The Role of Self Efficacy and Affective Aspect Toward Student’s Mathematics Learning Achievement

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Abstract. Self efficacy (SE) is a believe on how far an individual can measure his/her ability in solving problem. If it is related to learning, student with high SE will make effort as much as possible to be able to complete the assigned task; he/she will achieve optimum learning achievement. This means that the higher student’s SE, the higher student’s learning achievement. Therefore, SE has important role toward student’s mathematics learning achievement. Meanwhile, there is another factor which also has important role towards mathematics learning achievement, which is the affective aspect. Affective aspect is the quality which shows a person’s characteristics in showing their feeling or emotion. The role of affective aspect in learning will provide information on how the student feels and values mathematics from his/her point of view. The better the student’s value towards mathematics, the learning achievement will be optimum. Therefore, both SE and affective aspect, both have important role towards mathematics learning achievement. However, SE has stronger role towards student’s learning achievement compared to affective aspect. Student with high SE and affective aspect will achieve high learning achievement, whereas student with low SE and affective aspect will achieve low learning achievement. Student with high SE and low affective aspect will achieve high learning achievement, but student with low SE and high affective aspect not necessarily achieve high learning achievement. Finally, the teachers are suggested to pay more attention to the student’s development of SE, because it is an important factor towards mathematics learning achievement.

INTRODUCTION

Mathematics is a basic science that supports the advancement and development of science and technology in the era of globalization. Mathematics is the basic science, which surely is by root of science and technology development [1]. Mathematics can develop independently, can also be developed in accordance with the needs of other fields that require mathematics. Given the importance of mathematics, it can be understood that at every level of education; from elementary to secondary school level, mathematics is one of the compulsory subjects.

In mathematics at school, there are several factors that are important to mathematics learning achievement. These factors can be either internal or external factors. The internal factor is the factor that comes from within the student such as attitudes, interests, motivation, self-confidence, self-efficacy, etc. External factors are factors derived from outside the student such as the environment and peers. Beliefs, self-concept, attitudes and self-efficacy are all interrelated and are likely to affect academic achievement (Relich & Way, 1994; Philippou, 1998; Thompson, 1992). It is argued that in the area of mathematics education, Reviews These factors form a complex network that brings about changes in mathematics achievement [2].

In connection with the study of mathematics, self-efficacy (SE) is one of the vital factor to the mathematics learning achievement. Self-efficacy is the foundation of human agency [3]. Furthermore, Bandura defines SE as an individual’s belief in its capacity to solve the problem given [4]. According to Bandura and Schunk, self-efficacy is the judgments we make about our potential to learn successfully and the belief in our own capabilities [5]. The choices we make, the effort we put forth, and how long we persist are influenced by self-efficacy. This is in line with what is expressed by Bandura, 1997; Pajares and Kranzler, 1995 that the SE is the social cognitive approach defined as a conviction of an individual against his/her capacity to organize the activities in completing a task [4].
Based on these descriptions, it can be concluded that the SE is owned by individuals who are confidence of their capacity and skills to complete the task. If it is associated with learning math, self-efficacy has been assessed as individuals’ judgments of their math capabilities in solving specific problems, perform math-related tasks, or succeed in math related courses (Betz & Hackett, 1983) [6]. Therefore, if a person has strong SE, then he/she can complete any task assigned optimally. This is in line with the opinions of Jerusalem and Schwarzer (1992) that people with strong self-efficacy know they can overcome obstacles, focus on opportunities, and perceive stressful situations as challenge than those who harbor self-doubts about their ability to overcome difficulties. Thus, the SE cannot be separated with the learning of mathematics. The higher self-efficacy owned by a student, the more persistent he/she to complete the task. It is certainly a positive impact on academic achievement. So, in every learning; especially math teachers or educators should not overlook the SE as one of the factors that affect the level of student achievement.

Other important factor in students’ achievement is the affective aspects of students towards mathematics. Affective domain is one of the learning domains needed by students beside cognitive and psychomotor. The perception of mathematics as the most difficult and feared by the students is one of the reasons why the affective aspects required in the learning of mathematics. According to Anderson and Gable, affective is a quality that shows how a person expresses feelings or emotions [7]. McLeod (1992) identified the concept of affective into four, namely beliefs, attitudes, emotions, and values (which included ethics and morals) [8].

Learning mathematics by adding affective aspects of students can be implemented properly in order to achieve the expected learning outcomes. The benefit of the affective aspect is to give a strong influence on learning and knowing how students feel and assess mathematics. At the same time, students will learn the key that affect the learning habit. This is in line with the opinions to exert a decisive influence on learning and on how pupils perceive and value mathematics, as well as on their own view of themselves as learners [9]. At the same time, they constitute a key element which influences their behavior. Therefore, it is expected that the increased affective aspects of the students; mathematics learning achievement will also be increased.

Based on the description of the background, it can be concluded that SE and affective aspects have important roles to students’ mathematics achievement. This is similar to what is disclosed by McLeod (1989) that students' beliefs and attitudes towards mathematics teaching and learning play an important role in mathematics education. Furthermore, the learning outcomes of students are strongly related to their beliefs and attitudes towards mathematics (Furinghetti & Pehkonen, 2000; Leder, Pehkonen, & Torner, 2002; Pehkonen, 2003; Schoenfeld, 1992; Thompson, 1992). From both factors, there is one more dominant factor contributing to the students' mathematics achievement. Therefore, this study aims to determine which factor gives a stronger role to the students' mathematics learning, self-efficacy or affective aspects.

**REVIEW OF LITERATURE**

**Self Efficacy (SE)**

The first important factor to the students' mathematics achievement is SE. As revealed by Bandura, SE is the foundation of human agency. This means, SE is the foundation of one's personality that determines belief in something [3]. Some researchers use an instrument of SE to measure the confidence of individuals in solving specific problems (Hackett and Betz, 1989), the strategy of independent learning and self-regulated learning (Bandura, 1989), and in performance of writing and reading task (Shell, Colvin and Bruning, 1995). Furthermore, Bandura summarize that self-efficacy in general will: (1) affects individuals in decision-making, (2) determine the quality of encouragement, perseverance, and flexibility of individuals in activities, and (3) affects the mindset and emotional individual for not giving up easily [10].

SE then further defined by Bandura (1986) and Schunk (1989b) as the strength of one's belief in one's ability to complete specific and designated tasks and reach attendant standards. Generally it is held to be domain-specific, context sensitive and specific task. Furthermore, according to Bandura and Schunk, self-efficacy is the judgments we make-about our potential to learn successfully and the belief in our own capabilities [5]. The choices we make, the effort we put forth, and how long we persist are influenced by self-efficacy. Then, the theoreticians of social cognitive approach define self-efficacy as the belief of individuals on their capacities to carry out and organize the activitie needed in fulfilling a task (Bandura, 1997; Pajares and Kranzler, 1995 in Muret Peker, 2016). Bandura (in Murat Peker, 2016), self-efficacy can be defined as an individual's belief in his/her capacity to solve the problem given. Thus, the SE may be defined as the belief of a person in completing a task [4].

Bandura states that SE is a fundamental concept of personal judgment that affects a person's choice, effort expended, and how long he/she can survive the challenge. If it is associated with learning math, SE is shown as a strong predictor of mathematical problem solving ability as a thorough mental abilities [11]. Mathematical problem solving is closely related to students' mathematics achievement of. So, it can be said that SE-matter can not be separated from the learning of mathematics. The higher SE owned by a student, he/she will be more optimal
in finishing the task given. This opinion is in line with the definition by Jerusalem and Schwarzer (1992), people with strong self-efficacy recognize that they are able to overcome obstacles and focus on opportunities. Therefore, they perceive stressful situations as more challenging than those who harbor self-doubts. It is certainly a positive impact on academic achievement; the higher the SE the earner to resolve any problems given. Therefore, in every learning, especially math, teachers or educators should not overlook the SE as one of the factors that affect the level of student achievement.

Bandura (1989) states that there are four main sources in the SE. SE can be obtained, modified, enhanced or reduced through one or a combination of four sources, namely: (1) Experience mastery, which are valuable experiences that have been obtained in the past in which the experience can be success or failure both of which may increase or lowering SE owned. (2) Modeling (vicarious experience), is a source of SE obtained by observing the success or the failure of others. Through modeling, students can evaluate their academic and compares their abilities with others. (3) Social persuasion, related to the capabilities individuals have to reach their aims. The success of personal development should be measured in self-development rather than other aspects. (4) Psychological states, while evaluating the capabilities of individuals it is of importance to consider the judgments of individuals related to their psychological states. Individuals attribute their poor performances to emotional excitement and tension [4][12].

The main source that can be used to develop someone’s SE by Denisia and Jeyanthi Juliet are performance accomplishment, vicarious experience, verbal persuasion, and psychological states. Other opinions give the same explanation about the sources of SE, where these four sources can be used to improve or weaken someone’s SE [13]. To determine the level of SE owned by the students, Gist divide the dimensions of the SE into three parts, namely: (1) the magnitude, which is the dimension that describes the tasks according to the degree of difficulty, (2) strength, dimension associated with the level of strength or stability of a person against his conviction, (3) generality, this dimension relates broad field of duty or behavior. Some experience can gradually lead to mastery in the field of duty or to special level while others inspire confidence in finishing a variety of tasks. Those dimensions determine the level of a person’s SE. In developing self-efficacy, students need clear information to acquire the knowledge and skills, master the material, and so on [14]. Self-acquisition of some information becomes problematic when the progress is slow, such as during complex skill learning, where students may master some skills component readily, but fail to grasp others. Teachers’ feedback that points out the correct operations and remedies troublesome task valid aspects Provides capability information [15].

Individuals with high SE will have an optimistic attitude, a positive mood, an ability to process information more efficiently, have the mindset that failure is not something harmful but rather a motivation to do better. Individuals who have low self-efficacy have a pessimistic attitude, negative mood to likely become angry, feeling guilty, and make bigger mistakes (Bandura in Santrock, 2005: 265). Students with higher levels of self-efficacy set higher goals, apply more effort, persist longer in the face of difficulty and are more likely to use self-regulated learning strategies (Bandura, 1977; Wolters & Rosenthal (2000) [16].

Based on the description, it can be concluded that the SE is a powerful predictor of the students’ mathematics achievement. This is in line with what is expressed by the Pajares & Kranzler (1995) that self-efficacy had been shown to be as strong a predictor of mathematical problem-solving capability as general mental ability (Pajares & Kranzler 1995), a variable that generally found to be a powerful predictor of academic performance (Thornrike, 1986) [11]. Therefore, it is important for an educator to engage the SE in mathematics, because the higher the SE, the more optimum the achievement will be.

Affective aspects

The second factor which is vital to the achievement of mathematics learning is affective aspect. Affective aspect itself is one of the three domains of learning. Learning mathematics which adding the affective aspects of students can be implemented either as an attempt to achieve the expected learning outcomes. The use of the affective is to provide a strong influence on learning and knowing how students feel and assess mathematics from the student’s perspective. At the same time, students will learn the key elements that affect the habit of learning. This is in line with the opinions by Ignacio Gil affects exert a decisive influence on learning and on how pupils perceive and value mathematics, as well as on their own view of themselves as learners [9]. At the same time, they constitute a key element which influences their behavior. Similar to what is expressed by Miller, affective learning concerned on how learners feel while they are learning, as well as with how learning experiences are internalized so they can guide the learner's attitudes, opinions, and behavior in the future [16]. In the other words, the affective domain of learning is learning that relates to what is perceived by students when learning, such as how the experience drawn so as to guide and direct attitude, opinions and habits of the students in the future. Along the way, maybe find a negative attitude in mathematics. According to Ignacio Gil, the number of students who still regard mathematics as a difficult lesson to be one cause. For most pupils the subject is not a source of
satisfaction, but rather one of frustration, discouragement, and anxiety [9]. Many of them, even some of the most-
able, find mathematics to be just a tiresome chore.

Attitude influences an individual’s choice of action, responses to challenges, incentives, and rewards (Business Dictionary). Zelley, Marianne and Elaine (2005) Mensah, Oyere, & Kuranchie (2013) suggest that attitudes are generally positive or negative views about a person, place, thing or event which referred to as the attitude object [17]. Arul (1995) quotes Allport's definition of attitude as a mental and neural state of readiness organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations which are related. McLeod (1989b), who referred to it as a broad range of feelings and moods which are generally considered to be different from pure cognition, including, as specific components, attitudes, beliefs, and emotions. According to Anderson and Gable is a quality that shows how typically persons express feelings or emotions [7]. McLeod (1992) stated that "the affective domain Refers to a wide range of beliefs, feelings, and moods that are beyond the domain of cognition". Furthermore, McLeod identified the concept of affective into four, namely beliefs, attitudes, and emotions, and values (which included ethics and morals) [18].

Affective aspect is closely related to the attitude / behavior. The fact is that students who have negative attitudes towards mathematics learning will certainly have an impact on learning achievement. Pupils' attitudes towards learning mathematics are determined by individual personal characteristics related to their academic self-image and motivation for achievement. Their condition may be oriented towards certain subjects in the curriculum. In McLeod's conception, attitudes cover a multidimensional perspective of different kinds of mathematics and a range of feelings about each of them. In the opinion of Guerrero, Blanco and Vicente (2002), denial, negation, frustration, pessimism, and avoidance are some of the attitudinal and behavioral signs that many students show when they are faced with academic activities. This may be either generic (especially in pupils with chronic academic failure) or when faced with a specific task such as mathematics.

According to Zan and Martino (2007), attitude towards Mathematics is just a positive or a negative emotional disposition towards Mathematics. Neale (1969), however, defines attitude towards Mathematics as an aggregated measure of “a liking or disliking of Mathematics, a tendency to engage in or avoid Mathematical activities, a belief that one is good or bad at Mathematics, and a belief that Mathematics is useful or useless “. Similarly, Hart (1989) considers the attitude towards Mathematics from multidimensional perspectives and defined an individual's attitude towards Mathematics as a more complex phenomenon characterized by the emotions that he associates with Mathematics. Mathematics and his beliefs about how he behaves towards Mathematics.

Bohlin, (1998); Kennedy, Hyland, Ryan, (2006); Kretchmar, (2008) classifies five categories affective aspects, namely: (1) receiving / attending, it is refers to the student's willingness to take interest in some phenomenon or something in the environment. A person receives information consciously, willingly and attentively listens. He / she is pay attention to the environment and directs his / her attention with the selective focus regarding the importance of the information. (2) responding, it signifies a more visible activity of a student. Merely a person does not take interest in the environment, but he / she might willingly participate in the activity, takes initiative, and feel satisfied with the possibility to be active. A student consciously reacts to the environment and expresses his / her attention in a respective manner. (3) valuing, it is refers to the attachment of the value to some phenomenon, object, activity, etc. A student is not merely an active participant, but he / she recognizes the values as well as assumes the meaning and importance of the activities he / she is involved in. (4) organization, this level is concerned with bringing the values into the system. A student arranges values, relates and summarizes them by identifying priorities that help him / her in solving internal moral conflicts. A person compares different values, sets relationships among them, generalizes and joins them into the entirety. New or newly perceived values are compared with the former ones, and they ATTAIN a respective priority in the value system of a student. (5) Internalization, it is the final and most complex level of the affective domain in which a person's behavior depends on the value system, and values control a person. When the behavior consistently and for a long time is determined by the same values, a person develops the worldview based on specific characteristics, and he / she forms individual special learning ways. The student's behavior becomes predictable, typical and consistent in similar situations [19].

Some related studies include research conducted by Grootenboer and Marshman conclude that Affective is symbiotically related to students' beliefs in learning mathematics, attitudes and emotions influence their mathematics learning in the classrooms, and conversely, students develop mathematical beliefs, attitudes and emotions as they are engaging in the activities of the mathematics classroom [18]. Following that, the research conducted by Izabela Savickiene showed that the high academic achievement can be developed from their attitude and value that both are characteristic of the affective aspect in Bloom's taxonomy [19]. The same conclusion was also obtained from the research Boniface K. Nande, David A. Aboho, and Byron U. Maduewsi stating that the affective domain is very important in lifelong learning: It provides motivations, attitudes and feelings necessary.
for the learning [20]. The same thing was also obtained from research result by Inez Maria that influence the affective aspects of mathematical ability of students, in case of the learning achievement [21].

Based on the description of the affective aspect, it can be concluded that the affective aspect of student assessment can be seen from the attitudes, interests, self-concept, values and morals which are shown during the learning process against the student willingness to act positively or negatively towards mathematics. The more positive of an individual’s view in the learning of mathematics, it means that he has the impression of “comfort” to the learning of mathematics. This of course indicates the student will be able to obtain an optimal mathematics achievement. The higher or the better affective aspect of a person has, the higher the learning achievement in math will be. Thus, we can conclude that the affective aspect provides an important role on the mathematics achievement of students.

**METHODOLOGY**

This study is a literature study to describe the role of two factors, namely SE and affective aspects of students’ mathematics learning achievement. Based of the two factors identified, they will determine which factors give a more dominant role to student’s mathematics learning achievement.

**RESULT AND DISCUSSION**

**Correlation Between Self Efficacy and Affective Aspects in Students’ Mathematics**

There are several studies on the role of SE and affective aspects in mathematics learning. Some research are supporting SE as one of the important factor to student achievement. SE was mentioned to be a predictor of success in a person’s mathematics achievement. Some studies related the need of strong relationship of mathematics with SE in learning. Collins (1982) states that a student with high SE will acquire a far better achievement than a student who has lower SE [16]. The research conducted by Barry J. Zimmerman, conclude that self-efficacy have been found to be sensitive to subtle changes in students' performance context, to interact with self-regulated learning processes, and to mediate students’ academic achievement [22]. In other words, self-efficacy has an important role to mathematics achievement of students. The results of the study by Siegel, Galassi, and Ware (1985) found that a model of self-efficacy accounted for a larger portion of the variance in math performance than a model with anxiety and aptitude as the independent measures. Results of research by Diana K. May (2009) showed that the mathematics achievement of students are often influenced by the SE and the level of anxiety toward mathematics [23].

Individuals with high SE will have an optimistic attitude, a positive mood, which can improve the ability to process information more efficiently, have the idea that failure is not something that is harmful but rather a motivation to do better. Individuals who have low self efficacy have a pessimistic attitude, negative mood increases the likelihood of a person becoming angry, guilt, and enlarging their mistakes (Bandura in Santrock, 2005). Students with higher levels of self-efficacy set higher goals, apply more effort, persist longer in the face of difficulty and are more likely to use self-regulated learning strategies (Bandura, 1977; Wolters & Rosenthal (2000) preformance Howard Tanner and Sonia Jones).

Furthermore, the role of affective aspects related to mathematics achievement of students, some research suggests the same conclusion. The research conducted by Fennema and Sherman (1978) conclude that there is a positive correlation between mathematics attitude to mathematics performance [24]. This result is also supported by research conducted by Ngai-ying Wong (1992) that the affective aspects have a positive correlation as a predictor of the success of the mathematics achievement of students [25]. This opinion is reinforced by the results of research by Antonnen (1969) which reported a strong positive correlation between attitude and mathematics achievement [24]. Fennema and Sherman (1978) reported a positive correlation between perceived usefulness of mathematics and mathematica achievement, and more recently, Bouchey and Harter (2005) found that students' confidence were a critical predictor of success in mathematics.

Furthermore, the results of other studies in Maria Nicolaidou & George Philippou shows that ATM (attitude toward mathematics) and SE are predictors of performance and consistently with previous findings, the predictive power of SE was found to be stronger than the corresponding power of ATM ( Hacket & Betz, 1989; Pajares & Graham, 1999 • Pintrich, 1999; Zimmermann, 2000) [2].

Based on the description of the SE and affective aspects of students, it can be conclude that both factors have important roles on students' mathematics achievement. Of the two factors, there is one aspect that is more dominant compared to other aspects. Between SE and affective aspects, SE provides a more dominant influence on mathematics achievement compared to the affective aspects of mathematics students. Research conducted by Maria Nicolaidou and George Philippou resulted that there is a strong relationship between the SE and attitude
toward learning achievement, but the SE give a stronger role to student achievement compared with his attitude. Furthermore, according to Bandura & Nancy self-efficacy proved to be a superior predictor of amount of behavioral improvement gained from partial mastery of threats at different phases of treatment. This means, SE is the biggest factor that is important to student achievement. With SE, students will have a strong belief that it is corresponding ability to solve the problem given to him in earnest. Thus, SE is dominant in a student's potential success in learning mathematics [10].

Affective aspects also play an important role in the learning of mathematics. But the affective aspects of students in mathematics learning does not run consistently and occasionally found a negative correlation. This is because, if a person has a low affective aspect, it does not mean it will have lower educational achievement anyway. Therefore, despite having an important role to mathematics achievement but the affective aspects results are inconsistent. This is reinforced by the theory that the affective process is one part of the five processes of SE, which are affective process, cognitive process, motivation, perceived SE, and self-regulated [27]. For detail, look at the figure 1.

Affective process, which regulate emotional states and the elicitation of emotional or physiological reaction, are influenced by self efficacy [4]. Thus, the SE has a broader scope than the affective aspects. Therefore, between the SE and affective aspects of mathematics students, the one which have a stronger role and dominant towards mathematics achievement is SE.

CONCLUSION

SE and affective aspects are the two important factors in achievement of mathematics learning. Among the both factors, the SE is more powerful and more dominant compared to the affective aspects of students towards mathematics. SE and mathematics achievement of students has a positive correlation. The higher the SE of a student, the higher the learning achievements obtained, and vice versa. This does not apply to the affective aspects of mathematics students. A low affective aspect of student does not necessarily guarantee that the academic achievement will also be low. A high affective aspect of student is not necessarily will also signal as high academic achievement. Therefore, affective aspects and mathematics achievement of students have a negative correlation. Based on these descriptions, it can be concluded that the SE provides a more dominant role on the mathematics achievement of students.

Educators, in this case the teacher, should not ignore the SE in mathematics to obtain an optimal learning achievement. By developing SE, students will spend the capabilities to solve every problem that was given to him in earnest, which of course will improve students’ mathematics achievement to be optimal.

REFERENCES


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