
THE CROSS-CULTURAL PERSPECTIVE OF TEACHERS' BELIEFS AND THEIR INFLUENCE ON TEACHING PRACTICES: A CASE STUDY OF TWO TEACHERS TEACHING SECONDARY MATHEMATICS IN AUSTRALIA AND INDONESIA¹

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Research indicates that a teacher's beliefs have a powerful impact on the practice of teaching, since a teacher's beliefs constitute the reasons which account for the differences of individual teachers in teaching mathematics, without ignoring the influence of his or her content knowledge. This paper describes the cross-cultural aspects of a teacher's beliefs and its effect on his or her instructional practices under the constraints and opportunities provided by the social context of teaching.

This article documents the beliefs of an Australian and an Indonesian senior mathematics teacher and examines how these beliefs influence the teachers' practices. Knowledge of the beliefs of teachers from different countries given their cultural differences and equities will support a more explicit understanding of one's own implicit theories on teaching and learning. Interviews with the teachers and observations of them carrying out their teaching practices provided a window through which to see their beliefs and their influence on the underlying frameworks of the teachers' practices.

THEORETICAL FRAMEWORK

Research on Exemplary Practitioners

It has been proved that research conducted on exemplary teachers provides much to learn for teachers and curriculum developers (Driscoll, 1985; Kennedy, 1986; Lloyd, 1998; Tobin & Fraser, 1987; and Berliner, 1986). Additionally, there have been suggestions that case studies of expert teachers should form a part of teacher education programs (Berliner, 1986; and Shulman, 1986). Studying advanced practices could motivate and guide preservice and inservice teachers in their practice.

The Links of Teachers' Beliefs to Instructional Practices

Green (1971) and Rokeach (1960), as quoted by Thompson (1992) introduced the concept of a beliefs system and use this notion as a metaphor for examining and describing how an individual's beliefs are organised. However, Ernest (1989) suggests the definition of *beliefs* as views regarding the nature of teaching that topic (the purpose, the self-perceived role of the teacher and the relationship between students and teachers), the process of students' learning of that topic, and the nature of that topic. The categorisations of teachers' beliefs in this study are based on Ernest's views.

In devising approaches to the subject matter content and in adopting certain models of learning, teachers' beliefs do have an important role since beliefs act as a filter and a lens in seeing and understanding new information. Brophy & Good (1974) indicated that teachers' beliefs system are especially important in guiding their instructional decisions. Pajares (1992) suggests that beliefs about teaching are well established by the time students go to college, and as a result, such beliefs act as a filter through which new information on teaching is sifted. Prawat (1989) asserts that teachers with the same level of conceptual understanding may teach differently depending upon their educational beliefs (ie. their

beliefs about teaching and learning). Further, Putnam, Heaton, Prawat, & Remillard (1992) found that teachers' beliefs and knowledge affect how they perceive and act upon various messages about changing the way they teach mathematics. Teachers' conceptions of what mathematics is, and how it is learned, impacted upon their decisions about what and how to teach. However, research done by Kesler (1985), Parmelee (1992), and Van Zoest, Jones, & Thornton (1994) found that actions are not always consistent with stated beliefs.

Focus of the Study

The main focus of this study was on the teacher's beliefs and their impact on their instructional practices within the constraints and opportunities provided by the social context of teaching. The following questions helped to guide the collection of data:

- (i) What kind of beliefs regarding the nature of mathematics, and the teaching and learning of mathematics, does the teacher have?
- (ii) How do these beliefs influence his or her teaching practices on teaching mathematics?

METHODOLOGY

A qualitative case study approach was adopted (Merriam, 1988), using an ethnographic framework (Wolcott, 1988; Zevenbergen, 1998). The interpretive research methodology (Erickson, 1986) utilised both quantitative and qualitative techniques. Mr Ton, along with his 48 Year 11 Indonesian students, and Ms Skid, along with her 20 Year 12 Australian students were willing to participate in this study. The study was conducted in an East Javanese and a Western Australian senior high school. The schools were located in the metropolitan areas of Surabaya, the capital city of the province of East Java, and of Perth, the capital city of the state of Western Australia. The author proposed to describe the beliefs or the views of the two teacher—on the nature of mathematics, the nature of mathematics teaching, and on the learning process—and their impact on teaching practices.

Data Collection

Beside the researcher herself as the research instrument (Merriam, 1988), the study utilised an interview guide and a sequence of observations. The interview guide developed by the researcher consisted of questions devised to ascertain the interviewee's views of the nature of mathematics, and of mathematics teaching and learning. Information about Mr Ton's and Ms Skid's subject matter knowledge and beliefs obtained by the interview guide were complemented by a series of observations of their practices in the natural setting of the classroom. Interviews with them were conducted and audiotaped in between the observations and the summaries of the interviews were shown to them. Observation focused on the pattern of Mr Ton's and Ms Skid's teaching and their ways of representing and formulating the topic to the students; in order to establish the impact of their and beliefs on their teaching practices. The 6 lessons observed, 45 minutes each, on the teaching of Graph Theory in Indonesia lasted over a two-week period and the 11 lessons of 60 minutes each, on the teaching of Networks in Australia occurred over a three-week period. The smaller number of lessons in Indonesia was the result of shortening the original plan of teaching 14 lessons on the Graph Theory topic, due to the country's political situation. The teaching of the Networks topic in Australia was broken into two parts, before and after the term exams.

Mr Ton's and Ms Skid's lessons were also videorecorded and the resulting analysis and interpretation of their teaching was shown to them. In addition, the researcher discussed various aspects of their teaching practices with the two teachers. This was to sanctify that the research was conducted in a manner that "respects the rights of the individual whose privacy is not invaded and who is not harmed, deceived, betrayed, or exploited" (Burgess, 1989, p. 60). Interviews were also conducted with three top students, three middle ability

students, and three low ability students from each setting. This was done in order to obtain information from three groups of students of differing ability. The interviews sought students' opinions on Mr Ton's and Ms Skid's teaching, on the teaching materials, and on their learning.

Analysis

Initial analysis and data collection occurred simultaneously and evolved as the interpretation of each phase of data collection influenced the subsequent phases. Each interview conducted was based on the themes of previous observations and interviews, while taking consideration of the interview guidelines. The processes of data collection and analysis were recursive and dynamic (Merriam, 1988, p. 123). All the data for the study were organised into a case study database (Yin, 1994) which was constructed by listening to tapes, watching the videos, reading the transcripts, taking fieldnotes, and examining classroom artefacts. The videos helped to create a chronological account of lessons and a base for interview themes. Retracing the phases of data collection helped in identifying the emerging patterns and providing a basis for coding them thematically. The final stage of analysis categorised and synthesised the emergent themes within and across the data sources to lend coherence and richness to the written case study report.

THE SOCIAL CONTEXT

The study was conducted during a period of social, economical, and political crisis in Indonesia. The mass demonstration in and surrounding the Parliament Building not far from the school blocked the traffic and thus affecting the school's teaching and learning. Parents and teachers feared for students safety and the school was closed for two weeks at the height of the unrest.

The Indonesian school syllabi are determined at the central level by the Ministry of Education and Culture and implemented using a top-down approach. A single mathematics syllabi for K-11 and three strands of mathematics for Year 12. Every school in Western Australia designs their own syllabi, except those for Year 11 and 12. An external body, the Curriculum Council of Western Australia, develops these.

Indonesian Teaching Philosophy

Ki Hajar Dewantara, an Indonesian educational expert, inspired his countrymen with his famous teaching philosophy: *Ing Ngarso Sung Tulodo, Ing Madya Mangun Karso, Tut Wuri Handayani* (Tirta-Seputro, 1998, p. 9). This meant that being in front, the teacher is the model of the class; being in the middle, a teacher should generate their spirits to learn; being at the back, a teacher should facilitate and encourage their learning. In a loose way, a teacher's roles in these three different positions in the classroom can be translated as the roles of a model, a friend, and a parent. *Guru* or 'teacher' in Javanese, the dialect spoken by people who live in Central and Eastern Java Island, meant '*digugu*'—to be listened and '*ditiru*' to be modelled and followed.

THE TEACHERS

Participants and their Background

Both Mr Ton and Ms Skid were full time teachers at their schools. Mr Ton had been teaching in his present school for nine years and Ms Skid in hers for twelve years. Both teachers were regarded as caring teachers with a high standard of moral integrity and honesty. Mr Ton was the Head of Mathematics Department in his school and Ms Skid was the Head of Year 12, which was a pastoral care role.

Mr Ton's and Ms Skid's Schools

Being established in 1967, Mr Ton's school had a total number of 1200 students of Year 10 - 12 and 40 teachers at the time of study. Schooling were conducted in two shifts: morning classes from 6.45 a.m. to 12.20 p.m. and afternoon ones from 12.40 p.m. to 6.15 p.m. Ms Skid's school had been one of the most prestigious girls schools in Perth and was established in 1908. At the time of study the school had a population of 1000 students from K-12 and 75 teachers. Both schools were independent private establishments and recognised for the good ethics and sound teaching methods practised in the schools. In Mr Ton's classroom the students sat by pairs in unmovable desks, four lines of six rows, facing the teacher. The students in Ms Skid's classroom sat in-groups of three or four and sometimes two as they studied their single mathematics course.

Mr Ton's Beliefs

At the time of study Mr Ton was exposed to teaching a new topic in the Indonesian school mathematics and this resulted in his amazement at the uses to which mathematics could be put to solve real life problems in many different fields. He believed that this new mathematics topic offered much to students in seeing mathematics in a different way than he experienced it himself. He felt that the real world applications of mathematics would be especially attractive to students and would motivate them to learn more mathematics. Reflecting his view of the nature of mathematics as a mixture of a static unified body of knowledge and an accumulation of facts, rules and skills to be used in pursuance of some external end, Mr Ton often said, "Mathematics has absolute truth". But, his experience in studying the new topic led him to develop a view of mathematics as a dynamic, continuing, expanding field, "Mathematics develops according to world's progress. It was demanded to contribute its values there".

Mr Ton believed that he had to be firm in teaching, in deciding what was right and wrong when students asked about the solution of problems or definition of concepts, and in controlling the class, so that each student had an equal opportunity to learn. He admitted, "Each student had to learn in the classroom. The classroom must be quiet and be in order to develop some degree of tolerance among the class' members". Mr Ton had the view that it was important to cover all the material listed in the syllabus in the space of time provided, especially in preparing the students for sitting exams. Consequently, there were times that he felt the need to go ahead with a lesson regardless of the less-able students' questions and confusion with details of current or previous lessons. Mr Ton believed that this pressure would somehow push the less-able students to do more study in mathematics by themselves. The risk of being ineligible to move on to the higher grade was of deep concern to most students.

Mr Ton viewed the learning process as an active study of unknown objects until one knew them well. For him passive learning meant an absence of students' effort to learn: Students had to realise that they should not depend on the teacher for their learning, and that the effort to learn should come from themselves. Additionally, he believed that a teacher could not change the students, they should try seriously to change themselves. However, Mr Ton's effort to facilitate students' active construction of knowledge was limited by time and his teaching duties. "There is too much material to teach. ...". "The biggest problem is time". Although Mr Ton perceived his role in teaching as a learning facilitator and favoured active learning, the situation he faced in the classroom enhanced his acceptance of a view of learners as submissive and compliant.

Ms Skid's Beliefs

Ms Skid thought that mathematics was a growing active discipline, and that its connections were discovered through different tools, then expanded. She believed that the basic skills

in mathematics were important to students and that teachers were only teaching a fraction of mathematics as basic skills and basic applications, but some of the students were very excited about mathematics and wanted to learn more. Ms Skid had the view that the skills of mathematics are heading more to the application of mathematics and problem solving. She realised that the problem solving helps more students to enjoy mathematics a lot more than in her time when mathematics was a lot more rigid and only students who had a good analytical base, really experienced a positive sense of achievement.

Ms Skid embraced the view that the trend these days was towards teaching mathematics implemented with, rather than in isolation from, other subjects. She had the view that it was important for the students to be able to analyse and use the equipment and technology which were now available. She believed in attending regular inservice activities to catch up with new developments in teaching and learning. Ms Skid had the view that well-prepared lessons resulted in good teaching. She had the notes, an idea of what she wanted to achieve and how she wanted to achieve it for each lesson, "I need to know what the students need to do as homework. I also need to analyse the effectiveness of the lesson before I prepare the next one". She believed that students could be affected dramatically by teachers. As a result, she embraced the view that she had the power of changing students, to change their attitude to learning if it was negative, but not their fundamental personalities. At the same time she realised that she could have the reverse effect, the students could hate mathematics because of her. Additionally she had the opinion that it was an enormous responsibility that teachers can affect people's lives forever, hopefully in a positive sense.

Ms Skid perceived her main role in teaching as a learning facilitator and sometimes as the resource person of knowledge. "The students need to discover the concepts", she viewed herself as working as a team with her students: she directed the activities and they discovered the mathematics. Students should not just know the concepts they need to think them through to make sense. If she noticed students were regularly not doing their homework she would ask them why this was so. She tried to work with them because her aim was to prepare students for university where they would not have a teacher telling them what to do all the time. Ms Skid believed that students would have to be disciplined—self disciplined. She thought that one of the biggest problems for Australian students was to find that self-discipline, when they were in the university. Further, she believed that in different situations, a teacher might have a different role.

Ms Skid stressed the importance of success in learning to ensure students' enjoyment in studying the subject. She admitted, "I have to know that the students can work toward their final results". "I need to ensure that there must be success and the success must be according to the person's ability". Ms Skid believed that her main goal in teaching mathematics was that students graduated from school with skills developed to their best ability and with a positive attitude to their experiences. Ms Skid strongly believed that meaningful learning occurred only when students found enjoyment in their study. She embraced the view that students need to experience different approaches to learning, "I need to know that I am using the sort of learning that they can relate to". Ms Skid admitted that this activity might not be used with other classes, different classes have different styles of learning, and she responded according to the type of students she had. In promoting students' learning, Ms Skid believed in the freedom of the students to express their opinions and understanding in class. She liked them to focus on what they were doing not only on what they wanted to talk about. Ms Skid embraced the view that her responsibility to her students was to provide an atmosphere which was safe for them to learn, to ensure that the curriculum was covered and to ensure that she could find ways to extend their learning. The students did have to feel safe, free of sarcasm and free of criticism in a negative sense. They should get support and praise and learn. She believed in building on knowledge, and that was her responsibility.

The General Pattern of Mr Ton's Lessons

Certain patterns became visible during the observations. Mr Ton started his lessons by reviewing the materials taught in the previous lesson and raised several review questions. He then moved on to discuss the assigned homework, explained the difficult problems or asked one or two students to share their work with the rest of the class by working the problems on the board if the time permitted. Following this, he introduced the topic he intended for that day. He usually showed, read and explained the definitions of the concepts and provided some examples. Then he showed some example problems and tried to involve his students in working them out. He finished the lesson by giving the day's homework. It was usual for each lesson segment to flow smoothly to the next. The whole class approach was utilised in Mr Ton's class.

The General Pattern of Ms Skid's Lessons

Ms Skid started the lesson in a variety of ways. When introducing new concepts she always started from her students' point of view, and if necessary added her own illustrations of the concepts. She utilised many different techniques in generating the students' understanding of the concepts, always involved the students either individually or as a group in a whole class interaction. She was directing the students in their learning activities and at the same time the students were hoping to discover the concepts and build them into their own knowledge. She encouraged self-discovery by students and strengthened their understanding by giving them problems to work on, on handouts or in the textbook used. Meanwhile she raised questions to remind the students of any new terms they had met. While walking around the class visiting and talking to individuals or groups of students she assessed their understanding. When some students finished working on the problem she would ask them individually or in a group to share their work on the boards. Then she invited the participation of the rest of the class by asking them to make judgement of it. Ms Skid might even ask individual students to give their opinions of the work on the board.

DISCUSSION AND CONCLUSION

Mr Ton's dominant existing view of mathematics was Platonist and Instrumentalist. He had started to develop a Problem Solving view of the subject, but its implementation depended much on the opportunities and constraints of the social context of teaching in his setting. As a result, his actions reflected his dominant role as a model, which tended to maintain the one way of communication, in contrast to his perception of his role as a learning facilitator. This showed his adoption of Dewantara's teaching philosophy with more emphasis on the role model of a teacher. Consequently, Mr Ton's instructional practices tended to be autocratic. Ms Skid's view of mathematics, which was a combination of Platonist, Instrumentalist and Problem Solving, was supported by the class size, the facilities and resources available in her school, and the curriculum and syllabus utilised. Her practices tended to be more democratic. She managed to implement her role of a learning facilitator's view into action and viewed herself as standing on an equal base with her students.

In spite of his view of active learning, Mr Ton conducted a teaching that required submissive and compliant behaviour of his students in learning. Due to his embraced view that the class should be quiet and in order for learning to occur, Mr Ton tended to perceive active learning to be mainly 'active in mind', not necessary 'verbally active'. This perception was developed due to the normal large class size and other contextual factors of teaching in Indonesia. The course of learning of the students in Ms Skid's class reflected her view of active learning. Her students challenged her by raising questions and sometimes interrupted her explanations.

The findings of this study support the strong influence of a teacher's beliefs on his or her instructional practices, lend strength to the previous research which found that actions were not always consistent with stated beliefs. These also in line with research that revealed some degree of cultural differences in the perception of teachers' and students' roles, of the nature of teaching and learning, and of the nature of mathematics itself (Stigler & Perry, 1988). One of the causes of the inconsistencies was that personal perceptions were based on values and norms accepted by the person.

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Endnote

¹The study is part of a larger case study of senior mathematics teachers in Australia and Indonesia teaching the topic of Networks or Graph Theory.