

Getting Indigenous Students Ready for Mathematics Classes

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Abstract: The Healesville Cluster of the *Make it Count* initiative implemented a tutoring program with the goal of preparing students for their subsequent mathematics classes. Both Indigenous and non-Indigenous primary school aged students participated in the program. The results reported below indicate that the program was successful in building students' confidence and enhancing their engagement with mainstream mathematics classes.

Introduction

This paper outlines the processes of, and responses to, a particular tutoring process that was conducted in 2011-2012 as part of the Healesville Cluster of the *Make it Count* Project. A similar initiative, modelled on this program, was implemented at Monash University in 2012. The initiative at Monash involved the participation of Indigenous students in bridging courses to prepare them for study at the University. It was reported that the three-hour mathematics lectures that were part of the bridging course were very demanding for some of the students, who had had interruptions to their previous mathematics studies. Under the auspices of the *Indigenous Engagement Unit* (IEU), a tutor was employed to prepare the students for these mathematics lectures. The intention was to assist the students to learn from the lecture content. The co-ordinator of the program at the IEU recently wrote the following testimonial:

Having had contact with the previous cohorts of enabling program students I had seen first hand the consequence of students having their confidence shattered by very poor results in maths. These results and the negative experience they created inevitably led to the students questioning whether they were cut out for the program and certainly contributed to withdrawals from the program.... suggested that we hold the tutoring sessions *before* the students attended class. This approach has made the tutoring program we run a proactive measure that better equips the students for their coming lessons. This is in stark contrast to the usual reactive approach which tries to fill gaps in knowledge and which in worst case scenario seeks to restore shattered confidence before anything at all can be taught or learnt. Giving the students a chance to create a foundation to build upon in class has genuinely revolutionised the students approach to the unit and to their studies more generally. This approach has markedly reduced anxieties and concern amongst the students and has created a far more positive attitude within our cohort of students that has contributed to an overall lift in confidence and self belief. Importantly the shift in approach suggested ... has translated into our first ever cohort of students that have passed the maths unit comfortably with distinction averages.

The program, termed *Getting Ready in Numeracy* (GRIN), was originally developed for schools by the Faculty of Education at Monash University and has been implemented widely (see Sullivan & Gunningham, 2011, for a report of an earlier implementation). GRIN is an intervention designed to assist learners prior to the classroom session they will subsequently have. A tutor takes a small group of students and prepares them for their next mathematics lesson. It has different goals and a different structure from intervention programs that are designed to remediate general mathematical deficiencies. The following outlines the rationale for conducting the program in this way, presents some feedback from those involved in this particular implementation, and make some recommendations for future implementation of the program.

The Program Rationale

It is well established that many Indigenous students fall behind in mathematics, and eventually fall so far behind that participation in mainstream classes is problematic (see, for example, Thompson, De Bortoli, Nicholas, Hillman, & Buckley, 2010). There are many factors that can make mathematics learning difficult for students who have fallen behind. Of course, number sense and fluency with number calculations are important pre-requisites to classroom participation, but so are familiarity with the technical terms, general language structures, and subtle differences between related concepts. In addition there is substantial formality associated with setting out of procedures, interpretation of diagrams, use of instruments and even diagrammatic representations of manipulatives that increases the complexity of classrooms for those who are unfamiliar with these aspects. Connected to this is awareness of how mathematics learning creates employment and study options. While many students are aware of these connections, those students who are not so aware can benefit from having those connections explained. One of the goals of GRIN is to review or introduce each of these aspects that are relevant for the upcoming lessons.

A second rationale that guides the implementation of GRIN is the intention to prepare students for the social context of the classroom. No one wants to be seen as failing in the eyes of one's peers. While many classrooms operate on an assumption that students experiencing difficulty will ask questions of the teacher or peers, not all students are oriented to exposing deficiencies in this way. This has been described as performance avoidance (Elliot, 1999) and the effect is that rather than trying and failing, some students misbehave as an alternate way of participating in the classroom. The intention is that getting students ready for the class will increase the chances that students can feel confident enough to answer questions, to contribute suggestions and even to ask for help if necessary.

The program requires specific actions by the teachers in their planning, deliberate planning by the tutors, and ongoing communication between tutors and teachers to make the program work. The induction program for teachers includes processes for identifying the focus of classroom lessons and the importance of listing both pre-requisite and new language. The induction of tutors also focuses on the language demand of the mathematics to be learned, and techniques for listening to students. There is emphasis in both induction programs on developing effective communication mechanisms between teachers and tutors.

The Healesville Cluster context

Healesville is a town 60km northeast of Melbourne, where employment is principally based on sawmilling, tourism and more recently viticulture. Healesville is also the home of the Coranderrk mission and lies on the ancestral lands of the Wurundjeri people. Ten percent of Healesville's population of 7,000 are of Aboriginal or Torres Strait Islander descent. Healesville has two primary schools, one public high school and Worawa College, an Aboriginal girl's boarding school.

While GRIN has been implemented in varying ways in many schools, the data reported below ~~is~~ are from the implementation of the program in two schools within the cluster. These ~~include~~ schools were Healesville and Badger Creek Primary Schools, both of which have a significant number of Indigenous students. Both schools had implemented GRIN for small groups of Grade 1, 2 and 3 students in 2011 and continued to tutor these students through the GRIN program in 2012.

The GRIN program began with an induction for the teachers of students in the program and their tutors. During the first year the teachers and tutors met at the beginning and mid-way through the year to learn and revisit the key features of the tutoring program with an expert from Monash University. As mentioned earlier, the induction emphasised the

importance of teachers being intentional about the goals for their mathematics classes and effective communication between the teacher and students. Induction exposed participants to the key stages of the 15-minute tutorial, which would include recapping on the previous lesson, discussing resources and the language that would be a focus of the following lesson and setting expectations. Through this induction, participating teachers ~~decided to~~ developed a template that reflected the key stages of the program (~~see below~~) as shown in Figure 1. This template was updated weekly and this information conveyed to tutors, accompanied by a short verbal briefing. ~~Teachers were given one day of release per term as a way to ‘payback’ time owed to them. With this bonus teachers felt encouraged to continue to adequately maintain communications with the tutor and stay positive about the program.~~

Example of template:

		Date: 17/7/12
Time	Stage	Details
2 min	Previous lesson	Practicing quick addition and subtraction skills, how did the class go?
3 min	Oral number practice and reinforcement	Addition cards/ addition questions
5 min	Oral language immersion	Addition, plus, adding, equals,
4 min	Example of work	Have a vertical sum set out on whiteboard and children work together to solve it.
1 min	Summarise & Expectation setting	Trading in addition helps us to work out addition with two digit numbers.

Figure 1: An example of the template for communication between teachers and tutors.

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Badger Creek primary school runs three groups covering 9 children from Grade 1 and 2, Monday to Thursday. The GRIN timetable is kept as routine as possible, making allowances for specialist subject timetabling. All Indigenous students who participated ~~ing~~ in the program in 2011 continued their involvement in the program in 2012. The GRIN tutor is also employed by the school as an Integration Aide and so is in contact with the students, teachers and broader community in both roles.

At Healesville Primary, in 2012, GRIN operated ~~s~~ in Grade 2 and 3. There are two groups, each containing three children who meet daily between 9am and 10am with one tutor. GRIN operates within the school environment, but outside the classroom. GRIN at Healesville Primary entails the withdrawal of a group of three students for five sessions per week of about 15-20 minutes each.

While this implementation of GRIN was designed to boost Indigenous learners’ preparedness in numeracy, both schools include non-Indigenous students in their groups. This has an important benefit of communicating the expectation that all students will participate in the full mathematics program at the school.

In preparation for this report, participating teachers, tutors and the program co-ordinator were interviewed and their comments recorded, transcribed, and analysed to provide insights into the implementation of the program. These comments are presented in the following section.

Results

The following presents data and responses from the teachers of tutored students, some comments from the tutors as well as considerations for future implementation of the program.

NAPLAN data

Two of the students involved in the GRIN tutoring program sat NAPLAN for the first time in May 2012. Student A (non-Indigenous) has been involved in the program since January and her results for all subjects were all below the state average. Student B (Indigenous) has been involved in the program since June 2011. Student B was below average in all subjects with the exception of Numeracy where she reached the state average. Her teacher commented:

...she (Student B) is doing well on all of her topics tests. She really benefits from a bit of extra help. It just shows that this type of tutoring really works for her.

Responses from teachers

Overall the teachers noted benefits from the participation of students, their confidence and their engagement. For example, in discussing the impact on the participation of one of the Indigenous students:

... he has auditory processing issues and ... he often shuts down and gets visibly upset because of the stress of not understanding what's going on. Not because he doesn't want to know, but because sometimes it's just like blah, blah, blah, to him because of the auditory issues. ... with the GRIN, having that three on one, but mostly one on one time, it allows him to take it slower and he can actually concentrate more and hear what's being said. So, in class, instead of shutting down and getting frustrated and crying because he just misses it, he's able to participate. So, that's just the biggest change for him.

Another comment noted that the students showing increased familiarity with the tasks required in class:

it alleviates some of the stress from them when it comes to their maths class. ... when they come into maths classes they're more focused, because they have a sense of what they're going to do.

It has a positive effect on their confidence. When asked about this, one teacher commented:

The confidence of the kids, hands down. Every one of them, just saying you can see it on their faces, ... before the kids were on the GRIN program they would be, not disruptive, but just not participating.

Another teacher commented on how they adapted their classroom approach to enhance students' confidence:

I try ~~and~~ to increase their confidence as well because I found that my students aren't very confident in maths, the ones who are being tutored, so I try and increase their confidence by asking them the answers that I think that they'll already know because of the GRIN program.

The program involves withdrawing students from some other aspect of the normal classroom program, but the teachers seem to feel it is nevertheless valuable:

So, even though they're missing out on 15 minutes and that it is going to be a disruption to the timetable, they're actually present in their minds when they go into class, and the value of that is enormous.

It also seems that the benefits apply both in other subjects and also to other students in the classroom:

It flows into other subjects as well, they've all said that the kids are more likely to tune in, definitely more positive towards learning in general.

It is now easier to teach the whole grade, because those two or three kids are more tuned in to what's going on.

Teachers even commented on ways that the program assists them to direct their own teaching. Because they feel accountable to the tutor, they reflect on what they have decided to teach and they make sure that the teaching reflects what was tutored earlier that day, regardless of other pressures and interruptions. As we have found in other implementations of the program, the program actually assists teachers rather than creating an unproductive burden.

Responses ~~related to~~from tutors

Comments related to the tutoring component emphasise the building of relationships, and the interpretation of the program by the tutors. Some of the comments on relationships came from the program co-ordinator, such as:

They have relationships with their teachers, of course, but one on one with their tutor is a special time where they feel safer to take a risk, safer to have a guess or have a go, whereas before it might not have - like, in the classroom with so many other faces around, it might be a bit of a shame factor to get the answer wrong or not know something, so it's easier to avoid it.

I know that she's really happy that she has built relationships with children here at school and she feels a lot of ownership over that program and she does ensure the success of that program as well... She also appreciated the fact that she had training and that she's not just coming in and working in somebody's class, that she actually has a role and she has a program to deliver..

The tutors commented on their interpretation of the program:

It's like the children get a sneak preview of each day's maths activity and they get a chance to work on a one to one and learn the concepts on their own before they actually are exposed to those concepts again in the class room.

In reflecting on the impact of the program:

I just think it's great that the kids have the opportunity in the G.R.I.N. program to actually meet all the maths they were doing in the classroom, because the more one to one and the more opportunities to explore those maths concepts the better chance they have of gaining those essential skills.

There were also comments on students' attendance:

No one on the GRIN program wants to miss out, so they are making sure they're on time for school. One comes at about eight o'clock in the morning. He doesn't obviously have a great perspective of time yet, but he knows that he has to be here before school starts.

We have really good attendance here from both groups... makes those kids want to be at school on time.

Tutors even reported positive responses from the parents. One reported a parent saying:

I'm really happy that something is being done for my child

Another commented:

She (Mum) was just so pleased with everything. She was just so happy with the progress that he'd made. It was really, really good feedback from the family.

Of course, all tutoring initiatives foster positive relationships between students and tutors. In this case, the relationship has the potential to enhance the likelihood that the students can participate fully in the mainstream program.

Advice for others

We were also interested in the lessons that could be learned from this implementation. In responding to a prompt about advising others, the co-ordinator commented:

keep it regular and make sure that the teacher knows what they're doing in maths, to have that planned, so they can pass that information on to the tutor, so the tutor can get planned, so that she can pass it on to the kids. So, having those regular meetings is important and to have the space and the resources available.

In terms of the conduct of the sessions, one of the tutors commented:

If they're specifically talking to the kids, to always keep the language positive and to make sure that they keep in touch with the teacher so they feel confident in their job as when they're speaking in the sessions with the kids. To make sure that they build those relationships, not - genuinely, so to make sure they're doing it genuinely, to have the best chance of success, I think. Relationship building and positivity. Knowing when the kids are mucking around or whatever, to pull them back into line, but to know your stuff so you can get the kids engaged.

In terms of communicating between teacher and tutors, the teachers commented:

I think that you just need to talk to the tutor about the topics you are doing beforehand so she can also, she has expertise in the area and she may be able to add some more teaching resources to those lessons and just, perhaps, give her a talk about the way you teach and the different types of, the methods you have to teaching the maths.

I find that it's best just to have short meetings with the tutor every now and then to discuss any issues or problems that you might have and the tutors are usually fine as long as you let them know what's happening, like if you're going to miss a session. That's helpful.

On ways to respond to students in class, one of the teachers said:

Well, you see, often those G.R.I.N. students are a little bit weak in maths anyway and you need to give them opportunities to experience success, so I'd be rewarding them and encouraging them as much as you can. And asking them questions that you know they're going to have a fair idea of the answer, because it's all about self esteem at the end of the day and I'd just be making sure that you involve them in the activities and, particularly the ones that you've got the G.R.I.N. teacher to work with, so that they feel they belong to the group and they've got important ideas to pass on.

With respect to choosing the participants:

Then you need to choose the kids wisely. Obviously you want the kids to have the best success, so you need to put the kids in the group with people that they, not just get along with, but similar skills. ... she said that the ones that have the best success are the ones that are at school, the ones that have that consistency.

Conclusion

Clearly, Australian educators need to find ways to support the learning of mathematics by Indigenous students. This assistance can come in the form of relevant curriculums, sensitive pedagogies, and appropriate assessment regimes. It also seems that there will be students who are not able to participate in mathematics lessons because there are too many aspects that are unfamiliar, and the risk of trying and failing is high. The GRIN initiative appears to be a productive way to re-engage students who have fallen behind in their mathematics learning.

There are, of course, some challenges for the school in finding the personnel, the timing of sessions and a suitable meeting place, and considerations for the teachers and tutors in finding time and ways of communicating, and for adapting usual planning routines to accommodate this need for additional detail in the planning. It seems that the program has benefits not only for the participating students but for all students in the classes of those students.

References

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