PAPER 2

Scaffolding academic literacy at the transition from primary to high school

Building critical resources for success

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Research focus: **How does writing develop in science for students of varying attainment across the Year 6 to Year 7 transition?**

Context and data

- 3 co-educational primary schools and 1 high school.
- Monolingual, socio-educationally diverse

- Year 6 and Year 7 science writing
- Semi-structured interviews (n=11 x 3 over 12 months)

Findings

What trajectories **of development are evident in student writing** in the enacted **science** curriculum at the transition from year 6 to year 7?

I. What **kinds of writing experiences** do students have in year 6 and year 7 science and what **understandings about writing** are they developing ?

II. What **kinds of meanings** are students communicating in their science writing in year 6 and 7?

III. What **indicators of development** are evident in the writing of students of varying attainment levels in year 6 and year 7 science?

What were Year 6 students writing?

Note taking, short answer response

Reporting
Descriptive and classifying reports
Animals • states of matter • space • geological phenomena

Recording investigations – variable experience
Procedural recounts consisting of:
Aim ^ Hypothesis ^ Equipment ^Method ^ Results ^Conclusion

Explaining — limited examples
Typically *explanations were embedded within other texts e.g. discussion of results, information reports*

Reflective journaling
Reflection as part of science journaling at Mirabelle only.

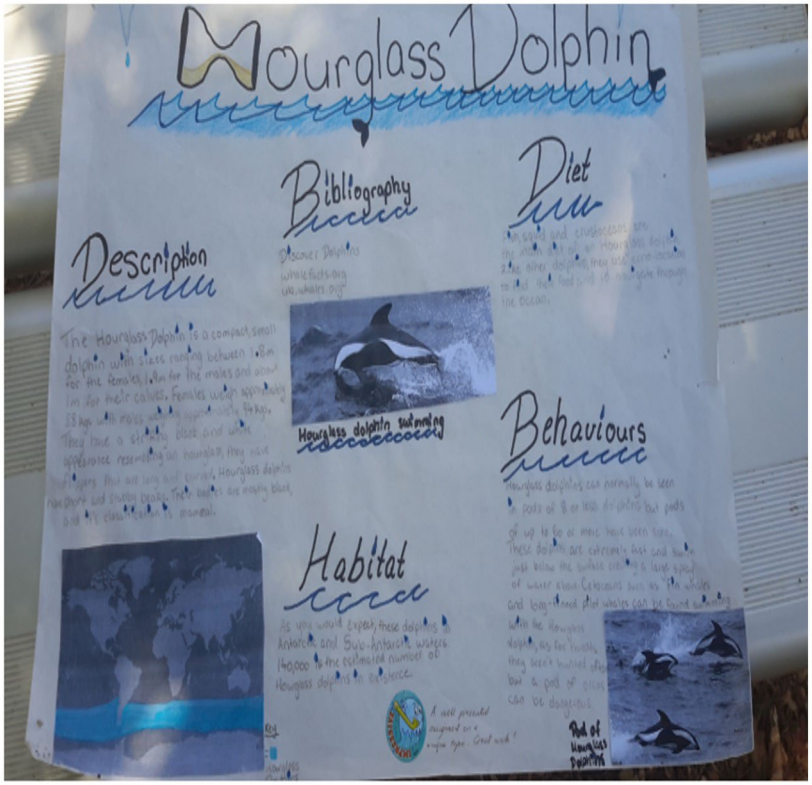

Figure 6-1 Information Report – Hourglass Dolphin

What were Year 7 students writing?

Note taking, fill in the gap cloze, short answer response.
Extended independent writing was relatively limited.

Recording investigations
Aim ^ Hypothesis ^ Materials ^ Method ^ Results ^Conclusion

Explaining
e.g. *Cause of the seasons*

Persuasive writing
Hortatory exposition
Why a scientist should feature on the $100

Classifying report
e.g. *Types of energy*

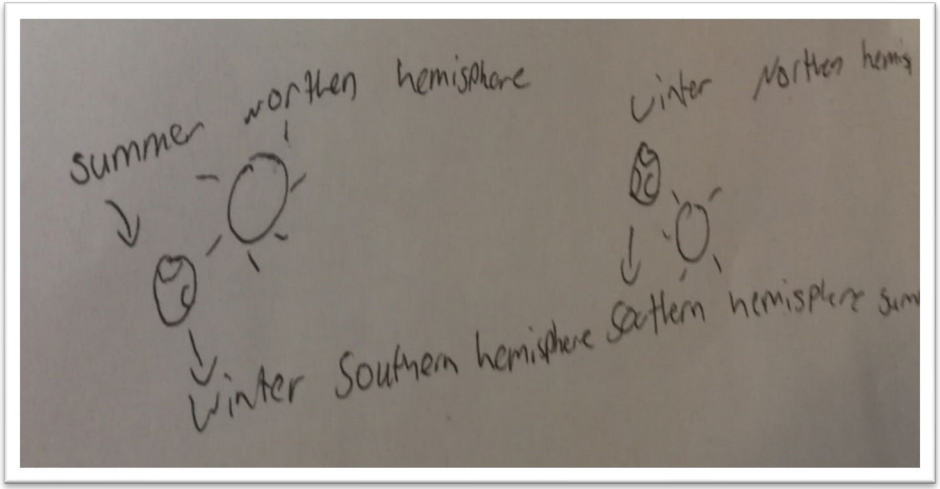

Diagram accompanying explanation of seasons

Year 7 teacher observed: They know a million facts, but they can't explain anything. We want to know how and why phenomenon occur.

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A linguistic view of writing development – what do we know?	
Texts and structures lengthen	text length increases (Nippold et al. 2005, Hunt 1969) sentence length increases (Loban, 1976) clause length increases (Berman & Verhoeven, 2002, Lewis, 2014, Hunt 1969)
Sentence level (clause complexing)	A shift from clause coordination to greater reliance on subordination (Perera, 1984, Harpin,1976, Allison et al. 2002) Coordination continues to be prevalent in some student texts into upper primary (Allison et al. 2002) Clause complexing and patterns of subordination vary by genre (Allison et al. 2002, Durrant et al. 2020)
Word and group	More Latinate/ Greek origin vocabulary in high rated writing (Myhill, 2009) Older writers use more abstract nouns than younger writers (Nippold et al. 2005). Increasing noun phrase complexity (Durrant & Brenchley 2022, 2023, Schleppegrell, 2006). Nominal group is an indicator of writing development (Durrant & Brenchley 2021, Lewis, 2015).
Condensation of meaning	Gradual increase in lexical density. (Christie & Derewianka,2008 Lewis, 2014)
Increasing diversity of structures & purposeful deployment	Increasing syntactic diversity - more deliberate and diverse deployment of grammatical structures Beginning to exert flexible control of clause combining. Differences more obvious by attainment than age. (Myhill, 2009)

A linguistic view of writing development – what do we know?	
Patterns of development	From spoken-like patterns to written-like patterns (Perrera 1985, Kroll 1981, Myhill, 2009) From declaration to elaboration (Myhill, 2009) From commonsense knowledge in congruent lexicogrammar to uncommonsense knowledge increasing condensed, technical and metaphorical lexicogrammar (Christie & Derewianka, 2008).
Widening range of genres Increasingly disciplinary accounts	Expanding range of genres - increasing complexity within genre families • from sequential explanations to causal and theoretical • from factual recount to historical account (Christie & Derewianka, 2008, Veel, 1997, Martin & Rose, 2008).
Science writing	• Increasing technicality and abstraction – a shift into 'uncommonsense knowledge' (Veel 1997) • Increasing lexical density • from temporal to more frequent consequential relations • from external to increasing internal connexion. (Veel, 1997, Christie & Derewianka, 2008) • Nominalisation emerging in primary school to construe technicality, textually oriented nominalisation (GM) in secondary school for managing explanation sequence (Unsworth, 2000)

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What kinds of meanings did students make in their science writing?

The Harbour Bridge*

What was the harbour bridge made of?

The harbour bridge is a steel [bridge]. But not mild steel, plain carbon steel.

The structure sits on 4 large concrete 'skewbacks'. 2 on either side of > the bridge.

The workers were worried about certain parts of > the bridge rusting. They [workers] used a product [[called porous]] which exposes the steel and barely any rust. They[workers] only put this product on places [[they [workers] thought would rust]].

The main strength of > the bridge is the 2 large beams underneath holding the whole structure.

Another very big part of > the bridge are the millions of little rivets holding the steel together like glue.

The twin arches of > the bridge are made up of chord beams that are loaded with compressions. This means they can bend to hold more weight.

Language choices build taxonomy through classification, (de) composition and measure

Classifiers precisely identify entities

- mild steel, plain carbon steel (bridge),

Quantifiers and measure dimensions to describe size and scale

- 4 large concrete skewbacks
- a total of 52800 tonnes of > steel.

Focus ^Thing structure identify part/whole relations:

- 2 [skewbacks] on either side of > the bridge
- another very big part of > the bridge
- the twin arches of > the bridge
- the main strength of > the bridge

Nominalisations realise technicality and abstraction
compressions, strength

Mix of simple, compound and complex sentences

A static view of phenomenon in Year 6 – taxonomising entities

Hourglass Dolphin – Sage (high attainer)

….

Description

The Hourglass Dolphin is a compact, small dolphin with < sizes ranging between 1.8m for the females, 1.9 m for the males and about 1m for their calves. Females weigh approximately 88kgs with males weighing approximately 94 kgs. They have a striking black and white < appearance resembling an hourglass, they have flippers that are long and curved. Hourglass dolphins have short and stubby beaks. Their bodies are mostly black and its classification is mammal.

Habitat

As you would expect, these dolphins live in Antarctic and Sub-Antarctic waters. 140, 000 is the estimated number of > Hourglass dolphins in existence.

Diet

Fish, squid and crustaceans are the main diet of > an Hourglass dolphin. Like other dolphins, they use echo-location to find their food and to navigate through the ocean.

Behaviours

Hourglass dolphins can normally be seen in pods of > 8 or less dolphins but pods of > up to 60 [dolphins] or more have been seen. …

Describers precisely identify perceived qualities
- A striking black and white appearance
- Flippers that are long and curved

Abstract nouns make visible the basis of taxonomy :

- a black and white appearance
- the main diet of > an hourglass dolphin
- 140000 is the estimated number of > hourglass dolphins…

Nominalisations name scientific activity and construe technical terms e.g. classification, echo-location

Afford an authoritative written like voice e.g. existence

Passive voice focuses on the identity being described

Mix of simple, compound and complex sentences.

Indicators of development in Year 6

The nominal group is a powerhouse for taxonomy in science.

- A striking black and white appearance resembling an hourglass
- The magnitude of > an earthquake
- [in] the mantle where there is an extra hot plume of molten rock which heats the Earth's crust and causes it to thin

Qualifiers are a major contributor to increasing nominal group length and lexical density

They function to:

- specify behaviour of Things e.g., *very runny lava that travels a long way*
- describing composition and spatial location e.g. *hard and rocky surfaces that are broken into large sections on the Earth's surface,*
- the two large beams [[underneath, holding the whole structure]].
- exemplifying a class of entity e.g. *cetaceans such as fin whales and long-filled pilot whales,*
a hard matter like a rock

Other indicators of development in Year 6

Other indicators of development in Year 6

Writing remained distinctly spoken like for some students and some writing tasks.

Some texts predominantly consisted of simple and compound sentences.

Clause complexing evident in phases of explanation and reasoning.

Gaps evident between students' exposure to scientific discourse and their uptake of those resources. Exposure does not equal uptake.

No transparent relationship between extent of experience of science in Year 6 and progress in Year 7.

Some writing tasks did not appear to position students to take up a disciplinary stance, nor require one.

Indicators of development evident in Year 6

Stages	**Seismometer experiment**
Discussion of results	The straight lines represent no movement. Our earthquake started out little then went to really strong the lines went crazy.
Method	We made a seismograph by a large piece of paper, pencil and a table We had someone shake the table while I was drawing a line.

Did Tracy understand the scientific purpose of the writing?

Why is there such a large gap between the writing recorded in Tracy's workbook and that produced independently?

Congruent grammar – speech written down.

Everyday lexis, intensifiers, colloquial language with inscribed attitude

Still developing control of sentence level syntax

Development was not uniform

Low average

Describing the tents

The tents were calico and had wooden poles. There was a mattress on the floor. There was a fire outside with a flagpole.

Time off

In their time off miners played cricket, music, cards, two-ups, also drank beer and into fight or a brawl.

Average

I learnt that the tectonic plates move in three different ways, which are converge, diverge and transform. Another thing [that I have learnt] is that when Newcastle had an earthquake in 1989, the earthquake could travel far enough [[we could feel it in The Oaks]]. The Richter Scale is one way [[to measure the magnitude of > an earthquake]]. (The amount of > energy released.)

High attaining

Volcanoes can be formed in three different ways, the first being the converging of the tectonic plates. When the tectonic plates converge they collide and one plate is pushed deeper into the mantle where it melts and rises to the surface> [of the earth] again to form volcanoes. This formation of volcanoes normally occurs around the boundaries of > tectonic plates.

Experiential grammatical metaphor evident in explanation texts

Title	Volcanoes
GENERAL STATEMENT	
Classification evaluation DESCRIPTION	The fiery, roaring, majestic, lava spewing mountains [[that reach up and touch the sky]] are called volcanoes. Named after the Roman God of Fire, Vulcan, these massive mountains are an important but deadly part of > our planet. There are three major types of > volcanoes, the first type> of volcanoes are Cinder-Cones. These volcanoes are quite common and have small sloped < sides; they [cinder cones] are made up of ash and debris from other eruptions. The next type of > volcano is a shield volcano; these volcanoes are small in < height but are very long and wide. They don't have a forceful eruption; instead, they produce very runny lava that travels a long way...
Explanation	Volcanoes can be formed in three different ways, the first being the converging of the tectonic plates.
- *convergence*	When the tectonic plates converge they collide and one plate is pushed deeper into the mantle where it melts and rises to the surface> [of the earth?] again to form volcanoes. This formation of volcanoes normally occurs around the boundaries of > tectonic plates.
- *divergence*	The other way volcanoes are formed is the diverging of the tectonic plates. When the plates diverge, they allow magma to rise up and cool down creating layers of > molten rock that eventually releases pressure [[that causes an eruption]].

Blue = nominalisation/ activity entities/ technical terms

Yellow = logical grammatical metaphor

Red = experiential grammatical metaphor

What changed in Year 7 science?

Text Stages and *phases*	
Phenomenon Identification *explanation preview* *compositional taxonomy*	The seasons on Earth are created by [[the way the Earth moves around the Sun]]. The Earth is created with two halves the northern hemisphere and the southern hemisphere. **So while** the Earth is rotating around the Sun, it tilts towards and away from the Sun.
Explanation Sequence *activity sequence* *causes and effects x* *+ cyclical nature of phenomenon*	**When** the northern hemisphere is tilting towards the Sun, that means that it is summer in the northern hemisphere. **And because** the northern hemisphere is tilting towards the Sun, that **means** that the southern hemisphere is tilting away that would **mean** that it is winter in the southern hemisphere. **And** the tilting changes every 6 months.

Expectation for and valuing of causal reasoning.

Logical grammatical metaphor emerging in causal explanations.

Pressure for complex sentences linked in temporal and consequential relations.

Intricate embeddings to manage causal reasoning point to nominalisation as a next step in writing instruction.

Not all students managed the task of causal reasoning in the first draft

Stages		*phases*
Phenomenon Identification	I believe that we have seasons because of [[how the Earth is on a tilt of 23.5 degrees]] **and** the way it orbits **and** every part of the Earth is a different angle **and** distance from the Sun	*explanation summary* *factor 1* *factor 2* *factor 3*
Explanation Sequence	**and as** it slowly rotates	*activity x*
Closure	**and** that's how the seasons change and continue to pass before our eyes	*conclusion*
	as temperature rises and drops the seasons change.	

Some students were not able to connect activity in complex sentences realising temporal and consequential connections.

Compound sentences that add/ list information in a spoken like manner persisted in some student texts.

What are the implications for writing development in science across the transition?

A need for more sustained opportunities for extended writing in science across Year 6 and Year 7.

A need for continuity of experience:

Nedda: *Science in primary school was 'nothing at all' like what we do in high school.*

Focus on the extent to which task instructions, topic and genre support, model and guide students to make valued disciplinary writing choices.

Nominal group development and control of clause complexing important across the primary to high school transition.

A need for curriculum to more precisely specify language structures and features by genre and discipline to support disciplinary literacy instruction.

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