The culture-rich mathematics class: Maximising learning opportunities

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1. BACKGROUND

In South Africa classrooms we have
- A diversity of cultures;
- Colours;
- Beliefs and
- Languages

How, then, does one establish a mathematics classroom in which all cultures have equal opportunities to learn mathematics?

- Teaching through ethnomathematics, which is addressed by some textbooks by including artwork

- Not forgetting that mathematics is about symbols and proofs and making mathematics classrooms culturally neutral with the focus on formal abstract mathematics

- The proposed solutions to multicultural classrooms depend on the view of the nature of mathematics and how it is learnt.

2. WHAT IS MATHEMATICS?

South African Curriculum and Assessment Policy Statement (CAPS) (DoE 2011, p. 8):

Mathematics is a language that makes use of symbols and notations for describing numerical, geometric and graphical relationships. It is a **human activity** that involves observing, representing and investigating patterns and qualitative relationships in **physical and social phenomena** and between mathematical objects themselves. It helps to develop mental processes that enhance logical and critical thinking, accuracy and problem solving that will contribute in decision-making. Mathematical problem solving enables us to understand the world (physical, social and economic) around us, and, most of all, to teach us to think creatively.

3. REVIEWED LITERATURE

Clarkson acknowledges that 'any if not most mathematics classrooms are micro sites of multiculturalism' (2004, p. 9)

According to Sullivan and Zevenbergen (2003, p. 108) 'students from socially and culturally divergent backgrounds are the most at risk of mathematical failure'.

It is therefore important to discuss the question of how to establish a mathematics classroom in which all cultures have equal opportunities to learn mathematics.

A young black teacher, Sipho was educated in a school that was racially very diverse. The teacher often expressed her prejudice towards non-white learners:

Where I was taught, the school I went to was ... we had white people and black people and we had a white mathematics teacher. Now, the treatment towards us, towards all of the black learners in the classroom was very bad and she was racist, you know, and every time she would demoralise us. She would make comments, like really seriously bad comments ... Like 'You wouldn't pass', 'You won't make it', 'This subject is not for you', 'Consider choosing another subject'. (Van Putten 2012)

Sipho achieved: E(40–49%) grade 12
but averaged 62,5% for mathematics at university

According to sipho, teaching mathematics requires an understanding of the emotions learners experience while in class, otherwise enjoyment of the subject is suspended and successful learning becomes unlikely.

Sipho believes that a teacher should adapt the style of teaching to be used in a particular class to accommodate the cultural diversity in that class.

Lesson planning must be flexible in order to allow for modifications and culture accommodation.

4. AN ETHNOMATHEMATICAL APPROACH

The Brazilian educator, mathematics philosopher and mathematician Ubiratàn D'Ambrosio was the first to introduce the term 'ethnomathematics' in the 1970s.

Influence of sociocultural factors on the teaching and learning of mathematics, since mathematics is embedded in sociocultural contexts in which connections are made between the mathematics content learnt and learners' home cultures.

According to D'Ambrosio (1985), ethnomathematics also includes mathematics currently practiced by engineers, where they learn topics like calculus, where the emphasis on such topics is mainly on the esoteric domain as opposed to the everyday mathematics

In cultural villages - learners who live in circular houses

- Connections -the area calculations of a square, a rectangle, a triangle and a circle,
- Construction of such houses and their surrounding yards
- Learn about geometric patterns
- Use other culture-specific examples as well.

Rowlands and Carson (2002): Caution that the use of ethnomathematics does not undermine the importance of formal, Western mathematical concepts and skills, as developing these inadequately can be detrimental to learners' career paths.

Presmeg (1998): The issue of cultural representivity is a sensitive one and must be handled cautiously

Using cultural backgrounds might be problematic for learners some might think that the contexts that differ from their own do not make sense to them while others might think that their own cultural backgrounds are being undermined.

Presmeg (1998)

1. Each student is considered as having a unique sociocultural history; each student has ethnicity.

2. This ethnicity is a mathematical resource; mathematics may be developed from associated cultural practices.

3. Students can use their ethnicity in developing mathematical activities for sharing with peers.

4. Since the sharing of elements of one's cultural or ethnic practices may be a sensitive issue, those who belong to a culture should be involved in making decisions about who should share the mathematics of its practices, and which practices should be shared.

5. TEACHING IN THE CULTURE-RICH MATHEMATICS CLASSROOM

To get back to our introductory question: How does one establish a mathematics classroom in which all cultures have equal opportunities for learning mathematics?

AN ETHNOMATHEMATICAL APPROACH

In a culture-rich classroom the teacher could use **multi-level teaching** and **active learning**.

6. CONCLUSIONS

- Cultural diversity in the classroom is a fact (SA).
- One way of addressing this diversity: Culture-based contexts.
- Contexts that are both familiar and unfamiliar to learners.
- CAPS (DoE 2011): Curriculum be meaningful to the learners' everyday lives through the application of mathematical knowledge to real-life contexts
- Linked between the everyday and the esoteric domain in mathematics
- Maximising learning opportunities
- The teacher should know and understands the learners' cultures