What is the science of learning? - with Dr. Nathaniel Swain

Triple R Teaching Podcast #190

Hello, this is Anna Geiger, author of *Reach All Readers* and creator of Reach All Readers. In this episode I welcomed back Dr. Nathaniel Swain.

I spoke with him quite some time ago about what we got right and wrong with balanced literacy. He also offered feedback to me as I wrote my own book, and now I'm excited to share his book, *Harnessing the Science of Learning*. This book is, I think, desperately needed because we're learning a lot about what science says about what to teach in terms of teaching reading, but not always *how* to teach it, and that's where the science of learning comes in. Here we go!

Anna Geiger:

Welcome Dr. Swain!

Nathaniel Swain:

Thank you for having me, Anna. It's lovely to be here.

Anna Geiger:

I'm very excited to have you back for a second time. There's an episode that we recorded we think maybe about a year and a half ago about comprehension and the science of reading, and I'll link to that in the show notes.

Today though, we're going to talk about something a little different. We're going to talk about the science of learning and a new book that you have written, which is coming out right about the time this episode is published, called *Harnessing the Science of Learning*. I'm very excited to get into that and talk about what the science of learning is and what that means for teachers.

Before we do that, could you just briefly introduce yourself?

Nathaniel Swain:

Sure. I'm Nathaniel Swain. I'm a senior lecturer at La Trobe University here in Melbourne, Australia. I'm also first and foremost a teacher and I have a background in other areas like linguistics and speech pathology. I just love working with schools, working with my student teachers that I'm teaching right now, as well as system leaders who are really interested in these ideas at the moment in Australia.

Anna Geiger:

Wonderful. And of course you're also a young dad with two young kids, we always like to catch up about that.

Nathaniel Swain:

Well yeah, we can't forget that of course. I'm back into work mode after a quick holiday with the family, so it's been lovely. Yeah, two kids, wonderful wife.

Anna Geiger:

So define for us, what is the science of learning?

Nathaniel Swain:

Any definition that tries to talk about this is essentially a body of knowledge that summarizes what we know about how we learn best and how best to teach.

Obviously there are a lot of different ways to answer the question of how best to teach and how much we learn, but there are also some really strong ideas, much like there is in the science of reading about other really important things...

Some of the four things that I sort of take readers through in the book with my co-author on the chapter, Zach Groshell, who you might be familiar with... We say that essentially learning is hard. It's actually one of the things that's really difficult for humans to do. We think that learning's quite easy and simple, but to be honest, there are lots of things that get in the way of our learning, one of which is attention. If we don't have our students' attention, the learning straight out of the gate's not going to happen. But then also working memory, which is extremely limited and we can't bypass that working memory unless we have knowledge of the things that we're looking at.

The second principle we unpack around the science of learning is the importance of knowledge, and how there are two different kinds of knowledge, biologically primary and biologically secondary. Those are two different distinctions, one of which is easy to acquire, biologically primary, and biologically secondary is very hard to acquire.

Essentially the science of learning talks about all the factors that influence what makes learning hard and how to make it easier, such as using great teaching practices that align with this body of work and essentially provide a bit of a guidebook for what we can do as teachers. As we'll talk about today, it's not a body of knowledge that's very familiar to a lot of teachers and educators at the moment.

Anna Geiger:

When I think back to my college education, I know it's so hard. I'm very sympathetic to colleges of education, trying to figure how to cram everything that you need to know to be a good teacher in a short amount of time. I know we always lament that there's never enough instruction on how to teach reading, but then of course they've got to have instruction on teaching math and classroom management and then this, the science of learning, and I am sure I must have learned something about it. I honestly don't remember though. I don't know. I know I didn't have a single class on it, like a class devoted to it, and maybe that's part of the problem.

Maybe we enter teaching not realizing that it's a lot more than this knowledge that's crammed into our heads; it's skill. That's what it comes down to and that's why the first year of teaching is entirely overwhelming because a lot of this comes with practice.

Nathaniel Swain:

Definitely, and I think in terms of things that are really strong takeaways that should be part of teacher preparation, and are certainly becoming part of teacher preparation because of some policy changes at the federal level here in down under.

Things like what is cognitive load and what is working memory, how do we break learning down into manageable chunks. Things that you basically learn the hard way if you're thrown in the deep end in the classroom. I can really overwhelm my students and confuse them by putting too much information all at once and by combining messages that shouldn't be combined. They actually need to be broken down and separated.

But also things like needing adequate time to practice and adequate opportunity to feel that sense of success on those smaller pieces before it adds back up into larger pieces.

What we're essentially doing there and what we should have learned about in all of our teacher education programs, I certainly didn't learn it when I became a teacher either, is that long-term memory is where the learning happens. If we don't have enough in long-term memory, enough knowledge, enough skills, enough understanding of the task at hand, then we easily overwhelm our working memories because the only way to compensate those limitations of working memory are to draw upon things that we already know and already can do.

Hence why phonics instruction and things like handwriting and spelling and all those things that are really foundational for literacy are actually bypassing working memory. When we become proficient decoders and spellers and handwriters, we don't have to think about those things anymore while we're doing the very complex process of crafting sentences, writing essays, and understanding what the author's trying to tell us when it might be a complex text.

I think you probably came across some ideas around the stages of learning and Piaget's theories. A lot of those theories are actually really out of date now. Stage theory and the idea that it's incremental and lockstep is pretty debunked. There are lots of things that previously we thought young children weren't able to do. When they're provided with the right instruction and the right opportunity to understand the task at hand, they can actually do things that previously Piaget's theories said were impossible for four and five year olds. You'll see echoes of that though in practices around the place.

Part of what we do in the book is not only say what these key principles are, but also what are the key misconceptions that are out there that basically get resolved, and the debates that we've had in the past that are resolved by the science of learning and the hard evidence that we have. I'm happy to take you through some of those if you're interested as well, Anna.

Anna Geiger:

Very interested. Yes, very interested. Go ahead.

Nathaniel Swain:

One of the first ones is, and this is a big one, and Dr. Groshell and I worked on this chapter together to try and synthesize how to communicate so many things in just one chapter. Essentially, we look at the idea that there's a misconception that the environment has to be stimulating and enriching and the environment itself is a source of learning.

What we've found when you look at the hard evidence is that actually when students are off wandering through the environment themselves and sort of doing the center-based sort of instruction, there actually is potentially a lot more opportunity for what we call extraneous load. Things that are not actually about the learning are being the focus of the student's working memory, so they're getting distracted by all the bits and all the pieces and all the things that are nice, but things that aren't necessarily relevant for them picking up the sound-letter patterns that you're trying to teach or the grammatical patterns that they should be doing.

The environment as teacher has certainly been debunked in many ways, mainly because novices get overwhelmed when they're just thrown into the deep end and told to explore and figure it out for themselves.

One of the other things is that old "guide on the side" adage, which I think is thoroughly debunked now, especially for novice learners when they don't have a background or enough adequate skill. It does

make sense to take control of the learning and for the teacher to adequately support students' understanding.

Kirschner, Sweller, and Clark talk about fully guided instruction where there's a process of incremental responsibility given over to the student through lots and lots of instruction, modeling, then practice, and then moving towards independent practice. It's that "I Do, We Do, You Do" sort of approach versus minimally guided instruction, which is more inquiry-based and discovery-based. That says I mustn't interfere with the student's conceptions of things, so I'm not going to give them the answer.

Those sort of approaches do work to some extent. That's how adults will learn things when they're already quite adept at something, but they actually work for relative experts rather than novices.

That distinction, just that idea that oh, you can actually be a "sage on the stage" when it's relevant to, not that you want to just lecture to your students. That's not what we're saying it. It's about actually taking full control of the process so you can guide the learning.

There is a time and a place for that and it's often when we're first introducing new learning to students and they're first getting their head around things. For math and for English, if we're not teaching things that need to be taught explicitly, then we're probably teaching things they already know. In elementary school, this is definitely the place to do lots and lots of fully guided instruction.

Anna Geiger:

I wonder if you could talk to me a little bit about something you mentioned a little bit earlier about how we didn't think kids could do certain things. Are you talking about the idea of developmentally appropriate?

Nathaniel Swain:

Yeah, to some extent. I think the idea that kids can't handle big ideas. I think this flows into... I could talk about history, geography, and social studies as well, but take the example of even spelling rules for example.

There are some phonics approaches that are still out there, and probably considered to align with the science of reading, that in some ways neglect to update their approaches to thinking what's possible for students to learn. Some phonics approaches do not teach spelling rules explicitly. They don't say that there's a pattern for why there's an AY at the end of a word versus an AY in the middle of the word. They'll say that students will just have to figure that out through statistical learning for example, because it's too hard for them to compute a rule.

Evidence will show, but also anecdotal experience will show, that you can get five year olds, if not four and a half year olds learning that there are two codes, there's AY and AI. One is AY at the end, and there's never at the end, AI.

My son, his school is doing a lot of work in this space and updating their phonics approach, which has been good but not amazing for a long time. What they're doing now is basically saying we can teach a lot more a lot earlier than we thought, including the rules, including the patterns and giving students opportunity to practice.

That's one example, but it even is things like saying our students won't be able to grapple with big ideas about things outside their local context. They can't understand big things like continents and countries and the states, and we have to push all of that into middle school or upper elementary school. I think that evidence does not support that view either.

In fact, there are some big ideas which are easier for students and children to understand such as where they are in the world and where America is on the map for example, as opposed to all the complexities of their local council. I think you might call your local governing sort of body the equivalent of local government. That's complicated. What are the rules for who does what?

That's actually more difficult to understand than that there are seven continents. Here's North America, here's South America, here are some facts about North America and South America. Wow, that's a really great lesson. We could easily do that with elementary students, but some reservations have been there in the field for a long time saying that little kids can't handle big ideas so therefore we have to push all of that global and ancient sort of history or geography until much later, which I think is a bit of a shame.

Anna Geiger:

That reminds me of a memory that I have from when I was teaching a little girl. She really struggled with school, and with reading it was really tough. Unfortunately I was using balanced literacy at the time and I never gave her the help she needed, but she was always paying attention in other classes.

I remember I was just teaching them about Arizona, which is where we were at the time, being part of the United States and part of the world. Once in a while you'll see a light bulb go on and that's what I saw for her. She was like, "Oh! I thought it was ALL Arizona!" Now it suddenly all came together for her. That was really neat. Sorry, just an aside.

I love you talking about what's possible with young kids, and this is very interesting because I just had an email maybe yesterday from someone whose friend had shared with her something she learned from a workshop I gave recently.

I had shared Dr. Shayne Piasta's research on alphabet learning in which she said this was pretty much true for preschool and kindergarten, that "Direct instruction works in terms of teaching letter names and sounds."

This teacher was curious what I meant by that and she almost sounded like that was not something her school would support, direct instruction in preschool. Can you talk to me about that a little bit?

Nathaniel Swain:

Well, the words "direct instruction" have a lot of connotations with them because of Engelmann's work in capital "DI." Big D and big I is basically a commercial company. It's a program, so there are a lot of connotations there that don't necessarily need to be there.

When we're talking about direct or explicit, so not talking about the company itself, that's essentially when you're basically teaching something directly. You're showing it, you're saying what it is, you're asking for students to repeat it, and you're then giving them opportunities to practice. When you teach initial sounds or when you teach the sound-letter patterns to start reading CVC words… When you show the code, like when you show the T and say this is /t/, that's direct instruction. That's as simple as it can be.

Rather than if you didn't do it through that way and you said, "Okay, we're going to read a story and in this story there are going to be some sounds."

Of course, you could embed it within that and say that's more age appropriate, but if the goal of the learning is just for them to learn those three or four grapheme-phoneme correspondences, it's a lot easier just to show them a card and say it.

There's nothing bad that can happen to do that when you're doing it with a three or four year old that's like, "Oh, that's an interesting squiggle." They're going to start obviously getting confused between them if they're not that familiar.

But over time, my daughter, who's now four, but we've been doing this since she was about three, she's got a good range of SATPIN, she's got N, she's got a few others, O and V and D. She's actually recognizing those simply because sometimes we get the cards out and play a bit of a letter game.

Direct instruction I think has this connotation of oh, it's so bad for children, it's going to really limit what they do, but actually it's just when you actually point something out or when you show something or model something, that's as simple as it is.

Obviously that's the starting point and then there's the need for practice, there's the need for opportunity to space out that learning over time so it's not just remembered on that one day but remembered next week, next month, next term.

In preschool, is it as important to do as much retrieval practice as it is in elementary school? I'd probably say no, but that exposure and that direct teaching and building that awareness in the early years is only going to increase their interest and increase their ability to grapple with sounds and with letters at an earlier age, and I don't think that does anything untoward to children's development.

I think one of the things we address is that idea that teaching should be more naturalistic and learning should be naturalistic, but that does apply when you're talking about biologically primary knowledge. That's things like oral language, like music, like dance, like being plonked in a new city and being able to find your way around just by getting to know the local area.

When we are talking about things that have just been invented, so things that are only 5,000 years old like reading, writing, and mathematics, our brains aren't naturally going to acquire those just through play and through song and through experiences. We actually need to sit down and show and model and give feedback.

It doesn't have to be as formal as everyone thinks, especially in the early years, but it does have to involve some of this is what this is, and this is what it isn't, and let's practice seeing if we can get them right through a game or saying which one is which. Then putting them together to make something out of those little pieces that we've built.

Anna Geiger:

Well, the next thing I'm going to say may tie into some of the other things you want to share in terms of what the science of learning is and what that actually looks like in the classroom.

I am sure, and I know because I've heard it, people will hear what you just said about teaching the letter sounds and beginning reading in preschool and say we're just pushing down. I just read that somewhere today. Many people think we're making kindergarten way too hard and that's where all of our problems are coming from. What would you say to that?

Nathaniel Swain:

Are we talking about kindergarten or are we talking about pre-kindergarten at this point?

Anna Geiger:

I'm talking about both. In America they talk about kindergarten, which is like five years old, a year before first grade, and that's what I hear the most, that today's kindergarten is a new first grade and that's not a good thing.

I'm sure a lot of things are happening that maybe aren't aligned with the science of learning, but just in general, how would you respond to that?

Nathaniel Swain:

Look, I have a distinction in my mind in terms of formal schooling and that depending on your country it might be different, but the first year of schooling, which in some of our states we do say kindergarten as well, I think there's no reason to hold back in terms of formal schooling. Yes, it's going to be age appropriate in terms of the amount and the pace and how it's structured. You're going to give more opportunities for play and still time for them to socialize and get used to how school works, but we shouldn't have to delay the explicit teaching of some of those building blocks of mathematics and building blocks of reading until any later.

I think anything you do before kindergarten, so Pre-K and before, is a bit of a bonus in my mind. I think Pre-K is not universal, I don't think, in the United States just like it's not... Some families do it, some families don't.

In terms of equity, the biggest lever we can pull is what we do in the first year of school because that's when it's universal to every student.

For some students, if we delay that introduction to even just the basics of phonemic awareness, how words can be broken into sounds and put back together, and the initial code instruction when we're showing some of those basic SATPIN code knowledge, if we delay that any further, we're actually potentially putting that child's literacy development at risk, in my view.

I think at that point in the first six to twelve months of schooling, the first year of school, it's really important that we start giving access to that instruction because we actually want to see how students respond to that instruction.

If we delay that until six months into kindergarten, and I'm talking about 15 minutes a day here, I'm not talking about endless time... Yes, there's plenty of time still for play, there's plenty of time to get them used to school and do all the other parts of the curriculum, but for 20 minutes or 25 minutes of phonics and handwriting and so on, if we delay that any further, we essentially put a big question on some of our kids that might need extra support earlier.

If we provide even just light touch small group intervention, so Tier 2 intervention within the first year of school, we could actually completely curb that trajectory.

In my own anecdotal experience, which aligns very well with the evidence, we had intervention for students who were showing some difficulty with sound awareness and with remembering the first four codes that we were teaching, so SATP for example. They started to do some very, very light touch small group intervention in the first five weeks of school, and the benefit was that you actually got three or four extra doses every week of that 15 minutes of instruction. It was very, very simple, very similar to what they've already done before, but an extra opportunity in a smaller group setting.

It essentially meant that those kids that were flagged as at risk in the first week, which isn't really that risky because we're only in the first few weeks of school, but essentially there's no difference between them and the rest of the cohort by the middle of the school year. In which case you've actually closed any gaps that might've been there immediately.

What benefit there is there is that you haven't sort of done a wait to fail approach where it's halfway through kindergarten or halfway through grade one when you're like, "Oh, I wonder what's going on with that question mark kid that I had? I didn't know how to peg them. We've been doing a little bit of literacy and we've been doing a little bit of reading and some kids seem to be picking up more than this child is."

We don't have to actually leave it to chance anymore, I don't think. If we know that the core ingredients you can do in 15 or 20 minutes a day, and you can provide that additional intervention early to see what they're going to be at risk for something like dyslexia because they do have a persistent phonological and graphemic difficulty, or whether they just need a little bit more of what probably most other kids would've had in preschool or with their parents at home pointing at some letters and saying some sounds and playing some sounds games.

I don't think it's age inappropriate at all, especially when, for me, the gates open when we say it's the formal schooling, because that's when the equity question comes to bear. That's when if we've got kids who are at risk or developmentally vulnerable, that's when we need to be providing them the most support because that's when we can make the biggest difference before the gap starts to create.

Anna Geiger:

I wonder if some of the people concerned about this, as they would call it pushing down curriculum, might also in some cases be the people who would say, let them read when they're ready. When they're developmentally ready, they'll learn to read. I see that a lot still unfortunately, where I see a parent concerned on Facebook or something and says, "I'm trying to teach my five year old their letters, but they can't remember any of them."

There will always be the people that say, "Let him be five, leave him alone. He'll do it when he's ready," when actually if you're explicitly teaching them and they're five and they're not picking them up, then that tells you something.

Nathaniel Swain:

It does, and it's that rapid automatized naming, which is also a predictor of whether they might have persistent literacy difficulties. It's the phonemic awareness. Those two are really one of the biggest pictures. So if they are having trouble learning those four sounds, like light touch for the four sounds, SATP for example, that's the usual set that we get. It may be I and N or I and M, for example, so you have a few more to play with to start making some words like "at" and "it" and "sit" and so on. If they're not picking up those in the first four months or first four weeks of their schooling, then it is a flag basically.

And it's not to freak you out as a parent or as a teacher, but it's just to say, okay, this child probably could do an extra small group or do an extra 15 minutes a day or an extra 10, even five minutes a day. Going through the four sounds takes 20 seconds, it takes 30 seconds.

It's, "Repeat after me." Simple. Done. That's just one review. Then we say, "Okay, can you do it by yourself now in a random order?" and you do the same thing, you just apply more exposures based on what they sort of need. But if it's as simple as that and we want to make sure that there aren't any gaps going, I don't think it takes over the curriculum at all.

There's not a question of how long it should take because it's not about sitting them down for an extended period of time and drilling them. It's actually about light touch, high impact exposures to the things that they really need. The phonemic awareness of hearing the sounds and segmenting the sounds in words and blending them back together, and then also the initial code knowledge of even just the first four or eight codes that you might introduce.

Anna Geiger:

Yeah, and I would say it's possible that some people concerned about the pushing down as they would call it, it may be happening because there are teachers that are not teaching in a way that's aligned

with the science of reading. I don't know of specific examples, but they may be doing inappropriate practices.

What can you tell us about what kind of teaching is truly aligned with the science of learning? Because we also know that that type of teaching is efficient, so it's not going to require young kids sitting for long periods of time with this maybe we might call it developmentally inappropriate approach by the teacher. Maybe talk more about what the science of learning looks like starting from the beginning in the early grades or kindergarten.

Nathaniel Swain:

Just to sort of couch what I'm about to say in some important sort of caveats. Obviously the science of learning is a body of knowledge and it's an evolving body of knowledge that's continually being tested and refined through scientific research and experimental and theoretical sort of work. What practices come out of that are obviously implications and are obviously interpretations, but it's not like we say there's a formula that's been created and it's the only way to do things.

In terms of the things I'm going to talk about now, it's probably general principles that then have knock-on effects for our instruction.

Essentially one of the big principles that we go through, I'm just quoting chapter four again, is aside from the fact that working memory is limited and learning is actually really hard, that knowledge is one of the ways that we can counteract that through building up their skills and their facts and their decoding awareness and code knowledge, all of that sort of stuff. Then also that great teaching can help break the learning down so it's manageable.

The fourth principle and the final principle that we look at is that actually a big part of learning is forgetting. Students will forget nearly everything that we teach them, and the initial instruction is not nearly as important as the retrieval and the review and the constant going back over things from last week, last month, last term.

So in terms of effective approaches that align with the science of learning, it's basically not pretending that learning and teaching is a set and forget activity. As depressing as it is, you're going to have to do a significant amount of review over things that have been looked at before.

One of the things that teach reading the best and teach spelling the best in the early years is that opportunity for initial instruction, which is bite-sized, which is manageable, which doesn't go for a million hours. That is actually really manageable in terms of it's a small number of new things that we're learning and we're connecting it to all the previous things.

It's two new codes that connect with all the six or seven or eight number of other codes that we've done, and then the same routine that we do to combine those together to read short words, so CVC words for example, or even VC words initially. Then that new content is essentially complimented by all of the previous content, and this isn't the teacher saying, "Okay, everyone, I'm going to teach you this from scratch again." That's reteaching.

What we're talking about here is review and retrieval practice. The teacher actually takes a slight back step and says, let's see what we all remember. You do call and responses, you do whiteboard responses, pair shares, opportunities for them to try and remember how to spell a particular word, or remember the code for a particular sound, or try and read words that they haven't looked at for a number of weeks or months.

All of these things basically add up to this cumulative effect of learning that can happen. We can basically assume that one exposure when you're teaching it on Monday is not enough. We need to teach it on Monday, reinforce it on Tuesday, have a little break, reinforce it on Thursday, have a longer

break, and do the following Monday, then two weeks from there, two months from there, a term from there.

The important thing there as I said before, is not to reteach it from the start, it's to actually see if the students remember, because the process of retrieval is the thing that actually enables the learning to stick a lot better.

It's like when you've half remembered something and then you force yourself to try and write it down. That process of trying to write it down or retrieve it from your memory actually solidifies that in your memory a lot better than say rereading material that you've already looked at before.

Rereading or reviewing or having someone reteach you feels like you're learning or that you already know it, but it's a bit of a deception. The thing that really makes learning stick is actually allowing yourself to start to forget it and then forcing yourself to retrieve it, and we can build that into all of the work that we do.

If you are not doing about 10 to 20 minutes of review of prior material for your literacy block, and I'm talking 15 minutes of spelling and phonics and word reading, but there also might be 10 or 15 minutes of sentence level work, there might be 10 or 15 minutes of review of the comprehension and vocabulary for example... Altogether it might be half an hour to 45 minutes of review for your day, but that review becomes actually more important than the initial instruction in some ways because it allows students to ensure that everything that they've learned previously is self-solidified, is kept in long-term memory, and becomes a tool they can draw upon to solve a new problem.

Anna Geiger:

Yes, when I was researching for the second chapter of my book, I think it was the second chapter, about the science of learning, that's what I wrote there too. I said, "We often spend the most time getting the information into our students' heads, but we should spend the most time getting it back out."

That was a really interesting thing for me to think about because I know as a teacher, I didn't spend enough time doing regular review. It's fascinating to me how with the long-term memory, there's no limits. I'll be talking to my husband and I'll think of someone from 25 years ago in college, and I'll suddenly pull out their first and last name. Where did that come from? It's in there.

But like you said, the point of that long-term memory is to equip us to have to have less in our working memory when we're trying to solve a problem.

Nathaniel Swain:

That's the way that we compensate it because it's not about the size of the chunks that we deal with in working memory, it's about the number of chunks.

We might have really elaborated schema or a really huge amount of background knowledge around a particular thing that we're trying to do.

Say we're reading Shakespeare, if you've read Shakespeare before and you're reading it again, you've got a huge schema that you can deal with a significant number of individual items that actually come together into constellations being like, "Oh, I recognize this metaphor. I'm familiar with this way of speaking. I remember when this character was about to do this." And so you can see through all of the potential things that are taken for granted and actually analyze what the author is doing or what this interpretation might be.

When a student's first beginning reading, it's laughable to put Shakespeare in front of them, right? Because there's just too much going on. There's too much that's assumed for them to even be able to

approach that task. They can't even decode the words, let alone understand the metaphor and the archaic language.

But the way that you get from decodable readers to Shakespeare is by laying all of those skills and knowledge in long-term memory and for eventually, all those things that are laborious right now, like decoding and encoding and spelling, eventually they become completely automatized. So then you're thinking about the message, the vocabulary, the underlying themes, the geographical and historical context, all of those things that should come to bear on an interesting text, not the squiggly lines and the stage directions and the distracting synonyms that might be on the page, for example.

Anna Geiger:

In just a minute we're going to go to our last question, which is talking more specifically about the science of learning and the science of reading together. But before we do that, I just want to address something that's still out there.

This is funny because my oldest, she's a senior in high school, she's going to be a teacher, and I'm not sure she trusts all the things that I tell her like how certain practices aren't really aligned with the research and we shouldn't be doing that in teaching and things. And I don't know, I'm her mom, so she hears me and doesn't always pay attention or maybe trust me, but I've mentioned that the theory of learning styles is not backed by research. I don't know when we talked about that.

Well, she was sitting on the couch one day and she said, "Mom! I'm reading my psychology book, and it says learning styles are not backed by research!"

I said, "Well, see, I told you!" So anyway.

Nathaniel Swain:

It takes a long time for ideas like that to become unstuck though, doesn't it, Anna? There are things that seem intuitively correct, like the idea of reading over your notes is going to help you to study when actually you need to turn the notes over and create flashcards and test yourself. That's what really helps it to stick.

Learning styles is intuitively appealing, but doesn't bear out in terms of basically everyone is able to take in information from multiple modes, and we need to make sure that those modes complement what we call dual coding theory. For example, there's a visual that complements the auditory or verbal information. If they're in conflict, then you've just overwhelmed two sets of working memory there.

So learning styles are lovely, but it doesn't bear out that we should have different approaches for different kids and based on their preferences or styles, and that's the real difference. We all benefit from clear instructions, from clear information, and from probably seeing things that complement the verbal individual, but it doesn't mean that one style is preferred over another and actually benefits learning individually.

Anna Geiger:

And that's good news for teachers who don't have to create a million different ways for their students to take in a particular lesson.

Nathaniel Swain:

No, just create a really solid way for them to take the information in. Sometimes it means actually turning the slide or turning the worksheet over and just focusing on something that you're unpacking

together. You don't want to have a stream of text up on the screen and then students be trying to read the text while you're trying to explain what the text is saying. Then a picture that's meant to be something quite different, even a GIF that is kind of funny about the text. Suddenly you've got a GIF that doesn't match text that's being talked about, but not immediately being read out in synchrony.

So there are actually two dialogues going on inside the kids' heads. It's like, "Should I listen to myself read or should I listen to the teacher talk about what we're reading?" That's when suddenly you've overwhelmed working memory because there are too many modes going on.

Anna Geiger:

Very interesting. I know your book is going to really lay all this out for people, and I know you have a chapter specifically on the science of reading, but maybe briefly now talk about why the science of learning is so important to remember as we think about teaching reading?

Nathaniel Swain:

I think in the groundswell that's happening in the states and in Australia as well, which is starting to happen, where the science of reading is changing instructional practices and changing the focus of what we're teaching, ensuring our instruction does align with the principles from the science of how we learn best is never more important.

I think you might have taken approaches or programs or resources that supposedly are science of reading aligned and chucked them into your classroom, but if you haven't thoroughly looked at everything in your pedagogy, everything in your instructional practices and thought, well, is this the most effective way to teach?

Look at *what*, but also the effective *how*, and then you're probably going to find that some things don't land and some things don't translate, and you might not get the change in outcomes that everyone's been boasting that is possible.

One of the biggest things we tackle in the book, which has the biggest implication for reading, is how we think about the teaching of comprehension and how we think about the teaching of the vocabulary that underpins students' ability to understand what they're reading, not just to get good at decoding.

Students will not necessarily learn those comprehension skills any better if they're in small, differentiated groups. Guided reading is one of the "gifts" from balanced literacy times and is huge in the US because of the influence of those big ideas. Some of the things knocking around are that our kids need to learn in differentiated groups because whole class teaching is not appropriate or doesn't cater for individual differences.

One of the problems with guided reading in some ways, and in differentiated groups in general, whether it's math rotations or literacy rotations or whatever, is that you actually, if not just half, you quarter, if not turn into a fifth of what you could actually be teaching to your students as a whole group and are spreading that instruction out into five parts, if not more.

The students get less time with you as the expert in the room who's going to explain, model, give feedback, and provide support in real time. Instead they get more time when they're not actually supervised by you as their teacher and are having to figure out for themselves with environment as teacher, as we talked about before.

Even if your guided reading sessions are amazing and you've got those groups working really beautifully and you've got all the rotations set up and you have got those three or four students in front of you

doing that great work, you've essentially given them a fifth of what you could have given them if you gave this at a whole class level.

I'm not saying that everything is immediately translatable to a whole class context, but we can get students reading and get students comprehending and get students responding to questions in real time. You can check for understanding with questions in real time at a whole class level, using things like mini whiteboards, using turn and talks, or pair shares, using cold calling for example. All of these practices make it easier to ensure that at a whole class level, everyone is still benefiting.

I think science of learning shows that we don't need an individualized sort of super differentiated approach for the teaching of things that everyone is essentially going to be learning. We can actually bring that whole class learning experience together and then provide those additional supports in different ways.

Some of the ways that I think have been shown to work in these classrooms that have made this shift to science of learning and science of reading is they will do initial instruction altogether and they'll do retrieval practice altogether. As students are having difficulty or showing they don't understand something on their whiteboard, the teachers can obviously go and work with them right then and there and dynamically provide that support while students are still finishing their task.

You can also be checking for understanding using cold calls and picking up on responses as you go. This means if you don't get 80% of your students comprehending or understanding what they're meant to be doing, you can go back and reteach based on the cold calls, based on the whiteboards that you are sort of checking.

As a result, your whole class instruction actually becomes really dynamic, really engaging, and a real opportunity to constantly get your students doing things while you're teaching, not just listening to you talk and sort of taking it in. They're actually responding in real time with their checking for understanding questions and responses on whiteboards.

As a result, after that whole class is finished, that's the time where you can go and do that extra group work when everyone else is doing the individual comprehension questions or task that follows.

You can catch up with that group afterwards and say let's go over this material further. That's when you can provide that additional instruction you would've done as initial instruction, you would've done during your guided reading group, for example.

For some teachers, that's like a mind-blowing idea. They're happy to do a phonics program and they're happy to teach things explicitly and even might be happy to do some knowledge building as per the knowledge-rich curriculum, which I know is starting to gain some traction in the states, but the idea of giving up their reading groups or literacy rotations might be pretty scary.

I think the message that I have for you, which we delve into detail into many different stories that we tell from the schools that we've featured in the book, real schools that have made this shift... When we move away from super differentiated, constant breaking up of instruction into little groups, and instead do the initial instruction as a whole class before we go into some groups for the kids who need it, basically they figured out that they were teaching a lot more with this new approach.

They were also getting to more of their students and understanding what more of their students could do, and also challenging those students that you typically had in a lower group and probably gave them lower work as a result and locked them into that trajectory.

Equity implications are real. Planning implications are real. You don't have to plan 20 or 30 different literacy rotation activities every week. You can plan some solid whole class literacy lessons with the view that you can apply more differentiation and support after the main lesson. The implications for your

students learning are real as well. You can see in real time what they're doing rather than hoping that those groups are just taking care of themselves while you're doing that one guided reading group.

Anna Geiger:

Yeah, I definitely would say that looking back at the teaching that I did, there was too much independent work time, mainly because I was doing a reading workshop model and thought that practicing reading was going to...

Yeah, I personally think there's value in doing some differentiation from the beginning with the small groups for foundational skills in phonics, but I don't think it's a fair trade-off if it's, like you said, where the teacher has five groups. It's pretty hard to do it with fewer than five groups.

I think it can work well when you're working with other staff, so that the kids have that and then they're getting that additional Tier 2 instruction later to help them catch up. I agree, if they're just down where the skill is and then they're not getting any kind of acceleration, that's where they're going to stay.

But I really appreciate... I've heard your interview with Staci Bain on her podcast about whole group instruction and how to improve that, because that has been a weakness, certainly for me as a teacher it was a weakness, and I think we just aren't always equipped to know how to do that. There's so much that you can do to keep that pace going and to involve more students and train yourself to see the students that are struggling. I look forward to learning more about that in your book.

Is there anything else about your book you'd like to share or any chapters you're excited about?

Nathaniel Swain:

On that theme, I think one of the big ideas that we look at is the idea of built-in differentiation. Within your whole class instruction, within the plan for the lesson, you actually have opportunities for acceleration and additional support planned into it. That might be additional responses that are there on that part of the lesson when students are working away applying the thing that you've just shown them. Some students will do the standard sort of response that's there for everyone, others will do the standard plus a bit of a challenge, and others will do the extra super challenge, for example.

I think the idea that you can actually build in extension that is actually on the same trajectory, on the same theme of what you're doing, because you're all staying together as a class and you don't have to say, well, everyone has to do everything exactly the same within that lesson.

There are three options on that slide. Everyone's going to do the first one. Some people might challenge themselves and do first and second, and others are going to speed through it, who I know are my high-flyers. They're going to do first, second, and third, and they're going to put all their energy into the third, which might be open-ended. It might be to create your own sentence, or it might be figure out your own words. All of that open-endedness is potentially there. At the end of the day, those kids who are needing extension, they don't actually need you to be next to them all the time because they're actually developing that independence.

I reckon there's an opportunity there to think, well, my differentiation can actually look quite different. Yes, I'll still do some small groups as needed, based on particular needs I'm identifying or by combining with another class who they've also got some ones who need that extra support.

But then we're sort of moving into slight Tier 1 plus Tier 2 territory, if you think of it that way. We don't have to eat into our core instructional time necessarily to make a way for those differentiated groups as long as students are able to access the curriculum that you're up to, at least that first set of examples.

What else am I excited about? Oh, this book is packed with lots of different things. It's aimed to be very accessible though, so we've deliberately taken a lot of the really nitty-gritty complexity out so that you could have a softer, gentle introduction to some of these really complicated ideas.

We also partner all of the examples with lots of school case studies, so we can actually see what it looked like in the school before, what they did, what was the change, what has it meant for their instruction, but also for their school community.

There are big links between instruction, academic engagement, and then behavior. Some schools, which were previously quoted as a bit of a circus, have found that the instructional piece has helped improve their behavior and their engagement and the students' feeling of success and motivation. Previously kids that were unreachable suddenly felt like they were understood, and that the teachers really could teach them and get through to them.

There's a huge message around behavior and engagement and how that's all linked to the choices that you make as an instructor, and that when you follow those principles from the science of learning, you make learning easier for every student, but especially for those students who are currently not best served by approaches that are pretty popular.

There's stuff in there for leaders. There's stuff in there for the change process and implementation science.

There's also some really great pieces in the science of reading chapter as a crash course for the science of reading. If you like one chapter where professors Pamela Snow, Tanya Serry, and my colleague Eamon Charles and I have basically tried to distill, if you took the science of reading into four main ideas, what would they be?

We take the readers through that as a way to sort of convince them that actually there's a lot here and a lot of reason to let go of some of those balanced literacy hangovers, which is some of the things we talked about last time, Anna.

But yeah, I'm really excited to hear what people think of it. I'm really excited to see how they find it helpful for their work.

I've said it's the book that you can throw on your assistant principal or your principal's desk if they've had a lot of trouble getting their heads around this stuff or not being willing to listen to you. Throw it on their desk and see what they think of it, is sort of how I've definitely framed it up.

It's something that's very accessible for anyone to pick up and hopefully a nice gift for a teacher that you appreciate or that you want to support in their learning as well.

Anna Geiger:

Yes, and I was able to get my eyes on a few chapters pre-printing, and I love how laid out it is, how clear it is, the bold print. It's very reader-accessible. I would say it would be an excellent book study for a whole school, because what you're learning in that book translates across the grade levels. Something to think about.

Nathaniel Swain:

Well, thank you. I'm glad you enjoyed the chapters that you've had a look at, Anna. Yeah, it's coming at the end of October, so you can get a pre-order in now. It's on Amazon and all the other places.

Yeah, I'd be keen in any way, if you are running a book study and you want me to do a quick sort of pop in or something like that, I'm really willing to be a participant in those studies as well and to help more people connect with it and ask questions about it as well.

Anna Geiger:

Are you willing to get up in the middle of the night to do that?

Nathaniel Swain:

Of course! Well, your afternoon is my early morning, so we can make that work. 4:00 A.M. is not that early in my neck of the woods.

Anna Geiger:

All right, well, thank you so much! I always enjoy talking with you and I am really excited to get my hands on the book as well.

Nathaniel Swain:

Thank you, Anna. It's been a real pleasure to connect with you again.

Anna Geiger:

I highly recommend that you head to Amazon or your other favorite online seller to preorder *Harnessing the Science of Learning*.

When this episode comes out, it's possible the book will actually be starting to ship. If not, hopefully very soon. I know you're going to get a lot out of it, and I don't know that there's another book quite like this one that's so easy to read and applicable for teachers, so check it out.

You can also find the show notes for today's episode at reachallreaders.com/episode190. Talk to you next time!

Closing:

That's all for this episode of Triple R Teaching. For more educational resources, visit Anna at her home base, reachallreaders.com and join our teaching community. We look forward to helping you reflect, refine, and recharge on the next episode of Triple R Teaching.