Maths Depends on Culture

Lyron Winderbaum

The Process of Learning/Developing Maths

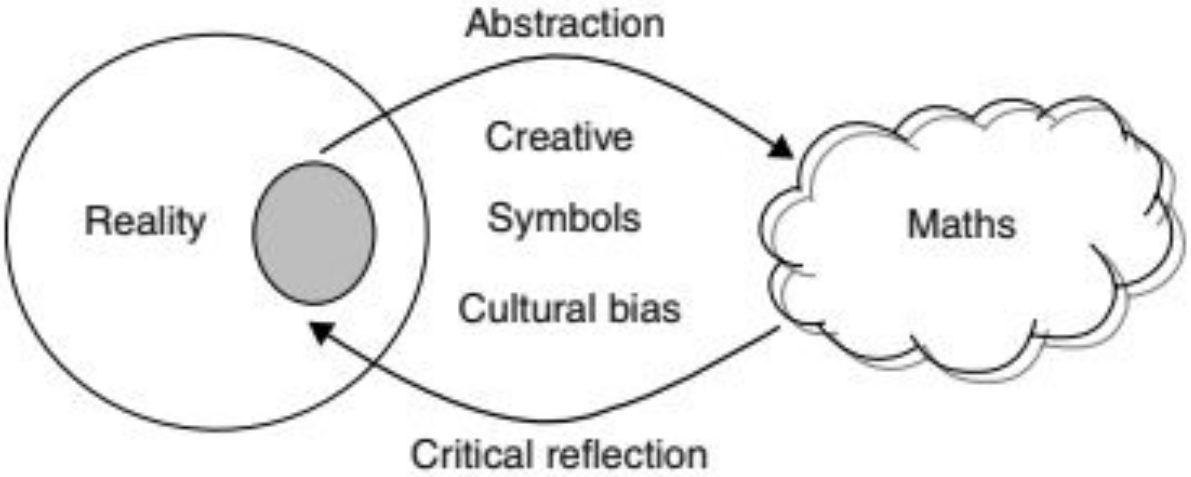


Figure 7.2: *The Cloud Model (Matthews, 2009, p. 47).*

So Where Does Culture Fit?

Our perception of reality is biased by our values.

Our values are largely a product of our culture.

So, Culture → Values → Perceptions → Maths.

This effect can often be masked if teacher and student share a cultural background.

Jordan Peterson

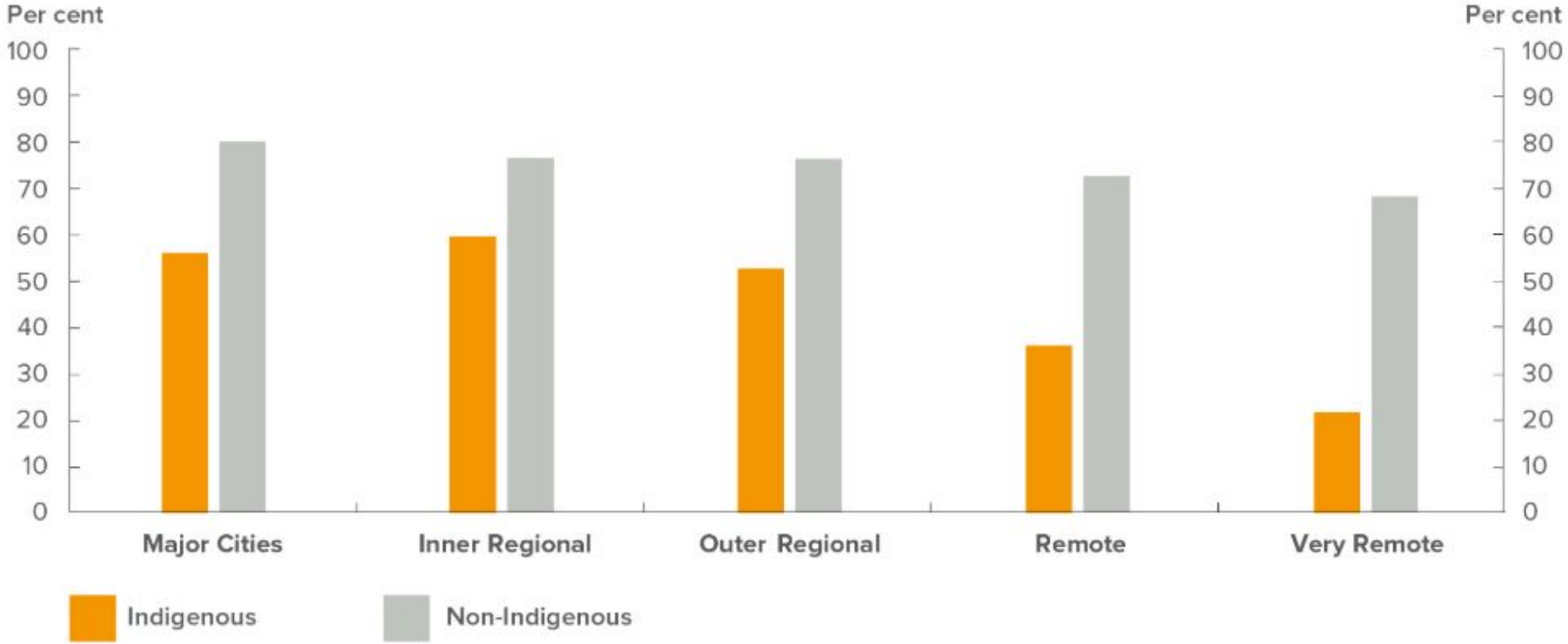
But if they differ in cultural background, students may struggle to find any relevance in the maths as it won't connect to their values.

Indigenous Students

``Indigenous students continue to be the most mathematically disadvantaged group in Australia'' --- Matthews (2007)

These poor educational outcomes cause decreased employment opportunities, and are correlated with poor health outcomes and risky behaviours.

Figure 13: Proportion of students attending 90 per cent or more of the time by remoteness, Semester 1 2017*



* Students attending school 90 per cent or more of the time; Year 1 to 10 combined; excludes NSW government schools.

Source: ACARA, 2017

Attendance - Symptom, not Cause.

The fundamental problems in maths education for indigenous students are:

- Expectations, and
- Relevance

To improve attendance a``build it and they will come'' approach is needed.

Expectations

Chris Sara has done fantastic work in this area, check out

- The Stronger Smarter Institute, and their
- High Expectations Relationships Framework

“In its crudest form, remote communities are the place to tuck our white trash away.”

Relevance

How can we make learning maths relevant?

- Placing in in contexts that have cultural importance to the students.
- Using culturally accepted practices to inform pedagogy.

Easier said than done. Some examples:

- The Garma Maths program,
- Christopher Matthews work.

Garma Maths

Is a program in the Yirrkala Community School in Arnhem Land, Northern Territory.

Position in the kin relationship gives a person certain responsibilities in both learning and teaching. For example, often in Aboriginal communities a father's brother may be assigned the role of guardian with teaching and supervisory responsibilities. Garma Maths uses this position in the kin relationship and its inherent responsibilities in the presentation and receipt of mathematics knowledge.

--- Excerpt from Robinson et. al. (1998)

Christopher Matthews

Is a Noonuccal (or Nunukal) man from the Moreton Bay area near Brisbane.

He has a PhD in applied mathematics.

Recently he has been developing strategies for engaging indigenous students in maths through culturally relevant pedagogies.

Mathematics through Storytelling and Dance

Figure 7.3: *Year 2 student's representation of 4 + 2 = 6.*

We mixed our culture and maths together and it surprised me. I can now walk away with a different understanding of Math and my Aboriginal heritage (Morris and Matthews, 2011, p. 32).

--- Matthews (2007)

The Role of Language

Maths is often described as a language.

I would say maths has its own language used to describe it, and a large component of learning maths is learning the meaning of words used to describe it.

If English is not a students first language, it is key to discuss terms and concepts across multiple languages in order to compare and contrast their meaning.

Such discussions also offer a critical opportunity to uncover cultural differences. Even if teacher and student share linguistic backgrounds, if they differ in cultural backgrounds the meaning of words can differ.

Culture Differences Reflected in Language

'Birds' and 'animals' are such obvious groupings for small children in our society but is that the way Aboriginal children perceive their world? At Groote Eylandt there is a generic term *wurratjitja* for flying animals - with butterflies, flying foxes and bats included - and that's not really quite what *we* mean by 'birds'. In a language spoken in North East Arnhem Land all animals, birds and reptiles that are hunted and eaten are grouped together and classified as *wayin*.

--- Excerpt from Graham (1982)

History… and Change?

Indigenous disadvantage in maths education has been discussed in the literature since the 1980's.

The principles to be followed in terms of addressing this issue have been clearly and consistently laid out as far back as Wilson (1979).

Examples of these principles being put into practice are given since the 90s (see the work of Robinson (1998) and Bucknell (1995) for example, or Matthews (2012) more recently).

Yet, it is still not common practice. Why?

Conclusions

Ultimately I think that taking into account a culture that is not your owns perspective is a very challenging thing to do, and the most important thing is to encourage greater diversity amongst maths teachers.

Failing that however, I think the key things we can do is:

- Relationship building supported by cultural competency,
- Set high expectations, of both students and teachers.
- Engage in collaborative discourse to negotiate terms and meaning.
- Set the learning in a culturally relevant context.

References

AIATSIS (https://aiatsis.gov.au/collections/collections-online/digitised-collections/ethnomathematics-australia/contents)

Bishop, A. J. (1988). Mathematics education in its cultural context. *Educational studies in mathematics*, *19*(2), 179-191.

Bucknall, G. (1995). Building bridges between Aboriginal and Western mathematics. *The Australian Journal of Indigenous Education*, *23*(1), 22-31.

Closing the Gap (https://closingthegap.pmc.gov.au/education)

Graham, B. (1982). Can we count on maths?. *The Australian Journal of Indigenous Education*, *10*(2), 4-10.

Howard, P. (1995). Listening to what people have to say about mathematics: Primary mathematics and the thoughts of one Murri student. *The Australian Journal of Indigenous Education*, *23*(2), 1-8.

Matthews, C., Watego, L. A., Cooper, T. J., & Baturo, A. R. (2005). Does mathematics education in Australia devalue Indigenous culture? Indigenous perspectives and non-Indigenous reflections. MERGA.

Matthews, C., Cooper, T. J., & Baturo, A. R. (2007). Creating your own symbols: Beginning algebraic thinking with Indigenous students.

References

Matthews, C. (2012). Maths as storytelling: Maths is beautiful. *Aboriginal and Torres Strait Islander education: An introduction for the teaching profession*, 94-112.

Morris, C., & Matthews, C. (2011). Numeracy, mathematics and Indigenous learners: Not the same old thing. *Indigenous Education: Pathways to Success*, 29-33.

Patrick-Rolf, M. (1990). Creating a Good Maths Learning Environment. *Aboriginal Child at School*, *18*(5), 15.

Robinson, J. A., & Nichol, R. M. (1998). Building Bridges between Aboriginal and Western Mathematics: Creating an Effective Mathematics Learning Environment. *Education in Rural Australia*, *8*(2), 9-17.

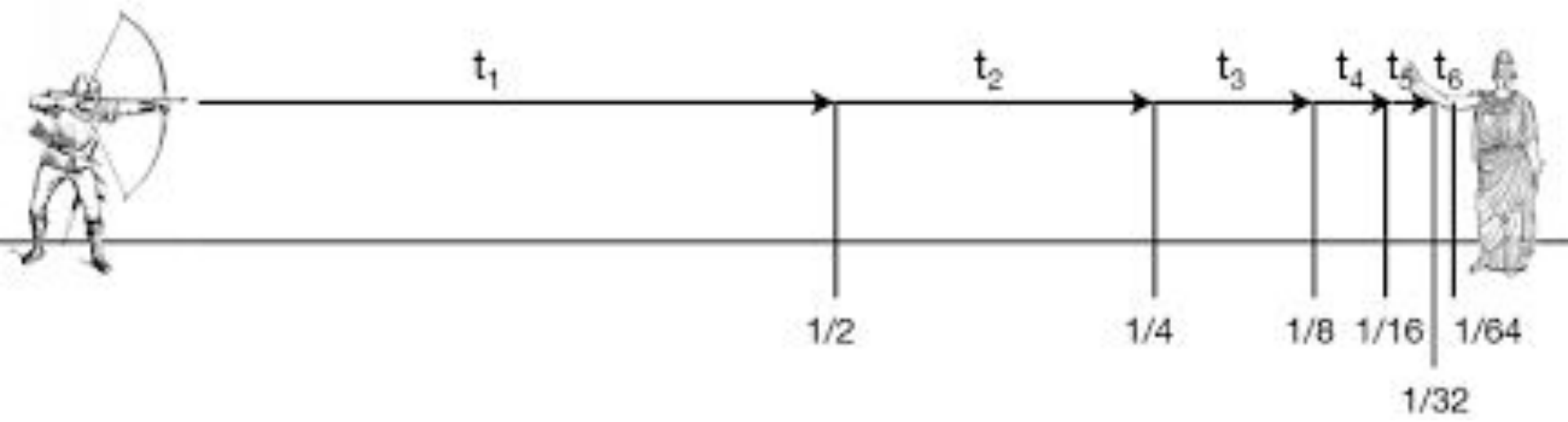
Rowlands, S., & Carson, R. (2002). Where would formal, academic mathematics stand in a curriculum informed by ethnomathematics? A critical review of ethnomathematics. *Educational Studies in Mathematics*, *50*(1), 79-102.

Stronger Smarter Institute (https://strongersmarter.com.au/)

Wilson, R. (1979). Mathematics Programs for Indigenous Students: Some Guidelines. *The Australian Journal of Indigenous Education*, *7*(5), 33-47.

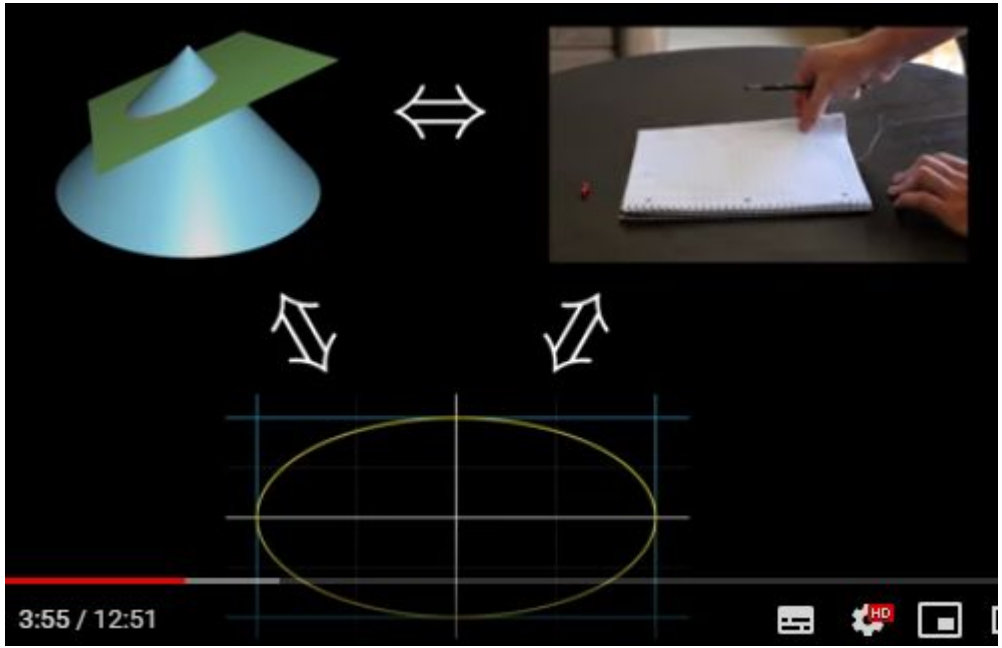
Zeno’s Paradoxes (~450 BC)

Reasoning is not fixed or absolute. We modify our reasoning to match our reality. We make observations of the world around us and let those observations guide our reasoning.



Different Perspectives

Can be incredibly powerful mathematical tools.



https://youtu.be/pQa_tWZmlGs