INSIGHTS

Spotlight on opportunities to learn

The 2022 NMSSA study included an activity that involved Teacher Assessors talking with small groups of ākonga about their learning in mathematics and statistics. Nearly 600 ākonga from 200 schools were involved nationwide. This poster describes what we found out, and gives some suggestions to enhance classroom practice.

Additional information can be found in the 2022 NMSSA Achievement and Contextual Findings reports for mathematics and on the NMSSA mathematics data window (see https://nmssa.otago.ac.nz/).

NMSSA

Wānangatia te Putanga Tauira
National Monitoring Study of Student Achievement

Te Mahau | Te Tāhuhu o te Mātauranga Ministry of Education

University of Otago Te Whare Wānanga o Otāgo New Zealand

NZCER Rangahau Mātauranga o Aotearoa

For more information on effective pedagogies in mathematics see the *Common Practice Model*.

Opportunities to Learn Mathematics at Year 4 and 8

Insights from the 2022 National Monitoring Study of Student Achievement (NMSSA)

Illuminating—why are learning opportunities important?

Providing ākonga with **multiple opportunities** to progress in mathematics and statistics[1,2] is critically important. All ākonga have the right to be equipped with the mathematics they need to **understand** and **navigate the world** around them[3]. National and international research shows that effective teachers of mathematics draw on **inclusive** and **collaborative** pedagogies that empower ākonga as **active participants** in their own learning[4].

In effective learning environments, ākonga have opportunities to engage in **communication, reasoning** and **sense making**, and to develop **deep mathematical understandings**[5]. Rather than just presenting mathematics as a body of knowledge to be memorised, capabilities such as **problem solving, reasoning**, and **critical thinking** are recognised as crucial for 21st century learners[6].

Informing—what did we find out?

Independent and collaborative learning

About half of the ākonga we spoke to indicated that they got to work both **independently and collaboratively**, *"depending on the activity"*.

> *"We do the maths matrix independently then work in groups to work through word problems."*
>
> *"When we're doing our worksheets we work by ourselves but when we're working in our maths rotations groups we work together."*

About 25 percent of ākonga told us that they **usually work collaboratively**.

> *"I usually work with other people to collaborate on ideas."*
>
> *"I like working with others and if anyone needs help, we can help each other."*

About 25 percent of ākonga told us that they **usually work independently**. Some of these ākonga described independent work that promoted individual thinking and self-reliance:

> *"I usually work by myself because I want to be in charge of myself."*

A small number described a less agentic learning environment:

> *"We have to work by ourselves or we get in trouble."*
>
> *"You're not allowed to work with others."*

Mathematical explanations

Some ākonga described opportunities to **share their reasoning** and **explain** and **justify their thinking** with other students.

Some ākonga described opportunities to **share ideas** and **explain thinking** with their teachers.

> *"If we're working in a whole group then we can share how we're working things out."*
>
> *"We call them arguments…we see whose ideas are better."*
>
> *"In our group we can say I agree or disagree and explain why."*

Some described more **teacher-centred approaches** to mathematical explanations.

> *"After marking we tell the teacher what we were thinking."*
>
> *"She'll ask us to explain how we worked things out."*
>
> *"There's a question after each problem asking how you solved it and our teacher checks this."*

About 10 percent of ākonga suggested they did not like sharing their thinking or were not given regular opportunities to do so.

> *"We get to but no one wants to."*
>
> *"Not many people do it though—only the smart ones."*
>
> *"Our teacher doesn't usually ask us."*

Being 'good' at mathematics

Almost all ākonga described **constrained views** of what it means to be 'good' at mathematics.

Some expressed a belief that people who are 'good' at mathematics have an **innate ability**, and maths is **easy** for them.

> *"They're just smart and they understand it."*
>
> *"They just look at something and know the answer."*

Others told us that being 'good' at mathematics involves **memorisation, performance** and **speed**.

> *"They have a good memory."*
>
> *"Always knowing the answers, always putting your hand up."*
>
> *"You have to be the first one to answer the questions."*

Some ākonga told us that learners who are good at mathematics *"go to extension maths"* and *"are in the smartest groups"*. They told us that being given the opportunity to work on **challenging tasks** meant you were 'good' at mathematics.

> *"All the smart people get to do the hard questions and all the bad people get to do the easy ones."*

A small number of ākonga shared a **broader view** of what it means to be 'good' at mathematics.

> *"They don't give up and they help others."*
>
> *"There's no one way to be good at maths…everyone has their own ways…and not everyone is good at the same kinds of maths."*

Improving—how can these insights be used in practice?

Te Mātaiaho, highlights the importance of kaiako providing multiple opportunities for all ākonga to learn and progress in mathematics. To foster **rich opportunities for learning** mathematics kaiako can:

- Inquire into the use of **ambitious, responsive**, and **equitable approaches** to learning and teaching mathematics
- Create an **inclusive** and **supportive** mathematical learning environment, where all ākonga have opportunities to demonstrate their **strengths in multiple ways**. For example, kaiako can draw attention to mathematical capabilities like **asking questions, making connections**, or **representing ideas clearly**
- Hold **high expectations**, **believe in the potential of every learner**, and give all ākonga opportunities to **actively engage** with **rich and challenging mathematical tasks**
- Use **strengths-based** and **social groupings** to support ākonga to experience mathematics as a **collective** endeavour. Additionally, provide space for **independent** learning so that ākonga have opportunities to reflect, practise and consolidate new thinking
- Show that you value **deep, conceptual understanding, critical thinking**, and **reasoning** by, for example, using open-ended problems, and encouraging ākonga to articulate their ideas and construct logical arguments
- Make classroom discourse an integral part of teaching and learning, and provide multiple opportunities for ākonga to learn through **talking, questioning** and **actively making sense of a broad range of mathematical ideas**
- Explicitly teach ākonga how to engage with **mathematical communication** and **mathematical practices**, for example support ākonga to provide a good mathematical explanation or use representations to learn new ideas and explain ideas to others
- Promote the idea that mathematical capabilities are not dependent on innate talent. **Encountering challenge, being stuck**, and **persevering** when solving problems are key to learning and doing mathematics.

[1] For brevity, the term 'mathematics' is used when referring to the mathematics and statistics learning area.

[2] Ministry of Education. (2023). *Te Mātaiaho, the refreshed New Zealand curriculum*. Author.

[3] Royal Society Te Apārangi. (2021). *Pāngarau mathematics and tauanga statistics in Aotearoa New Zealand: Advice on refreshing the English-medium mathematics and statistics learning area of the New Zealand curriculum*. Author.

[4] Anthony, G., & Walshaw, M. (2009). *Effective pedagogy in mathematics*. (Educational Practices Series, no. 19). International Bureau of Education; ; Kazemi, E., & Resnick, A. F. (2020). Organising schools for teacher and leader learning. In G. M. Lloyd & O. Chapman (Eds.), International handbook of mathematics teacher education: Volume 3 (2nd. ed., pp. 393–420). Brill Sense.

[5] Bush, S., Roy, G. & Jackson, C. (2020). *Catalyzing change in middle school mathematics: Initiating critical conversations*. The National Council of Teachers of Mathematics, Inc.

[6] Hunter, R., Hunter, J., Jorgensen, R., Choy, B.H. (2016). Innovative and powerful pedagogical practices in mathematics education. In: K. Makar, S. Dole, J. Visnovska,, M.Goos, A. Bennison, K. Fry,(Eds) *Research in mathematics education in Australasia* 2012-2015. (pp.213-234). Springer