds treatments (treatment) that match the differences in ability (aptitude) of students, which is treated optimally and effectively applied to students of different ability levels (Crombath, in Nurdin : 2005). While Snow argued that ATI is a model approach to learning that seeks to tailor learning to the characteristics (aptitude) of students in order to optimize academic achievement / learning outcomes. This approach was developed based on the assumption that the optimization of academic achievement / learning outcomes can be achieved through the adjustment of learning (treatment) with different abilities (aptitude) of students (Snow in Nurdin: 2005).

From Snow's statement illustrates the reciprocal relationship between student learning outcomes obtained by setting the conditions of learning. This means that, *presrasi* academic / student learning results obtained are influenced by the conditions of learning which was developed by teachers in the classroom. Thus, implicitly means that the more suitable treatment / method of learning (treatment) is applied teachers with different abilities (aptitude) of students, the more optimal learning outcomes achieved.

From some of the above description, it appears that ATI essentially aims to create and develop a learning model that really care and pay attention to the relationship between a person's ability to learn or experience is typically with the learning method (treatment). To achieve these objectives ATI tries to find and choose a number of approaches, methods, strategies, tips that will serve as a treatment (treatment) is appropriate, the treatment according to differences in student ability. Then through an interaction that is *multikatif* developed these treatments in learning, so that eventually can be created optimizing academic achievement / learning outcomes. The higher the optimization of academic achievement / student learning outcomes, the higher the level of success (effectiveness) ATI model development approach in learning. For the level of success (effectiveness) ATI approach to model development can be achieved well, then the implementation should be noted several principles: First, that the interaction between ability and treatment of learning takes place in a complex pattern, and continually influenced by variables *duties* / position and situation. Second, that a structured learning environment is suitable for students who have low skills. Meanwhile, a less structured learning environment (flexible) suitable for smart students. Third, for students who lack confidence or have difficulty in adjusting, learning tends to be better when in a highly structured learning environment. In contrast to students who have high self-confidence, learning will be better in a flexible learning situation.

In implementing the model of ATI's approach, the problem of grouping and setting the learning environment for each student ability characteristics, is a fundamental problem that must be considered by the teacher. ATI learning models Stages are as follows:

a. Early Treatment

Providing early treatment of students with aptitude testing is intended to determine and establish the classification of students according to ability level and at the same time to know the potential of each student's abilities in dealing with information and new knowledge.

b. Grouping Students

Grouping students based on the results of aptitude testing, are classified into three groups consisting of students with high, medium and low.

c. Providing treatment (treatment)

In each treatment group was given a deemed fit / suitable to their characteristics. Students with high given treatment in the form of self-learning through the modules plus the independent learning through modules and math text books that are relevant. Students who have medium and low ability are given conventional lessons or regular teaching. While students who have low skills are given more treatment in the form of re-teaching and tutorials that can be given by teachers or tutors who have received advice and guidance from teachers.

d. Achievement Test

At the end of each implementation, testing performed in the assessment of academic achievement / learning outcomes after learning treatments given to each group of students 'skills through some trials and improvements and revisions, held achievement test to measure students' mastery of what has been studied. After learning using various ATI ended with treatment (treatment) identified previously, was then performed posttest to the three groups of students. Scores / posttest value achieved at the end of the lesson students will be used as material analysis to determine the level of success (effectiveness) ATI learning model development.

2. Model Quality, Appropriateness, Incentive, Time (QAIT) in learning Mathematics

QAIT learning model is a model that focuses on elements that can be modified by the teacher or school that is Quality, Appropriateness, Incentive and Time (quality, accuracy, incentives and time). In QAIT learning model, the four elements should be sufficient for learning to be effective. The following will explain the purpose of the elements QAIT:

- a. Teaching quality is the extent to which the presentation of information or the ability to help students easily learn the material. Quality of teaching is largely the product quality of curriculum and presentation of the lesson itself
- b. Exactly that is the extent to which teachers ensure that students are ready to learn a new lesson (that has the ability and knowledge necessary to learn it) but have not received these lessons. In other words, the level of teaching a lesson *tersebut sudah* appropriate if not too difficult and not too easy.
- c. Incentives that is the extent to which teachers ensure that students are motivated to do the tasks of teaching and to study the material being presented.
- d. When that is the extent to which students are given enough time to learn the material being taught.

QAIT learning model is suitable for use in mathematics lessons. Mathematics is a field of study that are considered difficult for students. According to Best (2003: 252) mathematics is a way to find answers to the problems faced by humans, using the information, using knowledge about the shape and size, using knowledge of the counting and the most important thing is to think in human beings themselves in viewing and using the relationship -relations.

Students often have difficulty in learning mathematics. Difficulties in learning mathematics called *diskalkulia* (*dyscalculis*). This term has a medical connotation that views the relationship with the central nervous system disorders. (Lerner, 2003: 259). This difficulty is not only a low rate capability *menimpah* students only, but also experienced by students who are capable of average and high ability. There are several factors causing difficulties in learning mathematics. First, the material taught by teachers means teachers do not make sense not link new

information with what is already known to students and did not present the material in a sequential and orderly. Second, the level of teaching that is less precise. Third, lack of motivation to students.

According to Lerner (2003: 259) there are some characteristics of children learning mathematics berkesulitan namely the disruption in spatial relations, abnormalitaspersepsi visual, visual-motor associations, perseverasi, difficult to know and understand the symbols, appreciation disorders of the body, difficulty in language and reading and Performance IQ far By knowing the nature of mathematics and the difficulties faced by students in learning mathematics, QAIT model is very suitable to be applied to solve various problems. This is because this model can explain how to connect to each other four elements that have been described. The relationship between the elements in the model QAIT and its relationship to mathematics are:

Teaching Quality. This refers to some action in the first place most people think when they think about teaching. The most important aspect is how far these lessons make sense to students. This is the most important thing in learning mathematics. To ensure reasonable lesson, the teacher should present the material with a sequential and orderly. Teachers need to connect new information with what is already known to students. Sometimes the concept would not make sense to students. Therefore, for the concept makes sense let the students find or experience it for yourself. For example the concept of numbers can be taught by way of introducing itself figures, the number of objects that show the numbers and words that show the number itself. For example:

△	△△	△△△	△△△△	△△△△△	△△△△△△
1	2	3	4	5	6
satu	dua	tiga	empat	lima	enam

The concept of size can be taught in a way the students measure the length of the board, weigh heavy objects, or assess the amount of money. The measurement should start from a coarse to fine, for example from step to meters, from inch to cm, from considering the use of lifting weights and so forth

Another important aspect of quality teaching that is how far the teacher to monitor how well students learn and adjust teaching pace so that it does not last too fast nor too slow. It is very important in learning mathematics, because if students do not understand mathematics items from the beginning, then to study the matter further would be difficult. How should teachers do to find out how much material has been arrested students is by asking questions. If the answers show that students follow the lesson, the teacher can proceed with the next material a little faster.

Appropriate level of teaching. The level of knowledge, ability and motivation of each student is different. The diversity of students requires that teachers provide an appropriate level of teaching. Teachers can always be sure that if they gave a lesson materials to all students in a class: some students may have learned the material much more quickly than other students and even some students may not get these lessons at all. In mathematics is essential to accommodate differences in student abilities. If this is ignored low-ability students who would probably fail because they do not have the prerequisite skills, and students with high end will feel bored with something which for them is a slow learning rate.

Some students will be able to answer the questions the division before he studied and some students can not answer these questions. The best way to overcome differences in student ability that is by the use of appropriate methods of collaboration, where students who have different levels of performance can help each other (Schniedewind & Davidson, 2000).

Incentive. Incentive or motivation is needed in the learning process. Therefore, in the model QAIT incentives is an important element to generate awareness of students in learning. However students must be motivated to do the tasks. Especially in mathematics who are in need of motivation to do the questions. Problems are different and complex will make students bored. Therefore, motivation is needed so that when hit, the student will keep trying until you find a solution. How to give

teachers an incentive to the students in learning math is different. One way is to assess student work. Gold, Reilly, Silbernman and Lehr, (2009: 142) found a higher performance in a given class value. In addition, teachers also can motivate students to dare to do math problems on the board by providing benefits such as stars or other prizes. Also give praise to the students even though the answer is wrong so that students are still motivated to do math problems.

Surprising or challenging students with questions that can not be solved with the current students' knowledge can lead to curiosity and motivation. A seventh-grade teacher in the UK set an example to motivate students in a math lesson on equivalent fractions. First he ordered the students to divide duadan then split two more fractions $\frac{8}{13}$ and $\frac{12}{20}$. By working in pairs, they immediately agreed $\frac{4}{13}$, and $\frac{2}{13}$, $\frac{6}{20}$ and $\frac{3}{20}$. Then he gave them $\frac{13}{20}$. After a few moments hesitation, the students came back with $\frac{6\frac{1}{2}}{20}$ and $\frac{3\frac{1}{2}}{20}$. "My goodness? All the fragments in this fraction makes me scared! "If there is no other way that we can use to simplify this? "Round?" A student suggested. "Use decimal"? Another student suggested. Finally, after much discussion and debate, these students realize that they can use their knowledge of equivalent fractions to find the answers $\frac{13}{40}$ and $\frac{13}{80}$. Driving students to a familiar pattern and then break that pattern will motivate and involve the whole class, which makes them far more effectively than is possible just by explaining it from the beginning. The element of surprise that challenge students' understanding at this time, making them very curious about issues that might not ever consider their previous.

Time. The last element QAIT model is time. Time available should be used as effectively as possible. In mathematics, teachers must be able to divide time. For example, how much time is used to describe materials, frequently asked questions and discuss exercises.

3. Role of Teacher Aptitude in the application of Model Treatment and Interaction (ATI) and Quality, Appropriateness, Incentive, Time (QAIT) in learning Mathematics.

Implementation QAIT model in ATI approach will produce an effective pembelajaran. John Carroll as the inventor of QAIT model describes that learning would be better if more time is for students to learn in relation to the time they need to learn. The time needed for product orientation and ability to learn, time is actually used depends on the time clock is available for study, teaching and student persistence (Slavin, 1998: 51). In addition to the time in learning QAIT focused on elements that can be controlled directly ATI is the teachers in implementing the quality, accuracy of learning, incentive or motivation to learn and time

Furthermore, Slavin (1998: 52) adds to QAIT be effective, each of the four elements that should be sufficient. No matter how high the quality of teaching, students will not learn a lesson if they do not have the ability or prior information required, if they do not have the motivation, or if they do not have the time they need to learn these lessons. On the other hand teaching kalaumutu low, there will be no difference how banyakpun known to students, how they are motivated or how much time they have. The most important aspect of quality of teaching is the extent to which these lessons make sense. Introduce a prerequisite material by linking knowledge that has been known by the learner, motivate learners to be active and creative as well as explaining tips or rules of the game how students work both individually and in groups, is an activity that must be implemented beginning teachers in each learning process takes place. Then, with a growing positive attitude towards learning activities, by: conducting quality learning, indicating that these materials are useful and provide feedback to show student progress.

The role of teachers in the implementation QAIT (Quality, Appropriatenes, Incentive, Time) in ATI in mathematics are as follows:

- a. Delivering learning objectives
- b. Informing the material to be studied
- c. Inform models of learning and the steps
- d. Grouping of students based on aptitude testing
- e. Providing learning module to the high group

- f. Explain the material to the group of medium and low
- g. Increase the peer tutors and give freedom to the low group to select a peer tutor
- h. Conduct assessment and guidance to students
- i. Applying the method of peer tutoring and training directly to the group terbimbing lower than the initial lesson
- j. Providing training
- k. Appoint peer tutors
- l. Assist students in concluding lesson.
- m. Giving the post test at the end of the learning

QAIT included in certain steps of the above steps, for example in delivering the learning objectives, teachers should conduct brainstorming, deliver the benefits of the material. In informing the material should be packed in such a way, so students interested in understanding the material that informed; in the division of the group not only from the teachers who assess, students participate in assessing themselves, whether students, including groups of high, medium and low. Assessment should support the learning of important mathematics and provide useful information for teachers and students (NCTM, 2000: 22).

In presenting a lesson to the group of medium and low, the level of teaching is appropriate if lessons are not too difficult, or not too easy for students. In even this method is disclosed that the teacher brought a new concept with a number of questions, so that the construct pengetahuan previously with the new. The flow of association (Russeffendi, 1991:129) says, "a new concept which will be studied it must dikaitan students with a familiar concept. The more powerful the better terms he will learn. " In addition, Ausubel (Ruseffendi, 1991:172) argued that meaningful learning is learning to understand what is gained is associated with other conditions so that learning is better understood.

C. Conclusion

The concept of model approaches and Aptitude Treatment Interaction (ATI) is an approach that seeks and finds treatments (treatment) that match the differences in ability (aptitude) of students, which is treated optimally and effectively applied to students of different ability levels. ATI is a model of learning approaches in an attempt to tailor learning to the characteristics (aptitude) of students in order to optimize academic achievement / learning outcomes.

Implement all the steps in the ATI need to be assisted with QAIT model (Quality, Appropriateness, Incentive, Time) for effective learning can get maximum results for all students both groups less, medium and high, not only dominated by the high group only, because of his understanding lessons adjusted to the precision of mathematics learning, motivation and the time required by each group, especially for each individual.

ATI learning models Stages are as follows:

- a. Early Treatment
Conducting initial tests to determine and establish the classification of students according to ability level and at the same time to know the potential of each student's abilities in dealing with information and new knowledge.
- b. Grouping Students
Grouping students based on the results of aptitude testing, are classified into three groups consisting of students with high, medium and low.
- c. Providing treatment (treatment)
Students with high given treatment in the form of self-learning through the modules plus the independent learning through modules and math text books that are relevant. Students who have medium and low ability are given conventional lessons or regular teaching. While students who have low skills are given more treatment in the form of re-teaching and tutorials that can be given by teachers or tutors who have received advice and guidance from teachers.
- d. Achievement Test
At the end of each execution achievement test to measure students' mastery of what has been learned.

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