

## Culture and mathematics

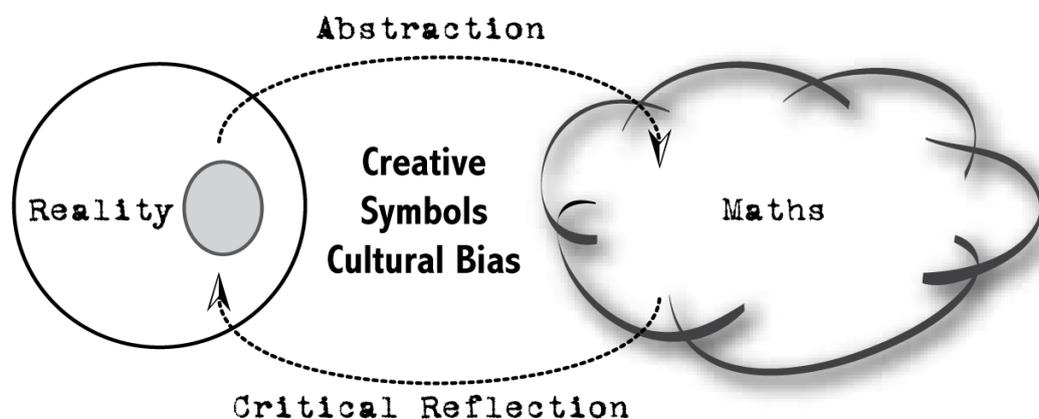
This resource supports teachers to embed Aboriginal and Torres Strait Islander perspectives in the mathematics curriculum. While this resource looks at an approach to mathematics through an Aboriginal and Torres Strait Islander perspective, it will benefit the teacher and students in any classroom.

QSA would like to thank Dr Chris Matthews, an Aboriginal man from the Quandamooka Nation (Moreton Bay, Queensland), for his contribution to the development of this resource, through both personal consultation and his writings.

## Background information

Dr Matthews states that it is important to consider that culture has a huge impact on the way mathematics is learned. He suggests that in order to understand the cultural aspects of mathematics, it is necessary to know what mathematics is. Figure 1 summarises Dr Matthews view on the fundamental question of the epistemology of mathematics. He believes developing pedagogy that is centred on this cycle will lead to an authentic mathematical literacy, enabling students to achieve at a high standard.

Figure 1. Epistemology of mathematics (Matthews)



## Explaining the cycle

The observer:

- chooses a particular part of the reality (represented by a grey circle)
- creates an abstract representation of the real-life situation, using a range of mathematical symbols, which are combined to form a symbolic language we call mathematics
- uses the mathematics in its abstract form to explore particular attributes and behaviours of the real-life situation and then mathematically communicates these ideas to others

- critically reflects on their mathematical representation to ensure that it fits with the observed reality.

Consequently, the abstraction and critical reflection processes form an important cycle where mathematics and its knowledge are created, developed and refined.

Dr Matthews argues that most students (Indigenous and non-Indigenous) only experience mathematics in its abstract form (i.e. they stay within the cloud), and do not experience and appreciate the cycle of abstraction and critical reflection.

## The MAST approach

Maths as Storytelling (MAST) is a pedagogical approach that originated from the model in Figure 1. Dr Matthews developed this approach in a research project to explore new ways of teaching algebra for students who are underachieving. The approach focuses on stories and explores how symbols and their meanings can communicate these stories.

The *Maths as Storytelling* approach has five steps, as described below.

1. Students explore the meaning of symbols and how symbols can be used to tell and create a story.
2. Students explore simple addition investigations by acting it out as a story, e.g. two groups of people joining each other. A discussion can then identify the story elements, such as the different groups of students, the action (the joining of the two groups) and the consequences of the action (the result of the joining).
3. Students create their own symbols and use concrete materials to represent the story. The story is then “told” by the students. They use the materials to create their own symbol for “joining two groups”, and for “resulting in”, or “same as”, to represent the action (or history) of the story.

**Figure 1. Example of mathematical reasoning of a Year 2 student**

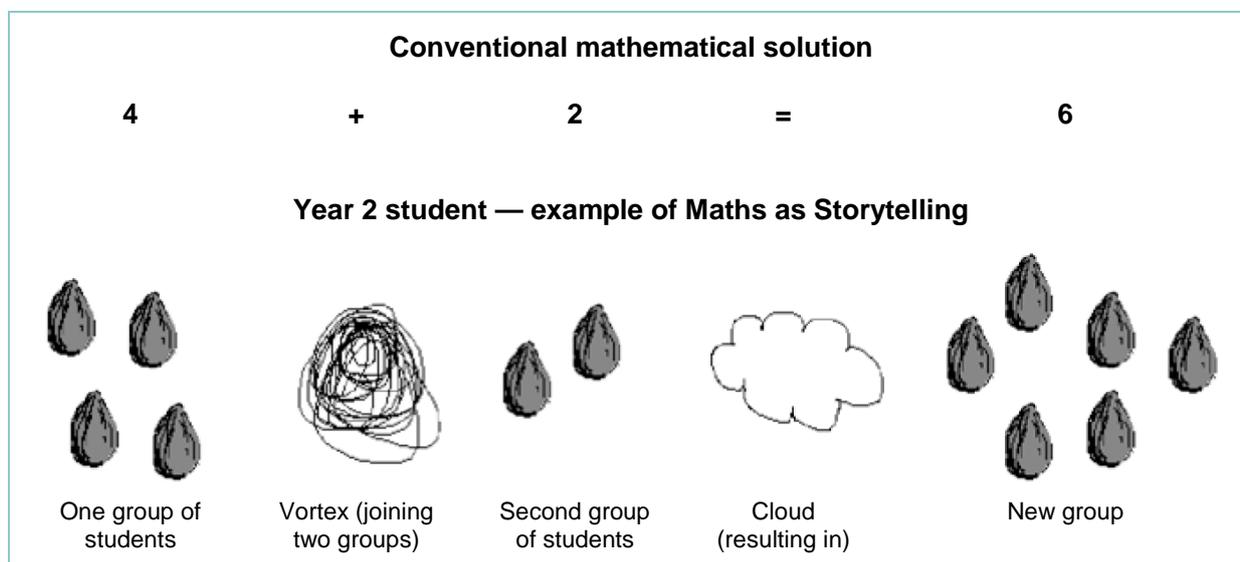


Figure 2 demonstrates an example from a Year 2 student who used the MAST approach. When the student was asked what his symbols meant, he explained his mathematical story, i.e. a vortex sucks the two groups together and the cloud gently places them down.

4. Students share their symbol systems and any additional meanings their symbols may have with the group. This step is important to get students used to writing within different symbol systems, and to develop a standard classroom symbol system.

- Students modify the story (a key step in introducing algebraic ideas) with help from the teacher.

## MAST in the classroom

The MAST approach can help students understand more complicated equations,

e.g. algebra. In Dr Matthew's publication, *Creating your own symbols: Beginning algebraic thinking with Indigenous students*, this Year 8 class situation was described.

- Students were asked why equation  $2x = 8$  was divided by 2 to find  $x$ .
- Students were asked to represent the equation in a creative manner with two  $x$ s on one side of a line, and eight circles on the other.

x		oooo
x		oooo

- Students were then able to see that dividing both sides in two (see diagram below) will give the value of  $x$ .

x		oooo
x		oooo

The teacher believed that this could not have been done without the student having previously experienced the MAST approach. In addition, students also expressed a sense of freedom in being involved in creative activities, shifting the focus away from conventional mathematical symbols to an approach that focuses on the underlying meaning and structure of mathematics.

## Questions for teachers to consider

Figure 3. Artwork by Kargun Fogarty, Gwamu, Yugambeh and Jagera man



- Do you understand the meaning of the symbols or story in the artwork above?
- What would help you to understand the meaning?

- Could this help you to understand what would help students gain an understanding of maths symbols?
- Is the way that you teach maths, engaging all students in your classroom?
- Could the *maths as storytelling* process be implemented in your classroom?
- Would this process benefit students both Aboriginal and Torres Strait Islander and non-Indigenous students in the classroom?
- Would presenting this as an Indigenous process show Aboriginal and Torres Strait Islander students that their culture is valued in the classroom?
- Would this instil pride as Aboriginal and Torres Strait Islander people?
- Would this help non-Indigenous students to gain some understanding about Indigenous culture and processes?

## Further reading on this topic

Matthews, C, Baturo, A, Cooper, T, 2005. Creating your own symbols: Beginning algebraic thinking with Indigenous students.

<http://eprints.qut.edu.au/14627/>