

Do Teachers Implement Their Intended Values in Mathematics Classrooms?

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There is little knowledge about what values teachers are teaching in mathematics classes, about how aware teachers are of their own value positions, about how these affect their teaching, and about how their teaching thereby develops certain values in their students. This paper from the VAMP project presents parts of the case studies of two Australian mathematics teachers which concern the relationship between their intended and their implemented values. As well as discussing data about these teachers' values, two possible approaches to the analysis of the interview and observational data are also presented.

At PME 24 FitzSimons, Seah, Bishop, and Clarkson (2000) outlined the Australian Research Council funded three-year project which included the goals of: (a) investigating and documenting mathematics teachers' understanding of their own intended and implemented values, and (b) investigating the extent to which mathematics teachers can gain control over their own values teaching.

Values in mathematics education are the deep affective qualities which education aims to foster through the school subject of mathematics (Bishop, FitzSimons, Seah, & Clarkson, 1999; Bishop, 1996) and are a crucial component of the mathematics classroom affective environment. While accepting that values, beliefs, and attitudes are dialectically related (see Krathwohl, Bloom, & Masia, 1964; McLeod, 1992; Raths, Harmin, & Simon, 1987), our concern is with the values of mathematics, mathematics education, and education in general (see Bishop, 1996), rather than more global values such as social, ecological, moral and so forth - although these are by no means incompatible, and indeed may influence teachers' personal value systems.

As Bishop, FitzSimons, Seah, and Clarkson (1999) note, there is little knowledge about what values teachers are teaching in mathematics classes, about how aware teachers are of their own value positions, about how these affect their teaching, and about how their teaching thereby develops certain values in their students. Values are rarely considered in any discussions about mathematics teaching, and a casual question to teachers about the values they are teaching in mathematics lessons often produces an answer to the effect that they don't believe they are teaching any values at all. It is a widespread misunderstanding that mathematics is the most value-free of all school subjects, not just among teachers but also among parents, university mathematicians and employers. Mathematics is just as much human and cultural knowledge as is any other field of knowledge; teachers inevitably teach values, and adults certainly express feelings, beliefs and values about mathematics which clearly relate to the mathematics teaching they experienced at school (FitzSimons, 1994; Karsenty & Vinner, 2000). More fundamentally we believe that the quality of mathematics teaching would be improved if there were more understanding about values and their influences.

It has long been recognised that teachers are continually making decisions in the classroom (Bishop, 1976) and that they are often in the position of having to judge between two or more competing values (Bishop, 1972). It is also recognised that there are differences between the values that are officially planned and those espoused by teachers (e.g., Lim & Ernest, 1997), as well as between teachers' espoused beliefs and their actual classroom practices (Lerman, 1998; Sosniak, Ethington, & Varelas, 1991) – due in part to differential positionings as interview subjects and as teachers.

This paper, then, concentrates on parts of the case studies of two Australian mathematics teachers which concern the relationship between their intended and implemented values. One teacher is an early-learning years teacher in a suburban Catholic primary school and the other teaches at the lower secondary level in a rural government school.

Methodology and Justifications

This project relied on working with, rather than on, teachers. Initially we talked about values with groups of teachers, using video clips and written classroom incidents as prompts, in professional development settings. From among the teachers who attended these sessions, and from others who completed a circulated questionnaire, we established a small group of teachers willing to work with us in their classrooms.

The basic approach adopted with each teacher was a cycle of preliminary interview, classroom observation, and post-observation debriefing interview. This cycle was repeated on two or three days. The classroom observations were video-taped, and the interviews audio-taped. This process not only asked teachers to reflect on their teaching practices and to say what values they were intending to teach; it also asked for authentication of the teacher's analysis by seeking to observe those values being implemented in the classroom situation, devised by the teacher.

Using this strategy we studied whether the teachers could articulate their own intended values, and whether they then implemented these in their classrooms. Before each observation lesson, the teacher presented the observer with a brief lesson plan including the flow of content and the teaching strategies, and also nominated the values they were intending to teach in the lesson. 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 are transcribing and analysing the audio-tapes, but the video-tapes were used to stimulate discussion with the teacher. In some post-observation interviews the video-tapes became the key memory prompting device for the teacher, who then was able to elaborate on values-related episodes for the researcher. The researcher had also noted points at which both explicit and implicit values teaching seemed to be occurring, and the use of the video-tape helped both teacher and researcher to recall the detail of these episodes. The aim of the post observation interview was for the teacher and

researcher to come to a shared agreement on some particular examples of when and how values teaching occurred in a particular lesson.

In the following two case studies, we present two possible approaches to the analysis of the interview and observational data. (This project is still ongoing and more data will be available at the conference.) The first takes an holistic approach to intended and implemented values, and the second focuses more on the particular values nominated by the teacher and/or observed by the researcher.

Case Study 1 (Kay): Grade1/2 (6-8 year-old students)

Table 1

Values Teaching Portrayal Matrix

Implemented Values			
Intended Values		Implicit	Explicit
	Nominated	e.g., students to internalise rewards	e.g., “today we are going to focus on purposefulness”
	Not nominated	unconscious routine, e.g., motivating praising students	e.g., group norms, and routine procedures developed over career lifetime

This middle-class, suburban Catholic primary school, of about 400 students in total had, independently of our project, adopted a general “Value of the Week” programme; on one particular week the value was “purposefulness.” The female teacher, Kay, with 16 years experience, interpreted this value as: “If you have a dream you work to it.” One observed class began with two girls modelling purposefulness by attempting to build and rebuild a house of cards, while Kay led a class discussion about what they might have been thinking and feeling — a good example of what we are calling explicit values teaching.

The activity Kay called “Ticket maths” arose as a means of overcoming the lack of coverage for the topic of number skills, and to keep students gainfully employed, interested, engaged for about 20 minutes – while she worked more closely with a smaller group. It was an open-ended activity, with short questions, such as: “write all you know about the number 0” written on small slips of paper. The students could choose any ticket they liked, and as many as they liked. The teacher had tried to keep the questions within the ability range of all groups - wanting the children to experience success as well as to extend the grade 2 students. The intention was to involve literacy skills in the correct writing of numbers as well as accuracy of calculations.

In the interview prior to the lesson, Kay had indicated that her intended values were: (a) to give freedom of choice within structured activities, (b) for students to internalise rewards, and (c) for students to challenge themselves (purposefulness). These may be considered as mathematics education values, and have the potential to generate creativity and independence. The intended mathematical values were to develop number skills and a variety of means of expression for these, both written and oral. These values were to be made explicit to the children through whole-class discussion and/or the nature of the activity itself. Extracts from the transcript of the pre-lesson interview reveal these ideas.

Researcher: Why do the children like ticket maths?

Kay: Maybe it's a bit of a win-win situation ... It is also good to make use of existing resources ... [Last time] I didn't say 'don't get counters' and I didn't say 'do get counters'. It was interesting [to see] the children who worked without counters. ... [About values] 'I'm wanting you to give your best.' ... I'll be really pushing purposefulness tomorrow. It's a really good value for working. ... I hate rewarding what's normal behaviour in children.

Researcher: So you want them to internalise the rewards?

Kay: Oh, yeah. ... I hate behaviour being manipulated by a bit of silver paper [a silver star reward]. I want behaviour to be manipulated by your own sense of place and space. 'I'm wanting you to challenge yourself. I'm wanting you to give your best.'

The lesson observation indicated that values (a) and (c) were implemented explicitly, but that value (b) was only implemented implicitly. In addition there were other values implemented which were not nominated by Kay. For example, group norms had been established so that the children began as a whole group sitting on the floor, in order to focus on the lesson content in its fullest sense of mathematical activities and ways of working mathematically, and in accordance with this week's Value (i.e. purposefulness). In addition, other norms had been well established, such as the idea that the small focus-group was not to be interrupted if possible, and that there would be a breakup of activities within the allocated timeslot for mathematics.

The researcher's interpretation of the values implemented but not nominated by Kay include the need for motivation of the students, and the need to avoid causing the students shame or humiliation. For example, during the activity "Ticket maths" she left the small group and circulated among the other students, checking their work, praising them verbally, and even drawing 'smiley faces' on their pages. This behaviour appears to contradict her earlier espoused value of students seeking intrinsic rewards, but it is not uncommon for teachers to have to make decisions between competing values. It also happened that one student, whom Kay recognised as attempting to please her, had made an error (writing 9×9 instead of $9 + 9$). Following her non-judgemental suggestion that he lay out the problem again with counters, he discovered his mistake.

In addition, Kay was aware of the need to justify her actions to parents and other teachers. Over a career lifetime teachers develop and formulate certain values in order to articulate them when called upon to do so, but mostly they remain tacit. In the terms of this project, we consider them as ‘not nominated’.

One possible way of demonstrating the relationship between Kay’s intended and implemented values is presented in Table 1 (above).

Case Study 2 (Josh) : Grade 7 (12-13 year-old students)

Table 2

Values intended and/or implemented

Value	Intended		Implemented	
	Nominated	Not nominated	Explicit	Implicit
Relevance	X		X	
Appropriate use of technology	X		X	
Mental computation	X		X	
Scientific practice ^a	X			X (unaware)
Listening		X	X (unaware)	
Accessibility of the teacher		X	X	
Efficiency		X	X	
Peer teaching		X		X
Confidence		X		X

^a This refers to Josh’s valuing of scientific practice, such as in starting a lesson with a definition, encouraging student collection of data/information to conduct the appropriate analysis, and the way in which his activity worksheet layout resembles a student laboratory work report.

Josh teaches mathematics to a Grade 7 class in a middle-class, rural secondary school, which has a student population of about 900. He was a chemist in the local dairy centre before entering the teaching profession 14 years ago. This industry experience has obviously influenced his outlook towards the purpose of education in general, and towards the inculcation of values through (mathematics) teaching in particular. In his questionnaire response to a student hypothetical question of the purpose of studying mathematics in school, Josh wrote that the school subject “will help you prepare for dealing with a range of situations throughout life – especially solving problems”. In his response to another hypothetical situation of several students protesting against working in a group, his view was that while one may work better individually, “this will not always be possible, especially later in life when you

are working. Everyone needs to be able to learn to get on with other people in a cooperative fashion”.

Thus Josh is a teacher who perceives both the subject of school mathematics and the ways through which this subject is taught as means of preparing students for meaningful daily living. Josh’s espousal of this value of ‘relevance’ also drove the group investigative activity entitled ‘Handspan and foot pace calibration’ in one of his ‘measurement’ lessons. In this activity, students calibrated their individual handspans and foot paces, used these to measure (in groups of two or three students) several real-life objects, compared their measurements with those obtained with a tape measure, and answered several questions given at the end of the worksheet.

Josh introduced the activity to the class in the following way:

“Now, what we are going to do today — going to the next exercise stage, is to find out how many centimetres this hand (showing and referring to his hand), your handspan (pointing at students, referring them to their own hands) is that you can use that to measure — things when you — might not have a ruler handy ... so when you need a quick estimate of something that’s — long and you want to, a bit more accurate than to just say that, oh, (pointing to a student desk) the table is somewhere between two or three metres, or one and two metres, is that right. You want to — you get it more accurately. And — particularly handy for ... people who work on farms, and that means you might be out, and you got to get back to the — to the shed or workshop to get some something, and you are going to — interrupt in the end quite a bit of your work or something. So, that’s the first thing we have to do. We are also going to measure your pace, so I’m going to see how many centimetres (demonstrates striding across the front of the classroom) — you can comfortably step. Say, you can use your pace or your step to also also estimate distances.”

The value of relevance Josh espoused is both mathematical and mathematics educational in nature. Mathematical knowledge is portrayed as relevant and useful knowledge; at the same time the pedagogy of this knowledge employed by Josh (e.g. the ‘Handspan and foot pace calibration’ activity) demonstrates that the internalisation of this value is useful for students’ own present and future experiences and challenges. This value, in turn, influences Josh’s portrayal of other values in his lessons, such as cooperative work, exemplified in his questionnaire response given earlier in this section, and in the following statement made in one of the post-lesson interviews:

I want you to — to learn how to, how to work with different people. I always — go — go on to say, look, you know — the school here, seventy teachers, you know. Seventy teachers! And we got to work together. I can’t just, just [say] ‘Oh, I’m not going to teach — such and such people and teach someone else I happen to like’.

Here is another value which is not only nominated by Josh, but is also explicitly implemented and espoused in his lessons. Some other values, however, might have been intended but were not implemented, at least not observable by the researcher. Yet others were implemented (or portrayed) but not intended, or at least not nominated by the teacher. For example, there were several occasions on which Josh explicitly emphasised that students listen to him, or to one another. When a student asked him to read out a question again, he replied that “you got to listen here.... We do this [mental mathematics exercise through verbal dictation of questions] so that people practise listening!” Yet this is a value which Josh was unaware of implementing. Table 2 (above) lists some of Josh’s values that were observed in his lessons.

Issues and Further Questions

This project has one more year to run, so this report is of work in progress. As indicated above, we are exploring various means of analysis in this new mathematics education research territory. The tables shown above can only ever present a partial picture, and we recognise the need to avoid simplistic dichotomies. For example the use of the word ‘implemented’ implies that a certain value is already intended to be taught by the teacher. But as we have noted with Josh, teachers may well be portraying certain values in their teaching that were not intended, and of which they were unaware. These could well include values with negative connotations. Are teachers aware of this possibility? And are there any strategies to help them overcome this problem?

We can also raise questions about the validity of the researchers’ interpretations; each of us is working from multiple positionings and making subjective decisions about salient features of the data. The interviews and discussions with the teachers do help to clarify ideas, but one danger remaining is the likelihood of world-views being already shared between researchers and teachers. Is this a problem?

We believe it is not a problem because we are less concerned with discovering what values teachers are teaching, and more concerned with aim (b) above - discovering how much control teachers can gain over their values teaching. So the next phase of the project involves teachers nominating values that they are not currently implementing, or implementing explicitly, and then monitoring their attempts to do so.

We hope that by clarifying the relationship between the teachers’ intended values and their portrayal of values in the classroom we will be able to offer teachers and teacher educators appropriate strategies for developing this neglected but crucial area of values education in mathematics.

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*Values and Mathematics Project website: <http://www.education.monash.edu.au/projects/vamp>