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In this issue:

Scan is a leading refereed journal that focuses on the interaction between information in a digital age and effective student learning. Scan offers engaging professional support for all educators.

Launching spelling through reading and writing

Robyn Wild is a literacy consultant, author and presenter of PETAA's online course, Launching spelling through reading and writing. In this article, Robyn offers practical suggestions for using rich reading and writing experiences to support spelling development and confidence in Early Stage 1.

I grew up thinking that I was a bad speller, and I was. I was in primary school in the 1960s, where we had spelling and English grammar textbooks, and once-a-week compositions (and where the red slashes through every second word were the only writing feedback I ever received). I remember being read to only a few times during my entire time at school, and I still remember the sense of failure I felt on getting 21 spelling mistakes one Friday, in a Year 1 dictation.

While I had a wonderful childhood, it did not include books, and my memories of learning to read and write were often accompanied by tears. I didn't make ANY connection between reading, writing and that stand-alone subject called **spelling**. Whatever my teachers were doing wasn't helping me to connect the dots. My understanding that I was a 'bad speller' solidified.

As a not-so-young teacher, I attended a spelling course run by Faye Bolton (who'd written on teaching spelling with Di Snowball) and she said something that changed the way I looked at myself as a speller. Faye suggested that we should help students see themselves as **developing** spellers, rather than as good or bad. She explained that spelling was more than just memorising words – that there were spelling strategies which I could draw on as I wrote, and that I could learn how words worked **every** time I read and **every** time I wrote. This was all news to me!

I was teaching Kindergarten at the time, where there were no spelling lists or Friday dictations, so there was no need to keep spelling as a separate subject, isolated from daily reading and writing. Instead, I had a go at embedding spelling information into everyday literacy activities.

The spelling goals that I adopted for my Kindergarten students (informed by Di Snowball and Faye Bolton) clarified my planning. Snowball and Bolton (1999, p 5) suggested that 'the overall goals should be for children to:

- understand that the primary purpose for learning about spelling is so that others can read their writing;
- know that their writing is valued regardless of the stage of development of their spelling;
- develop an interest in words and spelling and want to do their best;
- learn how to apply spelling strategies that will help them to write or learn any word;
- learn specific words that they use frequently and so become able to correctly spell these words automatically; and
- know how to use a variety of resources to help with spelling'.

Then I focussed on what I wanted to teach the students: how words are spelled in English (that is, the English orthographic system) and what effective spellers do to spell correctly (that is, use a range of spelling strategies). **The English orthographic system** enables readers to connect spelling to sound and to meaning and includes: phonological awareness, graphophonic knowledge, morphemic knowledge and etymological knowledge. **Spelling strategies** include: sounding out, chunking (onset and rime, letter combinations, syllables or parts of words that carry meaning), using visual memory (look, say, cover, visualise, write, check), using spelling generalisations, using analogy, consulting an authority, using meaning, and using memory aids.

So, where should I start? Well, that was easy… I always started with assessment. Once or twice a term, I gathered a writing sample from each student to search for common errors. As I read each work sample, I thought about three questions:

1. What spelling strategies **can** this student use well/consistently?
2. What teaching points **could** I focus on?
3. Which ones **will** I start with?

I often referred to syllabus outcomes before asking myself one more question:

4. Do other students in my class have similar spelling needs?

Before I knew it, I had a list of common spelling miscues and a clear idea of the orthographic areas and spelling strategies on which to focus. I planned to embed this spelling information into my daily literacy practices.

My students and I engaged in **daily modelled, shared, guided** and **independent reading** and **writing**. I wanted to ensure that they saw successful readers and writers at work; were given targeted support when needed; and had plenty of time to practice their new spelling skills and understandings.

Then it was just a matter of pulling it all together by drawing students' attention to the chosen spelling information throughout each literacy session and, indeed, throughout the day.

More practical ideas for establishing and refining literacy sessions can be found in the following resources:

- Wild, R. (2009). *Where do I start? Stimulating ideas for literacy-rich primary classrooms*. Newtown, Australia: PETAA.
- Lowe, K. (2016). *For the love of reading: Supporting struggling readers*. Newtown, Australia: PETAA.
- Department of Education WA. (2004). *Reading resource book: Addressing current literacy challenges* (2nd ed.). Port Melbourne, Australia: Rigby Heinemann. (First Steps third edition materials are also available online.)
- Department of Education WA. (2004). *Reading map of development: Addressing current literacy challenges* (2nd ed.). Port Melbourne, Australia: Rigby Heinemann. (First Steps third edition materials are also available online.)
- Fountas, I. C. & Pinnell, G. S. (2016). *Guided reading*. Portsmouth, NH: Heinemann USA.

My Kindergarten literacy session

The following timeline provides an overview of a typical literacy session in my Kindergarten classroom. In most activities, I was working with the whole class. At two points, I worked with small groups or individuals, while other students worked without my support. Additional ideas for organising literacy sessions can be found in 'Where do I start?' and the other titles suggested above.

- 9:00am – secret sentence, morning routine (calendar, count children)
- 9:10am – news groups and news book
- 9:20am – read enlarged text (big book, interactive whiteboard)
- 9:30am – guided reading/conference (small groups/individuals working with teacher) and literacy centres (students working without teacher support)
- 10:15am – modelled, shared or interactive writing
- 10:20am – guided writing/conference (small groups/individuals working with teacher) and individual writing (students working without teacher support)
- 10:35am – feedback
- 10:45am – read aloud.

Secret sentence

During the daily secret sentence, I wrote an enlarged text in silence, as the class tried to integrate the three cueing systems (semantic, graphophonic and syntactic) to gain meaning from the text. We referred to letters in their names and the alphabet chart for help.
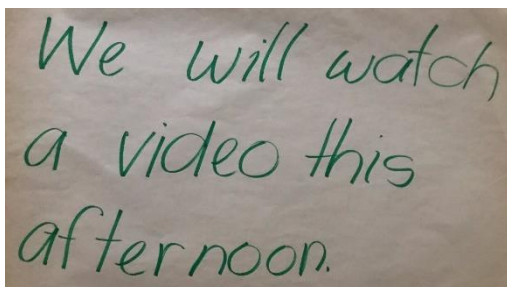
Each day, students deciphered a new secret sentence.

News book

We re-read the entire news book each day before adding a new dictated story. This book became the most important writing reference, as it contained commonly used words, popular sentence starters and a myriad of letter patterns… and, importantly, there was at least one expert for each page who could decipher every word! For example, while we all became familiar with the plurals, cvc words, the silent 'e', rhyming words {my, by}, letter blends {sh} and family words {can, fan, man} as we read and re-read Callen's news each day, Callen knew just where to find each word and letter on his page:

A page from the news book.

Big books/interactive whiteboard/charts

Big books, charts and resources displayed on the interactive whiteboard enabled me to introduce students to a vast range of texts. I could focus students' attention on aspects of the reading process, contexts for reading, reading conventions, and comprehension and word identification strategies. In this way, spelling instruction happened daily as I focused attention on phonemic awareness and graphophonic understandings, and introduced new and exciting vocabulary.
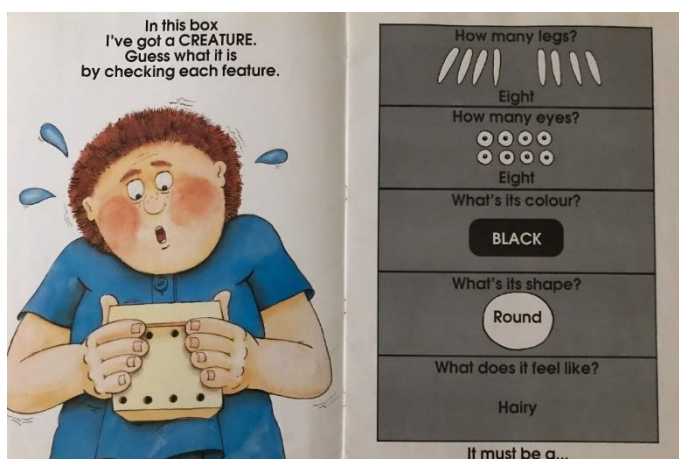
Extract from 'Creature features' [Informazing!] by David Drew (1988. New York: Rigby)

Reading enlarged texts together allowed me to focus students' attention on the chosen teaching point and to demonstrate exactly what goes on inside the head of a successful reader, as I gained meaning from the text.

Guided reading

Guided reading provides an opportunity to draw together a small group of students with similar needs to support, guide and question them as they read texts silently. In addition to focusing on, for example, comprehension or text types, I would also regularly ask students to notice letter patterns, base words, rhymes… or **any** aspect of spelling. I simply needed **one** example of a spelling generalisation in the text to start the conversation!

Extract from 'The Big, Brown Box' by David Drew (1994. South Melbourne: Thomas Nelson Australia).

Independent reading and literacy centres

No one should ever need to design a literacy centre activity, as it's so easy to find numerous great ideas! Texts on guided reading will usually have suggestions for organising literacy centres too. It's worthwhile spending time setting up effective routines and equipment, as it will free you to differentiate your teaching for small groups or individuals.

Suggested texts include:

- Diller, D. (2003). *Literacy work stations: Making centers work*. Portland, ME: Stenhouse Publishers.
- Blakemore, C. J. & Ramirez, B. W. (1999). *Literacy centres for the early years classroom.* South Melbourne, Australia: Longman.
- Moore, J. E. & Norris, J. (2005). *Literacy Centres: Book 1*. Glebe, Australia: Blake Education.

But the hub of any literacy classroom is its **class library**. Ensure your students are offered an interesting range of texts and an inviting spot that entices them to read… then give them the time and encouragement to do so.


Students enjoying independent reading (left), courtesy of the class library (right).

Modelled, shared and interactive writing

The class would help me create an enlarged text every day. I was able to model the writing process, pointing out different text types and writing strategies and demonstrating writing conventions and skills. From the first day of Kindergarten, I showed students how to invent spelling, listening for the sounds in each word and linking those sounds to letters and letter patterns. We referred to the news book and print around the room for help but, most importantly, my students became 'risk-takers' and 'brave' writers in Term 1. They realised that their writing was **their** responsibility. Only after a whole term encouraging independence and creativity, did we compare their writing attempts to standard spelling. Rather than being constrained by correct spelling, they were excited by the prospect of 'writing like a grown-up'. They became word-detectives and spelling problem-solvers.
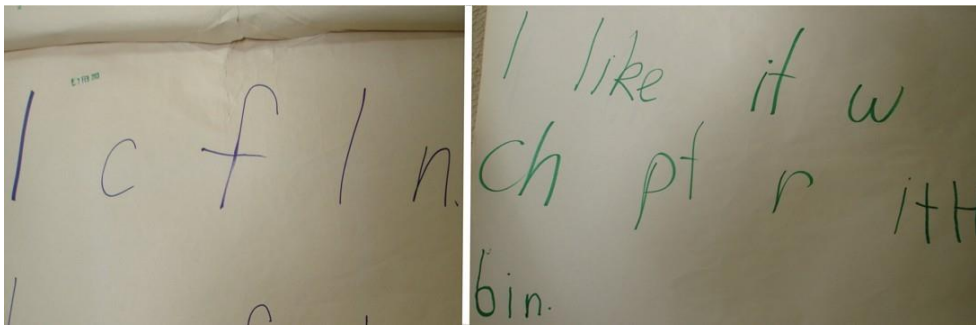
'I cooked fish last night' and 'I like it when children put rubbish in the bin'.
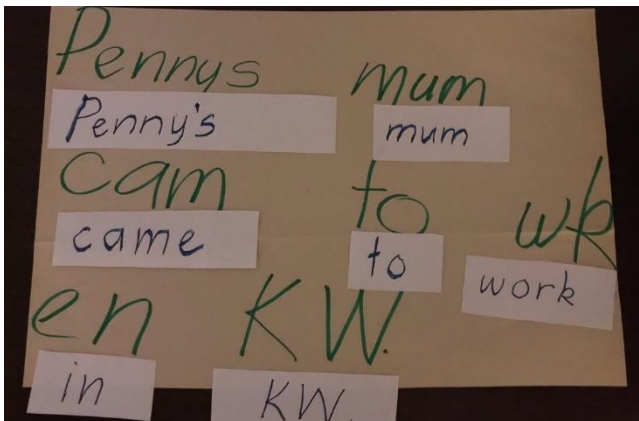
'Penny's mum came to work in KW'.

Guided and independent writing

Students then wrote their own texts every day, bringing the writing process to life! They thought, planned, organised, drafted, asked for help, edited, proofread, published, conferenced and shared. They 'owned' their work and were responsible for it. They thought about their audience and tried to create their 'best' stories.

When small groups of students worked together in a guided writing group, we focused on common writing concerns, with each student creating and improving their own attempts. It was during these writing times that I gathered additional information about them as spellers. I observed how they transferred spelling information into their own writing, saw how they solved their own spelling concerns, and discerned other common spelling issues. That way, I targeted my teaching to **their** spelling needs, rather than relying on an external spelling program or list to dictate our next spelling focus.
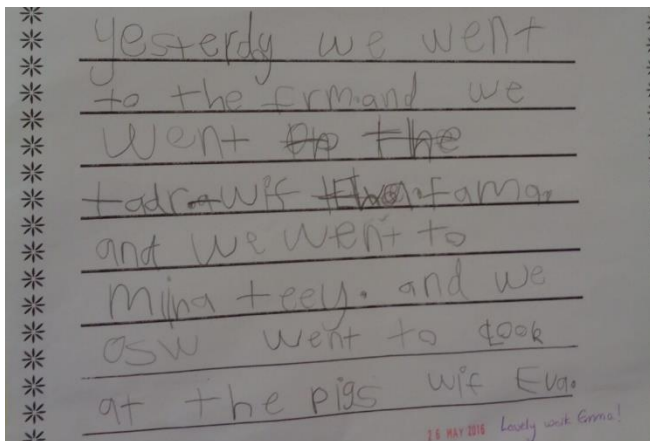
Independent writing: The farm excursion.

Read aloud

Then, and most importantly, I read aloud to the class every day. I might choose a picture book, a poem, a factual text, a multimodal text, great literature, or a silly rhyme. The text might be on a topic connected to a class discussion or author study, or it could be a traditional fable or story from far-away lands. These wonderful texts are full of fantastic vocabulary that whisks everyone away from the known.
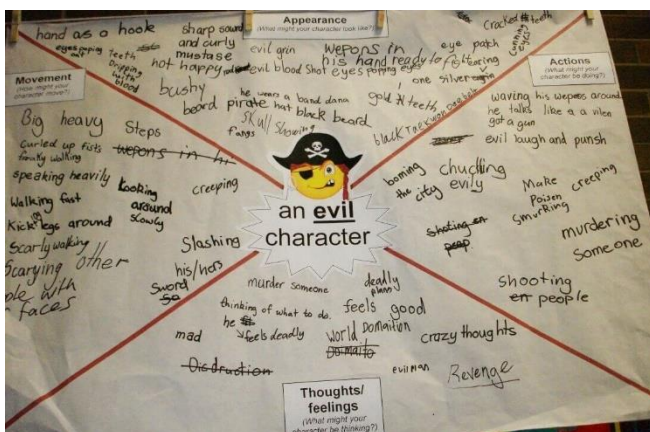
Vocabulary from read aloud texts is displayed for use in subsequent writing.

This vocabulary can then be displayed, played with, and used in subsequent writing. Use these words to demonstrate spelling generalisations and to refer to as you and the children write. If your class senses your enthusiasm for exciting vocabulary, they'll want to use it too… and to know how to spell it.

Vocabulary, organised alphabetically (left) and available on student desks (right).

Characteristics of effective spellers

As Snowball and Bolton (1999) indicate, effective spellers:

- use a variety of spelling strategies to spell and learn new words
- automatically recall high-frequency words, personally significant words, and topic and signal words
- continually build their vocabulary
- understand the English orthographic system
- understand and apply spelling generalisations
- self-monitor and generate alternative spellings for unknown words.

I never tried to create perfect spellers. Rather, I sought to nurture effective, efficient spellers who **want** to write.

References and further reading

Blakemore, C. J. & Ramirez, B. W. (1999). *Literacy centres for the early years classroom*. South Melbourne, Australia: Longman.

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SPaRK - The All New Must Have Orange 430

Holly Robinson is a teacher at Harbord Public School. In this Shared Practice and Resource Kit (SPaRK), Holly offers a range of engaging activities relating to the concepts of argument and point of view for Stage 2 students.

Resource overview

An intriguing picture book, 'The All New Must Have Orange 430' by Michael Speechley is a humorous tale about a boy who desperately wants the 'latest and greatest' toy. After seeing a persuasive advertisement in a magazine, Harvey, who enjoys playing with the latest fad toys, is determined to have his own Orange 430. His initial excitement about buying the toy fades when Harvey discovers the toy has so many components. In addition, each of the parts appears to have no actual function. Upon realising his purchase is completely useless, he tries to return the object and finds many other children on a similar mission. All the children who purchased useless objects eventually grasp their situation and collaborate to send a powerful message to Useless Object International.
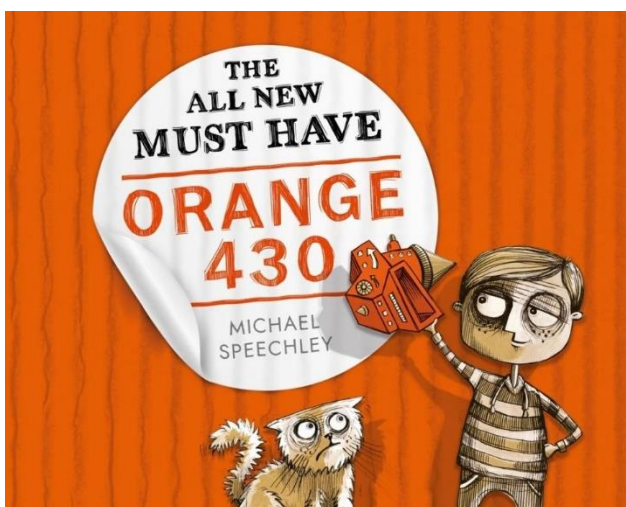
'The All New Must Have 430' by Michael Speechley (2018. Melbourne: Penguin Random House)

The 'All New Must Have Orange 430' is a relevant text for children in Stage 2 as it presents issues relating to consumerism, sustainability and the impact of advertising. Students in Stage 2 will engage quickly with this text on a personal level, relating it to their everyday lives and their world. Once the students develop this personal connection with the text, they can begin to understand and connect to the deeper themes in the picture book and discuss the impact of more complex issues such as consumerism and sustainability.

When sharing this text with children, multiple readings are necessary to allow them to explore each of the features in this book. The choice of words to tell the narrative, the pictures which mirror aspects of the story, and the intricate details embedded in the illustrations integrate to convey the tale. The 'All New Must Have Orange 430' provides a limitless opportunity to explore a range of visual literacy concepts including the symbolism of colour along with the design and layout of each page.

Syllabus links

The 'All New Must Have Orange 430' relates well to the English Textual Concepts of argument and point of view which in turn, have links to the NSW English Syllabus.

Argument

Students understand that opinions should be supported by information and ideas presented in a structured way.

They learn that:

- opinions can be refined through negotiation with others
- paragraphs contain a single idea
- paragraphs are made up of topic sentences and evidence
- certain language (eg description, modality, aspects of images) carries a persuasive force.

Point of view

Students learn that point of view influences interpretation of texts.

They understand that:

- different points of view affect a story
- different modes and media convey point of view in different ways
- meanings of stories may change when viewed through the eyes of different characters in the story or different responders to the story.

Use of these two English Textual Concepts can address various syllabus outcomes for Stage 2 English. The outcomes best linked to the perspective and activities presented below include: EN2-2A, EN2-4A, EN2-7B, EN2-9B, EN2-10C, and EN2-11D (NSW English K–10 syllabus).

Educational significance

By Stage 2, students should have an awareness that arguments need to be expressed in a clear and precise manner. Using this picture book, students can further develop their

knowledge of argument and begin to understand that opinions need to be supported by information and presented in a structured way. 'The All New Must Have Orange 430' provides a limited, albeit persuasive argument for a toy marketed as the Orange 430. The advertisement uses language choices which are considered persuasive, for example, 'all new must have', 'these will not last' and 'on sale now'. While these phrases may appear convincing, by exploring them closely through aspects related to the textual concept of argument, students should come to understand that these phrases are constructed as an advertising technique of appealing to the emotions. They are not substantiated by any evidence. Students could be asked to experiment on how to make the argument more persuasive by using evidence, a better structure, more explicit language choices and relevant images.

Using the English Textual Concept point of view to underpin the way students explore 'The All New Must Have Orange 430' provides an opportunity for Stage 2 students to understand how point of view influences and affects our understanding of a narrative. The story is told from Harvey's point of view and is centred around his purchase of the Orange 430. For children, the need to save money to buy the 'latest and greatest' toy and the associated disappointment when the toy is not as wonderful as it was advertised to be, is one that resonates deeply with students. Thus, another child's point of view helps students to connect and personally engage with the text.

'The All New Must Have Orange 430' also offers understanding of another point of view, that of the company Useless Object International and their president, Mr Ripoff. Mr Ripoff's concern is about selling products and his company suffers when the children realise his products are totally useless. Students in Stage 2 should be able to comprehend how this could affect him and the company. By looking at this point of view, students will be able to understand how the author has manipulated the student's feelings towards Useless Object International and influenced their interpretation of the text.

Suggestions for using this resource

Before introducing 'The All New Must Have Orange 430', teachers could present a relevant advertisement on a current fad toy to the students. This may be in print or an audiovisual delivery of a television commercial. The class can brainstorm student feelings about the product and consider why they feel such a desperate desire to have it. After a discussion on the current product, the teacher could show students a commercial for a previous fad toy, such as a fidget spinner or Rubik's Cube and investigate how successful this toy was. Most students will be able to tell you that the toy was fun and exciting for a few weeks but now lies somewhere hidden in the house.

When reading the picture book, it would be beneficial to discuss the written text and the visual literacy components separately. This may be undertaken over several readings focusing on different Stage 2 concepts. In the written text these may include direct and indirect speech, modal verbs, commas and the use of simple, compound and complex sentences. For visual elements, the text provides many opportunities to examine how colour symbolism (the use of orange and sepia tones), the placement of elements in the illustrations, movement and salience have shaped meaning in the text.

Teaching activities

Questioning

After reading, present two styles of questions to the students about the book. These may include specific textual questions unique to this narrative and overarching conceptual questions, such as those related to argument and point of view. Questions may include:

- What message did you get from this text?
- Why did Harvey purchase the Orange 430?
- How did Harvey develop as a character throughout the text?
- What would you say to other children who may want the Orange 430 or another Useless Object?
- What would you do with an Orange 430?
- How did the author create an argument which convinced Harvey to purchase the object?
- Who sees, thinks and tells the story?
- Describe how you feel about Mr Ripoff? Why do you feel that way?

Persuasive writing

Once 'The All New Must Have Orange 430' has been studied in depth, students could write an exposition to other children convincing them not to purchase the Orange 430. Students will need to identify the purpose and choose an appropriate audience for their written work. For instance, it could be written as a persuasive letter to a friend.

The OREO structure, outlined in this YouTube video (2.25), offers a useful guide to writing evidence based paragraphs within the structure of an exposition.

Students should be guided to consider arguments which focus on:

- the uselessness of the object;
- the cost of the object and how this money could be better used;
- the poor packaging choices and how this impacts on the environment.

As an additional activity, students could write another exposition presenting Mr Ripoff's point of view. The purpose of this piece would be to write an exposition which persuades children to purchase a Useless Object or an Orange 430. Students will have to think carefully about their chosen audience and ensure language choices suit the purpose of the text. This may also be written as a persuasive letter.

Syllabus links: Stage 2 - English

A student:

- EN2-2A: plans, composes and reviews a range of texts that are more demanding in terms of topic, audience and language
- EN2-7B: identifies and uses language forms and features in their own writing appropriate to a range of purposes, audiences and contexts
- EN2-9B: uses effective and accurate sentence structure, grammatical features, punctuation conventions and vocabulary relevant to the type of text when responding to and composing texts

- EN2-10C: thinks imaginatively, creatively and interpretively about information, ideas and texts when responding to and composing texts.

Exploring advertisements

Students should then create a new and improved advertisement for the Orange 430. The advertisement should include written and illustrated components to advertise the Orange 430 as an outstanding product. This will allow students to demonstrate their knowledge and understanding of the text, point of view and argument.

When creating the advertisement, students should consider the following things:

- Modal language
- Direct and indirect speech
- Sustainability
- Colour choice
- Salience
- Movement of images

Syllabus links: Stage 2 - English

A student:

- EN2-2A: plans, composes and reviews a range of texts that are more demanding in terms of topic, audience and language
- EN2-7B: identifies and uses language forms and features in their own writing appropriate to a range of purposes, audiences and contexts
- EN2-9B: uses effective and accurate sentence structure, grammatical features, punctuation conventions and vocabulary relevant to the type of text when responding to and composing texts
- EN2-10C: thinks imaginatively, creatively and interpretively about information, ideas and texts when responding to and composing texts

Experimenting

The All New Must Have Orange 430 provides many opportunities for students to develop their critical and creative thinking skills. Some of these could include:

Science/STEM focus:

- Repurpose an unused toy to make it useful again.
- Repurpose an old box and create a new game.

English:

- Create a television commercial to accompany the Orange 430 and/or the repurposed toy.
- Rewrite the story from Mr Ripoff's point of view.
- Source quality advertisements and discuss the techniques companies use to make them persuasive.

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School librarians making global connections: Conjecture mapping and researcher practitioner partnerships

Peer reviewed article

Dr Barbara Schultz-Jones (University of North Texas), Dr Marcia Mardis (Florida State University) and Dr Sue Kimmel (Old Dominion University, Virginia) share their research on a way to support evidence building of causal relationships between the school library and a teacher librarian's contribution to student outcomes.

Writers' note: We often look to our Australian colleagues for research they've conducted and experiences they are willing to share. We thought our recent research project could be of interest as we explored causal evidence of practice.

Editor's note: This research is presented for Australian teacher librarians to consider a research project from overseas and how it may impact how we develop evidence of practice.

Introduction

This research describes the origins of the American Association of School Librarians (AASL) Causality School Librarians and Student Success (CLASS) work and the high-level findings of the initial research phase. Strategies are shared for operationalising further research on those high-level findings through conjecture maps that guide researcher-practitioner partnerships.

School librarians or teacher librarians as they are known in Australia and elsewhere, are guided by the school library guidelines of the International Federation of Library Associations (IFLA). These guidelines position school librarians as unique contributors to the learning environment through their own work, as well as through their collaborative work with classroom teachers.

Background

The American Association of School Librarians (AASL) initiated a project called Causality School Librarians and Student Success, or CLASS. The initial phase of the CLASS project was a 2014 convening of researchers that culminated in a white paper in which AASL laid out a ten-year research agenda. In the CLASS II phase, three research teams from Florida State University, Old Dominion University and the University of North Texas set out to accomplish two pieces of research. To answer the research question "What causal relationships between school-based malleable factors and student learning are present in published research?" we performed a large-scale meta-synthesis of effective classroom teacher practices documented by high quality causal research. Then, we examined those practices to develop theories regarding which ones fit best with the work of school librarians, and provided testable designs employing the findings from our aggregation. These resulted in theoretical conjectures to test through small-scale pilot studies. These pilot studies allowed us to refine our theories and understand how classroom practices translate to a school library environment.

Method

The aggregation of high quality causal research was extensive. Each team conducted independent searches. Florida State concentrated on the What Works Clearinghouse where the most stringent, quantitative research is stored, and examined articles across the educational spectrum. Old Dominion conducted a widespread search of EBSCOhost with a focus on educational best practices and subtopics, and examined Hattie's Visible Learning (2009) analysis of 800 syntheses, focused on all learning. The University of North Texas searched the Scopus database with the keywords "school librar*" + the relevant terms identified during the broad Scopus search with keywords "caus* AND school* AND/OR learn* AND/OR achiev*". Collectively, this resulted in 1,598 studies as our starting point and these were then winnowed down to 310 studies that met the U.S. Department of Education's highest standards for evidence, as identified in the Every Student Succeeds Act, a federal omnibus of education legislation for primary and secondary schools. There are four levels of evidence ranging from *demonstrates a rationale*, through *promising* which may include well-designed qualitative research all the way up to *moderate* and *strong* levels, which include quasi experimental and experimental research. The 310 research studies illustrated the two levels of moderate and strong. From those 310 studies a number of effective practices surfaced that school librarians could implement and probably are implementing. Many of these approaches are ones that would be expected by school librarians to use when they engage with learners, however, they haven't been studied in terms of whether they have a causal relationship with student learning outcomes in the school library context.

As we proceeded with our work, federal education policy began shifting. The following quote from Mark Schneider, Director of the Institute for Educational Sciences (IES), the research arm of the U.S. Department of Education, indicates that IES is now shifting from documenting what is effective to implementing what is effective and this shift in emphasis fits well with the CLASS II work:

> In years past, IES has spent much of its budget and energies identifying what works for whom under what circumstances. But that's only part of our job.

> Just as important: We need to figure out the best channels to get that information into the hands of teachers, so that more students have teachers who are using the most effective, evidence-based methods. (2018)

One of those promising methods to identify and implement effective teaching and learning practices is researcher-practitioner partnerships (RPPs).

Findings

In this section we share some of our findings employing conjecture mapping, a tool employed by Research-Practice Partnerships and a useful and promising tool for our next step.

Research-Practice Partnerships

Rather than serial experiments, RPPs allow educators to work alongside researchers to test, examine, and refine improvement incrementally and cyclically along the lines of design-based implementation research. These long-term partnerships allow for deep engagement in the practices and with the participants (Penuel & Gallagher, 2017). RPPs are a strong model for beginning to investigate causal phenomena in learning in school libraries because RPPs are flexible and tailored to the local environment. The role of the educator and researcher are transparent in this model and they're accounted for, and the focus remains on understanding the changes in teaching and learning practices that improve outcomes as well as on the evidence generated by these implementations. Importantly, along the way, learners are able to continue their normal practices and benefit throughout the process.

Researchers and practitioners begin with the theory or conjecture, then collect data, analyse the results and adjust the intervention for subsequent implementations and, throughout the initial conjectures, refine as well, adding to the transferability of results. The RPP model has many benefits including considering student success beyond test scores and leading to the question, how do we create a plan for operationalising RPP? We begin with a simplified version of a conjecture map to illustrate the components and application of this technique.

Conjecture mapping

Learning scientists interested in RPP's often employ Design-based research (DBR), an iterative process of testing and refining both theory and practices. Sandoval (2014) proposes that conjecture mapping provides a means of simultaneously evaluating a design and building a theory in order to uncover "causal mechanisms of effective learning environments" (p. 20). In synch with design based research, conjecture mapping allows for iterative cycles of conjecture and field testing that provide the researcher with the opportunity to elaborate and build out the initial conjecture and map based on findings and local contexts. The attention to context is especially key for educational research where contexts are understood to impact learning outcomes.

Sandoval (2014) asserts that any learning environment inherently expresses theoretical hypotheses about the learning that occurs in that environment. Those of us interested in research into libraries as learning environments must therefore pay attention to the kinds of learning that are made possible by our designs not only of the facility or the materials in our collections but of the types of social and discursive practices in these spaces. Conjecture mapping requires that we make those theoretical hypotheses explicit and allows for

predictions that can be empirically tested regarding learning outcomes in the environment. In practice, conjecture mapping often leads to revisions to initial conjectures and maps in order to conduct further testing and refinement of theory. Lee, Recker, and Philips (2018) provide an overview of how their conjectures and map changed as they examined the development of STEM makerspaces in rural school and public libraries.

Components of conjecture mapping

The conjecture map starts with a high-level conjecture. An example might be "school librarians impact student achievement in reading through the provision of a variety of texts." This is a familiar conjecture to school library research as the object of numerous correlational studies beginning with Gaver (1961) and followed by a wealth of studies known as the State or Impact Studies (Scholastic, 2016). Conjecture mapping is highly structured with particular elements often referenced as a "grammar" of conjecture mapping and depicted in Figure 1: design conjectures, mediating processes, and outcomes. These elements serve initially as a thinking tool asking the researcher to surface theories or assumptions about what is happening in a design for learning to produce the desired outcomes. Figure 1 depicts the components with a preliminary example provided for illustrative purposes.

Conjecture: Students with access to a school library staffed with a professional school librarian read more and read better.

Design conjectures
- **Tools and materials**: Collections
- **Participant structures**: Access to collections
- **Discursive practices**: Talk about books

Mediating processes
- **Observable interactions**
  - o   Librarian talks with students about books and reading
  - o   Students have access to collection
  - o   Students choose reading materials
  - o   Unlimited check-out.
- **Artifacts**: Collection of materials curated by school librarian to meet student needs and interests.

Outcomes
- Students read more (as measured by circulation, observation, self-reporting)
- Students read better (as measured by assessments and teacher observation).

Figure 1. Draft conjecture map

Sandoval (2014) suggests reading the map as "'if learners engage in this activity (task + participant) structure with these tools, through this discursive practice, then this mediating process will emerge'" (p. 24) and "'if this mediating process occurs it will lead to this outcome'" (p. 24). The design conjecture attends to the tools and materials, task and participant structures, and discursive practices in the learning setting. Another way to think about this would be what will participants be doing, with what tools or materials, and what

kinds of talk or discourse will they engage in? These features of the design ask library researchers to extend beyond the facility and collections of materials provided by the library to think about the people in the setting: their roles, activities, and talk. From Figure 1, we originally jumped to thinking about collections and access to the collection as necessary to promote learning to read, but the conjecture map caused us to wonder about what discursive practices might need to be in place in the library. An obvious choice from our experience was that librarians often talk with readers about books and what they are reading. Booktalks, for example, might be a formal way that librarians talk about books but the conversations through read-alouds, among the shelves, or at the circulation desk were other places we might find discourse about books and reading. The conjecture map drew our attention to these practices as potentially salient to a theory of how librarians and libraries contribute to the development of readers.

Mediating processes are those artifacts or interactions enabled by the structures of a design that we theorise will lead to the desired outcomes. Thinking through this component of the conjecture map requires us to think more deeply about the way our proposed design for learning: access to a collection and talk with the librarian about books and reading function to develop students as readers. At this phase we are also thinking about what we can observe: artifacts and interactions. This component therefore provides guidance about what types of data we might collect to test our conjectures. What protocols will we develop for observations, and what kinds of work samples or other artifacts might we collect? These mediating processes are by definition in the middle between our designs and the outcomes we hope to measure and are connected by theory to those other components. Sandoval distinguishes these connecting theories as "design conjectures" and "theoretical conjectures." These connecting conjectures might develop from early empirical trials or from the extant research literature. In the early stages, they may be preliminary and uncertain. For example in the library if we wanted to say that a collection of easy to read books leads to improved reading outcomes for a group of students we would need to document some mediating processes or artifacts such as students selecting those books to read. Our illustrative example includes interactions between a student and the school librarian and between the student and the collection. An artifact we might include would be statistics about the size and nature of the collection. We also propose some measures of the desired outcome that students will "read more and read better."

Findings applied to a conjecture map
In our synthesis of the studies in the CLASS II Aggregation we have numerous studies related to reading. In this section we present these findings as evidence that might enlarge and focus the preliminary conjectures we provided above regarding the contributions to reading achievement of a centralised library collection staffed by a professionally certified school librarian.

To begin, we focused our conjecture on new readers from lower socioeconomic status (SES) homes, because our findings from educational research suggested that the impacts of effective teachers (Konstantopoulos, 2009; Nye et al., 2004), access to books (Allington et al, 2010), and early interventions (Assel et al, 2007; May et al., 2014; Pinnell et al., 1994) have a greater impact on those students from lower SES. In the design for learning we added details about the kinds of materials and access provided to new readers. The research indicated readers need access to a wide selection of reading materials (Allington et al.,

2010; Fisher et al., 2001) and practice in reading real and engaging texts (Stevens & Durkin 1992; Vadasy et al., 2005) that includes new vocabulary (Swanborn & de Glopper, 1999) and with predictable or decodable texts (Box & Aldridge,1993; Jenkins et al., 2004). A professionally trained school librarian is clearly in a position to select and provide access to a wide selection of these kinds of materials. But the research suggests providing a collection of books is not sufficient (McGill-Franzen, 1999). Talk about books and reading is important to reading comprehension as students construct meaning about what they are reading as they develop into stronger readers (Fisher et al., 2001; Pinnell et al., 1994; Rosenshine & Meister, 1994; Saunders & Goldenberg, 1999; Stevens & Durkin, 1992; Wasik & Bond, 2001; Whitehurst et al., 1994). Conjecture mapping led us as school library researchers to wonder about the kinds of discursive practices that might be important in our designs for learning and the CLASS II research provided empirical support for a focus on targeted talk with readers about books and reading. A revised map informed by our findings is included in Figure 2.

Conjecture: New readers from lower SES who are provided frequent access to a library with a professionally curated collection of books, along with opportunities to talk about what they are reading, read more and read better.

Design conjectures
- **Tools and materials**: Collection includes a wide variety of real and engaging texts selected to include new vocabulary and predictable and decodable texts for new readers.
- **Participant structures**: New readers have daily access to the collection and the librarian.
- **Discursive practices**: Students have opportunities to talk with the librarian about books and reading.

Mediating processes
- **Observable interactions**
  o Conversations between individual students and the librarian about books and reading.
  o New readers are provided the opportunity to visit the library at least daily to select books from the collection.
  o New readers are not restricted in the number of books they may borrow.
- **Artifacts**: Circulation record of the students.

Outcomes
- New readers find more books to choose, read more, and read better.

Figure 2. Revised conjecture map

Discussion

As researchers, we see in this conjecture map several contrasts with common practice and a map for designing research to test these conjectures. Our high level conjecture translates to a hypothesis that might be tested with a matched quasi-experimental design:

> Kindergarteners from lower SES who are provided daily access to a library with a professionally curated collection of books along with opportunities to talk about what they are reading, read more and read better than similar kindergarten students who

are provided with "business as usual" access to the collection and opportunities to talk with the librarian.

However, we might also start with an exploration of the intervention the conjecture map suggests. The CLASS II research also provided numerous studies that suggested the importance of training educators to implement an intervention. In this case, we see that both school librarians and teachers would need to be introduced to a new practice of allowing kindergarten students daily access to the library with unlimited check-out. The research provides a rationale and educators would need to buy into these practices. We might pilot this intervention and observe what design or mediating processes might need to be built into the map. Such an iterative cycle of testing and refining is exactly what conjecture mapping provides and is illustrated in the work of Lee, Recker, and Philips (2018) who quickly discovered there were practical realities for the librarians in their study that they had not anticipated with their early conjectures.

CLASS II research finds these researcher-practitioner partnerships and using conjecture maps as a productive way to start to build theory, build out theory and build in form or context and the complexity that we know exists in educational settings.

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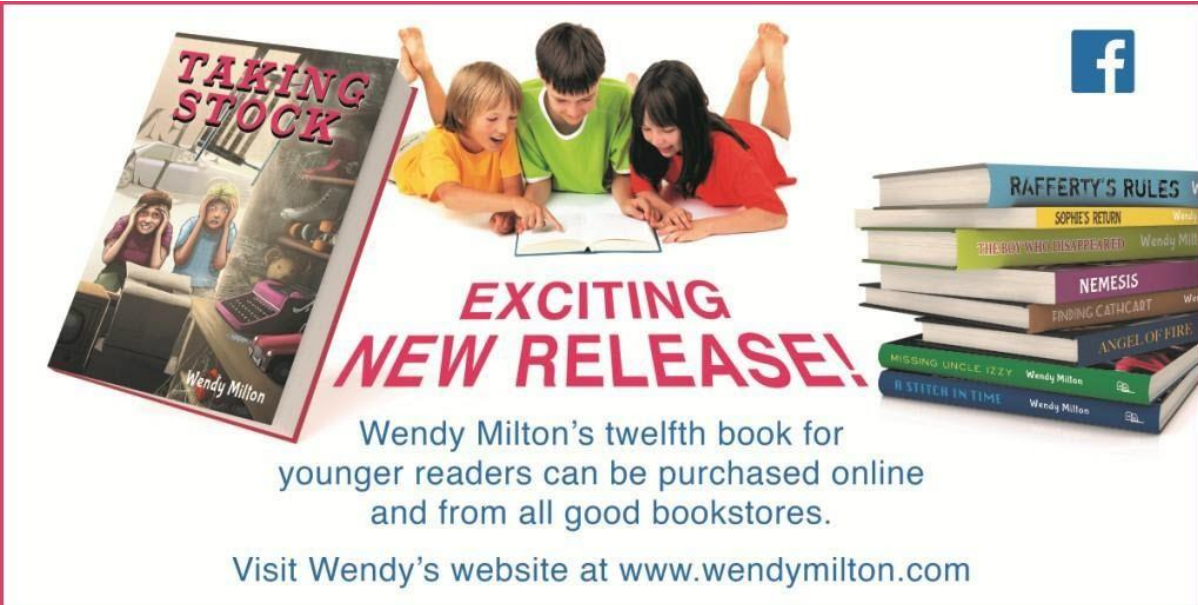
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