Table of Contents

Acknowledgments v
Introduction 1
Pre-test 15
Pre-test Rubric 17

Lesson 1 Everything Interacts: Concept Introduction and *The Great Kapok Tree* 19
Lesson 2 Interactions Among Living and Non-living Things: Ecosystems and Food Chains 37
Lesson 3 Interactions and Literature: A Novel Study 55
Lesson 4 Interactions and Perspective: Art Analysis 67
Lesson 5 Interactions and Balance: Simulating Ecosystems 77
Lesson 6 Interactions Through Words and Images: Poetry Analysis 91
Lesson 7 Interactions and Invasive Species: Overpopulation of Feral pigs 101
Lesson 8 Interactions Through Positive Relationships: Picture Book Study 117
Lesson 9 Interactions and Change: The True Story of Ivan 131
Lesson 10 Interactions and Teamwork 141
Lesson 11 Interactions Within Us: Biography Study 159
Lesson 12 Culminating Project 175

Post-test 180
Post-test Rubric 182
References 183
Appendix A: Instructions for Using the Models 185
Appendix B: Blank Models and Guides 221
Appendix C: Rubrics 235
About the Authors 239
Australian Curriculum: English Alignment 241
Australian Curriculum: Science Alignment 247

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Introduction

Interactions in Ecology and Literature integrates the study of food webs and ecosystems with fictional and informational texts. Aligned to the Australian Curriculum, this unit will have students examine relationships among living things and the environment as well as interactions between literary elements in texts and visuals through engaging activities and differentiated tasks.

CONCEPTUAL FRAMEWORK

Interactions in Ecology and Literature is designed specifically for students to support the acquisition of textual analysis skills, including identifying the relationship between literary elements within a text, enhancing thinking and communication skills and connecting conceptual generalisations from cross-curricular themes through a variety of media, including literary texts, nonfiction texts, video, art and guided explorations about ecology and interactions. The Integrated Curriculum Model (ICM; VanTassel-Baska, 1986) is the conceptual framework used for the unit design. Components of the framework are embedded in each lesson: accelerated content, advanced processes of the discipline (e.g. literary analysis, scientific inquiry), and conceptual understandings. The curriculum content and resources selected for each unit are at or above the year level(s) for which the unit was intended. Additionally, higher level resources are used in a variety of lessons. Each lesson also includes process skills and specific models or activities to help students analyse a variety of texts, art and scientific phenomena. The content of each lesson is connected by the overarching theme of interactions and key generalisations that span a variety of disciplines.

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INTENDED YEAR LEVELS

This unit is aligned to curriculum content appropriate for students in Years 4–5, but was originally piloted with gifted and advanced learners in Years 2–3. The accelerated content is necessary so that gifted students have the opportunity to gain new English knowledge at a pace and level that is appropriate for their learning needs. Gifted students' readiness and experience levels vary, as do their abilities. Some gifted students in Years 2–3 may find this unit engaging, while others may need to wait until Year 4 or 5 to fully participate and understand the unit concepts.

Experienced teachers of general classrooms may use this unit with their high-achieving students as part of a deliberate differentiated approach that includes in-class flexible groupings based on student needs.

LESSON FORMAT AND GUIDELINES

Each lesson in this unit follows a similar format for ease of use. Teachers select from a variety of questions, activities and differentiated products to best meet their students' needs. There are also opportunities for talent development and discussion of social-emotional components within the curriculum. Table 1 summarises each lesson. Other key features of the unit and lessons are outlined in the following sections.

ALIGNMENT TO CURRICULUM

The unit incorporates key content found in the Australian Curriculum for English and Science. Students read both literary and informational texts from a variety of sources and perspectives. Through the examination of multiple texts, they learn subject content from their readings and are required to provide text-based evidence to support their answers or ideas. The English-focused lessons also support opportunities for students to make or analyse an argument, defend a position or interpret a text. Of course, part of close reading and understanding of a text includes the use of subject-specific vocabulary. The readings selected throughout the unit build upon specific concepts and highlight multiple perspectives. Many readings use vocabulary of the specific discipline or advanced concepts, which students must understand and attempt to define.

The beginning of each lesson includes a list of the overarching goals and objectives as well as curriculum content descriptions specific to each lesson. The end of the unit includes an alignment chart for both English and Science. This unit was not

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Table 1
Lesson Summaries

	Lesson	Key Question	Summary
1	*Everything Interacts: Concept Introduction and* The Great Kapok Tree	How do the interactions of different textual elements help readers understand the purpose of a text?	Students are introduced to the concept of interactions and explore issues relating to deforestation using *The Great Kapok Tree* and a nonfiction pro/con text.
2	*Interactions Among Living and Non-living Things: Ecosystems and Food Chains*	How do interactions between living and non-living things impact the environment?	Students examine how living things interact through food chains and food webs. Following an exploration of the interactions between abiotic and biotic factors, environmental interactions for filling in a pond will be explored using the Science Analysis Wheel.
3	*Interactions and Literature: A Novel Study*	How does an author's use of character interactions develop the theme of the story?	While reading *The One and Only Ivan*, students examine literary components such as theme, symbolism and characterisation through a variety of activities that help them understand how an author uses character interactions to promote theme.
4	*Interactions and Perspective: Art Analysis*	How do different elements in a picture interact to create meaning?	Using *A Sunday Afternoon on the Island of La Grande Jatte* (1884) by Georges Seurat, students complete a visual analysis and examine the interactions between technique (pointillism), colour, balance, etc. within art.
5	*Interactions and Balance: Simulating Ecosystems*	How do interactions among living things help support balance in ecosystems?	Students learn about the need for balance between living organism populations within an ecosystem. Using an online simulation, students begin to understand the need for larger populations of producers and smaller populations of consumers and that balance exists.
6	*Interactions Through Words and Images: Poetry Analysis*	What impact does the author's intentional interaction of words and images have on the meaning of a piece of literature or art?	Students analyse poems grounded in ecology and the concept of interactions. Students have opportunities to develop their own poems or artwork that include details about an animal's interactions within their environment.
7	*Interactions and Invasive Species: Overpopulation of Feral pigs*	What impact does an imbalance or an over-/under-population of one species have on an ecosystem?	Students learn about the impact that imbalance due to shifts in one organism population can have on an ecosystem. Exploring feral pig population growth, students complete a table and graphing exercise and examine ecological consequences and potential solutions.

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Table 1, Continued.

	Lesson	Key Question	Summary
8	*Interactions Through Positive Relationships: Picture Book Study*	How can interactions help build positive relationships?	Using two picture books (*Say Yes,* by Jennifer Castles and *Each Kindness,* by Jaqueline Woodson), students learn about how interactions with others, through words and actions, can be used in positive or negative ways. Students explore the relationship between interactions among characters and plot.
9	*Interactions and Change: The True Story of Ivan*	Should animals be kept outside of their natural habitats?	After reading *Ivan: The Remarkable True Story of the Shopping Mall Gorilla*, students explore the issue of whether or not animals should be kept in zoos. Students compare the fictionalised version with the real-life account and create skits that emphasise their stance on the removal of animals from their natural habitats.
10	*Interactions and Teamwork*	How do group interactions help others survive?	Students explore ways in which animals work together to survive by examining specific species and how they interact in order to gather food, protect themselves, communicate, migrate or adjust to changes in their environment. Students apply newly learnt information about interactions between and among species to the characters they have read about throughout the unit.
11	*Interactions Within Us: Biography Study*	How do a person's interactions with their life experiences impact their future?	Using songs from animated films and biographies of J. K. Rowling, Michael Jordan and Walt Disney, students explore how individuals interact with their own life experiences, especially failure, and ways in which those interactions impact their future.
12	*Culminating Project*	What role do interactions play in ecosystems and literature?	Students are provided various options to demonstrate their understanding of content and concept connections throughout the unit through a project of their choice.

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designed to meet every curriculum requirement, but focuses in depth on advanced skills and accelerated content. Supplemental information may be necessary to complement a full English or science course and ensure that all required content for a specific year level is taught.

Materials

When providing differentiated activities, it is important for the materials and readings to be at a level commensurate with the student's ability. The readings and resources in this unit have been carefully selected and include either sophisticated concepts or reading selections at or above the year level. The materials section includes a list of resources needed for the lesson. Some of the listed materials are optional, and many of the selected texts, visuals or videos are readily available online as a free download. When possible, reliable sites and specific links, available at the time of this unit's printing, are provided. *A word of caution*: It is important to note that some of the readings or some concepts may be controversial or contain sensitive content. It is up to the teacher and school administration to understand the context of their school and to determine whether or not a reading or scientific discussion is appropriate or whether a different text or discussion-based question should be used.

Introductory Activities

The introductory activities provide a real-world connection or "hook" that sets the tone for the remainder of the lesson and enhances student engagement. Sample options include quick debates about an issue or dilemma, illustrations to convey a key concept or idea or key discussion questions that help students better understand the relevance of a lesson's text, art or science concepts. Often these introductory debate topics or discussion questions are revisited at the close of the lesson, allowing students to revisit and review their initial answer or stances given newly absorbed content.

In-Class Activities to Deepen Learning

The activities included here provide hands-on or thought-provoking ideas that support or solidify student learning. Tasks incorporate hands-on activities, real-world connections and opportunities to construct scientific explanations through the development and use of models. They may include issue-based questions linked to a big idea, quick debates, scientific investigations or technology extensions. These activities also include opportunities for self-reflection on how the lesson content

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impacted their learning. The activities in this section are intended to be taught as part of the main lesson.

Choice-Based Differentiated Products

Several choice-based differentiated products are also part of each lesson. Students may select one of the choice products to showcase their strengths and individual understanding of a particular content area or, if pressed for time, teachers may require two or three choice-based products for students to complete during the course of the unit. The options listed allow students an opportunity to pursue their interests and to gain a deeper understanding of a learning objective as they present their understanding in a creative way. Differentiated products vary by lesson and may include investigating a real-world problem, designing visuals to represent abstract ideas or conceptual understanding, applying an advanced model to other related sources, writing essays and developing products or presentations for an audience. Rubrics are provided in Appendix C to guide product creation and teacher feedback. The rubrics may also be used for peer and self-evaluations.

Opportunities for Talent Development

Students need opportunities to build upon their interests, strengths and curiosity in ways that expose them to new ideas and allow for them to extend their learning. This section provides students with ideas and opportunities to extend their learning in a variety of ways connected to the lesson, including career exposure.

Social-Emotional Connections

Social-emotional connections are an important part of processing and understanding oneself in addition to relating to events in a story or scientific phenomenon. The social-emotional connections are meant to encourage students to identify with story characters, biographies and lives of scientists; reflect upon their personal stories; and consider life paths and careers and what a scientist or author does.

Personal Response Tasks

The Personal Response Tasks incorporate multiple curriculum content descriptions and require complex thinking. Students are asked to respond to a prompt by creating an essay in which they create or analyse arguments, critique texts, explain an issue from multiple perspectives or explain the development of key concepts presented in an informational or fictional text. It is at the teacher's discretion to determine how many practice tasks students should write throughout the course

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of the unit. Although not explicitly stated in the unit, teachers are encouraged to model the writing and literary analysis process, help students analyse exemplars and inappropriate responses, while also providing individual feedback.

Concept Connections

The concept connections section focuses on the third component of the ICM. The purpose of this section is to help students see the relationships between different texts and perspectives as these relate to key generalisations about interactions. A graphic organiser comprised of the conceptual generalisations and key unit readings is provided in the unit to help students organise their ideas and determine connections among the various readings and scientific investigations. It is important to refer to the concept generalisations in each lesson, even if the concept chart is not completed for every lesson. It is also recommended that teachers create a working wall that students can continue to build upon throughout the unit. Teachers may post the specific concept generalisations on a wall or bulletin board and ask students to add relevant content understanding and connections between concepts and content to the wall after each lesson. This can be used as an informal assessment and way to help students continue to reflect upon and process their learning.

Assessment

The assessment section focuses on assessing a student's understanding of a single-faceted objective, such as analysing a previously conducted inquiry-based science activity, making inferences or determining how an author used a literary element to convey an idea or theme. The assessments may be used to determine the extent to which students understand the meaning of a text or scientific content and can provide supporting evidence and target instruction based on individual needs. Teachers may require students to complete an assessment, a variety of different formative assessment tasks throughout the lesson (e.g. responses to questions, concept connections) or differentiated product tasks so that students' thinking and understanding can be measured in a variety of ways. Additionally, exit tickets are included in this section to check for understanding of various lesson concepts and content. They may be used to guide whether or not teachers need to reteach portions of a lesson or concept.

Handouts

Following each lesson, all necessary handouts for lesson completion are included (e.g. readings, visuals, organisers, blank analysis models, inquiry-based science guides and other sources not readily available online). As previously stated in the materials section, sometimes teachers are led to specific web-based links or it is recommended that popular sources be found online. This is especially import-

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Lesson 1

Everything Interacts: Concept Introduction and *The Great Kapok Tree*

Key Question

How do the interactions of different textual elements help readers understand the purpose of a text?

Objectives

Content: To analyse and interpret fiction, nonfiction and art, students will be able to:

- analyse how literary elements interact to promote meaning within a story or poem; and
- evaluate how an author uses language, structure and point of view to reveal purpose and/or advance a claim.

To understand ecosystems, students will be able to:

- synthesise information to explain how interactions in an environment among living things bring about change; and
- analyse the relationship between living organisms in an environment.

Process: To develop interpretation, analysis and communication skills, students will be able to:

- respond to an analysis of literature, nonfiction or art by developing arguments or elaborating on explanations through writing a variety of texts (e.g. essays and paragraphs, including relevant and sufficient evidence to support claims).

Concept: To develop conceptual thinking about interactions English and science, students will be able to:

- use inductive reasoning to develop generalisations about interactions; and
- examine the relationship between interactions generalisations in multiple contexts.

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Australian Curriculum: English Content Descriptions

ACELA1496	ACELT1605	ACELY1698
ACELT1603	ACELY1692	ACELY1699
ACELT1604	ACELT1609	ACELY1701

Australian Curriculum: Science Content Descriptions

ACSSU073 ACSSU043

Materials

- *The Great Kapok Tree: A Tale of the Amazon Rain Forest* by Lynne Cherry (to read aloud; one copy for each small group – optional)
- Chart paper and textas (for small groups of students)
- Sticky notes (one medium-sized pack per student; or a stack of blank sticky note-sized scrap paper or small note cards)
- Handout 1.1: Literary Analysis Cubes (optional; folded into cubes)
- Handout 1.2: Blank Literary Analysis Wheel – Primary (if not using cubes)
- Handout 1.3: Deforestation Pros and Cons
- Handout 1.4: Blank Text Analysis Wheel – Primary
- Handout 1.5: Concept Organiser
- Rubric 1: Product Rubric (Appendix C)

Introductory Activities

1. Explain to students that they will be learning about interactions among animals, people, books, art, words and the environment. Ask: *What is an interaction?* Solicit a variety of responses. Explain that "inter-" means *between*. So "inter-" actions are actions between different living and non-living things.
2. Give each student a set of sticky notes or scrap paper. Ask students to walk around the room and look outside, noticing different people, animals, insects, plants and objects that interact. Have them record each interaction on a separate note.
3. Divide students into pairs or small groups. Ask them to combine their interaction examples with their partner(s) and organise them into different categories.
4. Afterward, discuss:
   - What is similar about all of the interactions we shared?
   - What are the differences?

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