Accelerating Learning in Mathematics

RESOURCE 11: ADDRESSING AVOIDANCE BEHAVIOURS IN MATHEMATICS CLASSES

Students who are underachieving in mathematics often exhibit behaviours that range from attempting to disappear off the teacher's radar to creating major distractions from the task at hand. These behaviours include:

- silence or non-participation
- piggybacking or reflecting back others' answers to questions
- random guessing when asked to volunteer a response
- distracting other people within the group.

Most of these students show low levels of confidence when participating in discussion, asking questions, or sharing ideas. They may have worked in classes where sharing ideas was not a priority or where strong students dominated the talk, or they may be anxious about being wrong.

This resource helps teachers to identify some reasons for behaviours that inhibit participation and provides some strategies to engage these learners and so increase their achievement in mathematics.

Why is this important?

These behaviours are only symptoms, so it is important to try and understand the causes behind them. Students who are passive or disengaged are not participating and therefore not learning. Because mathematical talk is fundamental to constructing mathematical understanding, it is important to identify barriers to participation and to employ strategies that break these down.

Beliefs underpinning effective teaching of mathematics

- Every student's identity, language, and culture need to be respected and valued.
- Every student has the right to access effective mathematics education.
- Every student can become a successful learner of mathematics.

Ten principles of effective teaching of mathematics

1. An ethic of care
2. Arranging for learning
3. Building on students' thinking
4. Worthwhile mathematical tasks
5. Making connections
6. Assessment for learning
7. Mathematical communication
8. Mathematical language
9. Tools and representations
10. Teacher knowledge.

See *Effective Pedagogy in Mathematics* by G. Anthony and M. Walshaw, Educational Practices Series 19, International Bureau of Education, available at www.ibe.unesco.org

POSSIBLE CAUSES OF AVOIDANCE BEHAVIOURS

All students are individuals, so you need to try and get to the bottom of the issue (the cause of this behaviour) for each student before deciding on a strategy. Be aware that "boredom" can be a cover-all excuse for opting out or acting up. Boredom is not a cause as much as an outcome.

Some possible causes include:

- language skills – for some reason the student can't read well enough to extract meaning from maths texts or can't understand teacher explanations or questions
- mathematical identity – the student's experiences with maths (or lack of experience with it) cumulatively result in low or no confidence in their ability to make sense of it (*Effective Pedagogy in Mathematics/Pangarau BES*, pages 54–55, 58–60)
- personal safety – the student doesn't feel safe taking the risks needed for learning. They may not feel safe culturally, the class may lack structure, or socio-mathematical norms may not be well established (*Mathematics BES*, pages 54–60)
- insufficient challenge – the student may not be challenged enough because the teacher believes they can't achieve and so gives them low-level tasks (*Mathematics BES*, page 60)
- lack of connection to student's life or needs – they can't see the relevance or point of the mathematical content because the teaching style is not connecting with them. (See the Effective Teaching Profile in Te Kotahitanga.)

Encouraging and modelling mathematical "discourse" has a positive impact on learning. Students learn how to participate and contribute to the mathematical talk and this builds their confidence. The effective teacher not only facilitates but also participates in the discussion and comments critically on the quality of the talk. In this way, the teacher guides students to learn how to explain and justify their mathematical reasoning and explore and challenge others' thinking (Hunter and Anthony, 2010).

Teachers have noted that when they succeed in boosting students' confidence and participation in ALiM groups, students also participate increasingly in whole-class discussions in all curriculum areas.

SILENCE OR NON-PARTICIPATION

Some students verbally freeze whenever the spotlight falls on them. They may look down or away, shrug, or offer a quiet "I don't know" when asked to respond to a question or comment. Such students think they have nothing to contribute. They may identify themselves as "not being good at maths" and be afraid they'll say something wrong or silly in front of their peers. They may also feel that they take too long to form a response and say "I don't know" so that they don't have the pressure of others waiting for them.

Silence can indicate that a student needs more thinking time to process the content of what is being said or that the student is confused or "lost" and doesn't want to say this out loud. Observe the student's body language for clues to whether they are still thinking and need more time or whether they are confused and unsure of what is expected.

Sometimes the silence results in the teacher moving on before other students get restless. The student with low confidence or the student who is confused feels relief, and the slower processing student feels frustrated and gives up. Providing more wait time before expecting an answer can relieve the pressure and encourage these students to participate.

Periods of silence are also common for second language learners, especially initially, when they are acquiring the new language without producing it. This silence may not mean unwillingness to participate but rather a period of intense observation and listening. Pairing and co-operative learning strategies can support students as they learn a new language. As they acquire basic interpersonal communication skills, ensure that the language learner is supported with non-verbal gestures, diagrams, and contextualised problems. The vocabulary of mathematics presents difficulties because the meanings of words (such as point, power, square, negative) often change in mathematical contexts.

PIGGYBACKING AND RANDOM GUESSING

"Yep, I was thinking the same thing as her", "I got the same", or "That's what I was going to say" are common strategies for deflecting attention or seeming to participate without contributing anything original. This may indicate a low level of confidence and/or confusion about the content of the discussion. Again, confidence will increase only with understanding and success.

The thinking-aloud process has been found to have a significant impact on raising achievement for low-achieving and special needs students. Both listening to others' explanations and documenting one's own thinking in a step-by-step process has been found to support understanding. A teacher may try responding to a piggyback statement like "I did the same as she did" with *Great. Let's go through that process together again.* This way the student gets the practice through revoicing, and being guided through, a successful process whether they actually did do it that way or not.

Random guessing can be a task-avoidance strategy when a teacher poses a problem. Students may call out random numbers in the hope that the teacher will move on. Teachers may do so because it seems so obvious that it was a wild guess and there wasn't any thinking to unpack or pathway to follow for understanding.

A student's impulsive response can be a way to be seen to participate but not actually contribute. The student may also believe that what a teacher wants to hear is an answer, any answer, rather than wanting to hear thinking. Teachers need to be honest in their response to the student and to show that they see them as capable of an answer that shows more thought.

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The development of effective mathematical ways of speaking within a classroom or within a group is crucial to supporting students to "become less preoccupied with finding the answers and more with the thinking that leads to the answers" (Anthony and Walshaw, 2009, page 19). Students may not be sure what thinking sounds like, or they may need practice in turning their ideas into words. Slowing things down and unpacking a problem before asking for responses can reduce impulsive responses. For example: *Let's look at the numbers and the action words in this problem and circle them. This might help us decide what we need to use to solve this.*

DISTRACTING OTHERS

Disruption or distraction is another task-avoidance behaviour that can undermine the participation of everyone in the group. A student may simply not be engaged with the mathematics, or they may be unsure or confused and not want to have their lack of understanding exposed. They may use this strategy because they have attention difficulties or are feeling frustrated with the pace or expectations of the lesson: "I never get a turn", "I never get to answer", "This is boring".

Involving students in establishing the purpose of the lesson and evaluating its progress are effective ways to engage learners. Questions about the lesson itself as well as the content are important in the co-construction process. For example, draw the students into thinking about their own learning by asking: *What are we learning? Why are we learning this? What would be fun to try? How are we going so far? Is this too easy, too hard, too fast, or too slow? Can we imagine doing this another way or creating another model or recording with a different diagram?*

Effective formative feedback and honest praise can also reduce task avoidance. Feedback focused on the mathematical talk and work (rather than the distracting behaviours) and praise for thoughtful contributions shift attention from off-task events to the group work. Cultural practices and responses to praise need to be considered. In a culturally responsive and supportive classroom, praise can have a positive effect; however, students may not respond to praise in the same way if they do not feel culturally valued in the broader context of the classroom or school (Butterworth and Bevan-Brown, 2007; Te Kotahitanga).

SOME STRATEGIES FOR SUCCESS

Once you have identified the behaviours that act as barriers and explored the motivation behind them, you can employ effective strategies to help students participate in and contribute to the mathematical talk in the group.

The following strategies are derived from research, teacher discussions at ALiM expo days, and the reflections of teachers in charge of ALiM programmes. While effective practices in facilitating classroom dialogue are useful for all students, the following have been successful specifically with the target groups.

1. Remove the spotlight from individuals

Consider the experience of the underachieving student who feels the intense glare of the spotlight when asked for a contribution, such as an answer to a problem or an idea to share. Try to avoid having anyone respond individually. Stress the collective pronouns of "we" and "us" and provide students with the support of working as a pair or triad and contributing as a team. Honest praise, encouragement, and critique are then given to the group, not to the individual. This practice may support silent students to be more vocal, first within their pair and then with their pair in the wider group. This practice also reduces the need for piggybacking, especially when there are only two discussing something or getting ready to share.

2. Shift attention from answering to evaluating

Instead of posing problems that require calculation before engaging with concepts, turn things around and eliminate the need to come up with an answer. Evaluate a fictional student's answer to build confidence and break down the "teacher questions – student answers" dialogue model.

> *Here is someone's work on a sharing problem. I wonder if we can follow their thinking. Tell me what you see.*
>
> *How do we think they arrived at this answer?*
>
> *If we could ask them to add one thing that would make this clearer for us, what would we want?*
>
> *OK, so we think a diagram here would help us know where these numbers came from. I wonder what sort of diagram we could suggest?*

3. Model thinking by thinking aloud

How can we support students who don't know what to do when told to *Have a think before you answer*?

An effective method is to model what thinking sounds like by speaking your own thoughts out loud and being very specific about what steps you are going through to form a response. Students' expression of their thinking gets better with practice provided they know what they are expected to be doing.

The random guessing and distraction tactics used by some students may reflect a high level of confusion. They may not understand how other people are actually getting answers to maths questions or what other people "see" in their heads. By opening up the process of engaging with a problem, working through different ideas, and identifying points of confusion, you can provide critical insight for students.

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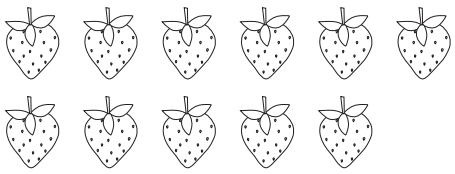
OK, I'm going to take a turn now and share my thinking as I solve 32 + 41. I look at this equation, and I know I'm going to be using tens and ones. So I imagine 32 on the hundreds board. I know I have to add on 40 and I have to add on 1. That is 4 tens or like going down 4 whole rows. So I think: 10 more is the next row – I'd land on 42, then 52, then 62, and the fourth row is 72. And then add on 1, so that's 73. I think I've got an answer, but I want to write down the number and check my thinking. (If I keep the numbers all in my head at the same time, sometimes I get mixed up.) So I write down 73 and look at all the numbers together and see if it makes sense. It looks right because I know it can't be more than 100 because it's only a 30s number and a 40s number.

4. Revoice instead of questioning in order to guide discussion

Some students, especially those who have had negative experiences, can view questioning as confrontational. They may perceive a question as a personal challenge instead of a scaffold or support for their learning. Revoicing is an effective technique for guiding students to communicate in mathematically meaningful ways. It involves repeating student talk, rephrasing it, or expanding on it, using their own words as the springboard for the discussion. By revoicing, you can highlight ideas that originate with students, further develop implicit meanings within those ideas, and add new ideas to the discussion.

Sam and David were given 11 strawberries. How many strawberries does each get if they share them?



Student: We think when you share these, you each get half. So, 5. But you still have 1 left, so then you've got to break that 1 too, but it's only a piece. So we think maybe you each get 5 and a quarter. It's not like other double and halves.

Teacher: What I hear is that you think this is a different sort of problem – that you noticed it's not even when you share them out. I can see how you have 5 here and 5 here and then this 1 left over. You've decided it needs to be broken?

Student: Yes, because you can't just leave it over because everything needs to be shared. So we're going to break it. In half – oh, like 2 pieces. So, you get 5 and a half!

Teacher: So you've changed from half of 11 is 5 and one quarter to 5 and one half …

Student: Yes, because half is when you break in two, and quarter is breaking in … um, four?

By employing extra support and specific practices focused on building confidence, you can develop a learning environment where all students participate and contribute to rich mathematical dialogue. Once students experience success in mathematics, their progress will accelerate.

REFERENCES AND FURTHER READING

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