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## VALUES DESIGNED BY TEACHERS IN MATHEMATICS TEACHING IN SECONDARY SCHOOL

<sup>1</sup>Nyimas Aisyah and Mohd. Uzi Dollah<sup>2</sup>

<sup>1</sup> Sriwijaya University

<sup>2</sup>University of Sultan Idris Perak Malaysia

Email: nys\_aisyah@yahoo.co.id

### Abstract

The objective of this qualitative research is to identify values designed by teachers in mathematics teaching in secondary school. The respondents were two mathematics teachers in secondary school in Palembang. Qualitative data were collected twice through interview, and documents analysis. Results show that teachers designed values implicitly and explicitly. Values designed implicitly were responsibility, independent, formalistic, relevant, and accessibility, while values designed explicitly were activist, theoretical knowledge, and evaluating

**Keywords:** Design, Values, Mathematics Teaching

### INTRODUCTION

In Indonesian Government Regulation No. 17 Year 2010 concerning to Management Education Organization in Article 17 Paragraph 3, it is stated that basic education, including secondary school (SMP) aims to build a foundation for the development of potential students to become human who (a) faith and fear of the God, (b) has noble and sublime personality, (c) is knowledgeable, skilled, critical, creative, and innovative, (d) is healthy, independent, and confident, and (d) is tolerant, sensitive social, democratic, and accountable (Kemendiknas, 2010).

If it is examined carefully, this purpose suggests that value education is an important part in the teaching system in Indonesia. Therefore, it is no exaggeration when many parties today demanded an increase in the intensity and the quality of value education in learning process, including in mathematics learning process in secondary school.

Value Education is expected to evoke a sense of beauty to abstract mathematics, evoke an understanding of the importance of math and help a person to master mathematics better (NCTM, 1989). Even Nik Aziz (2003) asserts that mathematics is not separated from the elements of value.

Considering the importance of value education, teachers need to understand very well what it is worth and how to apply the value in mathematics teaching in the classroom. This means that teachers not only have to master the content of mathematics and pedagogy of teaching mathematics well but also have to learn more on the application of value in mathematics teaching.

However, with regard to the value inculcated by teachers in the classroom, Bishop (1999) explains that there are very few teachers teaching values explicitly. This is of course influenced by many factors, one of which is the lack of understanding and awareness of teachers to inculcate the value. (Fitzsimons, Bishop, Seah, and Clarkson, 2001).

To find out exactly how understand and awareness teachers to inculcate values in mathematics teaching, it can be seen from the lesson plan that the teacher made. Based on these lesson plan it will

be seen clearly how teachers inculcate values teaching mathematics in the classroom. Therefore the aim of this study is to identify values designed by teachers in teaching mathematics in secondary school.

### Values in Mathematics Teaching

In education, the values can be defined as a product that has been internalized and used by one teacher as the criterion itself. This means, the values of a person's predisposition about how it should or should not do, or the tendency of a person to do something (Hakam, 2000; Mohd Dollah Uzzi, 2007). Meanwhile, in the teaching of mathematics, the values can be categorized into three types namely general educational values, mathematical values, and mathematics educational values.

General educational values are the quality of values that should be inculcated by the teacher, school, community or culture to students at school. In Indonesia, general educational values are more popular as the character educational values that consist of 18 values derived from religion, Pancasila, culture, and national educational goals, such as religious values, honesty, tolerance, discipline, and hard work

Mathematics educational values are the quality values inculcated through practice and norm in mathematics teaching. There are five pairs of mathematical education values, namely formalistic view-activist, instrumental understanding-rational understanding, relevant-theoretical knowledge, accessibility-special, and evaluating-reasoning.

Mathematical values are the values that reflect the nature of mathematical knowledge. They are produced by mathematicians who have grown up in different cultures (Bishop et al., 1999). There are three pairs of mathematical values namely rasionalism- objectism, control-progress, openness-mystery.

Any study of values in the curriculum should acknowledge three possible levels of study: the intended (planned), implemented and attained curriculum. Thus, to explore values in mathematics education it is necessary to address these three levels too. In addition, just as it is necessary to distinguish espoused and enacted beliefs of the teacher, because what is said is not always what is done, and *vice versa* (Ernest, 1991), so too it is necessary to differentiate between explicit statements or espousals of intended values, on the one hand, and the often unintended but implicit, hidden or enacted values in the curriculum, on the other.

Overall we distinguish six categories of values in the mathematics curriculum, derived by combining these two dimensions, as illustrated in Table 1.

*Table 1: Different categories of values in mathematics education*

Curriculum Level	Intended (planned)	Implemented	Attained
Explicit values	Explicitly planned curriculum values	Teacher espoused classroom values	Values stated by learner as acquired
Implicit values	Implicit or hidden values in curriculum	Enacted teacher and classroom values	Values evidenced in learner's behaviour

### METHOD

This is the qualitative research involving one teacher in SMP N 10 Palembang (Lia) and one teacher in SMP Sriwijaya Negara Palembang (Yani). Data were collected through analysing documents such as lesson plan (RPP) and students' worksheet (LKS) and interview. Interviews were conducted used handycam.

The next steps was triangulation, that was combining data from documents' analysis and interview. The conclusion of values designed by teacher in mathematics teaching was derived in overall.

## RESULTS AND DISCUSSION

Based on the analysis of RPP prepared by Lia and Yani (not the real name) supported by interview of them, in general, there were nine values design by Lia and Yani. These values are shown in Table 2 follows.

**Table 2.** Values Design by Teachers

No	Type of Values	The First Teaching		The Second Teaching		The Third Teaching	
		Lia	Yani	Lia	Yani	Lia	Yani
1	Responsibility	X <sup>a2)</sup>				X <sup>a2)</sup>	
2	Independent				X <sup>a2)</sup>	X <sup>a1)</sup>	
3	Formalistic View		X <sup>a2)</sup>				
4	Activist	X <sup>a1)</sup>		X <sup>a1)</sup>	X <sup>a1)</sup>		X <sup>a1)</sup>
5	Instrumental Understanding	X <sup>b1)</sup>		X <sup>b1)</sup>			
6	Theoretical		X <sup>a1)</sup>	X <sup>b1)</sup>			X <sup>a2)</sup>
7	Relevant	X <sup>a2)</sup>	X <sup>a2)</sup>			X <sup>a2)</sup>	
8	Accessibility	X <sup>a1)</sup>	X <sup>a2)</sup>	X <sup>a1)</sup>		X <sup>a1)</sup>	X <sup>a2)</sup>
9	Evaluating	X <sup>a1)</sup>	X <sup>a1)</sup>	X <sup>a1)</sup>	X <sup>a1)</sup>	X <sup>a1)</sup>	X <sup>a1)</sup>

- a1) Designed aware and explicitly
- a.2) Designed aware and implicitly
- b1) Designed not aware

From Table 2 above, it shows that teachers designed values implicitly and explicitly. Values designed implicitly were responsibility, independent, formalistic view, relevant, and accessibility, while values designed explicitly were activist theoretical, and evaluating

### Analysis of Values Designed by Lia

There are eight values designed by Lia in her teaching. Among the eight values, the evaluating value was the most dominant value designed explicitly by Lia at her three teachings. This value was designed to inculcate by Lia in the last learning process by giving the same exercises to all students. The example of evaluating value activity designed by Lia was : "Students work on individually exercises". In interview of pre-teaching 1, Lia said that she usually design to give the same exercises to her students for her regular teaching :

*"Untuk pengajaran kali ini soal latihan yang diberikan sama untuk seluruh pelajar. Nanti setelah ujian baru diberikan soal-soal pengayaan khusus untuk pelajar yang pintar dan soal-soal remedial untuk pelajar-pelajar yang bermasalah" (Lia/Pre-teaching 2)*

Another value that also dominantly designed by Lia at her three teachings was accessibility and it was design aware and explicitly. The inculcation of accessibility value was designed by Lia through providing an assistance to the students during the teaching process. For example, in her all RPP, one of the activities designed by Lia was checking and giving assistance to students around the

class : *“berkeliling memeriksa hasil kerja siswa dan memberikan bimbingan seperlunya sekaligus melakukan penilaian unjuk kerja dengan instrumen tes uji petik unjuk kerja” (Lia RPP 2)*

When asked about the need to provide guidance to the students, without hesitation Lia explained that:

*“when the student is having difficulty not given guidance from the beginning, of course, the students will continue to experience difficulties, and the students do not understand the material be learner. (Lia/Pre-teaching 2)*

Another strategy of accessibility value designed by Lia was giving apperception. In all her three teaching, Lia designed to remind students to material that has been studied and related to the material to be studied. For example, in the first teaching, the apperception activities designed by Lia was reminding the students about altitude, median, and angle bisector: *“mengingatn kembali materi pada pertemuan yang lalu yaitu garis tinggi, baris bagi dan garis berat” (Lia/RPP 3).*

In teaching 3, Lia designed to teach the area of triangle. This material was related to a altitude of triangle. Thus, in apperception activity, Lia remind students about altitude of triangle. Lia interested to remind students about altitude of triangle because she would ensure that the students were ready to learn about the area of triangle: *“apabila siswa belum memahami dengan baik konsep garis tinggi segitiga, maka materi ini akan diulang dulu sebelum mengajarkan materi luas segitiga” ( Lia/Pre-teaching 3)*

Lia also designed activist value aware and explicitly in her first and third teaching. This value was designed by Lia through discovering the concepts of mathematics in group of students. In the interview of pre-teaching 1, Lia confidently declared activist value as a value designed before her mathematics teaching.

- P : *Hari ini ibu mau mengajar menggunakan LKS. Supaya apa bu?*  
Lia : *Supaya anak sendiri yang langsung melakukan penemuan tentang jenis-jenis segitiga*  
P : *Kalau tidak menggunakan LKS kenapa?*  
Lia : *Anak jadi tidak terlibat dalam pembelajaran. Akibatnya anak cepat lupa dengan*  
P : *Ada tidak maksud lain ibu menggunakan LKS secara kumpulan ini?*  
Lia : *Ada, supaya anak saling membantu dalam menyelesaikan masalah*  
P : *Maksudnya apa bu?*  
Lia : *Ya, anak akan saling menghargai sesama teman*

*(Lia/Pre-teaching 1)*

Responsibility value was another value designed implicitly by Lia for the first and third teaching. In Lia's RPP, it was shown that Lia designed to promote responsibility value by asking the students to explain their work to their friends.

*“Masing-masing kelompok melaporkan hasil kerja kelompoknya, kelompok yang lain menanggapi dan guru memberikan penguatan terhadap jawaban siswa”*

*(Lia/RPP 1)*

According to Lia, asking students to explain their work is important to know that the students are really understand or not :*“Saya selalu meminta pelajar untuk mempresentasikan hasil kerja mereka, supaya pelajar lain dapat mengetahui apa yang sudah diperoleh dari pelajar lain” (Lia /Pre-teaching 1)*

The two last values designed implicitly and not dominant were relevant and independent values. Relevant values was designed to teaching 1 and 3. However, this value was inculcated not to invent the concept. Relevant value in the teaching 1 was inculcated only to motivate students to be interested in the materials, while the relevant value in teaching 3 was inculcated through the provision of day life context: *“On the bridge there are many shapes that are same with triangle, or it could be on the legs of the upper house”* (Lia/Pre-teaching 3)

In the interview of pre-teaching 2, Lia did not seem sure to inculcate the relevant value in teaching: *“Susah mau mencari konteks keseharian, karena materi pengajarannya melukis garis-garis istimewa segitiga.”* (Lia/Pre-teaching 2/1)

Besides relevant values, confident value also was designed implicitly and not dominant in Lia’s teaching. This value was design only for the third teaching. This was because the material was drawing the special lines of triangle:

*“Kalau hari ini, pengajarannya dirancang tidak secara kelompok, karena materinya adalah melukis garis-garis istimewa segitiga. Siswa akan diminta secara perorangan untuk mendemonstrasikan cara melukis garis tinggi, garis berat, dan garis bagi”* (Lia/Pre-teaching 3/2).

Lia deliberately was designing such teaching to be believed that students could independently work on tasks set by the teacher. When asked whether this independence was important for teachers’ teaching, Lia unhesitatingly expressed his belief that by training students to learn independently, the students would not depend on their friends. This suggests that Lia has actually been designed independent value in her teaching, although this design value was expressed only implicitly.

#### **Analysis of Values Designed by Yani**

There are seven values designed by Yani in her teaching. Among the seven values, the evaluating value was the most dominant value designed explicitly by Lia at her three teachings. This value was designed to inculcate by Yani in the last learning process by giving the same exercises to all students. For her first and second teaching, evaluating value was designed by giving exercises during learning process. While for her third teaching, evaluating value was designed by giving post test. For example, in RPP 3, Yani designed such activity: *“To deepen the material, the students were given extensive exercises about cube and block”* (Yani/Pre-teaching 3). According to Yani, giving the same exercises as an evaluation would allow me to check it out:

*“Siswa di kelas VIII.1 tu kemampuan hampir sama. Jadi tidak perlulah diberikan soal-soal yang khusus. Lagi pula saya kn jadi lebih mudah membuat soal dan memeriksanya”* (Yani/Pre-teaching 1)

Another value that also designed explicitly by Yani was activist values. This value was designed to find the area of cube and block by group of students. In her RPP, Yani wrote down the steps to find the formula of cube and block area as follows.

- a. *Teacher demonstrated how to find the area of the cube by using the net of cube*
- b. *Students were asked to form groups to make teh nets as in students’ worksheet.*
- c. *By using the neat of cube and block, students in group found the are of cube and block.*

(Yani/RPP 3)



From the RPP above, it is shown clearly that the students were facilitated to be active to invent the area of cube and block.

In the interview of teaching 3, Yani look very confident to inculcate activist value in her teaching so that the students would have longer memory about the material: *“Anak kan menemukan sendiri rumusnya, jadi mereka akan aktif dalam belajar. Dengan cara ini, ingatan anak juga jadi lebih lama dibandingkan jika hanya diterangkan saja”* (Yani/Prapengajaran 3/1)

Besides explicitly Yani also designed values implicitly. There are four values designed implicitly by Yani namely formalistic view, accessibility, relevant, and theoretical knowledge. Formalistic view was designed by Yani through the teaching step as follows: giving explanation – giving examples – providing exercises. In her RPP, Yani wrote down the teaching steps as follows.

*Siswa diberikan stimulus berupa pemberian materi oleh guru mengenai unsur-unsur kubus, balok, prisma, dan limas. Kemudian siswa diminta mengisi tabel yang ada di buku paket*  
(Yani/RPP 1)

Based on this RPP above, Yani was shown to explain the concept, definition, and important terms related to cube, block, prism, pyramide. It was reinforced by Yani through her statement:

*“Saya akan menerangkan istilah-istilah yang ada pada unsur-unsur kubus, balok, prisma, dan limas satu persatu kemudian baru meminta anak untuk mengisi tabel yang berkaitan dengan istilah-istilah ini”* (Yani/Pre-teaching 1).

According to Yani, she used this strategy to make students easy to understanding the material:

*“Anak akan lebih mudah faham dengan cara seperti ini, karena banyak sekali istilah-istilah dalam materi unsur-unsur kubus dan balok ini. Jadi kalau mereka disuruh menemukan sendiri kan susah”* (Yani/Pre-teaching 1).

Another value that also designed implicitly by Yani was accessibility. This value was designed in teaching 1 and teaching 3 by giving apperception in beginning of learning process.

In teaching 1 dan teaching 3, Yani was designed to remind the material that has been studied and related to the material to be studied. For example, in teaching 1, the apperception activity designed by Yani was reminding about “the types of geometrical” (Yani/RPP 1/2). While in teaching 3, the apperception activity designed bu Yani was “recalling neats of cubes/blocks and the area of square and rectangle” (Yani/RPP 1). From these two RPP, it was shown that Yani had given best effort to facilitate students to understand the material trough apperception).

In the interview of pre-teaching 3, Yani clearly stated that she followed this way because the neats of cubes/blocks was related to the area of square and rectangle:

*“Anak kan baru saja belajar tentang jaring-jaring kubus dan balok. Jadi saya akan ingatkan dulu tentang materi ini sebelum saya mengajarkan luas sisi kubus dan balok. Untuk materi luas persegi panjang dan persegi sudah dipelajari pada kelas VII, jadi anak juga sudah tau. Kalau anak sudah faham materi prasyarat ini, saya yakin mereka jadi lebih mudah memahami materi saya besok”*  
(Yani/Pre-teaching 3)

However in the interview of pre-teaching 1, Yani confidently stated independent value as her designed value.

P : Hari ini ibu mau mengajar menggunakan alat peraga

Yani : Ini, anak tu langsung disuruh praktik membuat jaring-jaring

P : Perorangan?

- Yani : Ya, perorangan  
P : Kenapa mereka bekerja perorangan?  
Yani : Kalau perorangan, biar anak itu berpikirnya terfokus bu. Kalau dengan kawannya kan, dia akan bertanya makmano makmano  
P : Maksudnya terfokus apa bu?  
Yani : Kalau dia menggambar, dia benar-benar menghitung ini berapa kotak  
(Yani/Pre-teaching 2)

From the excerpts above, it is shown that Yani was designed to promote independent value by asking students to make the nets of cube and block individually, so that students are not hanging with her friends.

The last two more values designed implicitly by Yani were relevant and theoretical knowledge. Relevant value was undesigned value because this value was not designed on Yani's RPP. However, in the interview of pre-teaching, implicitly Yani said that she would use every day contexts related to elements of cube: "... Misalnya kubus ini, dalam kehidupan sehari-hari kegunaannya apa. Ehm misalnya balok, digunakan dalam membuat rumah, dipakek kan bentuk kubus bentuk balok" (Yani/Pre-teaching 1/3)

Theoretical knowledge value was designed by Yani in teaching 1 and teaching 3. This value was designed through learning process only based on theory. One example of this designed value is shown in this problem in RPP 3:

*Given a block that size of 12 cm long and 9 cm wide. If it area was  $864 \text{ cm}^2$ , calculate the height*

(Yani/RPP 3)

Theoretical knowledge values was also designed by Yani in teaching 1. This can be seen in Yani's RPP that dominantly explaining the meaning of cube and block element without linking to the students' everyday context. When asked the reason to promote this value, Yani unsurely explained that she worried about the time: "Sebenarnya untuk materi luas permukaan kubus dan balok ini, bisa dikaitkan dengan kehidupan sehari-hari. Namun biasanya siswa mengalami kesulitan jika diberikan soal-soal seperti ini, terutama dalam memahami masalah. Saya khawatir waktu yang digunakan jadi lebih lama" (Yani/Pracapengajaran 3)

## DISCUSSION

Based on data analysis, it is shown that only a small value of teaching designed by teachers. The General educational values such as religious, social care, creative, and friendly were not shown in teacher's RPP. This is certainly going to affect to mathematics learning process in the class. Therefore, it is no contradiction if the inculcation of values in mathematics teaching is still a concern.

With the implementation of the curriculum in 2013, the teacher should have started designing value-based learning with lists of values into the syllabus and lesson plans and inculcated the values in teaching process in the class (Depdiknas, 2010)

Indeed mathematics learning in the classrooms can be a forerunner to the establishment of an advanced society. In mathematics teaching, teachers should not only provide abstract symbols and theorems that make most students are bored. Through the cultivation of the values in mathematics teaching, students are expected to be a formidable and creative man.

Actually there are many causes of this condition. First, teachers are not familiar with the inculcation of these values, so that it makes them difficult to find activities appropriate for the



cultivation of these values. Second, there is a big concern of teachers related to teaching time. Inculcating values in mathematics teaching will reduce the time to complete the material.

Actually inculcating values should not be explicitly in the form of a special activity or material. Teachers can internalize these values through matter/context or awarding exemplary example. For example, in geometry we know a lot of definitions or axioms which constitute a mathematical truth. But teachers can remind that essentially the only absolute truth that is with God. For other values, the teacher can apply by providing the everyday life context of nationality or social (Kemendiknas, 2010)

### CONCLUSION AND REMARK

Based on data analysis, it is found that teachers designed values implicitly and explicitly. Values designed implicitly were responsibility, independent, formalistic, relevant, and accessibility, while values designed explicitly were activist, theoretical knowledge, and evaluating.

To develop the teachers' ability to inculcate values in mathematics teaching, we need to develop more research of the development the kind of activities that can be adopted by teachers to inculcate values in mathematics education.

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