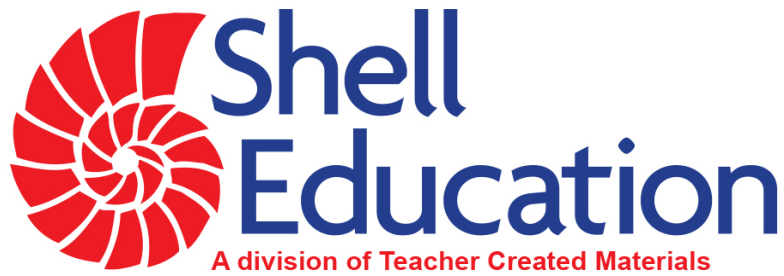


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SECOND EDITION

INTEGRATING THE ARTS IN SCIENCE

30 Strategies to Create
Dynamic Lessons

Vivian Poey • Nicole Weber
Gene Diaz • Sam Smiley

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Preface

Welcome to the second edition of the Integrating the Arts series! Now more than ever educators are experiencing what the arts have always accomplished: instructional approaches for social emotional learning and culturally responsive teaching that value students' funds of knowledge and lived experiences.

This series was launched initially to take the success of arts integration in transforming classrooms and to share it more widely, foregrounding effective and easy-to-implement ideas. Since then, educators reached out to us to share their success stories using strategies from the first edition. Here in our second edition we offer even more learning experiences for your classroom.

We're so grateful for the feedback we received from educators about the first edition of this series. We loved hearing how you could flip through the books with your colleagues at planning time and choose a lesson to implement that afternoon or the next day. The practical aspect of the books was a highlight of the feedback. We learned that the lessons were versatile and worked with a wide variety of topics and learning targets. You'll find this continues to be a focus in our latest work.

.....

"The arts help children develop creative problem-solving skills, motor skills, language skills, social skills, decision-making skills, risk-taking skills, and inventiveness."

—Sharuna Segaren
(2019, para. 20)

.....

Here's what you'll find new and different in the second edition:

- inclusion of diverse perspectives and culturally responsive strategies that invite students to tap into their individual ideas and lived experiences
- a variety of student examples
- carefully selected ideas for mentor texts of multiple genres and modalities
- suggestions for the inclusion of primary sources
- several new strategies to bring to your classroom
- call-out boxes to highlight key insights and ideas
- resources for finding texts that bring diverse voices to your classroom
- a new structure in the movement chapter that provides additional details for classroom implementation
- a focus on the elements and key vocabulary of each art form
- updated standards

Dig in and enjoy! Let the power and novelty of the arts bolster deep engagement with your content areas. We hope you create, experiment, and explore the artistic strategies alongside students, curating your own portfolio of creative work.

Storytelling

Understanding Storytelling

Storytelling has been part of every culture since the beginning of time (Norfolk, Stenson, and Williams 2006). Stories have been used to educate, inspire, and entertain. There is the story itself, and then there is the telling of the tale by a skilled teller. Storytellers use language, gesture, eye contact, tone, and inflection as they share a story with an audience. A good storyteller can create a sense of instant community among listeners as well as a deep connection with the material being explored (Hamilton and Weiss 2005). Because the storyteller interacts with the audience as the story is told, listeners often feel they become part of the story world. They can even feel as if they are cocreators of the story when it is interactive, when connections with characters are developed, and when empathy is established. Scharner (2019) notes, “We are wired for stories. It’s how our brain prefers to receive information” (para. 2). If you’ve ever heard a good storyteller tell a compelling story, you know it can transport you to another time and place.

In the strategies that follow, students benefit both from listening to stories and from becoming storytellers themselves. As listeners, students are supported in their visualization of the stories, which makes a narrative easier to both imagine and remember (Donovan and Pascale 2022). As storytellers, students develop additional skills, including skilled use of voice, improved verbal and nonverbal communication skills, and sense of pacing. Once stories are developed, you also can ask students to write them down, further enhancing their literacy skills.

When students become storytellers, they fine-tune their communication skills. Oral fluency is developed as students explore vocal tone and inflection, pacing, sound effects, and the addition of rich sensory details to the telling. Listeners feel invited on a journey. Also, participating in the creation and telling of stories brings forward students’ voices and their ideas.

Scientific ideas are easily embedded in or teased out of stories. Students find that stories provide

vivid contexts that show the relevance and use of scientific thinking. Well-placed scientific problems can easily be connected to characters’ dilemmas, requiring solutions in order for the story to advance. Such dilemmas can provide additional points of interaction for students and heighten the dramatic tension of the story.

“The benefits [of storytelling] are enormous. These can include increased enthusiasm for reading, focused engagement and improved listening skills, as well as the development of creative thinking and imagination” (Panckridge 2020, 44). As students create, tell, and retell stories, they also gain fluency in their communication skills, use of descriptive language, and persuasive abilities. They also expand their willingness to revisit, revise, and polish their work. By placing science concepts in story settings, we provide a context that gives further meaning to scientific ideas and adds interest to the stories.

Elements of Storytelling

There are five key elements to storytelling (National Storytelling Network, n.d.). To learn more about these elements, visit [storynet.org/what-is-storytelling/](https://www.storynet.org/what-is-storytelling/).

- **Interaction:** The storyteller actively engages the audience and adapts based on the energy and response of the audience. As a result, every time the story is told it changes.
- **Words:** The storyteller uses words (spoken, signed, or manual) to create connections and invite listeners into the story world through sensory details.
- **Actions:** The story is activated through vocalization, physical movement, and small and large gestures.

Storytelling (cont.)

- **Story:** The storyteller shares a narrative that has characters and action.
- **Imagination:** Storytellers encourage the active imagination of the listeners.

Strategies for Storytelling

Prompt

Students are invited to become storytellers themselves as they brainstorm, develop, and perform stories from a given prompt. Using a prompt to support storytelling works to develop many skills—understanding of beginning, middle, and end; character development; and the significance of circumstance, setting, and mood in creating compelling stories that are performed and engage the listener. In this strategy, an interview is used as a prompt. Students conduct an interview as a starting point and then weave a story, using what they learned. Students are charged with finding a way for the story to unfold and are in control of its progression.

Personification

Some people describe assigning human qualities to inanimate objects or ideas as *personification* and assigning human qualities to animals as *anthropomorphism*. Other folks use these terms interchangeably. We will use *personification* to refer to all such assignments of human characteristics, as it is most familiar to teachers and students. However, you should feel free to use what best fits your curriculum. Personification is an ancient storytelling tool that continues today; think of both Aesop and the *Toy Story* movies (Cahill 2006). Stories that give animals and objects human traits allow listeners to think about their shortcomings in a safe way and invite us to think about moral or ethical values. When students personify elements of the natural world such as the sun in a nonfiction narrative, they explore nonfiction concepts from multiple perspectives. These tales

engage learners and allow us to consider different perspectives. Because animals and objects take on human characteristics, the strategy also lends itself to figurative language.

“I cannot emphasize enough the importance of a pause. Placed at strategic moments of the oral storytelling, a pause can enrapture the audience and make them eager to find out what happens next.”

—Srividhya Venkat (2020)

Points of Entry

Entering at different points of the story can provide different structures for building a narrative. For example, we can create a prequel that starts before stories, we can add a new segment to the middle of a story, and we sometimes work backward to figure out where we need to begin. These different points of entry provide a frame that can support students’ abilities to create a story as well as to gain a deeper understanding of cause-and-effect relationships. In creating such stories, students analyze, evaluate, and create, the three highest-order thinking skills in Bloom’s revised taxonomy (Anderson et al. 2000).

Retelling

Storytelling is an oral tradition that is grounded in telling and retelling stories. With each retelling, a story grows more polished and more dramatic, with clear high points and striking moments. Students become more responsive to working with listeners and more adept at using the storytelling process to spark the imagination of the audience. This revisiting of stories also strengthens students’ writing skills, as stories get honed and more richly detailed with each retelling.

Students can use the plot of a story as a flexible frame, improvising as the story unfolds. This builds comprehension skills and gives students

Storytelling *(cont.)*

the opportunity to feel free to adapt the stories based on the response of listeners, dwelling longer on a particular moment or adding embellishment when needed. This responsiveness heightens awareness of the role of an audience, which translates into writing.

Collaborative Storytelling

Collaborative storytelling often takes place in kids' play (Hourcade et al. 2004) and has long been part of the cultural traditions of many families and communities (Coulter, Michael, and Poynor 2007). Students work together to build a story by adding short segments in their oral telling. Stories can be sparked by graphics, character traits, or settings. The story can be "passed" back and forth, with each teller adding details and information before passing it on to the next teller. A natural part of the process is a series of twists and turns that challenge students to maintain a shared story strand, keeping a clear logic so that the story remains together as it unfolds. This challenges them to listen attentively to the details and choices so that they can build on the unfolding events in meaningful and compelling ways by pivoting off given details, such as character traits, circumstances, and action. Students introduce obstacles and innovative solutions that take the characters on surprising journeys. Yew notes that constructing knowledge through the collective creation of narratives can provide more effective ways of learning in group settings than learning concepts individually (2005).



Personification

Model Lesson: Keystone Species

Overview

In this strategy, students investigate the interconnected relationship of various animals to a keystone species as they tell a story from an animal's point of view (anthropomorphism). Students also could take the perspective of something else in the environment and explore the interconnected relationship from that perspective. Personification and anthropomorphism challenge students to consider new perspectives and explore difficult ethical and moral dilemmas.

Materials

- ▶ a book that outlines the life of a particular species and its place in an ecosystem
- ▶ *Sample Concept Map* (page 38)
- ▶ *Fact Finding and Observations* (page 39)
- ▶ *Story Planner* (page 40)
- ▶ *Elements of Storytelling* (page 25)

Standards

Grades K–2

- ▶ Describes particular environments where some plants and animals can survive well, some survive less well, and some cannot survive at all
- ▶ Uses voice and movement in a guided drama experience

Grades 3–5

- ▶ Makes a claim that when the environment changes, the types of plants and animals that live there may change
- ▶ Investigates how movement and voice are incorporated in a drama work

Grades 6–8

- ▶ Analyzes and interprets data to provide evidence for the effects of resource availability on the number of organisms in an ecosystem
- ▶ Uses various character objectives in a drama work

Grades 9–12

- ▶ Designs, evaluates, and refines a solution for reducing the impacts of human activities on the environment and biodiversity
- ▶ Uses personal experiences and knowledge to develop a character who is believable and authentic

Personification (cont.)

Preparation

Select a book that outlines the life of a particular species and its place in an ecosystem, such as *At Home with the Gopher Tortoise: The Story of a Keystone Species* by Madeleine Dunphy, or select other similar stories about symbiotic relationships within an ecosystem. Practice reading the book aloud, and as you read, think about how to personify each animal. Experiment with the animals' voices and gestures to make the story come alive. As you read the story, note the different relationships between animals and take note of the interdependence of species and how the balance of an ecosystem can be disrupted by the removal of a single species. Make a list of all the organisms in the ecosystem and decide how the animal names will be distributed to students. Additional suggestions are provided in the Specific Grade-Level Ideas.

Procedure

1. Begin a conversation with students about interdependent relationships by asking questions such as "What do humans need to survive? What do animals need? What would an animal's habitat include? How are animals dependent on other animals or plants?" If students overlook the basic survival needs, be sure to mention water, space, food sources, and shelter.
2. Assign animals from your selected story to students to personify. You may need to assign the same animal to more than one student. Distribute the *Fact Finding and Observations* activity sheet for students to complete as you read the story aloud.
3. Read aloud your selected story about different types of independent relationships. Engage students as data collectors by asking them to listen for their assigned animals in the story and record characteristics of the animals (behavior, physical features, and so on) and how their animal relates to other organisms on the *Fact Finding and Observations* activity sheet. Stop reading occasionally to ask students to point out some of the relationships, such as which animals provide shelter or food for other animals. Ask students what makes a good story. Then, list story elements such as *character, setting, conflict, dialogue, and action* for students to reference throughout the lesson.
4. Ask students to discuss how the various species share interdependent relationships. Record students' observations in a concept map. Reference the *Sample Concept Map* as a guide to create one using the students' ideas. Display the class-created map for students to reference throughout the lesson.
5. After each student has shared how their species is connected to the web of relationships, present students with a scenario in which the keystone species is removed from the web. Discuss what would happen and which relationships would be affected both directly and indirectly.
6. Share the *Elements of Storytelling* and review with the students. Group students together who have the same assigned animal and distribute one *Story Planner* activity sheet per group. Direct students to use the chart to help them plan a story about how the disappearance of the keystone species changes their relationships. Ask students to consider the point of view of their animals, and remind them to refer to the concept map. Ask students to create sounds and gestures to personify their animals, such as a rabbit hopping about, a warbler flapping its wings, or a snake slithering along the ground. Circulate as students work, and use the Planning Questions to guide them in developing their stories and characters.

Personification *(cont.)*

7. Have each group of students tell their story to the class to make clear how a wide range of animals can be affected by a single species and how their lives and needs are intertwined. Use the Discussion Questions to debrief. Emphasize how the concept map you recorded as a class helped them remember the information.

Planning Questions

- ▶ What character traits will your animal have?
- ▶ Describe the issue that the animal is faced with as a result of the missing animal and how it will deal with it.
- ▶ What choices does the animal have in dealing with the issue?
- ▶ What props and gestures can you use to develop your character?
- ▶ Where will your story unfold?
- ▶ What will you see, smell, hear, and touch in this setting?
- ▶ What issue does your animal encounter? What choices does the animal have in dealing with this challenge?
- ▶ How will you create empathy with your character?

Discussion Questions

- ▶ How did you create a vivid character?
- ▶ How did the concept map we recorded as a class help you remember the information in the story?
- ▶ What are examples of other interdependent relationships?
- ▶ How did you use the interdependent relationships to help you develop your story?
- ▶ How did personifying an animal as it coped with the removal of a keystone species help you think about human relationships to animals and their environment?
- ▶ What story elements did you use to bring your story to life (narrative, actions, movement, and words)?

"To achieve integration of ideas requires making the less visible (molecules, electrons, cell components) and abstract ideas (energy, photosynthesis, entropy) comprehensible to students without obstructions embodied in the symbolic and sometimes obtuse language of science used to communicate these ideas. . . . This is why science teachers often use metaphors and analogies to help students access ideas, explanations and theory."

—Peter J. Aubusson, Allan G. Harrison, and Stephen Ritchie (2006, as cited in Braund and Reiss, 2019, para. 42)

Personification *(cont.)*

Specific Grade-Level Ideas

Grades K–2

Instead of assigning the names of species for students to personify, distribute pictures of the animals. (*At Home with the Gopher Tortoise: The Story of a Keystone Species* provides great pictures in the back of the book.) Have students tell improvised stories, focusing on the personification of animals in their environments and their need to find food and shelter within a habitat.

Students also could personify a seed as it grows into a plant, an object as it moves across different surfaces, or an object as it spins or rocks back and forth.

Tell a story and invite students to portray the personified characters through movement. Then challenge students to become the storyteller and have the listeners pantomime the action.

Grades 3–5

Draw a concept map of the storytelling experience, encouraging students to improvise and add twists and turns to their story. Students could add interdependent connections to the story that they research independently. Encourage students to recognize the interdependence within food webs and discuss the connections. Be sure to have students consider the point of view of the animal they personify. What is the human impact on their character?

Students also could personify part of a machine that has been lost or the potential uses of a tool.

In addition to narrating a story invite students to create moments of dialogue and interaction between characters.

Grades 6–8

Students can investigate species external to the web in the story. Each student can become a character in the story and create tension and suspense on the existing relationships within the ecosystem. Encourage students to invent character behaviors based on their observations and the emotional responses of their classmates. Investigate animals that students are familiar with that live in local ecosystems (schoolyard, watershed, forest). Discuss the connections between different interdependent relationship cycles. As students personify each animal, ask them to consider the animal's point of view. How does their character view humans? How do humans affect their character and its environment? Invite students to activate the thoughts of a character sharing what's on their mind as part of relaying the story.

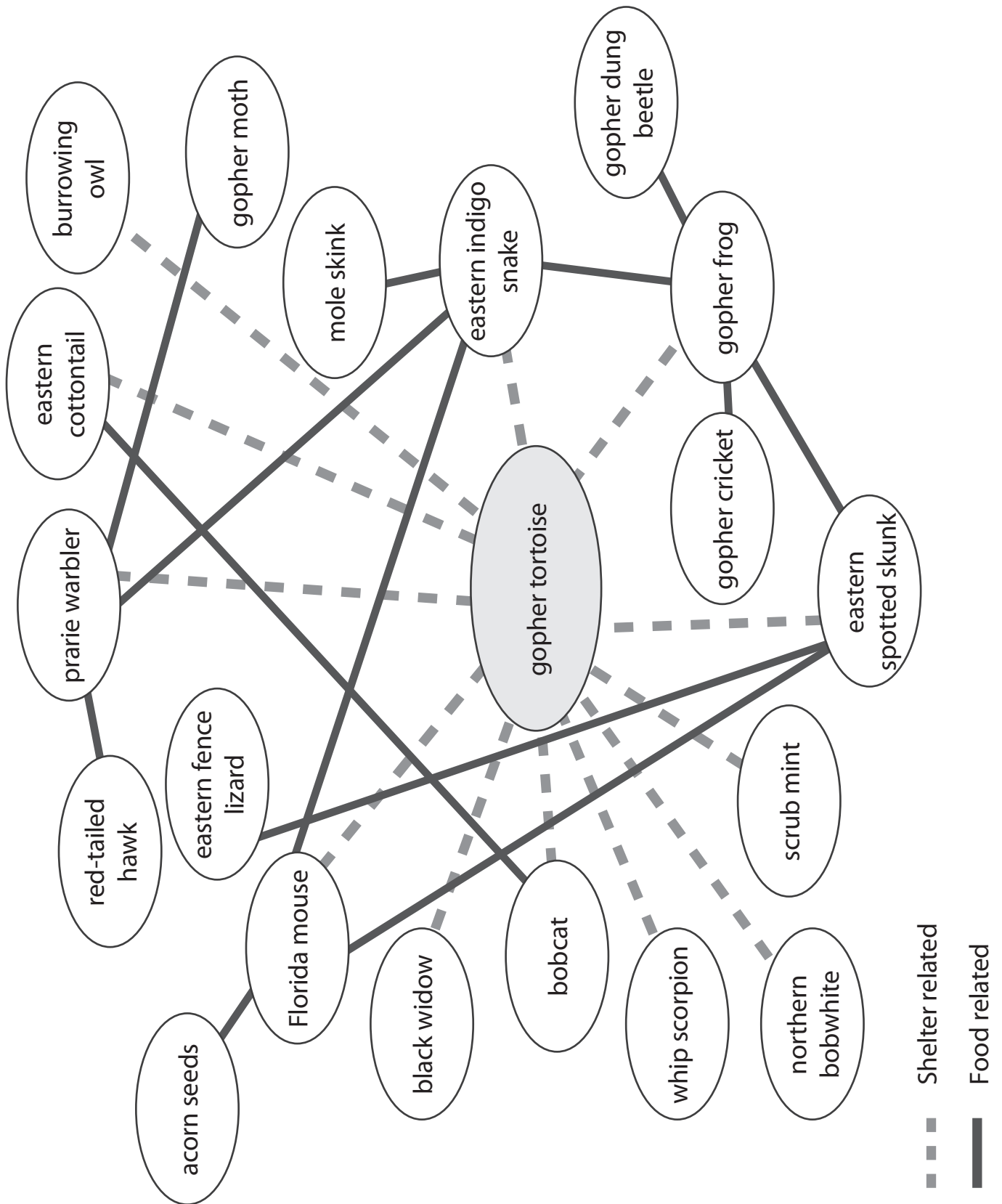
Students can personify a molecule of water as it travels through an environment or changes from one state to another (gas to liquid), or they can personify a fossil as it is formed.

Grades 9–12

In addition to the suggestions for grades 6–8, students can personify concepts of astronomy such as a black hole, chemistry concepts of acids and bases, or layers of the atmosphere.

Invite students to integrate the listeners into the story for “choose your own adventure” type tales, where the story can pivot based on feedback from the listeners.

Sample Concept Map



Name: _____ Date: _____

Fact Finding and Observations

Directions: As you listen to the story, fill in the chart to record information about your animal that will help you create a story.

Animal	
Animal Characteristics	
Habitat (food, shelter, water, space)	
Interdependent Relationships	Animal 1
	Animal 2
	Animal 3

Name: _____ Date: _____

Story Planner

Directions: Use this chart to plan your story.

Storytelling Technique

Personification: How will you personify your animal? List its character traits. How will you use voice and gesture to show these traits?

Story Elements

Beginning: Introduce your animal. Describe the animal in its original habitat, including the location, sounds, water, food, and shelter.

Middle: Describe how and why the keystone species was removed. What is your animal's reaction? What actions does your animal take? What might it be thinking? What might your animal say to communicate its reaction?

End: Describe how your animal survives. Who or what helps it? How does your animal feel? Where does it go? How might you end the story—with a resolution? With a question?