

## Values Implemented By Secondary Teachers In Mathematics Problem Solving

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### ABSTRACT

This qualitative research aims at exploring the values implemented by the teachers in mathematics problem solving classroom. The subjects are three mathematics teachers in secondary school in Palembang. Data were collected through interview pre teaching, observation during the teaching process, interview post teaching, field recording, and document collecting. Observation to each teacher was done twice and was recorded by video recording. The result shows that the values implemented by the teachers are explicit and implicit. The dominant values implemented by the teachers in general category is the values of belief in God and the value of thorough, the dominant value implemented by the teachers in mathematics category is objectivism, whereas the dominant values implemented by the teachers in mathematics education category are formalistic and relevant

Key Words : General Values, Mathematics Values, Mathematics Education Values, Mathematics Problem Solving

## I. INTRODUCTION

### 1. Background

Advancement of information and communication technology (ICT) has a great impact on the change in values and behavior of students. One of these impacts in the context of social life is students' value orientation and perception on learning success. Orientation of ideal values on morality, ethics, and self esteem seems to have moved to a tendency towards hedonism and egoism. "My" identity is stronger than "ours". As a consequence, more violence and anacist actions dominate students' life. Value education is the most strategic approach to face this problem.

There are at least four reasons for implementing values in teaching and learning activities. First, Act No. 20/2003 on National Education System states that development of humanity values through educational democratization should be the main concern in education.

Second, national education objectives emphasizing aspect of belief in God indicates that core value on building national moral character should be based on values of God. This also indicates that affective and psychomotoric aspects are important aspects to consider in teaching and evaluation processes in addition to cognitive aspect.

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Third, moral development theory of Kohlberg (1996) states that everyone is responsible for values teaching to help students develop their own moral thinking. It means that teaching values in secondary school aims in guiding students to achieve a higher order thinking. Kohlberg also emphasized that values education is related to students' personality development. If students' skill is trained continuously in developing emotion, physical, and spiritual, it will produce students with a mature ethical and mind. Essentially, general values and skills are the most important things in teaching and learning especially in developing students' creativity. It means that general values are important to be implemented by the teachers so that the students have awareness that their knowledge is absolutely from the God.

Fourth, some education experts (Priyono, 2010; Maarif KR, 2010) state that values education that produce human (Indonesia) with character is the best alternatif now. To educate students to be human with character and committed, school (with all components) and parents have to cooperate in giving special attention to the students. The values such as truth, justice, sacrifice, freedom, honesty, discipline, and responsibility should be advanced.

In secondary mathematics teaching context, appreciation of values is the main objective in mathematics problem solving. In Education Unit Level Curriculum Year 2006 (Depdiknas, 2007) for mathematics courses, it is stated that the purpose of mathematics teaching and learning in secondary school is that the students have respect to the usefulness of mathematics in real word. It means that the students should have curiosity, attention, confidence, and interest in learning mathematics especially in problem solving. This purpose is related to affective domain in mathematics teaching and learning curriculum. This is a very important purpose because mathematics is considered as an abstract object and has not related directly to real word. So, mathematics is popular as a difficult and boring subject comparing with another subjects such as language, literature, and sports (Aplin dan Saunders, 1996; Lee dan Cockman, 1995) dan juga sains (Allchin, 1999; Tan, 1997; Proctor, 1991).

Values education that evokes a sense of beauty toward mathematics will enhance understanding about of the benefit mathematics and can help the students in mastering mathematics (National Council of Teachers of Mathematics, 1989). This

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opinion is supported by Nik Aziz Nik Pa (2003) stated that mathematics is not separated with values.

In education and research sense, value is considered as a belief, philosophy, and view of life that That become attitude measured either positive attitude that may be followed or negative attitude that may not be followed in the society (Hakam, 2000; Halstead, 1996; Swadener dan Soedjadi, 1988; Dede, 2006; Bishop,1999; Rokeach, 1970). According to Bishop (1996), general values, mathematics values, and mathematics education values. General values are values associated with religion, culture, discipline, economics, etics, moral, personal, civic, social, community, spirituality, management, law, health, and enviroment. Mathematical values are values associated with the nature of mathematical knowledge itself, and are derived from the way mathematicians of different cultures have developed the discipline of mathematics. Based on White's (1959) ideological, sentimental and sociological components of culture, Bishop (1988, chap. 3) classified values of mathematical culture. He identified three corresponding, complementary pairs of mathematical values, namely, rationalism/objectism, control/progress, and openness/mystery. Mathematics education values are values associated with accuracy, clarity, consistent, creative, systematic, efficient working, flexible, open, persistent, and work effectively.

To implement values in mathematics teaching and learning , teachers can use some approach of teaching, one of them is mathematics problem solving approach (Taplin, 2010). Mathematics problem solving is a process of implementing mathematics knowledga in a new situation (Ernest, 1991). In mathematics problem solving, we need a process of selecting the appropriate strategy to solve the problems. This process indirectly will involve logics, reasoning and also emotion of students in discovering the new expected situation. Through mathematics problem solving, the students are trained to select the concepts assocaiated with problem situation and solve the problems at once.

Mathematics problem solving is an important vehicle to educate the students to live through interest development, common sense, and the power to distinguish. Specifically, mathematics problem solving is not only an approach that encourage flexibility but also as an ability to respond to uncomfotable situation that require the immediate solution. Through mathematics problem solving approach, the students are

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encouraged to construct their own knowledge and responsibility for their own learning process. Mathematics problem solving is also an important life skill to help the students to show the mathematics education values that are important to develop their life.

However, mathematics teachers did not understand about the application of value in teaching mathematics. Based on the dialogue which was done by the writer with some teachers in junior high school in Palembang and looking at the lesson plan that was created by the teachers, it can be concluded that teachers still used cognitive and psychometric more in teaching mathematics. Teachers also did not understand about the relationship between value and teaching mathematics especially in mathematics problem solving. The result of this problem was the students had low ability in mathematics problem solving and it became a big problem in education in Indonesia.

Knowing the importance of value in mathematics problem solving and low of teachers' understanding, so it was very useful to study about the value implemented in mathematics problem solving.

## **2. Research Question**

Based on the explanation above, it can be formulated as “what kind of value did teachers give in mathematics problem solving in junior high school?”.

## **3. Objective**

The goal of this problem was to know about the value implemented that was used by the teachers in mathematics problem solving in junior high school.

## **II. RESEARCH METHOD**

In general, there are two types of data collected in this research, namely (1) data about values implemented by teachers in problem solving teaching in secondary school, and (2) data about the obstacles in implementing values in mathematics problem solving teaching in secondary school. To obtain the data, this research used three instruments, namely interview guided, observation sheet, and document analysis.

Deep interview conducted face to face between the researcher and each teacher in one or two hours. The questions were designed unstructured. It means that ,

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the questions posed by the interviewer are based on the previous question. Therefore, the interviewer should be listened carefully the teachers; explanation before posing the next questions (Johnson dan Christensen, 2000). Aspects that be interviewed to the teachers will cover general values, mathematics values, and mathematics education values.

Observation is used to get a more specific data about values implemented by the teachers in mathematics problem solving teaching and leaning. This data is used to support interview data (triangulation data). Observation is conducted to the teachers during the teaching process. In this reasearch, observation is conducted by the researchers collaborated with two students of mathematics education departement, using observation sheets. During the observation lessons we looked specifically for those values being implemented, but also we looked for other values being portrayed by the teacher.

We also collect the documents used the teachers in mathemativs problemsolving in the class. The documents such as lesson plan, students, work sheets, and other teaching aids are important documents that will be concerned in this research. These documents will be used to support the interview and observation data.

### **III. RESULT AND DISCUSSION**

This research is conducted from December 2<sup>th</sup> 2010 until February 22<sup>th</sup> 2011 di SMP Negeri 10, SMP Negeri 17, dan SMP Negeri 18 Palembang. The respondents are one mathematics teacher from each school. To each teacher we are interviewed pre-teaching, observing during the teaching process, and interview post-teaching. As addition, the researcher also analyzed the learning device such as student work book, dialogue focus and observation in mathematics problem solving by using routine and non- routine test.

The data analysis of the observation was based on the transcription of the observation result that was done by the teachers in the class, dialogue face to face with the teacher (pre and post-teaching), field notes, and document analysis. In table 3.2 would be showed the values implemented that was used by each teacher in mathematics teaching

Table 3.2. Values Implemented in Mathematics Teaching

No.	Values Implemented	Teaching I	Teaching II	Explicit	Implicit
<b>Teacher R01</b>					
1	Rasionalism	X	X		X
2	Objectivism	X			X
3	Control		X		
4	Openness	X			X
5	Formalistic			X	
6	Relevan	X	X		X
<b>Teacher R02</b>					
7	Mutual assistant and cooperation				X
8	Rasionalisme	X	X		X
9	Formalistik	X	X		X
10	Instrumental	X	X		X
11	Relevan		X	X	
12	Relasional		X		X
<b>Teacher R03</b>					
13	Mutual assistant and cooperation		X	X	
14	Rasionalism	X	X	X	
15	Relevan		X	X	
16	Formalistic	X	X		X
17	Instrumental	X	X		X
18	Creative			X	
19	Thorough	X			X

Based on table 3.2, it showed the dominant values that was used by the teachers in mathematics problem solving were rationalism, formalistic, and instrumental.

The value of rationalize was one of the mathematics values. This value was used by the teacher when they asked the students to find the true of the answer.

- Guru : Contoh nomor tiga, keliling sama dengan delapan delapan itu ya. Nah ini. Bener dak ini jawaban di buku ini? Kemaren kan Ibu bilang, coba diteliti. Ada kesalahan disini. Ada kan? Tanda bagi berubah menjadi tanda kali, maka pecahan setelah tanda bagi di.....balik (beramai-ramai) Jadi diameternya tujuh puluh. Yang (b) ditanya jari-jarinya kan? Ya*
- Siswa : Sudah bener belum?*
- Guru : betul (beramai-ramai)*
- Siswa : betul yaa.*
- Guru : Jadi diameter sama dengan dua r. Ada pertanyaan tidak ?*
- Siswa : Tidak (beramai-ramai)*

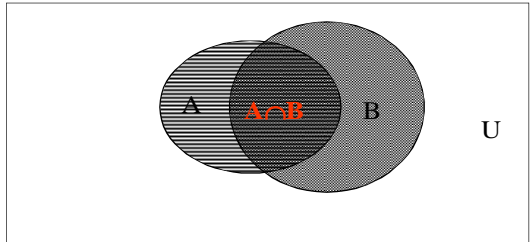
*(R03/Teaching Observation*

*1 )*

The value of formalistic was one of the mathematics education values. The formalistic value was used by the teachers because in teaching and learning process teachers were able to use reasoning deductive as showed in the following slide.

**IRISAN**     ∩

•  $A \cap B = \{x | x \in A \text{ dan } x \in B\}$



**$A \cap B$  bagian yang diarsir horisontal dan vertikal**

**Contoh :**  
 $S = \{a, b, c, d\}$     $T = \{f, b, d, g\} \rightarrow S \cap T = \{b, d\} = T \cap S$

1

(R02/Teaching Observation 2)

Relevant value is applied at the time of the teacher associate professor of learning materials/knowledge of mathematics with everyday life, One example of the value of this relevant in the context of the use of buying and selling in the school canteen.

**Contoh soal:**

Kantin sekolah membeli 4 dus minuman kaleng dengan harga 12.500 per dus, kemudian dijual dengan harga 2.600 per kaleng. Jika satu dus itu berisi 6 kaleng. berapa besar untung kantin sekolah tersebut

**Penyelesaian:**  
 Diketahui : minuman kaleng yang dibeli = 4 dus  
                   harga per dus = 12.500  
                   harga jual per kaleng = 2.600  
                   1 dus = 6 kaleng

Ditanya : untung kantin = ?  
 Jawab :

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Furthermore, based on interviews pra-teaching, observations during teaching, interview post-teaching and document analysis, the teachers are visible inconsistencies in applying the values in the teaching of mathematical problem solving. Each one value on a teacher-designed lesson plans but did not take place on teaching teachers. Those values are the values of cooperation on the teacher R02, the formalistic in R01 and creative value to R03.

In her first teaching lesson plans teachers to implement Teacher R02 designing a group. Through this group of teachers teaching in R02 expects to apply the value of cooperation. But at the time of teaching, teachers give more a matter of routine problem solving so that students can be answered individually. R02 confessed during an interview post-teaching: *“seharusnya tadi pada latihan terakhir tadi soal dikerjakan secara berkelompok oleh siswa. Namun karena soal itu tidak terlalu sulit, maka siswa mengerjakannya secara individu. Pada pengajaran berikutnya saya akan mencoba memberikan satu soal pemecahan masalah yang lebih menantang untuk menerapkan nilai kerjasama ini”* (R02/Pasca-teaching 1)

In the case of Teacher R01, who failed to apply the value is the value of formalistic. At R01 teaching does not explicitly explain the formula to find the percentage profit / loss. In other words, an approach that teachers use are not fully deductive approach.

- Guru : Nah sekarang kita akan melanjutkan, selanjutnya judulnya disini nak ya, persentase...
- Siswa : Untung dan rugi. (beramai-ramai)
- Guru : Nah, mari kita lihat contoh soal nomor 2 di papan tulis (sambil menunjuk soal dan penyelesaian nomor 2 di papan tulis) Berapa harga beli kito?
- Siswa : 27.500 (beramai-ramai)
- Guru : 27.500, kalo pake persentase berarti dikali
- Siswa : 100% (beramai-ramai)
- Guru : 100% , nah biso dak dipahami?
- Siswa : Biso. (beramai-ramai)
- Guru : Yang di atas ni apa ini?
- Siswa : Untung. (beramai-ramai)
- Guru : Yang di bawah?
- Siswa : Harga beli. (beramai-ramai)
- Guru : Dikali 100%, bisa semua? paham?
- Siswa : Bisa. (beramai-ramai)



(R01/Teaching

*Observation 1)*

In interviews post-teaching, the teacher aware of this failure : “Yes, I should have been explained in advance the formula to determine the percentage of gains and losses before giving example problems. Since the start of my teaching was to discuss the homework, then the application of formalistic values become blurred”. (R01 / post-teaching interview 1).

In the case of Miss Een, who failed to apply the value of creative value. Miss Een actually have attempted to apply this creative value by providing problem-solving challenging problems follows:

*“Suatu taman yang berbentuk lingkaran kelilingnya adalah 220 meter. Hitunglah jarak terjauh kedua ujung lingkaran tersebut!”*

Teachers fail to apply the value of creative problem solving at the top, because too many teachers to help students at work on the problems. so that the students' creativity in solving this problem does not appear explicitly. Another factor that led to this failure is because many students make mistakes in solving this problem. Teachers repeatedly had to remind students to peruse in resolving this matter.

- Guru : Ini jawaban temannya.  
(sembari menunjuk jawaban siswa di papan tulis)  
Perhatikan langkah-langkah jalannya ini. Yaa. Ini rumus keliling sama dengan phi dikali d. Sudah benar atau belum?  
Atau ada yang salah? Perhatikan bener. Lihat. Cek. Dengan teliti, yaa. Karena matematika ini, butuh ketelitian. Atau ada yang punya pendapat lain.  
Tunjuk tangan yang punya pendapat lain. Ayo. Coba.  
Sudah bener ini? Sudah? Ayo?  
ya? Apa?*
- Siswa : Jalannya salah (seorang siswa menjawab) Jalannya salah, hasilnya?*
- Guru : Bener*
- Siswa : Jawabannya salah, hasilnya bener. Nah coba jalan yang bener. Ayo*
- Guru : (sambil menunjuk dan mempersilahkan seorang siswa yang menjawab tadi untuk maju ke depan kelas dan menuliskan jawabannya).  
Katanya jalannya salah, hasilnya bener. Kita lihat kesalahannya dimana.  
Jangan dihapus.....*

(R03/Teaching

*Observation 1)*

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In the case of Miss Een above, it can be concluded that she applied the rigorous value which was not planned by her in the lesson plan. It means that Miss Een did not consistently in applying the value implemented in mathematics problem solving.

Based on the above, it appears that in general teachers do not design the application of value in teaching this math problem solving. Most of the teachers who implemented an implicit value which means that the value is not designed earlier in the lesson plans of teachers. This is understandable considering the application of value is not yet a major agenda in the teaching of mathematics in the classroom. Although basically the teachers are very eager to implement these values in the teaching of mathematical problem-solving. To overcome this problem, the government's role is crucial. Grand Design Character Education are currently being developed by the government should begin with the Grand Design Values Education, so the application of values in teaching mathematics at junior high school can be implemented in letter and well planned.

## V. CONCLUSION AND RECOMENDATION

The results showed that there are three categories of value applied to teachers in the teaching of problem solving, namely the value of public education, the value of mathematics and mathematical education values. The dominant values appear on the general category of value is the value objektisme, while the dominant value appears on the category of value is the value of formalistic mathematics education and relevant. Values of the applied teacher implied that this is a newly perceived value of teachers post-teaching at the time of interview.

In connection with the above, it is advisable for teachers to implement the values in the teaching of mathematics and voluntary terancang to ensure all three categories of value, the value of public education, the value of mathematics and mathematical education values can be applied and thoroughly memorable. This of course will not be

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realized without government interference in the development of the Grand Design Values Education in Indonesia. Hopefully.

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