Up the Pipe

by Fiona Terry

School Journal
Level 3, November 2014
Year 6

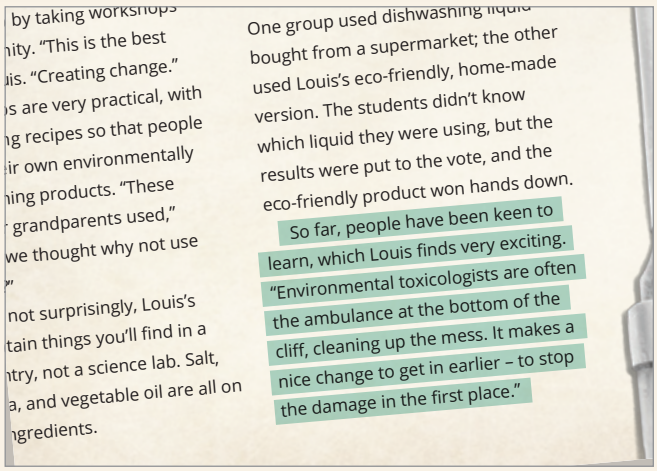
Overview

"Up the Pipe" shows real scientists in action, working on a project that has direct relevance to our daily lives. Dr Louis Tremblay and his team investigate the sludge at sewage treatment plants and go "up the pipe" to find out what goes down household drains. They want to raise public awareness of the harmful chemicals we may be using every day and convince us to use products that are less harmful to our environment. This article:

- shows students how scientists work together to find evidence to support their ideas
- has a strong theme of community awareness and action to protect the environment
- provides challenges for students to read scientific vocabulary and concepts
- provides opportunities for students to make connections with the text to draw inferences.

Texts related by theme **"The Fish Highway"** Connected 3 2013 | **"Saving Poorman's Stream"** SJ 3.1.10

Text characteristics from the year 6 reading standard



by taking workshops
nity. "This is the best
is. "Creating change."
s are very practical, with
g recipes so that people
ir own environmentally
ning products. "These
grandparents used,"
we thought why not use
"
not surprisingly, Louis's
tain things you'll find in a
try, not a science lab. Salt,
a, and vegetable oil are all on
gredients.

One group used dishwashing liquid
bought from a supermarket; the other
used Louis's eco-friendly, home-made
version. The students didn't know
which liquid they were using, but the
results were put to the vote, and the
eco-friendly product won hands down.

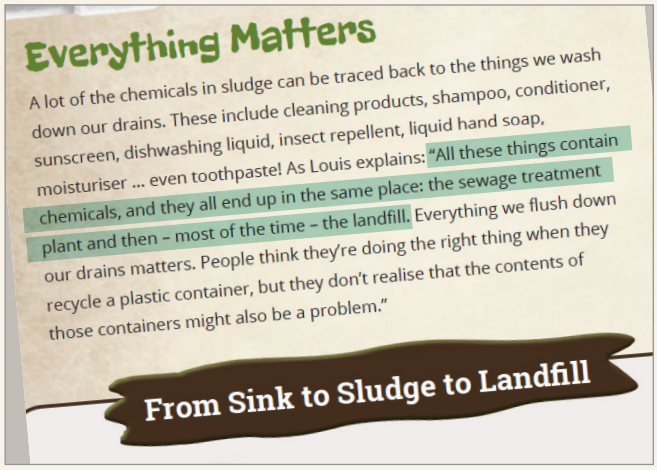
So far, people have been keen to learn, which Louis finds very exciting. "Environmental toxicologists are often the ambulance at the bottom of the cliff, cleaning up the mess. It makes a nice change to get in earlier – to stop the damage in the first place."

abstract ideas, in greater numbers than in texts at earlier levels, accompanied by concrete examples in the text that help support the students' understanding

How to Clean Green

Get clever and make your own greener cleaning products. The ingredients are all easy to find – most will be on the shelves at your local supermarket (although glycerine is usually found at a pharmacy).

mixed text types (for example, a complex explanation may be included as part of a report)

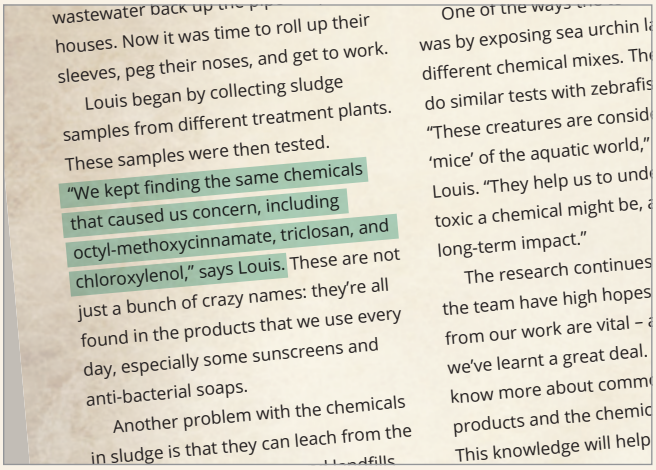


Everything Matters

A lot of the chemicals in sludge can be traced back to the things we wash down our drains. These include cleaning products, shampoo, conditioner, sunscreen, dishwashing liquid, insect repellent, liquid hand soap, moisturiser ... even toothpaste! As Louis explains: "All these things contain chemicals, and they all end up in the same place: the sewage treatment plant and then – most of the time – the landfill. Everything we flush down our drains matters. People think they're doing the right thing when they recycle a plastic container, but they don't realise that the contents of those containers might also be a problem."

From Sink to Sludge to Landfill

sentences that vary in length and structure (for example, sentences that begin in different ways and different kinds of complex sentences with a number of subordinate clauses)



wastewater back up the p
houses. Now it was time to roll up their sleeves, peg their noses, and get to work.

Louis began by collecting sludge samples from different treatment plants. These samples were then tested. "We kept finding the same chemicals that caused us concern, including octyl-methoxycinnamate, triclosan, and chloroxylenol," says Louis. These are not just a bunch of crazy names: they're all found in the products that we use every day, especially some sunscreens and anti-bacterial soaps.

Another problem with the chemicals in sludge is that they can leach from the

One of the ways
was by exposing sea urchin l
different chemical mixes. Th
do similar tests with zebrafis
"These creatures are consid
'mice' of the aquatic world,"
Louis. "They help us to und
toxic a chemical might be,
long-term impact."

The research continues
the team have high hopes
from our work are vital –
we've learnt a great deal.
know more about comm
products and the chemic
This knowledge will help

a significant amount of vocabulary that is unfamiliar to the students (including academic and content-specific words and phrases), which is generally explained in the text by words or illustrations

Reading standard: by the end of year 6

Possible curriculum contexts

SCIENCE (Nature of Science)

Level 3 – Understanding about science: Identify ways in which scientists work together and provide evidence to support their ideas.

ENGLISH (Reading)

Level 3 – Language features: Show a developing understanding of how language features are used for effect within and across texts.

ENGLISH (Writing)

Level 3 – Language features: Use language features appropriately, showing a developing understanding of their effects.

Possible reading purposes

- To find out why and how a group of scientists are working together
- To learn about a form of chemical pollution that we can help prevent
- To learn about alternatives to harmful chemicals in household items.

Possible writing purposes

- To carry out research and report on the chemicals found in some of the products used at home
- To write recipes for alternative cleaning products
- To write to families and school leaders suggesting changes that prevent harmful chemicals going down the drain
- To create a poster to help people choose products wisely.

The New Zealand Curriculum

Text and language challenges

VOCABULARY

- Possible unfamiliar words and phrases, including "sewage", "sludge", "polluted", "fertiliser", "landfills", "conditioner", "repellent", "moisturiser", "captured", "wastewater", "exposing", "embryos", "vital", "culprits", "environmentally friendly", "pantry", "eco-friendly", "overkill", "emphasises", "glycerine", "pharmacy", "washing soda", "citric acid", "stick blender"
- Specialist vocabulary, including "sewerage treatment plant", "toxicity", "toxic", "leach", as well as the names of chemicals that are listed in the article
- Scientists' titles, including "toxicologist" (and others as listed on page 27)
- Words that have two different meanings: "solutions", "greener"
- Idiomatic expressions: "a whole bunch of", "roll up their sleeves", "peg their noses", "high hopes", "won hands down"
- The metaphor: "the ambulance at the bottom of the cliff".

Possible supporting strategies

- As a part of exploring and building prior knowledge before reading, develop vocabulary lists or word webs associated with wastewater and sewage. You could use a simple diagram of a house to elicit the ideas and vocabulary for describing sewerage systems and what goes into them. Feed in and explain the meanings of key vocabulary. Have the students work in pairs or small groups so they have time to explore the topic orally. Provide bilingual dictionaries where appropriate. Add to the list during reading and discuss it after reading.
- Make a separate list of the scientific names and terms, many with Greek or Latin origins. Model breaking them into syllables, most of which are pronounced as they look. Encourage the students to look for chunks that are familiar from known words, for example, "oxy" as in "oxygen". The students may wish to explore the origins and families of these words as a later research project.
- For English language learners, it would be useful to introduce key vocabulary in context (as described above) a day or two before reading and provide opportunities for further exploration and practice before reading. (See ESOL Online, Vocabulary for examples of activities.)
- *The English Language Learning Progressions: Introduction*, pages 39–46, has useful information about learning vocabulary.

SPECIFIC KNOWLEDGE REQUIRED

- Familiarity with household water use, including some knowledge of where water goes
- Familiarity with the concepts of pollution, poisons, green options, and caring for the environment
- Understanding of the way scientists work, including knowledge of scientific methods
- Experience of working as part of a team.

Possible supporting strategies

- Review what the students have already learnt about the way scientists work, focusing on the scientific method and the importance of evidence.
- Encourage the students to discuss how other kinds of teams work, using the different strengths of team members to achieve a common goal.
- Remind the students to make connections with their knowledge and experiences as they read.

TEXT FEATURES AND STRUCTURE

- Report on the work of a group of scientists
- Headings, introduction, boxed information, glossary, recipes
- Graphic features, including photographs and a flow diagram
- Extensive use of direct quotes
- A wide range of sentence types with a variety of relationships between ideas, with many examples of modality (possibility, ability, and so on), along with different time frames and the associated verb forms ("The first job was …", "People think", "have found", "have been keen", "will always be").

Possible supporting strategies

- Review the features of a non-fiction article, reminding the students of how the features help them to understand the content.
- Preview the content orally before reading. (This is also a great way to reinforce and practise the key vocabulary.)
- Give pairs or small groups one or two of the images to discuss. Have them share their ideas with the whole group and start to generate predictions about the content. Prompt the students to use the key vocabulary.
- Create posters for each subheading. Have the students work in pairs to make notes under each heading. Give them a time limit. Have them pass the poster to another pair and add their ideas to the other posters. Repeat this for all of the subheadings. Display and discuss everybody's notes. Highlight and correct errors in vocabulary or language.
- The DVD *Making Language and Learning Work 3: Integrating Language and Learning in Years 5 to 8* provides examples of effective strategies for supporting English language learners in mainstream classrooms. You can watch the DVD online at ESOL Online, Making Language and Learning Work.

Sounds and words

Instructional focus – Reading

Science (Nature of Science, level 3 – Understanding about science: Identify ways in which scientists work together and provide evidence to support their ideas.)

English (Level 3 – Language features: Show a developing understanding of how language features are used for effect within and across texts.)

First reading

- Prepare the students before reading by using the previous suggestions to discuss the topic, the vocabulary, or the science curriculum concepts.
- Support the students to identify the "big questions" that the scientists wanted answers to. Chart these for later discussion.
- Draw their attention to the supportive text features and discuss how these can help us understand the text.
- Ask the students to use the text features to skim the text to get an overall sense of its purpose.
- Ask questions to help the students to think metacognitively: *How did your own knowledge help you work out what the scientists were doing? What inferences did you make? Which graphic features helped you understand the text?*

If the students struggle with this text

- Prompt the students to use the introductory paragraph to make connections with the topic and to formulate questions. Ask them to write down their questions so they can search for answers on a subsequent reading.
- Support the students who have difficulty with the vocabulary and language features. Structure the reading so they read one section at a time, then complete tasks that show whether they have understood it. Then, on subsequent readings, have them complete tasks that involve deeper understandings. Spend time unpacking the language features, but on a first reading, it is more important that the students understand the overall ideas.

Subsequent readings

The teacher

Direct the students to identify Louis's questions on page 27, then discuss how he would find answers.

- Why does he need a team to help him? What will each team member contribute?
- How will working together help Louis answer his questions?
- How might he share what he learns?
- How would the team work together?
- What would the work environment be like? What words and expressions helped you understand that?

The students:

- reread and discuss Louis's questions and how he will answer them
- make connections between the questions and the team members to infer why they are on the team and what each will contribute
- use what they know about idiomatic expressions to infer that the team is preparing to work in an unpleasant environment
- make connections between the text and their own experiences of working in a team to understand how the member's skills can work together. They infer that the work involved probably means that members might contribute to the project at different times.

The teacher

Support the students to follow the scientific method.

- Using what you already know about the scientific method, explain their testing method in your own words. What question was explored? What variables were used?
- What would this show the scientists? Why do you think they chose algae and sea urchins for their tests?
- Is this a good way to test the impact of chemicals on the environment? Why do you think that?

The students:

- identify the use of a plant and an animal for testing to compare effects of chemicals
- make connections with experiments they have done themselves to infer that the scientists used different mixes to find out which were most harmful
- think critically about the use of the algae and the embryos to evaluate the ethics of the testing
- draw conclusions about the impact of chemicals on small organisms and on larger plants and animals, including humans.

The teacher

Ask questions to ensure the students understand what is meant by "greener" choices.

- Why do you think the word "greener" implies "better"? What does it refer to? Where and when have you heard or seen it used?
- Why are some products "greener" than others? How can you tell?
- After reading this article, will you try to change the products you use at home or at school? Why or why not?

The students:

- think critically about the way products are advertised and used, evaluating their "green-ness" and the pros and cons of some products
- synthesise (with support) the information in the text and share their new understandings about the way they use everyday products at home and at school
- make connections between the text and what they know about terms such as "green", "eco-friendly", and "environmentally friendly". They infer that these things all refer to products or materials that are not harmful to people or the environment.

GIVE FEEDBACK

- The connections you made between river pollution from a factory and sludge from household sewage were very interesting. You've shown how deeply you feel about what humans are doing to nature.
- I noticed you used your finger to follow the flow chart while you read the text. That's a good way to make sure you connect words and images to understand a complex process.

METACOGNITION

- How is reading about science similar to or different from reading a fiction story? What strategies helped you with this article?
- What word-solving strategies did you use – or discover – as you read this text? Share an example with the group.
- In what ways can this text help you with carrying out and writing up your own science experiments?

Reading standard: by the end of year 6
The Literacy Learning Progressions
Assessment Resource Banks

Instructional focus – Writing

Science (Nature of Science, level 3 – Understanding about science: Identify ways in which scientists work together and provide evidence to support their ideas.)

English (Level 3 – Language features: Use language features appropriately, showing a developing understanding of their effects.)

Text excerpts from "Up the Pipe"	Examples of text characteristics	Teacher (possible deliberate acts of teaching)
The Project Team **Soil scientist** runs tests to see what effects the sludge chemicals have on soil. **Environmental chemist** runs tests to see what chemicals the sludge contains.	**SPECIALIST VOCABULARY** *Using the correct terms in a scientific report gives writing authenticity. It is often necessary explain the terms.*	Ask questions to support the students as they select vocabulary. ▪ What technical words and terms will you use? ▪ Will your readers know what they mean? If not, how will you support them? ▪ How will you make sure you've chosen the right words and that you understand what they mean?
Now it was time to roll up their sleeves, peg their noses, and get to work.	**IDIOMATIC LANGUAGE** *In most languages, there are phrases and expressions that usually convey an idea in an amusing or informal way.*	Prompt the students to reread the idioms on page 28. ▪ What was your response to these expressions? Had you heard them before? Why might writers use expressions like this? ▪ As you draft and revise your writing, look for places where you could use idiomatic language for effect. ▪ Ask a partner to check the effect before and after making changes.
At one of the workshops, at a Nelson school, students decided to test one of Louis's recipes on a pile of dirty dishes. One group used dishwashing liquid bought from a supermarket; the other used Louis's eco-friendly, home-made version. The students didn't know which liquid they were using, but the results were put to the vote, and the eco-friendly product won hands down.	**SCIENCE WRITING** *As writers record a science experiment, they answer some key questions:* ▪ *What was the purpose or question to be explored?* ▪ *What materials were used?* ▪ *What variables were tested?* ▪ *What procedure was used?* ▪ *What were the results?*	Model the conventions of science writing. ▪ In this paragraph, I identify the purpose or question of the experiment: Who can make a pile of dishes the cleanest? ▪ The materials are dirty dishes and dishwashing liquid (and a tub of hot water). ▪ The variables are two kinds of dishwashing liquid and the two groups, who didn't know which product they were using. ▪ The procedure is implied, and we all know what's involved with washing dishes! ▪ The results are clear. Prompt the students to use conventions such as these in their science writing.
		GIVE FEEDBACK ▪ I noticed that you checked the words you wanted to use and made some changes to spelling and your word choices. This shows me that you really understand the importance of accuracy when you're writing about science. ▪ Using this idiom made me smile, and that showed that I understood what you were saying. ▪ The detailed notes you made while you carried out your tests were essential for when you wrote up what you did. That's how good scientists work.

METACOGNITION

- Show me how you planned your writing. What techniques or strategies helped you?
- How has your own reading of science helped you write about science? What's the most important thing you learnt from your reading?

Writing standard: by the end of year 6

The Literacy Learning Progressions

MINISTRY OF EDUCATION
Te Tāhuhu o te Mātauranga

New Zealand Government

ISBN 978 0 478 44314 1 (online)