# Transcript

**Numeracy Webinar Series: Setting up the Conditions for Effective Teaching and Learning in Numeracy**

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NARISSA LEUNG: Hi, everyone. Welcome to the Numeracy Webinar Series. Thank you for waiting two minutes for us to get sorted. We just had our captioner coming on board.

So tonight we are looking at the second of the Numeracy Webinar Series. Welcome back to any repeat offenders who came to the first one where we talked about things like growth mindset, maths anxiety, all those types of things. So tonight we're talking about the building blocks for effective mathematics lessons.

Before we begin, I would like to acknowledge the traditional owners of the lands on which we all come to this meeting tonight. I pay my respects to Elders past and present and thank them for the care they've taken of this country over countless generations. I was lucky enough to spend the weekend running around the Grampians ‑ what a beautiful place ‑ and very happy to be running around on Country over there.

So my name is Narissa Leung. I am an education consultant in Victoria. You can see my contact details there. I'm @rissL on Twitter. I also have this - and this was born out of a teacher in a school asking if I had a website they could follow to find good texts to use for literacy and numeracy instruction. So that's my OzLitTeacher on Instagram and Facebook and my email is also there.

Thanks to all those people who have emailed me after the last webinar. I do really find it useful to find out what you've implemented since last time, what you found useful. Also thank you to those people who filled out the feedback from last time. We really try to take on board all of the feedback, the form that the lovely Laura sends out afterwards.

So if you are new to this webinar series, basically how it runs is I have split the content into three sections, but we know from all of the research around effective learning that we need to have a conversation in order for you to comprehend what we're talking about. So to enable that, we've got a Padlet. If you haven't used a Padlet before, you just put in that address that's on the screen. Laura has also emailed out the address to that Padlet and basically we encourage you to put your thoughts on that Padlet. If you have any resources or websites or books or lessons or anything like that that's relevant to the content that we're talking about, then you pop it in there and then we get to share it and together we will build our content knowledge across the State.

The fantastic thing about the Padlet is it stays there after tonight. So if people put some great resources in there and you think, “Oh, wow, I really want to go back and find what those resources were”, or if you think, “Oh, my goodness, I couldn't keep up with all the chatter going on in there”, that's totally fine, you can go back after tonight and go back through it at your own pace and access some of those resources. So it was really terrific to see how active you all were in the Padlet last time.

I see lots of you have already introduced yourselves in the Padlet. I see the girls have just introduced themselves – hello, girls - and I am encouraging you ‑ if you’re a repeat, so if you came to the last session, I would love you to put in there what have you trialled since last time because it's great to come to the webinars and sit there for the afternoon, and maybe you're with a whole staff, as a few schools are, but what have you implemented since last time, what have you trialled or what have you thought about? So I'd love to hear your thoughts on that in the chat. So that's the address for the Padlet. Looking forward to all of your contributions.

So tonight you will have seen on the Bastow website we're talking about three different things. The first we're going to talk about is the four mathematics proficiencies, then we're going to go on to explicit vocabulary instruction in relation to mathematics, and we're going to finish off with learning intentions and success criteria specific to mathematics. So hopefully by now you've done lots of learning on learning intentions and success criteria, but tonight we're going to focus and have a look at some example ones for maths.

Speaking of, here's our Understanding Goals. So you'll deepen your understanding of the four maths proficiencies. Just on that, Laura sent out a resource pack to go with tonight. So usually you'll have a little pack, usually it's just a couple of sheets on a PDF that you print off, and at several stages throughout the night we'll pause and I'll ask you just to do a reflection on the learning. So I put a K‑W‑L chart in there about the four proficiencies, so hopefully you've already had the opportunity to jot down what you already think you know and any questions that you have about the proficiencies. If you haven't, that's okay; you can do that as we move along. The second learning intention or Understanding Goal is you will build your knowledge of the why and the how of explicit maths vocab instruction; and the final one is strengthen your understanding of the importance of and the effective use of learning intentions and success criteria.

So here is the Success Criteria for tonight: you can describe elements of the four maths proficiencies; you can explain why vocab instruction is important in a mathematics classroom; list explicit vocabulary teaching strategies ‑ we're not going to go through all of them, but we will look at a couple of them; explain the importance of learning intentions and success criteria; and hopefully analyse the effectiveness or be able to discuss the differences between more effective and less effective learning intentions and success criteria.

So, as I just mentioned, in the resource pack I did put on page 1 a K‑W‑L to collect your prior learning around the four proficiencies. So in the chat I would like you to put some of your W responses, so what are some of your wonderings or the things that you want to know about the four proficiencies. I won't provide any time for you to go and do the knows and the wants now. We're about to move into learning about the proficiencies.

So the four proficiencies. At the end of the last webinar we looked briefly at the Numeracy Guide. I'm hoping everyone has gone and had a look at the Numeracy Guide as a result of this. That's the Birth to Level 10 Numeracy Guide, the new resource produced by the Department. The Numeracy Toolkit is coming out very soon, so this is the guide. We looked at the different aspects of this and last time we looked at the fact that this is the first page on the Numeracy Guide and the first tab on that it says Proficiencies, so that's where we're going to get the information for this. So feel free to go and visit the Proficiencies tab afterwards if you want any extra information or if you want to work through this with your staff.

So on the Proficiencies page, this is the diagram that you'll be greeted with and the four proficiencies that we use in the Victorian curriculum. So we're looking at fluency, reasoning, problem solving and understanding. And tonight we're going to go through each of these. We're going to look at what is it, what are each of the proficiencies ‑ well, actually, before we start that, we're going to look at how did these come to be, why did we end up with these and where did they come from? Then we're going to look at each of them in a bit more detail, hopefully look at some examples and some implications for teaching if we have this knowledge of the proficiencies.

So how did they come about? I was really interested in this because I guess I have a curious mind, so I'm wondering, “Okay, well, that's the end result, we've got these four proficiencies, but where did they start, who chose them, why are there only four, did there need to be more? You know, how did they come about?”. So basically what happened is that these proficiencies have been adapted from the recommendations in a report called the "Adding It Up" report. So this report was created by a project ‑ is a project, a team, I think about 16 people were involved at the time, and they were involved in researching effective mathematics instruction from kindergarten ‑ it's an American report - from kindergarten to grade 8. And it was in a time where there were sort of two schools of thought about maths instruction and sort of ‑ I don't want to say numeracy wars, like the literacy wars, but there was sort of two dividing opinions about what was best practice for maths instruction. So the idea for this project was to work out what does the research say, what does practice say, and let's make some recommendations so that they can move forward with effective practice. The team behind the report provided research‑based recommendations for teaching and curriculum and improving student learning in maths.

What they came up with is this idea of mathematical proficiency, which they defined as what it means for anyone to learn maths successfully. So, as you can see here, in the report there were five proficiencies and the first one was Conceptual Understanding, which we have adopted as ‘Understanding’. I think it's because we're Australian, we like everything shortened. I don't know, there's no research to back that up. Procedural Fluency was the second thing, which we've adopted as Fluency; Strategic Competence, which we've adopted as Problem Solving; and Adaptive Reasoning, which we've adapted as just Reasoning.

Then the final one was Productive Disposition. Now, we haven't adapted this as a proficiency in the Victorian curriculum. What it refers to is basically everything we talked about in the first webinar, so all of that growth mindset, all of the understanding about maths anxiety, all of that is what they're talking about in that productive disposition. And they came up with this idea that all of the proficiencies are weaved together. So you can see that diagram there on the right and they said that students or people need experience in all of the proficiencies to become good users of mathematics and no one proficiency was more important than any other.

So that was a really important finding from the group because they found that one of the most serious and persistent problems facing school maths in the US is a tendency to concentrate on one strand of proficiency to the exclusion of the rest, and fluency was probably the one that they were suggesting that - people were spending all their time working on fluency without working on problem solving, reasoning or understanding.

So the recommendation, or one of the recommendations, that came out of that report, the "Adding It Up" report, is this: "Instruction should not be based on extreme positions that students learn, on one hand, solely by internalising what a teacher or book says or, on the other hand, solely by inventing mathematics on their own." And they put an argument forward for that idea that we need to have fluency ‑ that's really important ‑ and understanding, but we also need problem solving and reasoning. So we don't want to be just focusing on fluency or just focusing on problem solving. We need to have all of these proficiencies weaving together.

So how does that match with what we're currently doing in our Victorian schools? Well, a lot of schools use John Hattie's work with that surface, deep and transfer learning. There's also a lot of schools that are familiar with the SOLO taxonomy. So the idea of surface, deep and transfer learning is that we need all of those levels of learning and we can't always be working at transfer learning; we need those foundational skills to build us up to that transfer learning.

The same with the SOLO taxonomy. They've got that idea of your prior knowledge, which is the red dot, the one idea, many ideas, connected ideas and extended ideas. So it's sort of a graduation that we move through and that's representing I guess all of those fluencies weaving together on that diagram back at the start.

So Victoria, or even Australia first when the Australian curriculum came out, ACARA adopted this idea they had the three content strands which they sort of referred to as the nouns of mathematics and then the proficiency strands, which were the verbs, so the doing parts. We had those four ‑ Understanding, Fluency, Problem Solving and Reasoning - and that's now transferred over into the Victorian curriculum. So that's how we came to have them.

Now let's actually get into discussing them. The first one we're going to start with is Understanding. So what is it? So understanding is understanding the how and the why of mathematics. It's connecting related ideas, and that idea of connection, that goes through all of mathematics because really maths is about relationships and connections and you'll see that the whole way through all of the proficiencies that we're talking about tonight. It also explains why nearly every maths book always has some image on the front cover of dots being joined together or something along those lines.

This understanding is about applying the familiar to new ideas and representing concepts in different ways, so it's really: do our students really understand the concept that we're teaching them? So this is really about knowing that maths is more than just a set of rules and procedures and understanding that it's much broader than that. It's about linking different mathematical concepts and that type of thing.

So let's have a look at an example. Oh, I forgot to mention here, I read some research: "A significant indicator of understanding is being able to represent mathematical situations in different ways and knowing how different representations can be useful for different purposes." I think that's probably the biggest takeaway for teachers, is to really think about: okay, well, how do we make sure our students understand these concepts beyond being able to sort of regurgitate the procedures that we're asking them? How do we know they really understand what they're talking about? So here this research is saying that if the students can represent it in different ways, then that's one way that we as teachers can see their level of understanding.

So just a simple example, all of these represent one quarter of a whole. Do our students know that these things represent one quarter or are we conditioning them to only understand that that first image is a quarter? Do we always represent it using a pizza? Do we always represent it using a square? And is the top left‑hand corner always the one that represents the quarter? So teaching implication for us for this is that we need to make sure that how we present the concepts leads to understanding.

The interesting one ‑ I've seen the star one used with students. They did an assessment and the students had to circle half. I think they had eight stars, but they weren't in nice alignment how we usually always present things when we're talking about fractions and it was quite interesting to see whether the students could circle half of the eight stars if they weren't all in perfect alignment. So that really helps to see: do they understand the concept that it is one in every two of the stars, that type of thing.

If we're looking for an example for older students, just looking at this, we've got the equation at the top and just that idea of being able to represent that in another way. So down the bottom, can our students see the connection between these two representations, so can our students see that 2x + 6 is represented on the scales down the bottom and what do they need to do to be able to even these scales up? So, sure, our students might be able to engage in the abstract version at the top, but do they really understand what it is they're actually doing and what that looks like in another way?

So understanding - why teach it? It makes learning skills easier. So if we really understand what it is we're doing, obviously it's going to make sense to us and then we'll be able to connect different mathematical ideas together. So students are less susceptible to making errors and less prone to forgetting if they understand. So if, for example, we've asked students to multiply two numbers together, so 9.8 times 4.2, if our students understand number, they'll know that 9.8 is roughly 10 and 4.2 is roughly 4, so 10 times 4 ‑ so the answer is going to be roughly 40. Whereas if they don't understand and have that understanding of number, then there's a big chance that if they come up with a completely unrealistic response, then they won't have that ability to say, "Hmm, that doesn't quite look right."

The other thing is that I found research that said that once students have learned procedures without understanding, it can be difficult to get them to engage in activities to help them understand the reason. So it's tricky to go back ‑ so if we've taught our students a procedure, so probably perimeter - let's talk about perimeter ‑ or let's talk about area, so length times width. So the students go, "Oh, yes, I've got to do length times width." If they don't actually understand what they're doing, it's unlikely, according to the research, that our students ‑ they'll be able to carry out the procedure, but they won't actually understand; they're unlikely to go back to that stage where they want to develop that understanding and connect that with other learning. So we need to make sure that we're focusing on understanding when we're teaching our students.

So teaching implications ‑ new learning needs to be linked to previous learning. The other implication for this, which I haven't recorded there, is that when we are teaching, we ourselves need to understand how this is connected to previous learning. I think another implication for this is that we can't just flick open the maths book and flip to the next page and teach that lesson anymore. So I think that's probably a practice that we had years ago and now that we understand more about this idea of proficiencies and the relationships in maths, we have to build in time for our students to really explore these concepts and work out how does what I'm learning in maths today relate to what I learnt in maths last week because that helps to build a stronger network and build more understanding in my mind. So teachers themselves need to understand these connections. So if you're a numeracy leader, then how do we build the content knowledge of our teachers to understand these connections?

Time needs to be set aside. And assessment ‑ I think there are big implications for assessment because how do we really know that our students understand these concepts and that they're not just demonstrating fluency? How do we know that they really understand the number concepts or all of the underlying concepts relevant to whatever it is that we're teaching them? So lots of thinking there.

Let's look at fluency. So fluency ‑ what is it? This is probably the one that we're most accustomed to. So lots of research talks about flexibility, accuracy, efficiency, appropriate strategy selection, and then I've also added recall there because that's the thing that we think of when we're talking about fluency often. So can our students demonstrate flexibility, accuracy, efficiency when they're engaging in their mathematics? This is not just number facts that we're talking about here. This is all types of different concepts in maths.

I am going to give you an example. Let's have a look. This is actually the scarf that I'm wearing, which I did by accident, so how embarrassing is that? But now that you've all mentioned it, how good is it? I made it myself. Let's talk about fluency. So fluency for me ‑ I am not a fluent knitter. I find it very stressful. Usually I have this kind of goal for myself, I try to knit one scarf every winter. It is the most stressful thing I do. I usually get my mother‑in‑law to cast on because I don't know how to do that, but thanks to YouTube, I've worked it out this year.

So in terms of fluency, I have recall - thanks to YouTube, I can recall the movement that I need to do in order to get the stitches across. I don't even know the vocab related to this. I'm accurate in most of my stitches, so enough of them to make it sort of look ‑ you can see that it's pretty straight; no holes in it. And efficiency is something that I'm working on. So when I first started knitting, I literally could only think about ‑ I had to look at what I was knitting. I couldn't listen to other conversations. I almost had beads of sweat dripping off my head because I was so worried about doing it and dropping stitches and all those types of things. But, as I've practised, now I can listen in on conversations and I've freed up some of my brain space to actually focus on other tasks while I'm knitting. And speaking of efficiency, one week. So impressed with myself. So I'm developing fluency with my knitting. This is all normal stitch, whatever that's called. I can't do the purl stitch, so that's something else I'm going to have to work out another time.

So focus on maths. What might fluency look like? Well, I've got an equation 199 + 46. Fluency is being able to recall. It is being able to use an efficient strategy to work that out. So I could write that down. I could put 199 and then put a + sign and then underneath it add the 46, or there might be another strategy that I could use that would be more efficient, and in this case for me I'm going to say 199, it's really close to 200, so I'm going to say 200 plus 46 and then I'll take one off it. So that's an efficient strategy for me. Thank you for the love of my scarf in the chat room. So here it's about developing efficient strategies.

We don't want to be focusing too much on fast, because otherwise we go back into that work that we were talking about in the first webinar with Jo Boaler's work around maths anxiety, but we're talking about: can we recall, is it accurate, is it efficient, am I flexible, do I have a few different ways of working that out?

I've put the word ‘perimeter’ down the bottom there because often fluency, we think of number facts and what we need to be thinking too is vocabulary related to mathematics. So when I see the word ‘perimeter’, am I back sort of in the learning pit - you know how I was with my scarf when I first started knitting - trying to work out what does ‘perimeter’ mean and spending a lot of my brain space trying to work that out before I then go and work out what's this teacher or the problem asking me to do? So fluency isn't just for number facts; it's for vocabulary as well, which we're luckily going to talk about tonight.

So why teach fluency? Because it reduces load on working memory. So the same as when I'm knitting, now I can focus on other things because this has become an easy task for me; the same thing with maths. So we've got a whole bunch of tasks that we want to just be set aside so we can work on the higher stuff, getting into that transfer learning that Hattie talks about. And it provides access to higher‑order tasks.

Now, it's interesting because I was reading some of the research from Pegg, who is an Australian researcher, and he said that this is the reason that we can't always be working on higher‑order tasks because we need to have these times when we're developing our understanding and our fluency so that we can then get to access those higher‑order tasks. So he said ‑ I think he used the word ‘fallacy’, that it's a fallacy that our teachers should be asked to have our students working on higher‑order tasks all of the time, because just like Hattie's surface, deep and transfer learning, he's not just talking about transfer all of the time.

I love all the love for my scarf in the chat. Very interesting. The next webinar is just about scarves you'll be pleased to know – kidding!

So the teaching implications for fluency, the first one is that we shouldn't just think of ‘fluent’ as only fast and, therefore, the activities or whatever it is that we're planning ‑ we need to keep that in mind. Our students need time to build fluency, and fluency absolutely links to all of the other proficiencies. It's not a standalone only work on this one proficiency; it's really closely linked to understanding. So often those two go hand in hand. Problem solving really relies heavily on fluency and reasoning relies on all of those things as well. We need explicit vocab instruction. And the other thing is that understanding lessons should precede fluency lessons. So we need to build that understanding first before we go and work on our fluency.

Just on that, I've put this text up here. It's very, very short. Those people who are in the literacy world will know this series, the "Not this but that" series ‑ very short, you can read it before bed, "No More Math Fact Frenzy". This just has some suggestions in there, so if you're sitting there thinking, “Well, how do we teach number fact fluency without always just doing time tests or things like that?”, that's a really great text with some really terrific ideas that you might want to look at. Just on that, someone asked after the last webinar in the feedback for a list of the resources and the references and Laura will email that out after tonight's webinar.

Okay, problem solving. Let's move on to that now. So what is it? Hopefully we all are well aware of what problem solving is. So students apply maths in novel situations. They make choices, they interpret, they formulate, they model, they investigate. They apply everything we've been talking about. They represent problems, apply existing strategies to solve them. They also create ‑ or they come up with problems themselves. So rather than us always feeding the problems to the students, the research suggests that our students need to build their skills in actually identifying and creating problems themselves. So we'll talk a little bit about that.

So just on problem solving, two types of problems ‑ routine problems, so this is where we sort of already know how to work out the answer and we're just kind of practising that and applying it to different versions, and then there's non‑routine, so we don't know immediately which solution we need to use and we have to work that out as well, and that's probably the type of problem that we need to focus on having more of in our schools.

Let's have a little practice. So "A bicycle shop has a total of 36 bicycles and tricycles in stock. Collectively there are 80 wheels. How many bikes and how many tricycles are there?" So this is just one example. You definitely can reword the question to come up with multiple answers. This is just one example. If our students were faced with this problem, then they need to make choices around how they're going to go about solving this. They need to interpret, ”What is this even asking me to do?” They might need to create models to try to work out how they'll go about answering this question.

The other thing is that they need to distinguish what is known from what isn't known; is there anything else in the problem that they need to know before they can work it out? So I'm just going to introduce you to one version of problem solving, or one approach - there are so many - that I came across earlier this year I think it was. I was listening to Rob Proffitt‑White from the Queensland Education Centre and I think he works with the schools around Gympie. They have this approach, this decode, decide and defend approach, to problem solving, so where they step the students through decode, what is the problem actually asking you to do, which type of maths do you need to engage in; decide, how you're going to attack that; and then defend, that's where reasoning comes in to say ‑ it's not necessarily defend your answer but it's defend how you came to it, and that's where you have all that justification, that type of thing. So I think that's a really interesting approach and probably something that we need to think about when we are doing that problem solving in our schools.

There might be multiple ways of solving this problem and that's when we get into reasoning, where we need to open that conversation up with our students, more so than the conversation around what's the answer. So our conversation needs to focus on the step before it: how did you come to that, what was your approach, what was your approach, and now let's talk about efficiency.

So why teach problem solving? Because we need to teach our students how to apply the mathematics beyond the classroom mathematics. So have a look at this quote here: "The mathematical capabilities students demonstrate by the time they are nearing school-leaving age foreshadows the approach those individuals will take to using mathematics later in life", which I think flows on to the next one: "Usually the opportunities to use mathematics that we come across are not packaged in quite the way they were in school."

So if you think about maths out in the real world, often we don't even know if we need mathematics to solve this problem that we've got sitting in front of us. So one of the things that we do in schools is we give too much information to students. They already know which area of maths they need to use to solve this problem and we've sort of taken away all of the heavy lifting. So when they get out into the real world and they're faced with a problem, their first question is: "Well, does this even involve maths and, if it does, what type of maths am I going to call on to help me to solve this problem?" So we've really got to think about when we are engaging in problem solving with our students, are we being too helpful to our students or are we letting them go into the learning pit that we talked about in the first webinar and really sort of be comfortable with being uncomfortable at the start and trying to work out, "Hmm, what is the maths that I need to use here, if any, to help me to solve this problem?"

Today is probably a bad day to mention the word ‘NAPLAN’, but NAPLAN is probably I think sort of the canary in the gold mine to help us to see if we need to work on our problem-solving skills in our school because often we might be working on an approach in maths or a concept in maths and we might have worked on understanding and fluency, but then when they get asked the question in the NAPLAN which often asks a question just a slightly different way or requires more problem solving, then our students have difficulty in translating that learning into the problem solving required. So I think sometimes if you get the NAPLAN results and you think, “Oh, okay, we didn't go as well as we did”, that might be the little canary that says maybe we need to be looking at how we're attacking problem solving with our students.

So teaching implications ‑ well, that was one of them. That was a free one. That wasn't on the slides. So students need experience and practise in creating problems as well as solving them, formulating them as well as solving them. You know that practice that we do in literacy that we're starting to really improve on, that idea of the think-aloud, so the teacher being the proficient reader in the class and speaks their thinking aloud so the rest of the students in the class can hear what goes on in the mind of a proficient reader, we need to transfer that practice into the maths classroom so that our students can hear what goes on in the mind of a proficient maths learner. So when we're solving a problem, if the teacher is engaging in that practice of think-aloud where a problem is posed and they're thinking out loud so the students can hear, how are they attacking this? So I think that's the practice that we can pull across from literacy quite easily.

And we need a lot more talk between students to vocalise the different approaches, so lots more talk between the students, turn and talk, and group discussion around not just the answer but about how you came to that answer. Luckily there's going to be a lot of talk on talk in the next webinar, so we're not going to talk about that tonight. That was a lot of "talks" in one sentence.

The final one when we're looking at in the proficiencies is reasoning. So you can see how all of these are really tightly linked, so hopefully that's been one of your learnings tonight. So reasoning, what is it? Basically that our students can explain their thinking, they can justify, all of those really rich verbs that we talk about. They can transfer their learning from one context. They can make inferences. They can compare and contrast. So now we're talking about that higher‑order learning.

Let's have a look at an example for reasoning. So for this example, I've gone back into the Birth to Level 10 Numeracy Guide provided by the Department and one of the tabs at the top is the Resources tab. So in here you might remember from the first webinar you get to a page where you can say I'm looking for reasoning resources, so I've just typed in here "reasoning" and hit “Search” and there's a list of resources that have come up. The first one is a secondary resource and the one I'm going to look at today is the second one, the "ReSolve: Assessing Mathematical Reasoning".

So basically the search function on that site links to a collection of maths resources available on the internet, and we heard about that last time, how there are bazillions of maths resources on the internet and we've had the great mathematical minds at the Department curating the best of those resources for us. So that's what's come up here.

So when you click on that, you go to a page. It tells you about the resource and on the right‑hand side it tells you what it supports. So you can see it supports the proficiency of reasoning, which HITS, the audience, et cetera, and then there's a link to whatever the external resource is. So in this case, it's the ReSolve website. This is a level 3 to 8 example.

So on that website it is amazing. They've got loads of teacher resources. A huge study was done for this. So here's one of the examples. So "Jane makes a Number Tower by starting with the numbers 1, 2, 3, 4 and 5 on the bottom row, then adding each pair of numbers to get the next row up. Jane thinks that to make the largest total at the top, you need to put the largest number (5) as the first number on the bottom row. Do you agree with Jane? Why or why not?"

So you can see how this is different to maybe a fluency or an understanding activity because they're not asking you to solve the problem. They're saying work out whether Jane is correct in her thinking and then justify it. So we're really talking about the reasoning here. I wonder if anyone is just quickly madly writing down all the numbers because they like to work things out. That's why these webinars take so long to prepare because I end up doing all the maths on the side. I digress.

So the other great thing about this website is they have annotated student work samples for this problem that has been posed. So this one is a lower‑level work sample. So up the top, the student says what their response is: "Whatever number you put down the bottom, it still gets you whatever number on the top" ‑ might need to work on some vocab there. And on the right‑hand side there's some annotations from the ReSolve team to help ‑ really it's about helping build teacher content knowledge around reasoning, so what is this student doing well, what might we need to work on.

So that's annotated work sample number 1 and it goes all of the way through to this one, number 6. So you can see different levels of student reasoning. I'll read it out just in case you can't read it. This student says, "You have to have the highest number in the middle because that's the one that affects the most numbers that will come afterwards. In the same way, the lowest number will have to be on the very ends because it will have the least effect on the numbers on top." So again, it's got all the annotations around the side to talk about the student's level of reasoning.

All of the resources on the ReSolve website are really aimed at building teacher content knowledge. So they have a PowerPoint that steps the teachers through how to administer this problem and really have that discussion beforehand. Lots of excellent resources all linked from our Numeracy Guide.

So why teach it? Because it is the glue that holds everything together. That's why. Reasoning and that conversation that goes along with it ‑ that's how we know if our students really understand what they're talking about in mathematics. And that verbalising, as we'll discuss when we're talking about talk in the maths classroom, it's good for the person who has to justify it, but it's also good for the rest of the students to hear different versions and different ways of working things out.

So teaching implications: we have to build student capacity for effective dialogue. We can't expect our students to just launch into these really rich and rigorous discussions justifying their thinking and explaining their reasoning. We have to go back to that Gradual Release of Responsibility and build their capacity to engage in those conversations, and we'll talk more about that in the next webinar.

It also means ‑ another implication is that as teachers we have to get better at asking better questions to elicit that type of thinking and that type of conversation from our students. Questioning is a lifelong endeavour. I don't think we're ever fully satisfied with our ability to question as teachers and that's something I think that we can just always work on.

The other implication is the need for explicit vocab instruction, and I'm not just saying that because we're going to talk about vocab tonight ‑ or I might be, just a little bit, but you can see in the first annotation and the sixth annotation there was a very big difference in the vocabulary the students had access to there. So we need to build that explicit vocab with our students.

And the final implication, which probably goes across all of the proficiencies: more time and less tasks. So it's absolutely fine to offer one problem and let kids go really deep on that one problem rather than handing out 20 problems in a class. We want them to do less and do it well and really go deep. So some of the teaching implications.

So there you have it: the four proficiencies. And I just grabbed this quote too. This is from the "Adding It Up" report: "Schools need to prepare students to acquire new skills and knowledge and to adapt their knowledge to solve new problems." Our job as teachers of mathematics is not to prepare them for NAPLAN. Our job as teachers of mathematics is to hook these kids onto maths learning for the rest of their lives so they're going to use this beyond the school gates. So we need to prepare our students to acquire new skills and to work out how do they acquire the skills when they don't have a teacher there sort of filling their head. We need our students to see maths as a useful tool that needs to be constantly sharpened and that they themselves can constantly sharpen.

So that was a lot of information in a short time. I'm going to give you three minutes to just open up your Supporting Resources Pack, page 1, and just do a reflection on the K‑W‑L. So what have you learned and what do you still want to know about the proficiencies? And if you can share some of your thinking in the chat. I'll give you three minutes. I understand sometimes people feel really time-pressured for the three minutes. It's just a moment to pause and reflect on all of the learning that we've had so far. So don't really panic if you don't have enough time to fill out every box in the three minutes. it's just time to reflect. Or if you're fortunate enough to join us with a team, to turn and have a discussion now. So I'll start the timer. (Pause).

Okay. Thank you. I know three minutes is a very quick time, but I do appreciate those people who have commented in the chat and put their wonderings in there. I had a few questions around sequencing of the proficiencies and also the time allocation. Unfortunately, I can't give you the hours to spend on the time allocation because it's completely reliant on those kids sitting in front of you and where are they at with their learning. It is generally recommended that you do work on understanding first and fluency before you move into that idea of surface, deep and transfer learning, so problem solving and reasoning, but there's absolutely no set recommendation or there's nothing set in stone about what you have to move through first. The thing that is important is that you understand that all four proficiencies are important for the students and that when you're engaged in the planning, we need to make sure that we've got allocation for each of those proficiencies and that we're not heavily focused on one proficiency to the exclusion of the others.

So probably a good time now to pull out ‑ let's have a look at the last unit that we worked on and let's have a look where were we in the proficiencies here. Did we just stay in the understanding and fluency, or did we push our students into problem solving and reasoning? So it's probably a good time now to reflect on some of the previous learning to work out what are our strengths and what our stretches? Where do we need to maybe challenge ourselves to push our students in the next unit?

I do say the word "unit" and I think sometimes I say that and I make the assumption that everyone is teaching in a unit, but I haven't found any research that suggests that pulling open the next page in the maths book is the way to go. A lot is all talking about teaching in units of work, and a unit of work needs to be more than a day long. So over the unit we might have a focus on ‑ part of it is on understanding, but we're working our way to problem solving and really that transfer learning and the reasoning in the unit. So it's probably time to have a look at how we are planning for our students. There's a book in the resources that I will recommend if you're at that stage where you're thinking about our planning and what does it look like in terms of units.

Let's look at vocabulary in the maths classroom. So let's start off with why. Simon Sinek always says start with ‘why’. So: "Knowledge of maths vocab affects student achievement, particularly in the areas of problem solving, reasoning and communicating about mathematics", and we've just seen an example of that in that ReSolve problem.

This next quote that I've put up here really blew me away: "Research by Gifford and Gore showed that underperforming math students who received vocabulary instruction showed standardised test gains as high as 93%". That's pretty amazing. That's really significant and I think that is something for us to start thinking about because vocabulary instruction is not a strength of our system at the moment in maths because we're thinking about the concepts and we're not necessarily thinking about the literature or the literacy of mathematics. We know that in reading, vocabulary is the most important factor in understanding student comprehension and so now we've got to start thinking about what does it mean for students in mathematics? What's the vocabulary knowledge relationship to their learning in mathematics? If you teach EAL students, this is exacerbated or even more important for those students for us to pull up and start explicit instruction of maths vocabulary.

So speaking of standardised tests, I hear there are some results out for one today. This is from an Australian researcher, I think he's a researcher, maths guru, Swan: "Literacy ‑ particularly vocabulary and graphics ‑ play a major part in NAPLAN numeracy tests." This is very relevant for today.

So if you go on to his website, he has actually looked at all of the previous NAPLAN assessments, the maths assessments, and highlighted the vocabulary that students need access to in order to be successful on those questions, and this image that is on the screen is the 2018 Year 5 assessment and you can see there highlighted some of the vocabulary our students need access to in order to be successful in those questions.

Unfortunately, if you're a secondary teacher, he hasn't got that on his website. However, it would be an excellent opportunity for you to sit down with your team and go through last year's or the year before and pull out that vocabulary yourselves to say: what do our students need access to in order to be able to have success with this question? I think there's some really big learning for us there because some of these concepts or this vocabulary we just skim over and expect our students to understand what it's asking them.

So I've just been onto a few of the previous NAPLAN tests and pulled out a couple of questions, just so that we can have a look and see what some of the vocabulary is. So on the top left - this is a Year 5 example - "Brendan made a special dice from this net. After he rolled the dice, he added the numbers on the bottom and the top together. What is the greatest possible total Brendan could get?". So if you think about what's some of the vocab in that question that might trip some of our students up or what's the vocab that our students need to have a really good understanding of? So with "What is the greatest possible total Brendan could get?", I'm thinking: do I expose my students to that type of vocabulary in the classroom or do I always ask a question and say, “What's the biggest total that Brendan can get?”. So “What is the greatest possible total”, what does that even mean?

Down the bottom, "Write a number in the box to make the number sentence correct." Do our students understand what a number sentence is? We know what a sentence is in reading. Do we know what a number sentence is in maths and how might I attack this problem?

Then on the right, this is a Year 9 example, "Jerry made this paper fan. He used 10 identical isosceles triangles. When the fan is open, its base forms a straight line. How many degrees is the angle marked a?" Wow, there's a whole lot in that question. That's really tricky. So when we start to look at the questions, we can see how vocabulary can impact a student's ability to even engage in the question. There's a whole lot, especially in that Year 9 one, that our students need to understand.

So here: "Language is not only a tool for communicating but a tool for thinking. Every mathematics teacher is a language teacher ‑ particularly the academic language used to formulate and communicate mathematics learning." So we can't say, "Well, I'm a teacher of mathematics; I'm not a teacher of literacy" because this is a really central component to your students understanding the concepts.

I find this really interesting because I love literacy, but thinking about the vocabulary in maths, maths is so concise - the language - and we don't waste words. There are no superfluous words in mathematics. It is very precise and concise. So: "Research has shown that maths texts contain more concepts per sentence and paragraph than any other type of text." So if we hope the English teacher is teaching our kids about vocab, then we need to be even more focused on it in maths because of this research here that it contains more concepts per sentence than any other type of text. That is mindblowing to me. How do our EAL students deal with this? How do our struggling readers deal with this? So the implications are we need to engage our students in explicit vocabulary instruction. We can't leave this up to chance anymore.

How do we teach it? Good question. Glad you asked. The first thing is that we need to select words to teach; that is, we need to plan in advance for explicit vocabulary instruction. That's for the most effective vocab instruction. So when we're planning our unit of work ‑ and I go back to that idea of planning a unit ‑ we need to think: what's the vocabulary our students might need access to over this unit of work.?

Fortunately for us, Dr Paul Swan has created a book if you're in primary school. Sorry secondaries. He has already gone through the Australian curriculum and said: if you're looking at this topic, here's some of the vocab that your students might need access to. He does have Year 7 NAPLAN vocabulary on there as well, so that might be relevant to secondaries, but I also think for secondary mathematics teachers, this book would be really useful because your students, when they're arriving in front of you from primary school, you are hoping they've been exposed to these words before they arrive in front of you, and if they haven't, then what are you going to do about it? So I think this is a really valuable text. You can buy this from the Maths Association of Victoria. Just get it on their website. It's probably the easiest way to buy it.

So how else do we teach vocabulary? The research says our students need between 7 and 15 ‑ most research says 7 and 12, but I found one that said 15 ‑ exposures to each new word. So that means we can't just say: we're looking at circumference, write it on the board once, and then somehow our students have developed an understanding of circumference. So they need 7 to 15 exposures of that word, and when we're talking about exposures, we're talking about they need to see it, they need to hear it, they need to test it out and roll it around on their own tongues and they need to write it as well. So how do we engage our students in these exposures of this vocabulary. Obviously we're not going to be able to teach every single word that our students need for the unit. We need to get really good at working out which words are we going to devote teaching time to.

So if you've been in the Leading Literacy course at Bastow or the network's leading literacy course, you'll be familiar with this idea of tiers of vocabulary. Tier 1 language is the language that our students are generally going to come across in everyday life. It's really the spoken language. So our students are going to hear this out in the yard, at home. I always say on ‘Home and Away’; it's that type of language. So tier 1 they're going to pick up by themselves generally by being out in society.

Tier 2 is the start of academic language, so these are the words that they're not necessarily going to be picking up just by listening to people talking in the yard. These are words that probably need explicit teaching. They are the words in picture storybooks, basically in academia, so things that you probably are only going to come across when you're starting to look in the academic world, so ‘formulate’, ‘contrast’. You know, people aren't running around the school ground going, "Oh, contrast this." So these are the words that are just that next level up.

Then the final tier, tier 3, this is technical vocab, so it's domain specific, so words that you're not going to come across generally in another forum other than that curriculum area. So I've put ‘quadratic’, ‘quotient’, ‘denominator’. They're not words that you're going to say at a party on Friday night unless it's a really weird party.

So academic vocabulary is tier 2 and tier 3. In the mathematics classroom we really want to focus on those tier 3 words and we'll dip down into the tier 2 words as well, depending on our students and the formative assessment that we are taking in about our students. So an example of that is you might just be focusing on tier 3 words and then the students engage in an assessment and you realise they don't actually know what ‘explain’ means or ‘justify’ or ‘illustrate’ ‑ that's a classic one on maths test; it says ‘illustrate’ whatever and the kids will do a nice little drawing because ‘illustrate’ is a term that we hear in writing and that means draw a little house with a person next to it. So when we're selecting words to teach, try to stay in the tier 3 and dip down into tier 2 when necessary.

So there are a few other challenges with vocabulary especially in the mathematics world. In your resource pack, I've put on page 2 some of the areas of challenge. So one is that there are some words that we use in mathematics that are used in normal everyday English but they have different meanings. That's a bit confusing. So I've put some examples there. ‘Difference’ is an example, ‘right’. So in mathematics we might talk about a right angle. In everyday English we might talk about something being right, as in correct.

There are some words that are only found in maths, some words for which they sound the same but they have different meanings in English and in maths. So what I'm going to do is I'm going to put my timer on and just provide you with three minutes just to have a read through some of the areas of challenge, and on the right‑hand side I've put some mathematical vocabulary and I want you to think about what might be the challenges with that word. So is it a word where the - I don't know - some words may have more than one mathematical reason, is it that? So ‘square’, for example. So I'll give you three minutes. I know you won't get them all done. Don't stress about it. It's just to have a think about the complexities of the maths vocab. I'll be reading some of your thoughts in the chat as well. (Pause).

Okay. Thank you, everyone, for contributing your ideas in the chat, and I really love that you're sharing resources and your own practices, especially around the use of ‑ I see a few people talking about their word walls. I would love it if you could post a photo so other people can have a look and get a bit of an idea. Don't forget you can come back after tonight and post in there as well.

Just on that, I do want to remind everyone that tonight's session is being recorded, so you will be able to access it forever after I think on YouTube. So if you have colleagues that you wanted to watch it with or someone is away, then you can always access all of this on YouTube on Bastow. Just search for Bastow's YouTube channel and there are some other webinars that you might want to watch on there as well. So don't worry if people have missed it tonight. I always get asked questions about that. It's always accessible afterwards.

So you can see some of the complexities around vocabulary in mathematics, and hopefully doing that activity has helped you to have those conversations in your staff room around some of the vocabulary. I am happy to send out some suggestions on answers with the resource pack, when Laura sends out her pack. Sometimes people always want, "Well, what were the answers?" I'm not going to tell you right now but I will send them out in the resource pack.

When it comes to teaching vocabulary, let's just have a short look at a few different ways or a few different approaches that you can take for vocabulary instruction. So the first one we're going to talk about is Marzano's six steps and this comes from his book ‑ well, it's actually not just his book; there's another author, Pickering. So this idea of Marzano's six steps, he suggests that you provide a description, an explanation or an example of the new term. That's step 1. Step 2 is that you get the students to restate that in their own words. And step 3 is that the students do something with it, so they do a picture or they create something.

Steps 4 and 5 ‑ oh, I've got ‘6 steps’, but only 5 on there on a numeracy webinar. Uh‑oh. I just realised that. So 4 and 5 is really talking about engaging with the words, so getting them involved in games and that type of thing. So he says that you don't necessarily go through all of the steps in one lesson, so you might do the first three, you might just do the first one and come back to the next step in the second day, and the engaging with the games and the activities, they're really in a few weeks' time you might pull up some activities related to the vocabulary.

Full points to someone who's just put on the Padlet a photo of their word wall. We would send you a chocolate but it would melt in the mail.

So the next thing I'm going to introduce you to is this idea of the Frayer model. So if you're familiar with the Leading Literacy course, you'll understand what the Frayer model is. We're just going to watch a short video explaining this model. Let's have a look at it now. This is also available on YouTube if you want to use this with your staff.

(Video plays with music only; no spoken words)

So that's the Frayer model. This is an example of the Frayer model. This one is adapted for English language learners or EAL students. The difference is that they have an extra line down the bottom, a connection to word, and the suggestion is that the students can make a link to their first language down there. I've seen this done really successfully in schools where they have a word of the week and then students go home and speak to their parents about that word, find their first language equivalent and then bring it back to school, which has been really exciting for some students because often it's the first time they've been able to acknowledge their first language in the classroom. So that's just an extra addition.

You can do this multiple ways. You can have a whole class Frayer chart or Frayer model in an A3 book at the front of the room. You can have each student whips their own up in their workbook. In this version of it, they have a definition, a picture, an example and a non‑example, or sometimes a synonym or an antonym. Probably an example and a non‑example is an easier way to do it. This is when we're talking about exposures, the students are playing with that language and really having time to build an understanding around it.

Another option is for students to have a maths vocab journal, and that's what we had at my school, where the students go in and as they learn new words, they'll add that to their maths vocab journal, which is also one of the steps missing from the Marzano's six steps, which I had Marzano's five steps.

Just some examples of word walls, but you can see some people have been posting them in the Padlet. Thank you for that. I want to point out these are not printed from Pinterest. They're not laminated sheets. The best word walls are organic; they are made with the kids. So they're not all absolute works of art. The one on the left, you can see that they've just written out the words. It's very handy the one on the left - they've got them on a card - because you can then pull those cards down and use them for other activities. So if you want to play - what's the name of the game - Charades or if you want to play Celebrity Heads, all of those types of things, which is one of Marzano's six steps, number 6.

On the right‑hand side they've just got some examples, and just another example. They don't need to be big, elaborate walls that you carry around with you. It can be as simple as writing up the vocab on the whiteboard behind you. If you're engaging in a unit of work around the one topic, then we can build that vocab wall as we're going over the unit. So lots of different ideas. You can put the word in the middle and then just get the students to write all the words they think might be relevant to that topic around the outside, that type of thing.

Another suggestion is just the idea of quick writes and sentence stems or exit tickets. I just put some examples here: "I thought that a function was…" this…"and now I know that a function is"…this. "Tell the meaning of range in statistics, in studying functions, and in everyday English". So we're acknowledging that the word ‘range’ has a variety of meanings, and we want to focus on what's the meaning in mathematics. So just some different ideas about how you can have a play with the vocabulary.

And the final one I want to talk about, because it's really particular or really specific to content vocabulary ‑ if we've got any science teachers out there, this is highly applicable to you as well ‑ the idea of looking at the etymology and the morphology of the words. So etymology, we're talking about the history of the word - not to be confused with entomology, which is the study of bugs, nothing to do with this. Morphology we're looking at how words are put together.

So have a look at this quote here. This comes from the book "Words their way" - or "Vocabulary their way", which is a secondary resource: "Over 90% of discipline-specific words contain Latin or Greek affixes and/or roots" ‑ 90%. So if we engage our students in learning about the roots and the prefixes and the suffixes, then our students have a really strong leg up into understanding what those words might mean.

I've put some examples here” ‘perimeter’, so we're looking at ‘peri’, which means ‘around the outside’ or ‘around’. So periscope, we're using one of those things to look around because we're using the word ‘peri’. I just think about when we're introducing our students to that idea of ‘perimeter’ and we always have that confusion - which one is area; which one is perimeter? - if we look at what's the root, ‘peri’, it means ‘around’, then we don't have that confusion anymore about which one is area and which one is perimeter because we really understand the vocabulary that underpins that.

So I put a few others there: fraction. ‘Fract’ is a break - or fracture as in fracture, so we know that it's breaking parts up. ‘Denominator’ comes from ‘nom’, the name. How do you know which one is the numerator, which one is the denominator? Because the one on the bottom gives it a name. How do we know that? Because it has ‘nom’, meaning ‘name’, in it. Oh, I love that. So that's another focus for you, the etymology and looking at the morphology of the words.

For more information on those, these are your resources. The one on the left is probably Year 6 onwards and it has a whole chapter on each of the KLAs, so there's a maths chapter, a science chapter. There's all of those - English, language, arts.

"Bringing Words to Life" gives you the theory about vocabulary instruction and a bit of a mix of the practical as well. The final one is if you're engaged in PLC process in your school, this is a really great text to ‑ it has different ‑ it's not just focused on the vocabulary, but the vocabulary is in two chapters of it, so "Mathematics Instruction & Tasks in a PLC at Work". I'll put all of the resources in the email that Laura sends out by the end of the week. So when she sends it out, she'll send out the evaluation, a copy of the presentation and a list of all of the references and resources.

I am going to reduce your reflection time to two minutes and I just want you to think about three things you've learned, two questions you have and one thing that was confirmed. So I'm going to give you two minutes to think about this and then we're going to move on to learning intentions and success criteria. (Pause).

…the success criteria. Thank you to those people who put things in the chat. It's interesting to read about the right angle triangles, and you're absolutely right: we do need to be careful about our vocab and how we present things and making sure that we're giving multiple representations. Yes, it's a tricky world, vocab, but a very exciting place.

Alright, learning intentions and success criteria. At the end of the lesson too. So let's start with ‘why’. It's a good place to start. I've put the numbers there. I had an inkling that many of you would be numbers people coming to a numeracy webinar. You can see I talk about effect size. Everyone is always on about effect sizes now. Let's have a look at some of those numbers. Teacher clarity: 0.75. So if you're not familiar with John Hattie's work, we're looking at above a 0.4 effect size as what's optimal. 0.75, that's very nice. Very high.

Learning intentions, 0.68; success criteria ‑ wow, 1.13. I'm going to argue that is not the fact that you just have a success criteria. It's how you use the success criteria. It's not the fact that you just put one on your planner and you didn't actually mention it to any of the students. There's more to it than that. Evaluation and reflection, and, of course, we're talking about the high‑impact teaching strategy of setting goals here.

Now, I have drawn "This strategy is demonstrated when students", because that's where the power of learning intentions and success criteria is. It's in building student agency. So in the high‑impact teaching strategies, it is when students actively engage with the learning goals to plan their own learning. It is when they're self‑monitoring their progress and providing evidence they believe demonstrates they have achieved the goals. That's what we're talking about when we're talking about student agency. Framing future learning goals based on identified strengths and areas for improvement.

So learning intentions and success criteria - really I think there's two elements to it and the first one is about teacher clarity. It is about us being really clear about: what do I want these students to do, know and be by the end of this lesson or this unit? When we can condense all of that thinking down into one learning intention, that helps us to be really clear on what it is that we're trying to achieve in that lesson. It then impacts the feedback that we're giving, it impacts the choice of activity, it impacts everything that we do in that lesson, and that's when we're coming back to that effect of teacher clarity.

The second part of it is the student agency part, where the students can then look at the learning intentions and success criteria and make a judgment about their own learning. John Hattie talks about that idea of: why should teachers be the ones who dob kids on the head and say, "You've got it, you've got it and you've got it". We need to build that capacity within for our students.

You may have seen this one. I presented these slides last year when I was talking about formative assessment. Learning intention is the ‘what’; success criteria is the ‘how’. Learning intention describes what the teacher wants the students to know, understand and be able to do. The success criteria helps the teacher and students make judgments about their ability to do that.

The learning intention outlines the goal of the lesson or the series of lessons and, yes, it's absolutely fine to have the same learning intention over a number of lessons. And the success criteria ‑ this is what hooks kids into the learning. It sucks them in and it helps them to remain motivated because we're building agency.

So learning intention, “What am I learning today?”, and the success criteria, “How will I know that I've learned it?”, rather than just passively waiting for someone else to say, "You've done a good job on that." So we want to build our students' capacity to work out themselves, “How am I going with this?”

So let's just do a quick compare and contrast of two learning intentions. So learning intention number 1: "I am learning to sort three‑dimensional solids based on various characteristics". Sometimes you see "we are learning", that's fine, "we are learning to", "I am learning to". Learning intention number 2: "I am learning the essential characteristics of three‑dimensional solids." So here if we don't provide clarity about what learners are expected to learn from a specific task, activity or strategy, learners will most likely view these events as exercises that simply require compliance. In other words, they will try to 'get it done'." So looking at learning intention number 1, we're actually talking about a task here. We're not talking about what's the learning that we want our students to achieve. We're actually talking here about what's the activity we want them to do. It's a very different thing.

Learning intention number 2 is what we want to be aiming for. This is the learning that the students are going to achieve. So, yes, they will sort three‑dimensional solids in a lesson. But why is it? It's because we want them to learn about the essential characteristics.

So I hope that we can see the difference in what we're asking our students to do in those two. One is task focused. That's just: we want the students to complete this task. The other is thinking: what do I want my students to learn? What do I want them to be able to know or be or do as a result of this unit?

I do have some secondary examples. Thank you for asking that. I'll make sure that they're included in the slides that go out in the resource pack that Laura is going to send out.

Another thing to think about when we're writing our learning intentions is it doesn't always need to only be mathematical content specific. So we might add a language content learning intention or a social learning intention. So there are two schools of thought on this. Sometimes the experts in the literature suggest that these could be learning intentions. Sometimes it's suggested that these are built into the success criteria.

So let's have a look at this. Mathematical content, an example: we are learning to write an equation to represent a real‑world problem; represent equivalent forms of numbers; learning to use the terms *relationship* and *equation*. So it's up to you, you might use that as a learning intention or you could have it as a success criteria, which I think is perfectly fine.

We need to remember that there is a social learning side and this kind of goes back to the reasoning part of it. This is listening to the ideas of others and respectfully disagreeing with the mathematical arguments of others. Gradual Release of Responsibility - we need to build our students' capacity to engage in those conversations where they can disagree respectfully.

So learning intentions and success criteria just in general: they are based on assessment and student need. They're not necessarily based on a planner that we created last year at the start of the year for every term henceforth. We need to think about: if this is the unit of work, what do the learners sitting in front of us now ‑ what do they need? So what's our learning intention that is for these learners?

It's planned before you go and select any activities for your unit of work. So this is a bit of a flip from our traditional practices where we might go, “Oh, this activity looks good and this one looks good and that one looks good” and then, “Okay, what's a learning intention that would fit that?” We have to flip that. What do our students need? Let's work out a learning intention. Let's be really clear and have clarity around what it is we're trying to teach and then that's when we go and work out what's the activity or what's the task we're going to get our students to engage in, so you might go on to that Numeracy Guide and find some resources that can assist to achieve that goal.

They need to be written in student‑friendly language because we want our students to use them to self‑evaluate. They can be used across a unit. You don't need a brand‑new learning intention every single time. The success criteria can be co-developed with students. Usually they need to have understanding of the content first before they can write really effective ones. I've certainly seen that done really well particularly in literacy lessons.

The real misconception that people have around learning intentions and success criteria is that they need to be always 100% shown upfront at the start of a lesson. That is not correct. The learning intention and success criteria might be revealed later in the lesson, depending on the focus of the lesson. If you're engaged in a problem‑solving lesson, for example, you're not necessarily going to post your learning intention that talks about the types of problems that you're going to be working on or the type of maths that you're going to use to solve those problems. The point is that at some stage in the lesson there needs to be a discussion around the learning intention and the success criteria and that guides your feedback because your feedback is linked to that learning intention and the success criteria. So we want to be rounding off our lessons by coming back to that and getting our students to self‑evaluate. So we don't need to always show it right at the start of the lesson. There is a big misconception about that.

The litmus‑test for effective use of learning intentions and success criteria: can our kids articulate why they're doing what they're doing and what they're learning? It's a really quick test: what are we learning about today and why are we learning about it; how will you know if you've been successful? It's that simple.

So if you want more information on the learning intentions and success criteria, head back to the Numeracy Guide and you'll see there's a page on there, a HITS page, and on that page there's links to each of the HITS and what they mean or their links to maths. So you can go on to the Setting Goals page.

I will send out some more examples of learning intentions and success criteria because I think it's really helpful to look at some other ones to craft off them to work out ‑ to use them as mentor texts effectively to say: what does an effective learning intention and success criteria look like and how should we be using them in our class? We really want to make sure that the end part of our lesson, we're going back to the success criteria and getting our students to self‑evaluate against that success criteria.

Alright. 3, 2 and 1 about learning intention and success criteria, so three things you've learned, two questions you have and one thing that was confirmed. And we're just going to finish up in one minute. So there's a couple of things that I want to draw your attention to and I'm going to put the success criteria up while I do this. I need to practise what I preach.

A couple of things. The first is that Laura is going to send out all of the resources for tonight's webinar by the end of this week. There's pressure for Laura. The next numeracy webinar, the next one of these, is on Wednesday, 20 November. We're going to talk about assessment and we're also going to have a lot of talk around talk. I'm lucky enough to be heading to a conference in America in October listening to the big gurus on talk, so I'll be all talked up.

There's also another strand of numeracy support being offered by Bastow. That's the Leading Numeracy Orientation. So if you're a numeracy leader in your school or a principal, then there will be a selection of webinars provided for you to support your role as a numeracy leader. So part 1 is for principals and that's on 11 September. So hop onto the Bastow website to check it out and to get more information about it and to sign up for that. If you're a numeracy leader, then 14 November and 27 November are the dates for you, but all of that is advertised on the Bastow website and I'm sure the lovely Laura will include that in her absolutely enormous email that she's going to be sending out this week.

So just to finish off, the success criteria: "I can describe elements of the four mathematical proficiencies" ‑ tonight is a tasting plate. It is to introduce you to these ideas and hopefully now you'll go off and springboard and do some further research around the concepts that we've talked about tonight. "Explain why vocab instruction is important in the maths classroom" ‑ that's a really quick change that you can make in your maths classroom to start pulling vocab to the forefront of the instruction. "I can list some vocab teaching strategies; I can explain the importance of learning intentions and success criteria" ‑ that's very hard to say quickly - and "I can analyse the effectiveness of learning intentions and success criteria". I really want you to pull out some of your previous ones and have a think about how effective were they and what work might I need to do in setting my learning intentions and success criteria.

But that is it from me for tonight. Thanks, everyone, for joining us on the webinar tonight. Thank you to everyone who has contributed to the Padlet. Don't forget you can go back and add and get more resources from there after tonight. Good luck in all your work. I will see you all at the next webinar. So goodnight, everyone.