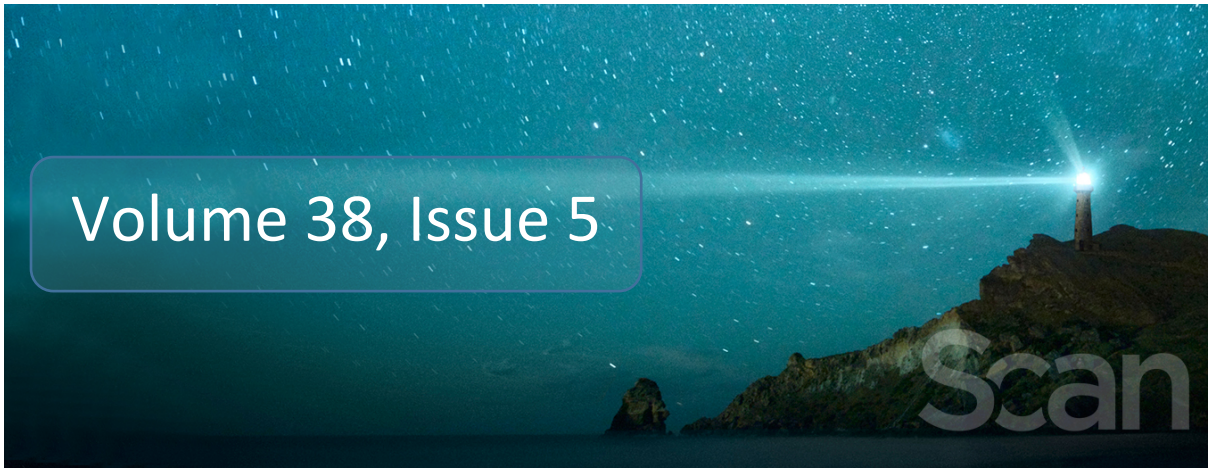

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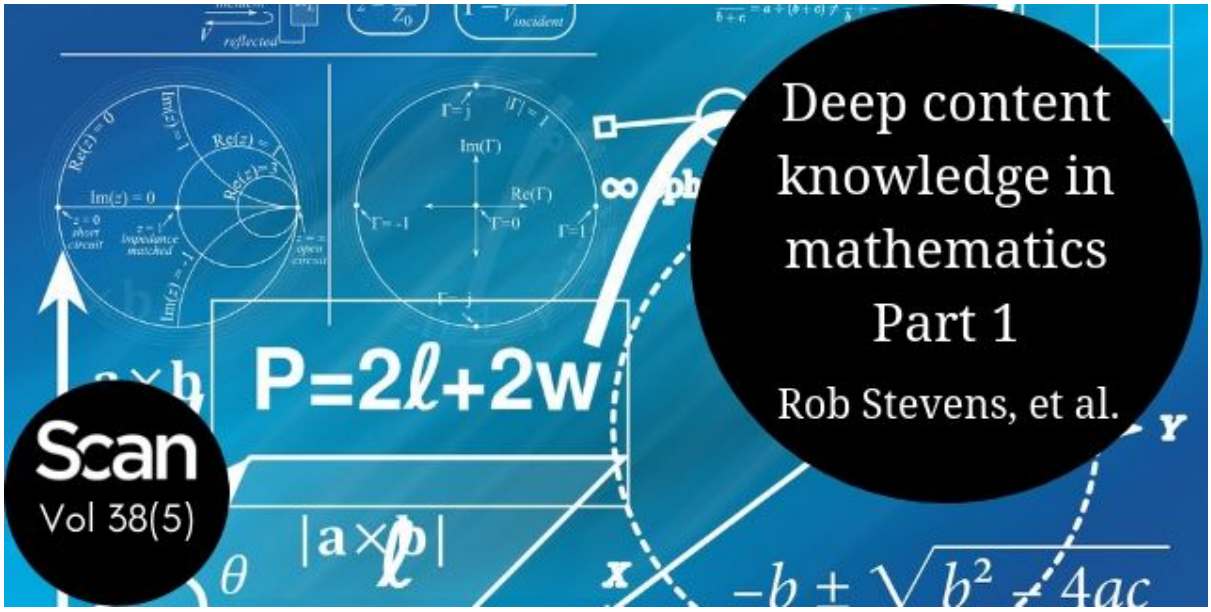


Deep content knowledge in mathematics - Part 1

Stevens, R., Liyanage, S., Liondos, N., Woo, E., Ali Kan, A., Blue, J., De Marcellis, L., Birungi, A., Brady, K., Tregoning, M. & Coupland, M.

Introduction

Schools are institutions charged with the responsibility of educating students by providing children and young people with opportunities to learn in particular courses of study. Nevertheless, the thesis that content knowledge in subject domains is a foundational principle of curriculum is a premise that is sometimes challenged in contemporary education systems. However, the content of disciplines—as variously endorsed, modified and practised within specialised fields—is pivotal to how knowledge is conceived of, taught and learned in schools and other education contexts, such as tertiary institutions, and to assessing student understanding in subject domains. As public documents organised in subject domains, NSW syllabuses attest to the importance of content knowledge in the school curriculum and a thorough knowledge of how to teach subject content is seen as preliminary to proficient teaching (NSW Government Education Standards Authority, 2018). The importance of content knowledge in a subject domain is supported by the NSW Government, where Goal 5 of the NSW Department of Education's Strategic Plan 2018-2022 states that 'all young people have a strong foundation in literacy and numeracy; deep content knowledge; and confidence in their ability to learn, adapt and be responsible citizens' (NSW Department of Education, 2018).

What is deep content knowledge?

Content knowledge can be defined as knowledge about the actual subject matter that is to be learned or taught. Content knowledge refers to the facts, concepts and principles that are taught and learned, as distinct from related skills such as reading, writing, or critical and creative thinking. Content knowledge is knowledge that… as distinct from knowledge how… (procedural knowledge).

In addressing the question of deep content knowledge in mathematics, one account is that deep content knowledge is philosophical knowledge.

Matthew Lipman (1991) says that philosophy deals with essentially contestable concepts - concepts that lie at the heart of any discipline when it is presented as a living thing rather than simply as a body of established knowledge. Lipman writes:

'Philosophy is attracted by the problematic and the controversial, by the conceptual difficulties that lurk in the cracks and interstices of our conceptual schemes ...The significance of this quest for the problematic is that it generates thinking. And so when we encounter those prefixes, "philosophy of science," "philosophy of history," and so on, we are grappling with the problematic aspects of those disciplines... It is when a discipline conceives of its integrity to lie in ridding itself of its epistemological, metaphysical, aesthetic, ethical and logical considerations [the philosophical, in short] that it succeeds in becoming merely a body of alienated knowledge and procedures' (Lipman, 1991, pp.33-34).

In applying Lipman's account of philosophy to the domain of mathematics education, a curriculum inclusive of the philosophy of mathematics entails seeking conceptual difficulties in ways that generate thinking. According to this account, an emphasis on deep content knowledge is therefore foregrounded through the development of reasoning skills.

Another account is that deep content knowledge is higher order knowledge.

The Structure of the Observed Learning Outcome (SOLO) taxonomy, (Biggs & Collis, 1982; Biggs & Collis, 1991; Biggs, 1995) provides a systematic way of describing how a learner's performance grows in complexity when mastering varied tasks. The SOLO taxonomy postulates five levels of increasing complexity in growth or development of concepts or skills:

SOLO Stage	Description
Prestructural	The task is engaged, but the learner is distracted or misled by an irrelevant aspect belonging to a previous stage or mode
Unistructural	The learner focuses on the relevant domain and picks up one aspect to work with
Multistructural	The learner picks up more and more relevant and correct features, but does not integrate them
Relational	The learner now integrates the parts with each other, so that the whole has a coherent structure and meaning
Extended abstract	The learner now generalises the structures to take in new and more abstract features, representing a new and higher mode of operation

(Biggs & Collis, 1991, p. 65)

Implicit in the SOLO model is a set of criteria for evaluating the quality of a response to (or outcome of) a task utilising general capabilities. The quality (or richness or complexity) of a response to a complex task varies with the relevance of the considerations brought to bear on the

task, the range or plurality of those considerations and the extent to which these considerations are integrated into a whole, and generalised to or related to, broader contexts.

Underlying the SOLO taxonomy is the idea that performance in a rich task consists of not overlooking any important consideration - so bringing to bear on the issue a range of considerations relevant to the issue and considering these in relation to each other.

Hattie (2012) interprets the SOLO levels as meaning:

- [Pre-structural: no idea]
- Unistructural: an idea
- Multistructural: many ideas
- Relational: relating ideas
- Extended abstract: extending ideas.

What does the SOLO taxonomy have to do with deep content knowledge?

John Hattie suggests that the Uni-Structural and Multi-Structural are about surface knowledge, and relational and extended abstract are about deeper knowledge.

He comments, 'Together, surface and deep understanding lead to the student developing conceptual understanding' (Hattie, 2012, pp. 60-61).

The SOLO model

Uni-structural	An idea	Surface
Multi-structural	Many Ideas	
Relational	Relating Ideas	Deep
Extended Abstract	Extending ideas	

John Pegg (2010) suggests that higher-order knowledge commences at the relational level. This arises through the ability to integrate information (Pegg, 2010, pp. 36-37).

Combining Hattie and Pegg's account we could say that deep content knowledge is higher order knowledge.

In **The Colors of Infinity – Arthur C. Clarke** [53 mins 10 secs] a number of notable mathematicians illustrate how simple formulas can lead to complicated results aligned with deep content knowledge.

What pedagogical practices are conducive to the cultivation of deep content knowledge?

There is a long history in education concerning the relations between pedagogical practice and content knowledge that are enacted through teaching and learning. Many interpretations have influenced the formation of curriculum content and how frameworks of content are then interpreted in classrooms. Cultural critic and theorist of critical pedagogy, Henry Giroux (2004), proposes that at the very least, an understanding of critical pedagogy entails recognition of the social, moral and political dimensions of knowledge and how agency in teaching and learning produces transformation (Giroux, 2004, p. 34).

This section of the paper examines research literature as it relates to the cultivation of deep content knowledge in mathematics learning. To begin the review, a practical example is presented as a way of demonstrating the nuances that occur in teaching and learning, and how the functional agency of a teacher is critical in setting up opportunities for depth of learning through the pedagogical decisions that are put into practice. A range of pedagogical approaches is then examined.

The significance of pedagogy through an example of learning to count

Counting forms a critical foundation in early years learning for very good reasons. When you're able to count, you can describe how much, compare quantities, combine collections, separate collections, and begin to solve problems using early additive strategies, and so on.

Counting seems like a reasonably simple act. You could ask a young child to count to 10 and she may recite: '1, 2, 3, 4, 5, 6, 7, 8, 9, 10.'

An adult may observe this behaviour and declare: 'She can count to 10'. This is not an inaccurate summary, however, it is not the entirety of the story. Being able to meaningfully count includes more than mere recitation. Reciting the number sequence suggests that a student is aware of the stable-order principle: knowing that counting involves an unchanging sequence of number words. This is just one component piece of a complex jigsaw puzzle of concepts and skills. Amongst other things, students also need to be supported into knowing that:

- counting involves matching the sequences with quantities, developing one-to-one number correspondence whereby each object or unit being counted must be given one count, and only one count only;
- the last number word produced describes the 'many-ness' of the entire quantity (or the cardinal value of the collection) and doesn't just name the last item that was counted. Teachers need to intentionally make connections to conservation and the order-irrelevance principle when supporting students to develop the concept of cardinality;
- it doesn't matter what is counted, the process is the same. The abstraction principle means I can count physical things, visible things, big things, small things, invisible things…the process remains the same and the emphasis remains on 'how many?'. This forms the basis of the commutative property and later extends into the multiplicative world, empowering students to be able to work algebraically in ways that make sense to them.

Learning to count may seem like a simple idea but a rich, complete understanding is both complex and nuanced. Linking collections to number names and numerals forms part of the big idea called

'trusting the count' (Siemon et al., 2012) and is inextricably intertwined with other early numerical skills and understanding such as subitising, knowledge of spatial patterns, reasoning, communicating, making meaning from numerals, and early additive thinking. 'Children must construct these ideas through a variety of experiences and activities' (Van de Walle et al., 2014, p. 101) and as such, teachers need to design appropriate tasks that take place inside learning environments focused on working mathematically. The pedagogical skills and decisions of teachers are equally as important as the content knowledge they have.

In addition to knowing how to support students develop both the procedural and conceptual understandings needed to be able to count, teachers also need to be aware of common misunderstandings students develop, and, develop horizon knowledge which includes understanding where ideas begin, where they extend to and how they relate to a larger landscape of mathematical competencies (Ball & Bass, 2009). For example,

'in countries like Australia and the United States, there has been an over-emphasis on counting at the expense of building strong visual images of the numbers to 10, in terms of their parts – that is, as relative quantities. This has resulted in a significant proportion of students in the middle years of schooling developing an over-reliance on some form of counting and/or additive thinking to solve problems that involve multiplication or division (Siemon et al., 2016, p. 297).

When we consider the importance of deep content knowledge through the seemingly simple task of learning to count, it is perhaps unsurprising that research shows that 'teachers' mathematical knowledge matters and significantly predicts gains in students' achievement' (National Council of Teachers of Mathematics, 2010). Without deep content and specialised knowledge, educators are unable to make discerning, targeted decisions about where to invest their time, energy and resources in order to support the students they work with. Thames and Ball (2010) are succinct in recognising the nuances required in teaching and the relations between pedagogical decisions and mathematical content knowledge, in teaching and learning:

'Teaching is not merely about doing math oneself, but about helping students learn to do it. This is challenging and requires specialised, skilled ways of knowing the domain… mathematical knowledge for teaching is a kind of complex mathematical understanding, skill, and fluency used in the work of helping others learn mathematics' (Thames & Ball, 2010, p. 228).

Pedagogies that relate to the cultivation of deep content knowledge in mathematics

Glenda Anthony and Margaret Walshaw (2009) discuss an effective pedagogy of mathematics teaching. They identify ten effective pedagogical practices:

- an ethic of care
- arranging for the learning
- building on students' thinking
- worthwhile mathematical tasks
- making connections
- assessment for learning
- mathematical communication
- mathematical language
- tools and representation
- teacher knowledge.

They note that effective teachers:

- provide students with opportunities to work both independently and collaboratively to make sense of ideas. Students' learning opportunities are supported through independent, whole-class, partnered and small group situations
- support students in creating connections between different ways of solving problems, between mathematical representations and topics, and between mathematics and everyday experiences. These practices are supported by encouraging students to make and test conjectures about mathematical ideas and concepts where students demonstrate multiple solutions, representations and flexible thinking
- facilitate classroom dialogue that is focused on mathematical argumentation. This is explored through examining conjectures, disagreements and counterarguments as well as teaching how to communicate mathematical ideas and thinking
- shape mathematical language by modelling appropriate terms and communicating their meaning in ways that students understand. Concepts and technical terms need to be explained and modelled in ways to support students' true understanding of the terms and their meanings
- carefully select tools and representations to provide support for students' thinking. Tools provide vehicles for representation, communication, reflection and argumentation. These tools support students at all stages of their learning, and are also important
- have clear ideas about how to build procedural proficiency and how to extend and challenge student ideas and adjust a lesson according to the needs of the students (Anthony & Walshaw, 2009).

Direct and Dialogic Instruction

Hattie distinguishes between Direct and Dialogic Instruction.

Through direct instruction students learn from:

a. watching clear, complete demonstrations of how to solve problems with accompanying explanations and accurate definitions
b. practising similar problems sequenced according to difficulty and
c. receiving immediate corrective feedback.

Through dialogic instruction, students learn from:

a. actively engaging in problem solving, persevering to solve novel problems
b. participating in a discourse of conjecture, explanation and argumentation
c. engaging in generalisation and abstraction, develop efficient problem-solving strategies and relating their ideas to conventional procedures; and to achieve fluency with these skills and
d. engaging in some amount of practice (Hattie et al., 2017).

An example of dialogic instruction in a community of inquiry is Philosophy for Children. Lessons are stimulated by a question asked by a student, a current news story, a picture book for younger students or a short film clip. Children are invited to say whether anything interested them or puzzled them about the stimulus. From this, a whole class discussion ensues relating to life's big questions. Students learn how to respectfully disagree because the focus is explicitly on taking issue with a claim rather than taking issue with a person ('I disagree with your argument' rather than 'I disagree with you') (Jensen & Kennedy-White, 2014). Students take it in turn to speak and to facilitate an orderly discussion a Speaker's Ball was used. The person with ball is the speaker and everyone else is a listener. The ball is rolled from person to person, as indicated by a show of hands.

Differences between the direct and dialogic methods are the types of tasks students are invited to complete and the role of classroom discourse, collaborative learning and feedback (Hattie, et al., 2017).

Hattie has found that Direct Instruction has an effect size 0.59. Dialogic Instruction has an effect size of 0.82 - double the effect size of 0.4, which is generally regarded as one year's teaching for one year's growth.

Hattie observes that the higher effect size of dialogic instruction does not mean that teachers should always choose this approach over another. It should never be an either/or situation. Rather it should be a both/and situation. The art of teaching involves teachers choosing the right approach at the right time to ensure learning and understanding how both dialogic and direct approaches have a role to play throughout the learning process, but in different ways.

Nor should teachers confine their practice to direct and dialogic pedagogies. The pedagogy chosen should be fit for purpose.

Hattie suggests that direct instruction best contributes to surface knowledge and dialogic instruction best contributes to deep knowledge.

Hands on learning in mathematics

The concepts at the heart of Mathematics are highly abstract. Naturally, teachers and students seek ways to make these concepts more tangible. This can be achieved through hands on learning such as by drawing. It could be said that learning Mathematics involves learning to draw better. There are other ways besides drawing, the use of manipulatives more generally, that can facilitate rendering abstract mathematical concepts more tangible.

According to an enactive perspective on cognition, the brain is not composed of computational machinery locked away inside the head, representing the external world to provide knowledge upon which we can act. Rather, in action – whether reaching and grasping, pointing, or gesturing – the brain partners with the hand and forms a functional unit that properly engages with the agent's environment.

We, like other animals, are action oriented. Our ability to understand the world comes from a pragmatic engagement with it, along with other people. The mind consists of a structural coupling of brain-body-world constituents. The brain is not the sole cognitive resource we have available to us to solve problems. The body and the world also play their part.

This all has implications for how we teach and learn. Teaching should not involve transmission of content from teacher to students like a jug filling a mug. Learning involves active engagement with the world: working with other people, manipulating physical objects or representations of them – not necessarily inside our heads.

Mathematics should also be taught by students manipulating physical objects, such as counters, an abacus, blocks, pieces of string, flowers, snails, bubbles, puppets, computer simulations.

A meta-analysis of studies compared the use of manipulatives, or hands-on practical apparatus in teaching mathematics, with teaching that relied only on abstract mathematical symbols (Carbonneau et al., 2013). The researchers found statistically significant evidence that manipulatives had a positive effect on learning with small to moderate effect sizes. This is

compelling evidence in favour of using manipulatives - though the ways in which they are used is hugely important.

Conclusion

Deep content knowledge in mathematics, is philosophical knowledge - the problematic and the controversial.

Deep content knowledge in mathematics can be cultivated by a stronger emphasis on dialogic instruction and hands on learning (the use of manipulatives to help render abstract mathematical concepts more tangible).

Cultivation of deep content knowledge in mathematics is likely to involve a major transformation in the way that mathematics has been taught for centuries from a didactic to a dialogical approach.

References and further reading

Anderson, L. & Krathwohl, D. (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives*. Boston, MA: Allyn & Bacon.

Anthony, G. & Walshaw, M. (2009). Effective pedagogy in mathematics. *Educational Practices Series, 19*. International Academy of Education.

Ball, D. & Bass, H. (2009). **With an eye on the mathematical horizon: Knowing mathematics for teaching to learners' mathematical futures**. 43rd *Jahrestagung fur Didaktik der Mathematik*. March 1-4, Oldenburg, Germany.

Biggs, J.B. (1995). Assessing for learning: Some dimensions underlying new approaches to educational assessment. *Alberta Journal of Educational Research*, 41(1), 1-17.

Biggs, J.B. & Collis, K.F. (1982). *Evaluating the quality of learning – the SOLO Taxonomy.* New York: Academic Press.

Biggs, J.B. & Collis, K.F. (1991). Multimodal learning and the quality of intelligent behaviour. In H. Rowe (Ed.), *Intelligence: Reconceptualization and measurement.* Melbourne: ACER.

Carbonneau, K.J., et al. (2013). A meta-analysis of the efficacy of teaching mathematics with concrete manipulatives. *Journal of Educational Psychology, 105*(2), 380-400.

Giroux, H. (2004). Critical pedagogy and the postmodern/modern divide: Towards a pedagogy of democratization. *Teacher Education Quarterly*, 31(1), 31-47.

Hattie, J. (2012). *Visible learning for teachers: Maximizing impact on learning*. London: Routledge.

Hattie, J., et al. (2007). *Visible learning for mathematics grades K-12: What works best to optimise student learning*. California, USA: Corwin, A Sage company.

Jensen, B. & Kennedy-White, K. (2014). The case for philosophical inquiry in K-12 classrooms. *Scan, 33*(2).

Lipman, M. (1991). *Thinking in education*. New York: Cambridge University Press.

National Council for Teachers of Mathematics. (2010). **Mathematics professional development.** *Professional Development Research Brief*.

NSW Department of Education. (2018). ***Department of Education Strategic Plan 2018-2022.*** NSW Government.

NSW Government Education Standards Authority. (2018). ***Australian professional standards for teachers***. NSW Government.

Pegg, J. (2010). Promoting the acquision of higher-order skills and understandings in primary and secondary mathematics. *Australian Council for Educational Research Conference*. Crown Conference Centre, Melbourne: ACER Press.

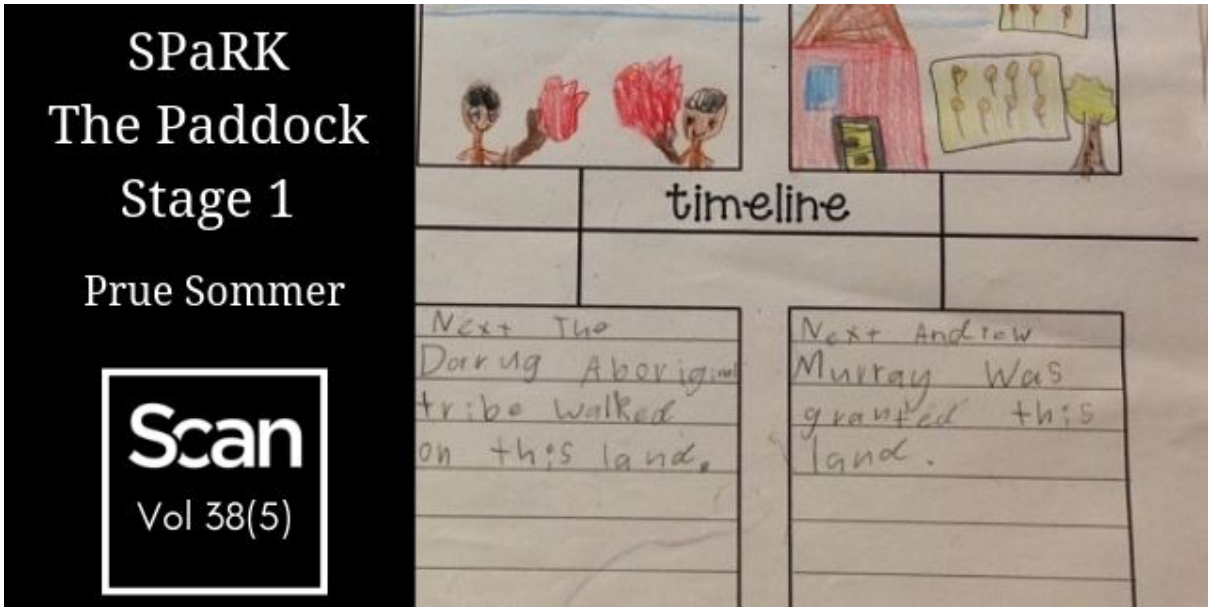
Siemon, D., et al. (2016). *Teaching mathematics: Foundations to middle years*. Oxford, UK: Oxford University Press.

Siemon, D. et al. (2012). Working with the big ideas in number and the Australian Curriculum: mathematics. In B. Atweh, M. Goss, R. Jorgenson & D. Siemon, *Engaging the Australian National Curriculm: Mathematics – Perspectives from the field* (pp.19-45). Mathematics Education Research Groups of Australasia.

Thams, M. & Ball, D. (2010). What mathematical knowledge does teaching require? Knowing mathematics in and for teaching.*Teaching Children Mathematics*, 17(4), 220-229.

Van de Walle, J., et al. (2014). *Teaching student-centered mathematics: Developmentally appropriate instruction for grades K-2*. Pearson.

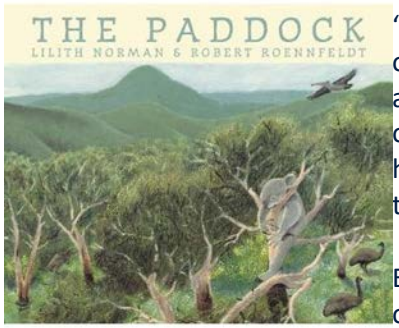
How to cite this article – Stevens, R., Liyanage, S., Liondos, N., Woo, E., Ali Kan, A., Blue, J., De Marcellis, L., Birungi, A., Brady, K., Tregoning, M. & Coupland, M. (2019). Deep content knowledge in mathematics – Part 1, *Scan, 38*(5)



SPaRK - The Paddock Stage 1

Prue Sommer

Resource overview



'The Paddock' by Lilith Norman and Robert Roennfeldt is an optimistic environmental picture book. Its lyrical text and atmospheric landscape paintings describe the life cycle of a piece of land called the paddock. It is uniquely Australian and follows its history from its beginnings as a lava field through to the arrival of the Aboriginal Peoples and then white settlers.

Each double page spread describes the paddock's transformation over time as flora, fauna and humans inhabit and adapt to it to suit their needs. The illustrations move from dreamlike awe through the primitive innocence of nature to the metallic shine and hard edge of civilisation.

Like 'Window' by Jeannie Baker, its environmental message is that there is always a cost to development. However, 'The Paddock' goes further in illustrating the reassuring ability of the earth to survive, to renew and repair itself, in whatever form the future may bring. 'Even if the soil should become sour and dead, the paddock will wait, as it has always waited, to live.'

Educational significance

'The Paddock' provides opportunities for students to explore the ways in which the same piece of land and its inhabitants change over time. The written and visual text cleverly represent an engaging timeline of change and renewal, inviting students to investigate concepts of continuity and change, and cause and effect to reinforce their understanding of history focus areas of the past in the present, and past and present family life. It also supports students' understanding of the geography focus on features of place.

Critical engagement with the text raises an awareness of the abilities of the author and illustrator to convey environmental messages with a subtlety that compels the reader to analyse and draw conclusions for their own context.

Suggestions for using this text

Use 'The Paddock' as a shared reading text. The language bounces off the page and is an excellent example of using figurative language effectively to convey meaning. Students complete a text-to-self, other and world Y-chart to make connections to the text.

Make connections to other texts that show a sequence of time, such as 'My Place' by Sally Morgan and 'Window' by Jeannie Baker. The students compare and contrast the different books. Is there a common message running throughout all the books?

- Discuss how the illustrations and text work together to create a symbiosis that draws the reader in.
- Investigate how the illustrations reinforce the text. Do they go further than the text in conveying meaning?
- Compare the illustrations from the beginning of the book where the shape and form is soft and flowing, to the last few illustrations where the artist has used harsh and sharp lines and colouring.
- Identify methods the illustrator uses to convey the different meanings.

During a reading of 'The Paddock', the students identify human and natural features on each double page spread. Do they increase or decrease as the book progresses? Tallying their data and graphing their results gives a visual representation of the changes that occur. Discussions about the possible reasons for the changes, along with the amount and variety of animals, would follow.

Use 'The Paddock' as a springboard for a class debate on the question, Do the benefits of civilisation justify the effects of it on the environment?

Teaching activities

Focus on historical concepts

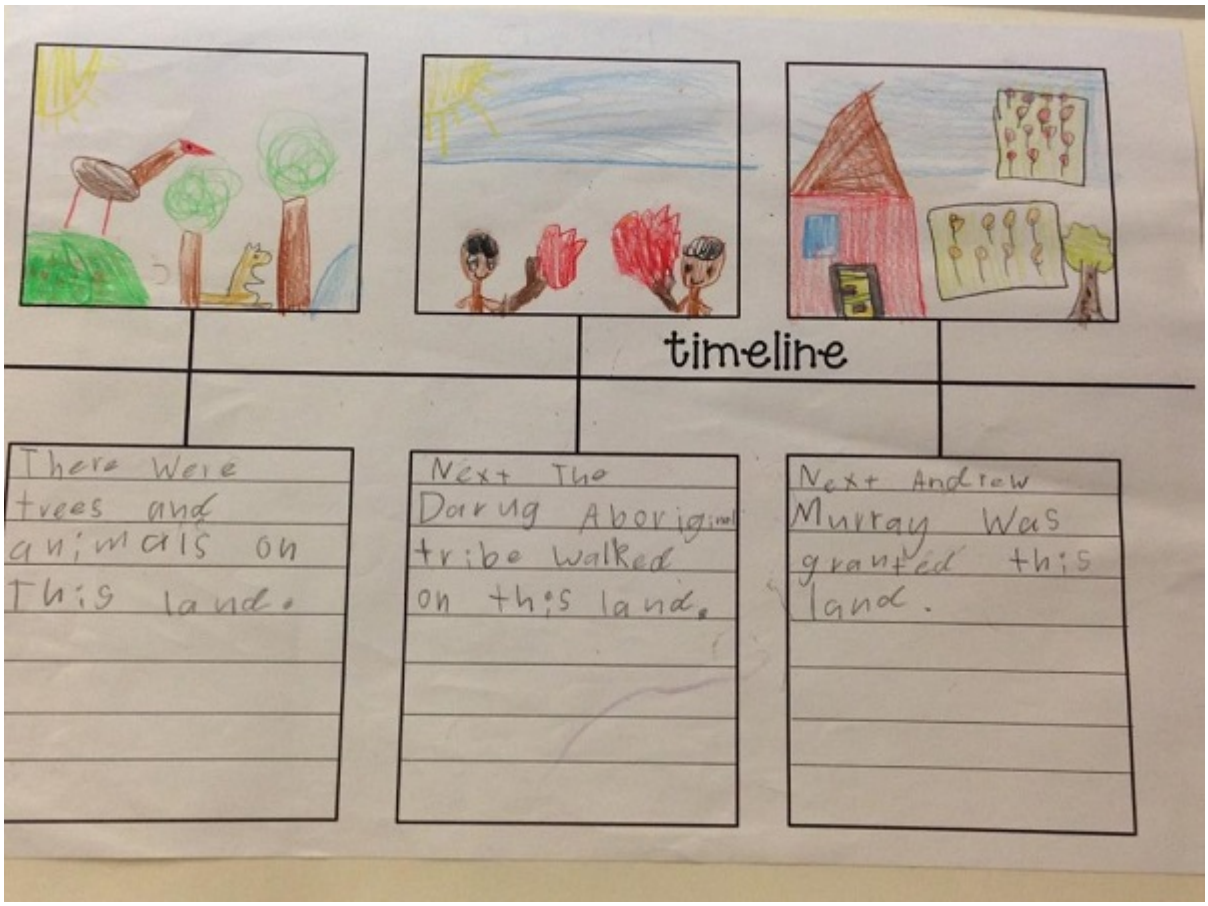
- How has the land my school sits on changed over time?
- What types of families have used this land?

After reading 'The Paddock', students are paired up and given a double page of the text to think, see and wonder about. Using the information collected, the students draw and write about their double page to create a page of a class timeline of how the paddock has changed, both in use and

inhabitants, over the course of the book. Each pair presents their part of the timeline to the rest of the class and adds it to the class timeline.

Using their knowledge of 'The Paddock's' historical timeline, the students investigate the history of their own school grounds and the different families that have used the land. Accessing local area history sites, local councils, maps, photographs and oral histories, the students investigate the site of the school and the changing inhabitants of that land that has occurred up until now. They group their sources in primary and secondary and label accordingly. The students sort the information into the differing family groups that have used the land to create a timeline and then individually draw and write about the land and the families that used it at that time in history.

Here is a work sample of a historical timeline that students at Murray Farm Public School in Carlingford, NSW completed of their school site, based on their reading of 'The Paddock' and their historical research. Pages could be added to make the timeline longer.



Syllabus links

History - A student:

- communicates an understanding of change and continuity in family life using appropriate historical terms **HT1-1**
- demonstrates skills of historical inquiry and communication **HT1-4**.

Content

Students investigate how the present, past and future are signified by terms indicating time such as ‘a long time ago’, ‘then and now’, ‘now and then’, ‘old and new’, ‘tomorrow’, as well as by dates and changes that may have personal significance, such as birthdays, celebrations and seasons, for example (ACHHK029):

- define and use terms relating to time, sequencing objects or photographs from the past, eg, then and now, past and present, a long time ago.
- How do we care for our land?

Focus on geographical concepts

After viewing ‘The Paddock’, the students wonder how they can represent the paddock in a different way. For example, how Aboriginal people would show the land. A discussion of a bird’s eye view would ensue.

- Why use a bird’s eye view?
- What are the advantages/disadvantages of using this view?
- Would ‘The Paddock’ be better represented by being illustrated in a bird’s eye view?

Students, in pairs, take one double page and replicate the scene by using a bird’s eye view. They then compare their view to the original. A whole bird’s eye view of ‘The Paddock’ could then be completed by adding all the pages together.

Students complete a fence line walk of the school property, completing a bird’s eye sketch map of what they observe. They note human and natural features along the way and use symbols to create their map. They draw in the surrounding streets and residential buildings.

Guide students to use iPads or laptops to access sites such as Google earth/ maps, to locate their school grounds and match their sketch to what they find. They add more detail to their map based on their findings. They refine their symbols and add a key to their maps.

Using **SIX maps** and a whiteboard, show students how to locate their school grounds using the advanced search function and selecting Basemaps, then choose the 1943 imagery and compare the two images.

- How has the site of the school changed over those years?
- Why has it changed?
- Who is responsible for the changes?
- How has the environment been impacted by the changes that have occurred?

Using all prior knowledge and geographical information collected, the students project what the land will look like in the future.

- What actions can they take to care for their school grounds and make it sustainable for the future?

As a class, the students choose the most important way they think the land can be used sustainably. Present that information in a poster, PowerPoint or digital book like **Book creator** for the principal’s and executive team’s consideration.

Syllabus links

Geogaphy - A student:

- describes features of places and the connections people have with places **GE1-1**
- identifies ways in which people interact with and care for places **GE1-2**
- communicates geographical information and uses geographical tools for inquiry **GE1-3**.

Content

Students investigate features of places and how they can be cared for, for example (ACHGK005):

- description of the natural and human features of places
- consideration of how a place can be cared for. For example, a park, farm, beach, bushland.

Experimenting

Students create a bush tucker garden by planting a variety of edible native plantings into the school grounds that reflect the Aboriginal tribe that occupied their land. The students maintain the gardens and run bush tucker workshops with other students in the school.

If in the school site's history the land was used for orchards, then the students could, as a long term project, plant a miniature orchard and use the produce to make small jars of preserves to hand out to people visiting the school.

Syllabus links

Creating a bush tucker garden addresses the cross-curriculum priorities:

- Aboriginal and Torres Strait Islander histories
- Sustainability.

It emphasises the relationships people have with places and their interconnections with the environments in which they live, including identifying ways in which people interact and care for places (**GE1-2**).

References and further reading

Baker, J. (1991). *Window*. Australia: Walker Books.

Book creator. (2019). Red Jumper Ltd.

Geography K–10 Syllabus. © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2015.

History K–10 Syllabus. © NSW Education Standards Authority (NESA) for and onbehalf of the Crown in right of the State of New South Wales, 2012.

Morgan, S. (1987). *My place*. Western Australia: Fremantle Press.

Norman, L. & Roennfeldt, R. (2012). *The paddock*. (Walker Classic). Newtown, NSW: Walker Books.

SIX maps. State of New South Wales (Department of Finance, Services and Innovation) Spatial Services, 2018.

Sydney Olympic Park. Sydney Olympic Park Authority. © SOPA State of New South Wales.

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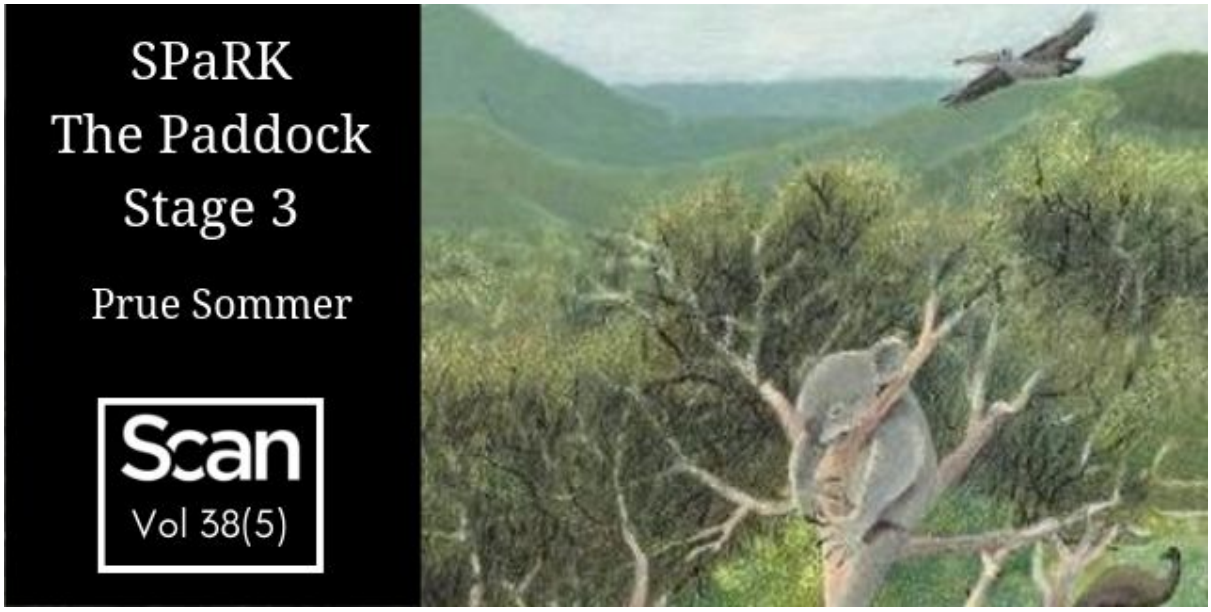
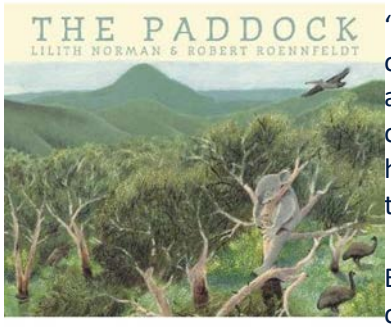


SPaRK - The Paddock Stage 3

Prue Sommer

Resource overview



'The Paddock' by Lilith Norman and Robert Roennfeldt is an optimistic environmental picture book. Its lyrical text and atmospheric landscape paintings describe the life cycle of a piece of land called the paddock. It is uniquely Australian and follows its history from its beginnings as a lava field through to the arrival of the Aboriginal Peoples and then white settlers.

Each double page spread describes the paddock's transformation over time as flora, fauna and humans inhabit and adapt to it to suit their needs. The illustrations move from dreamlike awe through the primitive innocence of nature to the metallic shine and hard edge of civilisation. Like 'Window' by Jeannie Baker, its environmental message is that there is always a cost to development.

However, 'The Paddock' goes further in beautifully illustrating the reassuring ability of the earth to survive, to renew and repair itself, in whatever form the future may bring. Even if the soil should become sour and dead, the paddock will wait, as it has always waited, to live.

Educational significance

Being a quality picture book, 'The Paddock' is an ideal text to include in a conceptual learning framework using the macro concept of change over time. In her Lady Cutler address in 1994, Lilith Norman spoke about why she thought 'The Paddock' was such an important book to write.

'I think very few (picture books) spoke straight to the heart. Very few had any subtlety. Very few were "onion" books with layer after layer to be peeled off and be discovered on each reading.'

Critical engagement with the text raises an awareness of the abilities of the author and illustrator to create these layers of meaning, while conveying environmental messages with a subtlety that compels the reader to analyse and draw conclusions for their own context. 'The Paddock' invites

students to investigate issues of environmental change and sustainability to support their understanding of the geography focus on factors that shape places.

Suggestions for using this text

Students discuss how the illustrations and text work together to create a symbiosis that draws the reader in. The students investigate how the illustrations reinforce the text. Do they go further than the text in conveying meaning?

Connections can be made to other texts that show a sequence of time, such as 'My Place' by Sally Morgan, and Jeannie Baker's picture books, 'Window', 'The Story of Rosy Dock' and 'Where the Forest Meets the Sea'. (View **ten minute videos** based on the last two mentioned titles by visiting Jeannie Baker's website.) Is there a common message running throughout all the books?

Teaching activities

How do people repurpose land to make it sustainable for the future?

After reading and viewing 'The Paddock', the students focus on the illustrations of how nature has reclaimed the land where the town once stood. They consider abandoned sites, find examples of such places and compare them.

- How has nature reclaimed the land?
- Should we leave nature to reclaim the land?

Students move their thinking to how abandoned or disused land can be effectively repurposed for the community. Students discuss any areas in Sydney they know of that have been repurposed, for example, new green spaces, parks, recreational facilities.

Students undertake a guided inquiry of how the current Homebush Olympic precinct was repurposed for the Sydney 2000 Olympic games. Google maps and **SIX maps** (with teacher guidance) are useful tools for this activity.

Using this as a springboard, students undertake an independent inquiry into how the site was once again repurposed after the 2000 games to make the land sustainable for the future. Visiting the site would be most beneficial so that fieldwork could be undertaken. If a site visit isn't practical, visit the **Sydney Olympic Park Authority website**.

Students may extend their learning further by investigating how, in an attempt to repurpose the area, apartment blocks have been poorly built, resulting in whole apartment blocks being evacuated before Christmas 2018. The students explore the why and how of this issue, including an investigation of which different levels of government are involved and are responsible.

Relating this back to their own school, are there any areas of disused land that could be repurposed? The students make an action plan and proposal, presenting their findings to the principal for consideration.

Syllabus links

Geography - Factors that shape places

A student:

- explains interactions and connections between people, places and environments **GE3-2**
- compares and contrasts influences on the management of places and environments **GE3-3**
- acquires, processes and communicates geographical information using geographical tools for inquiry **GE3-4**.

Content - Humans shape places

Students investigate how people influence places, for example (ACHGK029):

- description of who organises and manages places eg local and state governments
- identification of ways people influence places and contribute to sustainability, such as roads and services, building development applications, local sustainability initiatives
- examination of a local planning issue, the different views about it and a possible action in response to it.

Experimenting

Using their knowledge of 'The Paddock', the students investigate an abandoned development or ghost town in NSW or Australia. Examples could be the Newtown tram depot in Newtown Sydney, abandoned since 1957 and/or Yerranderie in The Blue Mountains NSW, which is an abandoned silver and lead mining town. They would investigate how they could repurpose the site for a sustainable future. Who would be stakeholders in this repurposing?

Syllabus links

This inquiry-based project has relevance to the cross-curriculum priorty **sustainability**. Students focus on protecting and repurposing environments while considering environmental challenges and the need for informed action

References and further reading

Baker, J. (1995). *The story of Rosy Dock*. Australia: Walker Books.

Baker, J. (1988). *Where the forest meets the sea*. UK: Walker Books.

Baker, J. (1991). *Window*. Australia: Walker Books.

Geography K–10 Syllabus © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2015.

History K–10 Syllabus **©** NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2012.

Jeannie Baker. (2016).

Morgan, S. (1987). *My place*. Western Australia: Fremantle Press.

Norman, L. & Roennfeldt, R. (2012). *The paddock*. (Walker Classic). Newtown, NSW: Walker Books.

SIX maps. State of New South Wales (Department of Finance, Services and Innovation) Spatial Services, 2018.

Sydney Olympic Park. Sydney Olympic Park Authority. © SOPA State of New South Wales.

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