

Culturally responsive teaching in mathematics in early childhood education



ECE resources

Culturally responsive teaching empowers children to learn by using familiar cultural resources to teach knowledge, skills, and attitudes¹, and to support children to make meaning of and understand the world around them². Learning is thought to be more meaningful, relevant, and easy to grasp when it is situated within children's own frames of reference and lived experience³, and children often achieve greater success when they are taught through their own cultural lens⁴. Cultural resources here include knowledge, prior experience, frames of reference, and ways of approaching and acting on the world⁵.

When teaching is culturally responsive:

- children's cultures are seen as an asset
- all cultures are valued as having mathematical knowledge to contribute to children's learning⁶
- cultural resources become part of the curriculum in their own right⁷.

Why is culturally responsive teaching important in mathematics?

Culturally responsive teaching is important in all areas of the curriculum, but may require careful reflection and high intentionality in the area of mathematics in particular. Mathematics is often taught without reference to culture, partly because it is easily viewed as an abstract and objective, culture-free subject⁸. However, mathematics is a product of human activity, and so the ways in which it is taught and used always reflect cultural values⁹. The values, concepts, contexts, and practices of the dominant culture are usually emphasised, while those of minority cultural groups tend to be underrepresented¹⁰. When mathematics is taught without reference to other cultures, it reinforces the dominant culture, and children from minority cultural backgrounds can develop deficit perceptions of their own culture in relation to mathematics¹¹.

This can result in children from diverse backgrounds making less progress in the school form of mathematics, and inequities and hierarchies being reinforced¹². Children can also be disadvantaged by the mode of teaching mathematics when this is unfamiliar to them. For example, at school, mathematics is often presented within contexts which promote competition and prioritise individual learning and knowledge, while children may be more familiar with collectivist-oriented contexts in which mathematical tasks are performed as a group¹³.

Equity in mathematics learning can be achieved when teachers explicitly connect mathematics to the social, cultural, and linguistic backgrounds of children¹⁴. When mathematics is contextualised in children's family and cultural practices, it is seen as practical and useful, and a bridge can be formed between children's informal knowledge and more formal mathematical concepts¹⁵. For Māori students, culturally responsive teaching practices such as incorporating taonga, tikanga, and te reo Māori into school mathematics teaching has been found to lead to significant achievement gains¹⁶. Acknowledging, valuing, and drawing from children's cultures in curriculum shows children that teachers care about them¹⁷, which can also be an important factor in enhancing wellbeing and learning. Finally, incorporating cultural resources from children's own cultures in teaching mathematics supports children to retain and develop their cultural competence¹⁸ in their heritage mathematical practices and knowledge¹⁹.

Diverse cultural contexts for teaching mathematics

Research shows that many families have important mathematical funds of knowledge or bodies of knowledge and skills which support individual and household functioning and wellbeing, and which can provide contexts for teaching mathematics. Funds of knowledge can relate to cooking, food preparation, and cultural activities²⁰ such as weaving, carving masks, and building canoes²¹. Pasifika art forms, for example, depend upon complex patterning activities. Tapa cloth designs often include growing patterns (patterns which increase or decrease by a constant difference, or by exponential growth) and are often represented as geometric patterns which have visual links to number patterns. Samoan sasa, which is a type of slap-dance, involves repeating patterns, as the synchronised patterns of movements of one dancer are repeated by subsequent dancers in turn²².

A measure of quantification is found in every culture, although the forms this takes might be quite distinct and diverse. In Australian indigenous cultures, quantification may take place through 'reckoning', or estimating the quantity of a group of items by recognising patterns rather than counting the objects one-to-one. This means indigenous Australians may be able to recognise large quantities of objects without recourse to counting²³.

How to develop culturally responsive mathematics teaching

Culturally responsive mathematics content: The selection of cultural contexts should not be superficial, based on assumptions about children's cultural experiences, or about putting mathematics into stereotypical cultural contexts²⁴. Instead, culturally responsive practice in mathematics should begin with an investigation into the mathematical funds of knowledge that children and their families have. Understanding children and families' funds of knowledge enables teachers to be clearer about the connections and understandings that children might make²⁵.

To learn about children's mathematical funds of knowledge, teachers need to be attentive and alert to information that provides insight into mathematical practices and understandings. This means actively noticing information about mathematical knowledge and understanding when it is offered, and asking questions and initiating conversations about the multiple ways in which children and families draw on and develop mathematical knowledge in their everyday lives²⁶. For example, teachers might notice and comment on the patterns in family member's clothing and jewellery, or they might ask whether families know about and use a particular shop or market for food shopping, and the kinds of things they buy²⁷. It might then be useful to visit that shop or market stall to see the way that mathematics is used: for example, are goods weighed out? How are prices displayed and calculated?

It can be helpful for teachers to work alongside other teachers who have strong cultural knowledge, or have a cultural buddy in the form of a cultural expert who can help teachers to develop their cultural knowledge²⁸, which can support interpersonal interactions between teachers, families, and children. Teachers also might share responsibility for developing close links with individual families from different cultural groups²⁹ as a way of sharing insights and knowledge across the team. Teachers can also find out how to count in children's home language. Children taught the counting system in their home language are found to be able to solve number problems more easily than children taught in a second language³⁰.

Culturally responsive mathematics teaching practices: It is also important that teaching practices for learning mathematics are aligned with children and families' cultural values. This might mean making more use of collaborative contexts for doing mathematics, with children sharing mathematical understandings in reciprocal ways, and supporting younger children and those with less experience to participate³¹. Collaboration can also be promoted through using inclusive language such as 'us' and 'we'³². Appropriate strategies will vary for each family. For example, research suggests that appropriate

strategies to engage Pasifika children in learning include telling stories to explain concepts, and using humour³³.

Demonstrating respect through high expectations and belief in children's capabilities, as well as respect for children's cultural backgrounds, has also been found to be important for children from diverse cultural backgrounds. In fact, older children report that, rather than their teachers having extensive knowledge about their culture, it is more important to them that they show respect and interest in their culture³⁴. Research has also shown that, for many diverse students in school, caring relationships make the most difference to children's engagement and achievement in learning. Behaviours that promote relationships between teachers and children, such as sharing emotions while engaged in mathematical activity together, are important³⁵.

Points for reflection: Culturally responsive teaching needs to be enacted in a thoughtful and critical way, so critical reflection on ways of being culturally responsive is very important. For example, a superficial inclusion of cultural artefacts or activities in mathematics learning might serve to diminish or denigrate the cultural practices as teachers focus on the mathematics embedded within them³⁶. It is also important to ensure that no learners are disadvantaged by the use of unfamiliar cultural referents, which means teachers need to ensure that children from different backgrounds are all offered appropriate entry points into the activity. Research notes some examples where the use of cultural examples in school disadvantaged some learners in the class and led to tensions between students³⁷, while in early childhood, research has documented particular groups of children being disadvantaged through the use of unfamiliar contexts for role play³⁸.

Endnotes

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- 26 Aguirre et al., 2012; Hunter, 2022.
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- 28 Averill, 2012b.
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- 30 Mogari, 2017.
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PREPARED FOR THE EDUCATION HUB BY



Dr Vicki Hargraves

Vicki is a teacher, mother, writer, and researcher. She recently completed her PhD using philosophy to explore creative approaches to understanding early childhood education. She is inspired by the wealth of educational research that is available and is passionate about making this available and useful for teachers.