WHAT IS THE ROLE OF VALUE ALIGNMENT IN ENGAGING MATHEMATICS LEARNERS?

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In an economic and political crisis, people are crossing national borders in search of a better life. Students from diverse cultures are entering mathematics classrooms and teachers are adopting strategies for value alignment to nourish mathematics teaching and learning practices. Teachers are striving to create harmonious learning environments so that diversity is embraced positively and is utilised in a manner that will enrich mathematical learning. Value alignment allows diversity to be rethought as an empowerment tool for effective mathematics learning. Vignettes from a recent PhD study are used to exemplify strategies that teachers used for value alignment and student engagement in mathematics classrooms.

DIVERSE MATHEMATICS CLASSROOMS AND VALUE ALIGNMENT

The movement of people across country borders is taking place in unprecedented levels due to reasons such as armed conflicts, globalisation and regionalisation of trade and business (Seah & Andersson, 2015). Students from diverse cultures are creating diversity in mathematics classrooms through their values. In countries such as Australia and Singapore, culturally diverse classrooms are part of the 'norm' due to the in-take of refugees and historical immigration. A finding from international comparative studies such as TIMSS (Trends in International Mathematics and Science Study) and PISA, is that effective teaching is more about responding to and valuing the socio-cultural aspect of the learning environment than it is about adopting particular teaching methods (Hollingsworth, Lokan, & McCrae, 2003; OECD, 2004). A teacher who facilitates value alignment in the classroom promises to strengthen the relationships between individuals and will nourish teaching and learning practices (Seah & Andersson, 2015).

Students make sense of and construct mathematical ideas in different ways, drawing upon their own unique experiences in life and mathematics learning (Seah & Andersson, 2015). Values in mathematics education are inculcated through the nature of mathematics and individual experience, and thus become the personal convictions that an individual regards as being important in the process of teaching and learning mathematics (Seah & Kalogeropoulos, 2006). In a culturally diverse mathematics classroom, a teacher has the opportunity to travel the world with her/his students and return with a metaphorical suitcase filled with diverse thoughts, opinions and values in a single day. In this paper, we consider how these ideas or values empower a teacher to enrich students' mathematics learning?

Teachers and their students enter their classrooms with their personal values. The decisions and actions that teachers and students make in a mathematics lesson reflect their respective valuing. As diversity in mathematics classrooms around the world

increases due to reasons such as crisis, development and growth, so does the demand for the mathematics teacher to become flexible in embracing difference. Given the stable nature of values, it is reasonable to argue that teachers and students cannot expect that the other party will naturally share their valuing. However, in an organisation such as a classroom environment, it is reasonable to assume that teachers and students will want to co-exist harmoniously and therefore they will adopt strategies to exhibit values such as tolerance, respect and acceptance without compromising their own values. In particular, this paper addresses the question how is this value alignment achieved in a mathematics classroom?

In a recent PhD study (Kalogeropoulos, 2016) that was conducted in Melbourne, Australia, the role of value alignment in engagement and (dis)engagement in mathematics learning was investigated. Four year 5/6 teachers and sixteen year 5/6 students from two different schools participated in the study. Teacher and student questionnaires, classroom observations and interviews were used as instruments to collect data. Critical incidents that arose in the observed mathematics lessons reflected value conflicts and how these were resolved to restore harmony and engagement within the mathematics lesson. In this paper, four vignettes are offered as examples of how conflict can be resolved through value alignment in situations of cultural diversity.

FOUR VALUE ALIGNMENT STRATEGIES

Vignette 1 – The Scaffolding strategy.

The scaffolding strategy is adopted by a teacher when they come to their mathematics lesson with some type of preparation to scaffold the learning of the intended learning objectives (Kalogeropoulos, 2016). In one episode noted in the PhD study and one that is rather commonly encountered in mathematics classrooms, a graduate teacher asked their students to complete a challenging worded problem independently. Certain students attempted the task but soon complained that the question was "too difficult" and began to disengage with their mathematics learning. The teacher responded by directing the students to complete similar but simpler word problems with a peer. The teacher's initial values of *independent work-style* was in conflict with their students' valuing of *small group work*.

> Student: It's better to be working together, sometimes you might not know something, your team mate can help you.

The teacher adopted the scaffolding strategy to reengage the learners by offering worded problems that were more suited to the learner's abilities and by allowing them to work in small groups for support. This practice was successful in this situation but it may not be 'equally' effective in another. For example, in a culturally diverse mathematics classroom, the option to work in small groups may appear daunting to a student who is limited in speaking/understanding the spoken language. In catering for students with language needs, a teacher may decide to offer additional

time and support. Therefore, depending on the situation, other value alignment strategies could also be preferred.

Vignette 2 – The Equilibrium strategy.

The equilibrium strategy is adopted by teachers when students unexpectedly refer to values that are not being catered for in their lesson (Kalogeropoulos, 2016). A critical incident arose when students requested a calculator to check their answers in class. The teacher's response outlined a conflict in values.

> Teacher: You won't have a calculator during NAPLAN [National Assessment Program Literacy and Numeracy] testing, so don't use it now.

For value alignment, the teacher decided that she/he would collect and correct the students' work, acknowledging the students' value of *accuracy*. The teacher maintained her/his initial values but also accommodated the students' expressed value, acknowledging *accuracy* as an important value in mathematics learning. This is an example of a classroom interaction between the teacher and the students representing a site of contestation and conflict which naturally occurs in mathematics learning but with the teacher facilitating the students' values, the student learning of mathematics is optimised (Seah & Andersson, 2015).

Vignette 3 – The Intervention strategy.

There are times in mathematics learning when teachers put most of their values aside and respond to the students' values that are being exhibited (Kalogeropoulos, 2016). As an example from the PhD study results, a student described their feelings when they were unable to independently complete mathematics tasks:

> Student: I am just picturing myself in the 5/6 unit, I wish I had something else to work on in Maths and then it got even harder because Ms Belinda gave us even harder ones.
>
> Interviewer: And did you cry that day?
>
> Student: Yeah sort of…sometimes embarrassed

This conflict situation was resolved when the teacher became attentive to the anxiety of the student and decided to offer her/him one-to-one assistance. The student reengaged with their learning because her/his teacher had intervened and provided the help that she/he required. In a 'multicultural' classroom, this strategy could be deployed frequently due to the diverse learners but is it the most effective but time-consuming strategy? Further studies would be required to determine this.

Vignette 4 – The Refuge strategy.

Finally, the refuge (not to be confused with the term refugee) strategy is when the teacher puts most (if not all) of her/his values to the side and uses her/his authority in a manner that postpones her proposed lesson planning and succumbs to the value

orientations of the students (Kalogeropoulos, 2016). In this situation, the teacher usually finds new values that are aligned between her/himself and the students. In a lesson observed, the students became stumped by a problem solving task that the teacher had planned. Even after three attempts of the teacher trying to explain the steps required to solve the mathematical problem, the students remained confused, became agitated and disruptive. The teacher spontaneously made a decision to play a mathematical game with her students. The chaotic classroom reformed to an enthusiastic environment as the teacher and the students' value of *fun*, was embraced. In a culturally diverse mathematics classroom, a teacher must be prepared and skilled when students demonstrate a particular interest in learning about a mathematical concept that they are unfamiliar with. For example, students may become more inquisitive during the introduction of new number systems and currencies. A teacher may need to display flexibility and make detours from their intended lessons to accommodate these areas of interest.

The four value alignment strategies described above were classified, based on the extent to which the mathematics teacher retained her/his values after value negotiation had taken place (see figure 1). These have been called, in decreasing order of teacher values retained: scaffolding, equilibrium, intervention and refuge (Kalogeropoulos, 2016).

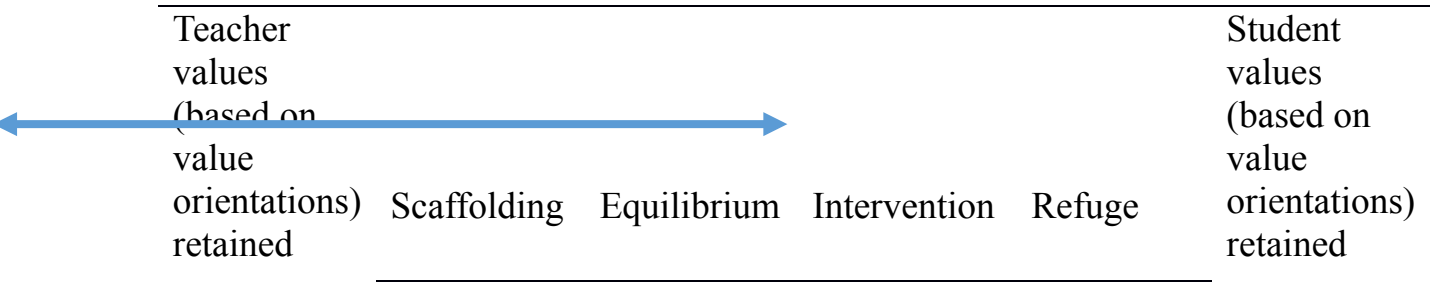

Figure 1. The four value alignment strategies.

The adoption of these strategies does not indicate that a mathematics teacher is losing control of their lessons. Far from it, it is suggesting something of the opposite. A teacher is conscious of triggers that lead to student disengagement and therefore uses her/his professionalism to adopt a value alignment strategy in an attempt to avoid a state of disengagement (Kalogeropoulos, 2016). In fact, such a mathematics teacher would be capable of recognising student values explicitly or implicitly and respond to these through an appropriate value alignment strategy. Could this be characteristic of an effective mathematics teacher?

OTHER RELATED STUDIES

Teachers' and students' values concerning effective teaching play a subtle yet influential role in the learning and teaching process (Zhang & Seah, 2015). Recently, Chinese students have achieved outstanding performances in PISA (Thomson, De Bortoli & Buckley, 2013). A recent study on the underlying values of effective mathematics teaching perceived by teachers and students in Chinese Mainland

suggested that both students and teachers value *fun, involvement, multiple methods,* and *examples* (Zhang & Seah, 2015). Are these four shared values of students and teachers in Chinese Mainland common to other places around the world?

In a different but related study, investigating the value structures of three Chinese regions, the results revealed six dimensions in the students' value structure, namely *achievement, relevance, practice, communication, information and communication technology* as well as *feedback* (Zhang, Barkatsas, Law, Leu, Seah & Wong, 2015). If 'values in mathematics education are the deep affective qualities which education fosters through the school subject of mathematics' (Bishop, 1999, p. 2) then how do teachers help students develop these values especially if the students have received minimal exposure to formal schooling? It has been suggested that the reason why East Asian students perform better in international comparative tests is due to their cultural value of *achievement* that has been internalised over the years as learners and provides them with the ambition to succeed in school mathematics (Seah & Andersson, 2015). So, how could the value of *achievement* be developed in children who are still fighting to survive?

'Students not only bring to school prior achievement…but also a set of personal dispositions that can have a marked effect on the outcomes of schooling' (Hattie, 2009, p. 40). Home factors can significantly influence the educational development of a student through parental support e.g. showing interest towards one's child's learning, with empathy towards their feelings and frustrations. Also, by providing students with resources such as calculators, to support their learning can also achieve positive educational outcomes (Bishop & Kalogeropoulos, 2015). For example, immigrant children need to adjust to a new set of values in their new environment and run the risk of conflict between home and school values.

> A different approach to the mathematical learning of minority students emphasises the crucial role of classroom discourse in shaping and building their learning identities; acknowledges the distance between the social and cultural frames of reference of pupils and the ones implicit within the school; and attempts to use cultural diversity as a resource, considering the contributions of ethnic minorities as a source of richness to be maintained and shared (Chronaki, 2005, p. 61-62).

In order for students to embrace mathematics learning positively, it is necessary to address the links between specific mathematics practices and the broader social values that the students assign to these mathematical practices (Chronaki, 2005). This way, mathematics becomes interesting, relevant and a solid foundation for value alignment.

The actions that teachers take (or choose not to take) may support the flourishing and well-being of learners and others or impact negatively on them (Boylan, 2016). For example, during a critical incident in a mathematics classroom, the teacher is provided with an opportunity to adopt a value alignment strategy or ignore the students' portrayed values and persevere with the planned task. These situations

could entail ethical choices that are ambiguous and cannot be resolved through applying a principle of set rules (Boylan, 2016). Instead, teachers could use the value alignment strategies (mentioned previously) to help them determine the student values that are being portrayed and how a negotiation can take place to ensure student engagement in mathematics learning.

Student engagement is a highly complex and multi-faceted construct (Fielding-Wells & Makar, 2008). The composition of a culturally diverse classroom involves students who bring with them personalities, values, and attitudes that are influenced by their own cultures. The schooling of immigrant children is a transition process where they are required to cope with many changes involved in moving from one culture to another (Gorgorió, Planas & Vilella, 2002).

This study has shown that it is important to:

- acknowledge the student as an individual.
- understand the meanings that students attach towards people and their environment.
- acknowledge the student as a member of the classroom community.
- recognise the meanings as social products developed from social interactions between members of the classroom community.
- acknowledge the student as an individual with a sociocultural identity (Gorgorió et al., 2002, p. 33)

Students attach values to situations, to actions, to themselves, and to others through an interpretive process, which is revised and controlled through the acquisition of new experiences. As mathematics classrooms become increasingly culturally diverse in times of crisis, there is a growing need for teachers to consciously engage their students through value alignment.

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