Challenges and Constraints in Researching Values[1]

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Values are taught in every lesson. However in mathematics classes this seems to be implicit rather than explicit. This paper outlines methodological difficulties encountered in researching the values teachers teach. One crucial area that has emerged is finding a common language with which meaningful dialogue can occur. We also reflect on differences, due to the different cultures, that have emerged between this Australian project, and a parallel project in Taiwan, including the influence of personal value systems.

Why Research Values?

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). They are a crucial component of the classrooms affective environment. Although values teaching and learning inevitably happen in all mathematics classrooms, the teaching of values appears to be mostly implicit. Thus it is likely that teachers have only a limited understanding of what values are being taught and encouraged. Values are rarely considered in any discussions about mathematics teaching. A casual question to teachers about the values they are teaching in mathematics lessons often produces an answer to the effect that they do not believe they are teaching any values.

This widespread belief that mathematics is the most value-free of all school subjects (Bishop, 1988) is not just held by teachers, but is also strong among parents, university mathematicians and employers (Ellerton & Clements, 1989). However mathematics is just as much human and cultural knowledge as is any other field of knowledge, and adults certainly express feelings, beliefs and values about mathematics which clearly relate to the mathematics teaching they experienced at school (Brew, 1999; FitzSimons, 1994). Hence it is clear that values teaching and learning does go on in mathematics classes, as it does in all classrooms. Furthermore we believe that the quality of mathematics teaching would be improved if we understood more about this phenomenon.

Values arise from different but overlapping influences on teaching. In this project we have identified three influences; general societal values often reflected in what we expect schools in general to be about, mathematical values that arise from the discipline of mathematics, and mathematics educational values that arise from the situation of teaching mathematics in school classrooms (Bishop, 1996). We have chosen to focus on those values that are associated more with mathematics and mathematics education rather than general societal values.

Thus we set out to answer three questions: (a) what are mathematics teachers' understandings of their own intended and implemented values? (b) to what extent can

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mathematics teachers gain control over their own values teaching? and (c) is it possible to increase the possibilities for more effective mathematics teaching through values education of teachers, and of teachers in training?

How Do You Research Values?

The challenge in this project was not only to decide what were key questions to ask, but to develop an appropriate mix of investigative strategies that would help us gain some insight into this area of teaching. The remainder of this section will outline the methodology we have developed; the following section will then reflect on how a team of colleagues in Taiwan have developed a different mix of procedures as they investigate these issues.

The methodology we have used is rather traditional in some aspects. Essentially we have opted for an interlocking approach at two levels - micro and macro. At the micro level the approach is to work with individual teachers using a cycle of preliminary interview, a classroom observation, and a post-observation debriefing interview. This cycle is repeated with the same teacher two or three times. The classroom observations are video taped and the interviews audio taped. We plan to analyse the audio tapes but not the video tapes which will be used solely to capture episodes from the classroom to stimulate discussion with the teacher during the debriefing interview.

In attempting to elucidate the first aim of this project, we are first looking to see whether teachers can articulate their own intended values, and whether they can implement these in their classroom. Hence in the preliminary interview we will be asking teachers to nominate values that they suspect will arise during the lesson we will be observing. In other words the teacher will have the opportunity to plan for the teaching of particular values. We will be entering the observation lesson and looking specifically for these values nominated by the teacher. We are not nominating particular values and asking teachers to teach those. Nor are we choosing a methodology that has us observing lessons in a rather random way, hoping to observe values that happen to be taught. We are keen to make the process open for the teachers and to see whether they actually teach the values which they have nominated. We believe this approach is rather novel in education research. It not only asks teachers to reflect on their teaching behaviour and to say what values they are teaching; it also asks for authentication of the teacher's analysis by seeking to observe the stated behaviour in a classroom situation devised by the teacher.

In the observation lesson we will be taking particular interest in the critical decision points during the teaching. These critical decision points are times in the flow of the lesson when the teacher needs to make a decision that will influence the direction the lesson takes. It seems to us that it is in those decision times that the influence of values that the teacher is teaching may be most clearly evident. Clearly at these decision points, values are not the only influence. School policy, the physical situation within which the lesson takes place and so forth will also play at times a more dominant role than the values that the teacher may be teaching (Bishop et al., 1999). Nevertheless, the implementations of values will also play a role in the decision making.

In the post observation interview the videos will become the central prompting device for both the researcher and the teacher. We hope that the teacher will be able to remember points in the lesson at which they thought they were teaching the identified values. They will be able to use the video tape to help prompt their memory and elaborate on these episodes for the researcher. As well the researcher will also have noted points at which values teaching seemed

to be occurring and the use of the tape will help the teacher recall these episodes. The aim of the debriefing interview is 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.

We plan to use a similar methodology to pursue the second aim of the investigation. The major change to the methodology will occur in the preliminary interview. We will no longer be asking teachers to nominate values that they normally teach, and from this broad set specify some which they suspect will be given particular emphasis in the coming observation lesson. Rather we will be asking teacher to implement some value(s) in the observation lesson that they do not normally teach, but on reflection they think they should be teaching. This change of emphasis will give further insight into how much control teachers may have over their teaching of values.

In piloting these techniques, and gathering some support from interested teachers, we have run a series of professional development sessions that incorporate some video clips of a teacher working with a grade 7 class, which were stopped at what seemed to be critical decision points. The participants were asked to nominate the options that the teacher had at these points. Subsequent discussions developed on influences which could have impinged on the various options available, including possible values. As well as the video, we presented a number of written episodes which were used to provoke teachers' thinking regarding the options they might have in classroom situations, and the underlying constraints that might be present. In particular, each discussion was finally directed to trying to decide what influence the teacher's values might have. Both these approaches worked well giving us confidence in the use of videos to stimulate recall of critical decision points, and the use of written scenarios in preliminary talks with teachers.

It has been instructive to reflect on the discussions we have had with six groups of teachers which indicate other issues for consideration. Perhaps the crucial finding from an analysis of our field notes taken during these sessions is the lack of an appropriate and shared vocabulary to discuss the types of values in which we are interested; that is values based in mathematics and mathematics education. The language involved in this investigation, and indeed in the transmission of values implicitly or explicitly in the classroom, is crucial. Indeed, this project essentially revolves around finding ways to make values linguistically explicit. This of itself will not lead to explicit values teaching. Rather, it will lead to a shared understanding between teachers and researchers. Because of the nature of language, a cultural artifact itself, one of course can never be sure that certain words do capture a shared meaning, or value in this case. If a shared understanding is accomplished, then we may be in a position to move to a further project that will involve examining the transmission of values from teachers to students. Both teachers and ourselves have struggled to find appropriate language so that these ideas - which are still being formed, reformed and refined - can be communicated in a positive manner.

As a research team we have always been conscious of this problem. In the research literature there have been many attempts at linking teachers' beliefs to their teaching of mathematics (McLeod, 1992; Southwell, 1995; Thompson, 1992; Tirta Gondoseputro, 1999). However the results of this research are equivocal (Bishop, 1999). Although some studies purport to find clear linkages, others do not. As Neuman (1997) suggests, subsequent actions need not necessarily correspond with stated intentions. A number of studies on beliefs were in the nature of self-reports, but there appears to have been few attempts to follow up these self-reports to see whether the teachers actually act upon their beliefs. For a variety of reasons

we do not always act on our beliefs in certain situations. We wondered whether this explained some of the confusion in the literature. Hence one of the meanings we bring to 'values' in this study is the notion that 'values are beliefs in action'. That is, the values that teachers are teaching in the mathematics classroom are not only beliefs the teacher holds, but their behaviour in the classroom actually point to these beliefs. These are what we call 'values'.

But this in itself is too simplistic, even if it gives us a touchstone to work from. In our own discussions, and in the professional development sessions we have conducted, various notions are clearly embedded in this notion of 'value'. We summarise some of these in Table 1.

Table 1
Aspects of Meaning Either Used in or Arising from Discussions with Teachers

General meanings of 'value'	Mathematical values (after Bishop, 1988)	Mathematics educational values
To value:	Openness	Clarity
to command	Mystery	Flexibility
to praise	Rationalism	Consistency
to heed	Objectivism	Open mindedness
to regard	Control	Persistence
A value is:	Progress	Accuracy
a standard		Efficient working
a thing regarded to have worth		Systematic working
a principle by which we live/act		Enjoyment
a standard by which we judge what is important		Effective organization
something we aim for		Creativity
qualities to which we conform		Conjecturing

In a very real sense, this problem of language was inescapable. As noted above, a central feature of this project is to explore together the linguistic framework that we as researchers and teachers will use to try and share our understanding of the values that they teach in their mathematics classrooms. Thus it was decided that a set lexicon to be made available to teachers involved in the project was neither possible nor practicable.

'Conflicting values' was another issue that has arisen in our discussions with teachers. When contemplating the different situations it became clear that teachers are in difficult situations at times. For example, a teacher wishing students to develop an investigative stance to a project, and the students themselves, may wish to achieve closure at different points. In resolving this issue it may be that the teacher will need to draw on another set of more deep-seated values to resolve the conflict. On the other hand, the situation may be resolved from other sources, for example the submission dates set by an external examining body over which the teacher has no control.

As well as the micro investigation with individual teachers, we have developed a macro approach consisting of a survey that also gathers teachers' ideas on the values they teach. The survey has clusters of items built around the themes of teachers' understanding of values -

specifically, (a) values teaching in the mathematics classroom, (b) institutional and socio-cultural influences, (c) mathematical values, and (d) mathematics educational values - as well as teacher control over these values.

The issue of language also arose when piloting the survey form. For the items using a forced response format, a certain amount of rewording had to be undertaken to clarify the ideas we wished to interrogate. However the two major results from the piloting of the survey involved other issues. The teachers' responses showed that they are without doubt interested in the ideas of values, and their teaching of them; they recognise the importance of these notions and the need to investigate them. However associated comments indicate that these are new ideas for the teachers who clearly have not hitherto recognised that their teaching of mathematics does involve teaching values.

Lastly, a common theme we have detected running through responses from piloting the survey form and during the professional development sessions has been the presence of a certain amount of apprehension from the teachers. The subject of 'values' seems to immediately provoke in many teacher notions of judgement and finding fault. This may be a comment on our society, but it is an aspect of this project that needs to be taken very seriously. This in part is a language issue, but also means that we need to be scrupulous in respecting the teachers' personal value systems. We have become even more conscious of the role a teacher's personal value system may play when reflecting on a parallel project in Taiwan.

Taiwan Research

It was always planned and hoped that parallel projects would evolve overseas; it was expected that different cultures might well have an important influence on how and what values are taught in mathematics classrooms. Colleagues in Taiwan, led by Professor Fou-Lai Lin, have developed one such project (Lin & Chin, 1998) arising from our initial contact in 1996 and from continuing communications and meetings since then. In this paper we wish to reflect on the different methodology that our colleagues have developed as they try to gain some insight into how and what values are taught in Taiwan's mathematics classrooms.

We think it is true to say that they like us intended to conduct interviews and classroom observations with a small group of teachers, before moving to a larger scale investigation using survey techniques and more observations on a wider sample of teachers. They did indeed start with a small group of three teachers conducting interviews, followed by classroom observations, and then another interview. However our colleagues have developed in Taiwan what they described as a 'dynamic interview technique' (Wu & Lin, 1999). These are interviews that are stimulated by using anecdotes from observations of the teacher's classroom, and feeding back to the teacher pertinent analyses of these observations. This sequence then moves to in-depth dialogue with the teacher. Rather than having a range of teachers, the project has worked with just the three original teachers. The dialogues are conducted over twelve or more interviews with a teacher in a year, with one, two or three researchers present in an interview with one teacher. The researchers range from an older, very experienced, well known researcher through to a younger colleague who not long before was teaching in a school.

The background of the researchers proved to be of interest with regards the methodology of the project. It seemed that two teachers in particular responded in different ways because of the background of two of the researchers. One experienced male teacher responded in a

more open manner to an interviewer who was more prepared to listen, to learn and to be able to share meanings (Chin & Lin, 1999a; Chin & Lin, 1999b). This may be a reflection of a Confucian trait in which a more experienced master plays "an active role in directing conversation while the researcher acted as a listener" (Chin & Lin, 1999b, p. 317) and learner.

In a second instance, a woman teacher who had been approached to participate in the project was at first reluctant to do so. She changed her mind after visiting one of the researchers in his office and noticing various artefacts that clearly indicated the researcher was a practitioner of Buddhism (Leu, 1999). In subsequent interviews it was noticed how the teacher responded differently to this researcher in comparison to the other researchers. As the interviews with the female teacher developed, it became clear that this teacher's overall life value system based on Buddhism was playing a prominent role in her teaching. She believed that one of the crucial aims of her teaching derived directly from these beliefs (Leu, 1999). It was easy for her to make direct links between this system of values she held and her teaching actions in the classroom. She also felt more at ease discussing such aspects of her teaching with the researcher who also practices Buddhism. For one thing she used a shared language derived from Buddhism in describing why and how she was dealing with values.

What do you do? In the 'classical' western situation that researchers have aimed for, there is supposed to be some notion of sameness operating from one interview situation to the next. This means that with appropriate protocols devised and followed, the results from all interviews can be combined because there is an assurance that the situations from which they were derived do not greatly influence the results differentially. In these instances from Taiwan, the interview situations turned out to be clearly different, and the differences did influence the responses of the teachers. It seems highly inappropriate to dismiss the results of these interviews because of the situations described. However to recognise these aspects of the situations and to include them as part of the data reporting seem to be essential. In these two cases it is clear that the intended curriculum was 'bent' in different ways to conform to some degree to each of the teacher's personal value set. These teachers held their personal beliefs so highly that they pervaded their acts of teaching and their self-perceptions as teachers. This seems to have been just as much an unexpected result for the Taiwanese team as it was for us.

We return now to the methodology that was used by the Taiwan group; multiple, intensive interviews with one teacher that spread over some twelve months. Why did our Taiwanese colleagues choose to use this approach? It seems that the major question that they are now asking is quite different from that with which they and us started. It appears that they are now trying to map the consistency of teaching values by a few teachers. One speculative reason for this alteration of the aim could be that the Taiwan research group is also driven by a cultural imperative. It may be that it seems more important to them that they are able to identify 'exemplary' teaching behaviour that can be held up as an example for other teachers to follow. Another formulation is that they are trying to depict what a 'model' teacher should be, so that other teachers have the opportunity to follow this model. We suspect the innate Confucianism that runs deep in the Taiwan culture may well influence such thinking.

Apart from reflecting on the changes in the two projects our different cultures seem to have promoted over time, another issue has been raised for our own project in contemplating our Taiwanese colleagues' work. They have used the fact that some of the teachers responded differently with particular researchers. This was unexpected. They have however recognised the special type of interaction that grew up and exploited it to gain a deeper insight into the

consistency over time of the values that these teachers portrayed in their classrooms. In the Australian situation, we had intended to pair researchers and teacher participants on a basis of time convenience. However the Taiwanese experience has prompted us to think that if there is a relationship between the teacher and researcher, then we should consider exploiting this. It so happens that some of the researchers and teachers have known each other for a long time. It may be that a teacher will feel more able to discuss values with a friend than someone they have only met recently. Although we have been careful to try and depict this investigation as one that is trying to understand values arising from mathematics education and mathematics, as noted above, one of the most common uses in society of the word 'values' contains the notion of right and wrong, and of judgement. Hence some teachers have been quite reluctant to join the project irrespective of how and what we say. This misinterpretation may lessen if the teacher and researcher know each other and a certain trust between them is already present.

However in following this line, there is a cost as our Taiwanese colleagues have pointed out. We noted above the difficulties already encountered concerning the lack of a shared vocabulary between researchers and teachers. This is likely to diminish if the researcher and teacher know each other. However another difficulty may take its place. Because there is a shared vocabulary, the teacher and/or researcher may not feel the need to explore in the same depth their understanding of a classroom episode because they feel that the other will understand fully 'what they are getting at'. We need to guard against this. As well, reflection on past, shared experiences will need to be interrogated carefully since it again is so easy to assume the other will fully understand linkages made between such experiences and a classroom episode. But we are staying with the notion of working with the teachers for three lessons at the most. Hence, the extended time frame that our Taiwanese colleagues have to revisit instances when they realise in their analysis of an interview that ideas had been assumed because of say the shared Buddhism belief, will not be available to us.

Conclusions

In this paper attention has been drawn to the importance of methodology in researching values. Some approaches, which give insights into these ideas, have been offered. However difficulties still remain such as the development of a shared language. The influence of culture has also been highlighted, both at the societal and personal level. It may be better not to try and wash away such effects with methodological approaches, but recognise them as legitimate and look within them to gain greater insight into how values are taught.

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