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Scan

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NSW GOVERNMENT

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Scan is a leading refereed journal, published monthly between February and November. Scan aims to bring innovative change to the lives and learning of contemporary educators and students. Through Scan, teachers' practice is informed by critical engagement with peer reviewed research that drives improved school and student outcomes across NSW, Australia and the world. Scan aims to leave teachers inspired, equipped and empowered, and students prepared.

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Caterpillars on the menu: How to use plasticine caterpillars to test ecological questions

Caitlyn Forster
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Caitlyn Forster explains how to detect a range of creatures that live in a local area through the use of simple plasticine caterpillars.

Ecological experiments can be conducted across schools regardless of their level of urbanisation. It is predicted that by 2050, 70% of people will live in cities. We often assume urban environments are not hosts to many animals, but this is not the case. Often, people just have not had a chance to see them, because they are distracted by a busy world, or many animals are too small or nocturnal. How do we see these seemingly invisible animals? One technique is to create model caterpillars and deploy them in the field to assess what is eating them. Model caterpillars are created using plasticine, which means predators that attack them will leave bite marks which can be identified to establish what predators are in a particular area.

The activities outlined in this article have syllabus links to scientific inquiry at various stages of K-6 curriculum.

- Early Stage 1 – Science and technology
  A student:
  STe-1WS-S: observes, questions and collects data to communicate ideas
- Stage 1 – Science and technology
  A student:
  ST1-1WS-S: observes, questions and collects data to communicate and compare ideas
- Stage 2 – Science and technology
  A student:
  ST2-1WS-S: questions, plans and conducts scientific investigations, collects and summarises data and communicates using scientific representations
- Stage 3 – Science and technology
  A student:
  ST3-1WS-S: plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions

Why caterpillars?

While caterpillars are not the only creature used, they are a very common predator model. The models are easy to make (most people have at some stage rolled plasticine or playdoh into a caterpillar shape before), and they are inexpensive. But importantly, caterpillars, particularly green looper caterpillars are a common animal, and a common food source to many other animals.

Plasticine caterpillars are a particularly useful for school experiments as they are simple to make, inexpensive, and can be sent out in large numbers. Plasticine caterpillars are a good option to study animals that are harder to see and they even give students an opportunity to study animals that have potentially very interesting systems, but may not be safe to get close to. The use of plasticine caterpillars is a simple way of allowing students to test many ecological questions and to inspire an appreciation in nature and lesser known animals in their suburbs.

One good thing about this kind of experiment is it is a commonly used ecological method for assessing predation in ecology. It provides a springboard for multiple different ecological skills. Students will have a chance to learn different plant types, urbanisation and also experience an insight into the anatomy of different animal groups. Ecological experiments of this type can be conducted anywhere and are highly beneficial to learning. Caterpillars can be deployed in schoolyards, backyards, courtyards and even balconies.

It is suggested that plasticine caterpillars can be used for inquiry-based ecological experiments. Students could begin with a question such as one of the following:

- Who's in your backyard? (Backyard biodiversity assessment.)
- Which parts of the playground provide a habitat for more animals?
- Do caterpillars' predators prefer red or green caterpillars?
- Do areas with more trees lead to more animals?
- Where are caterpillars most likely to be predated upon?

What's eating our caterpillars?

Here is an experiment for students to do in an outdoor area of the school.

Equipment needed

- plasticine or play doh (green is preferred, but other colours can be used depending on what question is being tested)
- flagging tape
- glue, wire or twist ties to attach caterpillars to trees
- small lunch bags
- clay extruder (optional)

Caterpillars are created by rolling out caterpillar shapes with plasticine at approximately 3.5mm in diameter and 25 mm in length, to better represent

smaller caterpillars, but depending on students' dexterity, it may be necessary to make them larger. Make sure caterpillars are all reasonably similar in shape and size. If you are using wire or twist ties, roll the caterpillars so that the wire runs along the centre of the caterpillars. Caterpillars can then be attached to surfaces, such as leaves, trees, brick walls using wires or glue. Leave them out for a week and then students can collect their caterpillars and assess the damage. It is possible to run this experiment overnight, but discoverability of the caterpillars by predators may be low. Depending on the question being asked, a minimum of 30 caterpillars should be placed in the field, but as with all scientific questions, the more the better!

Make sure when caterpillars are laid out their location is noted or attach flagging tape to the locations. This ensures they can be found, and any missing caterpillars can be accounted for. This is particularly important if you are placing caterpillars in trees, where it may be difficult to find the caterpillars again.

When collecting caterpillars to assess damage, be gentle so as to reduce further damage, which may make identification of predators difficult. As you are collecting them, put each caterpillar in its own bag, and label where it came from (eg. backyard, eucalyptus tree).

This activity is explained in detail in a short video (2.03): What animals are in your backyard?

YouTube video: 'What animals are in your backyard?' by Faculty of Science, University of Sydney.

Identifying caterpillar marks

Following are cheat sheets which indicate marks from some common animals.

Examples of caterpillar damage

Arthropod damage

Insects with chewing mouthparts leave small scraping marks on the body of the caterpillar. Chewing insects include **beetles, caterpillars and grasshoppers**.

Larger **spiders such as funnel webs** and **huntsmen** will leave fang marks in the caterpillars. These marks are usually scrapes or spots in pairs.

Wasps can use chewing mouthparts to bite their prey, and will leave small scrapes along the caterpillar. Some wasps use their stings to parasitise caterpillars. Stings will leave a single dot mark on caterpillars.

Bird damage

Birds with big beaks such as **parrots** can do significant damage to the caterpillars. The pointy shape of their beaks clamping down on caterpillars can tear them.

The beaks of smaller **birds such as wrens and robins** can still tear caterpillars, and leave lines along the caterpillars, but marks are smaller than damage by parrots.

Tawny frogmouths eat a lot of insects, and can tear the caterpillars. They have wider beaks so will cause wider marks than parrots or other smaller birds.

Images (illustrated by Bradley Drayton-Taylor) are adapted from Low, P.A., Sam, K., McArthur, C., Posa, M.R.C. and Hochuli, D.F. (2014), Determining predator identity from attack marks left in model caterpillars: guidelines for best practice. Entomol Exp Appl, 152:120-126.

Mammal damage

Mammals have teeth that can leave obvious looking 'bite' marks. You should be able to see an imprint of the teeth and see the shape of the mouth of larger mammals such as **possums**.

Rodents such as mice and rats can leave teeth marks like possums, but due to their size, they may look more like small scrapes. Teeth marks may still be obvious from the edge of damaged areas.

Reptile damage

Unlike us, **lizards'** teeth all look very similar to each other, so their teeth marks look straight and uniform. They will also bite small pieces out of the caterpillars.

Snakes have teeth that curve backwards, and fangs if they are venomous. These will leave scraping marks along the caterpillars.

In addition, Determining Predator Identity from Attack Marks Left in Model Caterpillars, offers more detailed information on identifying particular predators. When ecologists are doing these experiments, they have museum specimens, and colleagues to help identify particularly tricky marks. In the school context, we suggest that this is a great opportunity for students to work together in teams to try and identify marks using pictorial references, like those included here.

You don't have to use caterpillars

Plasticine and other forms of modelling clay are a common way to assess what animals are using a space. Many other model animals have been used for similar experiments, including eggs, frogs, and lizards. Including appropriate scents on model animals is also a possibility, thereby taking these experiments to a more sophisticated level.

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SPaRK

Shared Practice and Research Kit

Resource overview

Girl from the Sea

Sally Rasaiah
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Sally Rasaiah is a teacher librarian at Wahroonga Public School. In this Shared Practice and Resource Kit (SPaRK), Sally demonstrates how quality picture books can support teaching in Stage 3.

'I see, I think, I wonder', is an apt phrase to introduce 'Girl from the Sea', a visual narrative by Margaret Wild and Jane Tanner.

Two parallel stories are woven together throughout this mystical picture book. Neither story is explained in the words. Instead, they rely on Tanner's haunting artwork for interpretation and meaning. The sea is omnipresent, reminding the reader of its power and possibilities, dire and enjoyable in equal measure. The girl may be a figment of the imagination as she rises from the swirling waves to gaze at the very real family which lives in the cottage by the sea. She yearns to be included in the daily lives of the parents, children and their pets. She wonders if they can see, hear or feel her. Concurrently, the mother reveals her own story through her emotions and expressions. Did a tragedy befall this woman? What is the significance of her connection with the ghostly child from the sea?

Thoughtful readers of this multimodal text are left with a host of unanswered questions to ponder and with a significant amount of rich material for speculation and discussion.

Educational significance

Quality picture books have the power to extend and enhance students' critical and creative thinking processes. Gradual and systematic exposure to masterful writing and illustrating can influence students' attitude towards their own reading and writing. Analysing the way that an author and illustrator combine their crafts to produce works that delight, confuse, enrage or comfort is often a revelation to students. Stage 3 students need to have the same opportunities to interact with quality picture books as they do with quality novels, graphic novels, non-fiction and digital texts. Each format is important in the web of literacy that ensnares a reader. Award winning picture books (see websites for award books on the following page) provide a useful reference point for teachers who seek to surround themselves and their students with the best and most appropriate resources for their needs. 'Girl from the Sea', whilst it could be enjoyed as a shared read aloud for emerging readers, can also lead older students towards a deeper understanding of visual design and reading beyond the written script.

Syllabus links

Stage 3 - English
A student:
EN3-7C: thinks imaginatively, creatively, interpretively and critically about information and ideas and identifies connections between texts when responding to and composing texts.

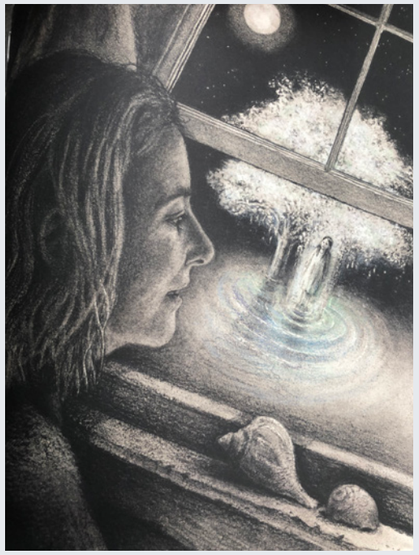
As suggested in the syllabus content, a student engages personally with texts when they think critically about aspects of texts such as ideas and events, and think imaginatively when engaging with texts using prediction, for example, to imagine what happens to characters after the narrative provided by the text. In addition, this picture book readily supports the English Textual Concepts of character and narrative.

Character
After an initial reading of the book, students are invited to discuss what they **see** through the lens of each of the main characters' perception. A scaffold for group discussion can take the form of questions that trigger an immediate response. For instance:

- Who are the main characters?
- Are they all human?
- What do you think the book is about?

Once students have brainstormed their first impressions of plot and character, they can deconstruct the complexities of how the mother and the girl from the sea change throughout the story as a result of events that have occurred or are unfolding. The teacher could point to the closeup image of the mother as she sees the girl (or is it an apparition) through the window and then joyfully embraces the shell-like plants.

Ask students to contrast the mother's demeanor in this image with previous depictions. Why does the girl's attitude move from wistful to playful in the course of the story? What pages show this change? Students may document what they **think** is happening in the plot. Sequencing the development of character traits throughout the story may be illustrated using a storyboard template.


Extract from 'Girl from the Sea'

Narrative
Stage 3 students may struggle to suspend disbelief in order to engage with the supernatural elements of this narrative. They may regard concrete themes as more relevant to their lives than abstract notions of a sea in the sky with dolphins. They may want the girl to be real because she interacts with the family pets, yet she is depicted as ethereal and ghostlike. How does this contradictory imagery influence the responder? Does the colour palette engender a particular atmosphere? Can the students read the pictures to make meaning of this narrative? Combine the responses for further discussion. Discuss in groups or pair share. Aspects of audience and purpose can also be incorporated into the discussion.

Suggestions for using this resource

'Girl from the Sea' could be the catalyst for a class or library display of thought-provoking picture books. The focus could be on 'The Girl from the Sea', with selected picture books in the collection seen as other examples of rich texts.

Teaching activities

- A document camera may be used to highlight pages of interest and specific features for whole class or group work. Display a series of pages throughout the duration of the unit for students to become proficient in identifying some of the different elements of visual design. The accompanying table offers aspects to consider.

- Brainstorm a list of emotion words, from commonly used language to more sophisticated words, found using a thesaurus. Identify words that best describe the central characters and create a word cloud of these emotive words.

- In 'Girl from the Sea', the only voice the reader hears is the girl's voice. Ask students to role play the part of the mother. How might she respond to the girl's questions? Would that change the way the reader feels about this mysterious girl?

- Artworks could be created incorporating the identified elements of visual design from targeted picture books. Interpreting the illustrations in quality picture books may support students working towards Visual Arts outcomes, particularly VAS3.3 and VAS3.4 as students are required to discuss artworks in terms of subject matter, artists' intention and audience interpretation.

Elements of visual design	Inquiry questions: · **What elements of visual design are used?** · **How do the illustrator's choices affect the way you interact with the story?**
Angles	· How is the reader positioned? · What difference does it make?
Colour	· Does the colour choice affect the way you feel about the character or the setting?
Gaze	· Is the character looking away or directly at the reader? · Do the characters' expressions reveal their feelings? · Does this help you to understand the story?
Symbols	· What is symbolic in the images? · What do you think these symbols represent?
Vectors	· Do your eyes follow implied lines or vectors from and between characters and settings? · Do these vectors demand to be followed? Why?

Using questioning to explore the elements of visual design

When students begin to ask themselves questions such as – **What's the big idea in this story? How are the ideas conveyed?** and **How does it affect me as a reader?** – teachers will know that they have set them on the path to asking all the right questions.

Experimenting

Teachers may choose to go beyond the book to develop comprehension, inference and engagement. For instance, an earlier Scan article, Literature and technology, suggests ways in which innovative use of technology and makerspaces can support and enrich a deep understanding of literature.

As with all studies of literature, enjoyment can be heightened if the reader has the tools to examine the author's purpose. This takes time and practice.

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Why are teacher librarians an excellent investment in contemporary schools?

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Dr Margaret Kristin Merga examines recent research to explore the diverse ways teacher librarians support quality learning and student literacies.

School leaders want the best for their students and therefore many school leaders have to make difficult decisions about where to prioritise their resourcing to optimise student outcomes. As an educator outside the classroom, the teacher librarian can be vulnerable to budgetary cuts within schools. Recent research suggests that teacher librarians often don't feel that their profession is valued and understood by both school leadership and their classroom teacher colleagues. The research shows that teacher librarians believe that school leaders play an important role in supporting and promoting their role within the school. Consequently, they are keen to work with leaders to offer quality learning for students and the broader school community.

But what exactly is a teacher librarian? The Australian School Library Association describes a teacher librarian as 'a person who holds recognised teaching qualifications and qualifications in librarianship'. This means that when schools employ a teacher librarian, they are bringing a person who holds expertise in both education and libraries into the school community.

So why are teacher librarians an excellent investment within a contemporary school? While there are many advantages, here are three key reasons that all schools need a teacher librarian.

1. They are experts at fostering reading engagement

In recent times, NSW students have shown the greatest declines in student reading literacy performance across the states and territories of Australia. Australia has likewise seen a notable slide in students' attitudes toward reading. While there are issues with relying on high-stakes tests such as the Programme for International Student Assessment (PISA) as a reliable measure of student literacy, this indicator suggests that greater attention to student literacy and related reading engagement may be warranted.

As I've reviewed in my 2018 book, there is strong research evidence about the role that reading engagement plays in boosting students' literacy scores.

> Recent research has found that library visitation may be the most influential factor when it comes to improving students attitudes toward, and frequency of participation in, the beneficial practice of reading for pleasure.

One of the reasons for the powerful relationship between reading engagement and students' literacy performance is likely to be the unique reading promotion role of the teacher librarian, which is not typically duplicated by any other staff member. Their combined library, literacy and literature expertise means that they are uniquely situated to build whole-school reading cultures in partnership with their school leaders, and encourage our young people to enjoy the benefits of being life-long readers. However, we need to understand what teacher librarians offer in relation to this role so that we can support them to have the time and resourcing they need to meet student needs.

2. They are ahead of the information literacy game

Want to enhance your students' cyber safety skills? Want to ensure your students understand correct source attribution and related intellectual property issues? Want to make sure your students move into higher education with a strong understanding of what constitutes plagiarism more broadly?

Building students' knowledge and skills in all these areas is within the scope of the teacher librarian role. As information literacy experts, teacher librarians also help schools to keep students safe by teaching them to make good choices online.

Teacher librarians often collaborate with classroom teachers as partners in building students' related inquiry-based learning skills, which are a key component of the Australian Curriculum in Humanities and Social Sciences.

As explored in my recent paper, teacher librarians do the following as part of their information literacy educator and support role:

- Perform background curation of sources for research classes and create research guides.
- Teach information skills such as search strategies, note taking, referencing and constructing bibliographies.
- Contribute to parent information literacy skills sessions.
- Teach students critical information literacy skills, such as evaluating information and sources.
- Plan and deliver training and support in inquiry-based learning.
- Support the delivery of quality online information services.
- Support the ICT staff with troubleshooting.
- Promote understanding and compliance around issues of academic integrity and plagiarism, copyright and digital rights management,

research ethics and online safety.
- Develop resources to support information skills in staff and students.
- Provide dyadic assistance with student searching.

As students spend more and more time online, both at home and during school hours, the need to build their capacity as safe and responsible digital citizens is only growing over time.

3. They support struggling literacy learners

In addition to building students' reading engagement, teacher librarians also work with struggling readers to help to close the literacy achievement gap and enable them to meet their academic and vocational goals.

This is important, because the number of struggling literacy learners is growing over time. The gap between high and low literacy performers in a Year 9 classroom can be as great as eight years.

> The diversity in student literacy skills poses a significant challenge for classroom teachers, and thus teacher librarians can play a valuable supporting role.

In many cases, low English literacy cannot be explained by English as an Additional Language or Dialect status or a diagnosed learning difficulty, meaning that support for struggling students can be hard to resource. Our recent research suggests that 'school leadership commitment to ensuring that struggling literacy learners have their literacy skills developed across all learning areas may be crucial to the realization of a supportive whole-school culture for struggling literacy learners'. A teacher librarian can help leaders to achieve this goal.

Teacher librarians help struggling literacy learners in many ways. Here are 10 common research-supported practices they use to help close the achievement gap. You can read more about them in How do librarians in schools support struggling readers? (Merga, 2018).

Teacher librarians:

1. identify struggling readers so that they can get extra support
2. provide them with age and skill-appropriate materials to keep them reading
3. teach them how to choose books that fit their interests and abilities
4. support the unique needs of students with special needs
5. provide one-to-one matching so that the unique interests of each individual student are taken into account
6. promote access to books so that reading can happen
7. enhance the social position of books and reading
8. read aloud to students
9. facilitate silent reading
10. prepare students for high stakes literacy testing.

As such, teacher librarians are a key part of the literacy support team for struggling literacy learners.

Watch this space

Most would agree that 2020 was a tough year, and 2021 also offers many ongoing challenges for young people and their families to grapple with. One of the many roles of the teacher librarian is to create safe and welcoming spaces, and I am currently leading a team with the generous support of the Bupa Health Foundation to investigate how Australian schools can make the most of their libraries as a wellbeing resource. We look forward to sharing our findings with you.

Final note

This article focusses on a small part of teacher librarians' complex work role. I would strongly encourage school leaders to weigh up the value of teacher librarians' contribution for students' literacies. I also urge leaders without teacher librarians to consider bringing one into their learning team as an important investment in student achievement.

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Writer biographies

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Caitlyn Forster is a PhD candidate at the University of Sydney. She is using behavioural economics to understand bee behaviour. Caitlyn is passionate about encouraging educators to use their local green spaces to conduct ecological experiments to inspire future generations to appreciate nature.

Sally Rasaiah

Sally Rasaiah has been a teacher librarian in independent and public primary schools since gaining her Master of Applied Science (Teacher Librarianship) in 2005. As a former editor of Scan, Sally has written many reviews for digital and print resources that supported teaching and learning across the K-12 curriculum. Sally is particularly interested in the way picture books enhance the reader's knowledge of culture and the world, past, present and future.

Dr Margaret Kristin Merga

Dr Margaret Kristin Merga is a senior lecturer and research-focussed scholar at Edith Cowan University in Western Australia. She is the author of more than 80 peer reviewed journal articles in librarianship, literacy and higher education, and the author of books on reading, libraries and data analysis. She is the inaugural Patron of the Australian School Library Association.