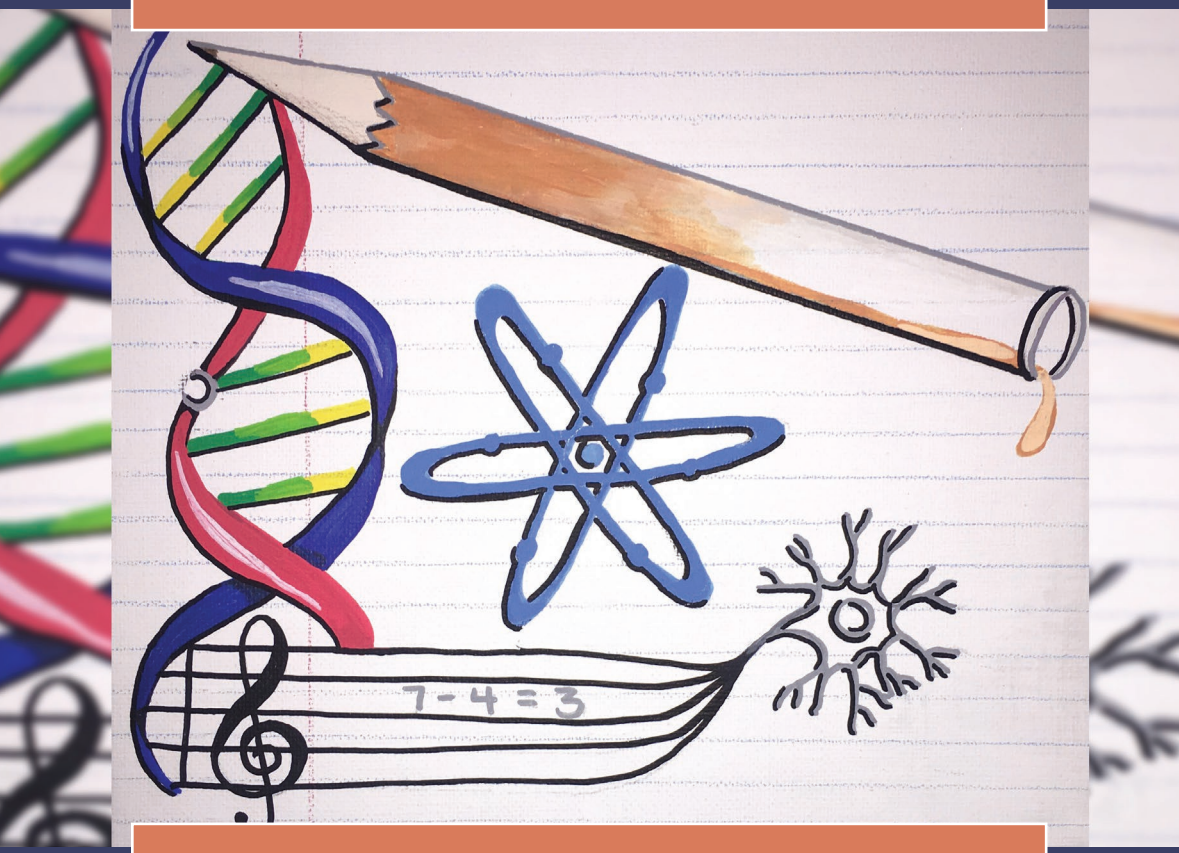
Pump It Up

Literacy Activities for the Classroom

Joanne Kilgour Dowdy and
Yang Gao (Eds.)



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Edited by

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A. HONIGSFELD

INTRODUCTION

Literacy is a complex endeavor. Think of a three-year-old, who eagerly listens to the same bedtime story he hears night after night chiming in occasionally and catching you if you miss a word or mistakenly turn the page without finishing the last paragraph. Or picture a four-year-old, who relentlessly scribbles her name on any available surface—walls, kitchen cabinets, and endless reams of paper—to leave a mark. How about the five-year-old who can't wait to go to kindergarten and begin to read and write independently. Throughout a child's and adolescent's literacy life, there are milestones and challenges, successes and struggles. Literacy development becomes a sustained endeavor that spans across the grade levels and is infused in every school activity. Oracy, or oral language development, is intertwined with the emergence of reading and writing skills along with the learning of new content and skills across the core disciplines. This is no small feat for a child to achieve! It must be a concerted effort by all educators to help develop such critical skills for students to be successful in literacy.

Have you heard, spoken, pondered or perhaps protested the idea that "all teachers are reading teachers?" Would it be more accurate to say that all teachers must nurture their students' literacy development, regardless of the grade level they teach or the content area in which they specialize? Literacy may be conceived to be at the core of all instruction that prepares students not just to be college- and career-ready but life- and world-ready as well, thus it deserves special attention.

It has been established that during their academic career, children progress through four major literacy roles as they develop more and more advanced literacy skills (Fang, 2012). These four roles are developmental and incremental as well as interconnected and interdependent in their trajectory. Students develop their skills as code-breakers, meaning-makers, text-users, and text analysts/critics, while also acquiring new conceptual understandings across the core content areas in the process:

1. As code-breakers, students begin by developing foundational literacy skills that provide the basis for decoding text written in English, whether presented in print or digital formats.
2. As meaning-makers, they begin to make sense of what the text they are reading means. First they are most likely to figure out the literal meaning of any text; however, with appropriate scaffolding and support, students begin to unlock further layers of meaning and uncover text complexity.

3. As text-users, readers start to expand their reading skills and tackle a range of text types and genres. They not only comprehend what they read, they also become apt at reflecting upon and responding to those texts. When students make reading choices for themselves, their literacy lives become more authentic and enriched as well.
4. As text analysts and critics, students take the next steps to independence and respond to what they read analytically and critically: they analyze, synthesize, and evaluate the readings while also participating in meaningful discussions with peers and their teachers.

These four roles offer a possible frame of reference for understanding literacy development. The contributors to the *Pump It Up: Literacy Activities for the Classroom* volume recognize that developing literacy is an intricate process that requires highly engaging and motivating learning experiences at every stage and in every content area. The seven sections of the book are thematically organized to allow for interrelated teaching ideas to be presented together. In *Section I: Exploring the Scientific World*, chapter authors connect science learning to a specific literacy and literary experiences as they share practical strategies for creative writing (Sarah Raven), vocabulary development (Jessica Wilson), and dramatic exploration of the scientific method (Amber Poponak).

Section II: Becoming an Artist contains a collection of chapters that connect literacy learning to visual and performing art. Each author takes a unique approach while offering step-by-step directions for both novice and experienced teachers to explore different art forms—music (Kayla J. Titko), mask making (Joanne Kilgour Dowdy), poetry (Mary E. Weems) and art and drama (Lauren J. Lutkus)—through literacy activities. The next section offers a rich collection of literacy and language arts strategies. *Section III: Appreciating the Beauty of Languages* helps uncover deeper levels of language using word associations (Rachel Foot), photography (Jessica Cervenak), poetry making (Tarah Kerr), video technology (James Nageldinger) and maga(zine) publishing techniques (Karen Andrus Tollafield).

To further expand and deepen the power of literacy learning, social studies, politics, and history are connected to literacy development in *Section IV: Embodying Social Justice*. Through topics of equity, diversity, identity development, and ethical dilemmas, chapter authors present both theories that support the suggested activities and specific steps for implementing the strategies they describe: how to use picture books for identity construction (Brenda Boshela), exploring a sense of belonging (Kenneth Cushner) and the means to construct family narratives (Gabriel Swarts).

Section V: Developing a Healthy Mind and Body takes the reader beyond the core subject matters and infuses literacy learning into Health and Physical Education through language awareness activities (Takahiro Sato) and through exploring social inequalities (Jennifer L. Walton-Fisette). As poignantly suggested by Molina (2012), the problem with math is English. Understanding and effectively using the language and literacy of mathematics must be well supported with experiential, meaningful

writing activities. Chapter authors contributing to *Section VI: Playing with Numbers* offer several powerful writing strategies within the context of mathematics instruction, with the purpose of helping students better formulate mathematical problems (Joanne Caniglia), deconstruct complex information (Karl W. Kosko) and enhance their mathematical reasoning and communication through electronic journaling (Margaret Bruder).

Finally, in *Section VII: Teaching in a Multicultural World*, literacy is explored through the lens of working with English learners while celebrating the richness of their lived experiences and enhancing their schooling with well-supported, scaffolded learning opportunities. The range of approaches shared in this section include game-like activities to enhance ELL's reading and writing skills (Yang Gao and Joanne Kilgour Dowdy), culturally-relevant pedagogy achieved through ethnoautobiography (Natasha H. Chenowith), a visually enhanced thematic unit on friendship (Jennifer L. Nigh), the use of fiction to increase motivation and comprehension (Aseel Kanakri), sharing children's literature (Mariana Romero), and using personal narrative writing (Steven L. Turner).

These chapters offer a unique approach to literacy education. Theory and practice are thoroughly intertwined, the clarity of each activity is carefully established, and ease of implementation is ensured through specific steps authors describe based on authentic classroom scenarios. ***Pump up your literacy instruction*** with *Pump It Up!*

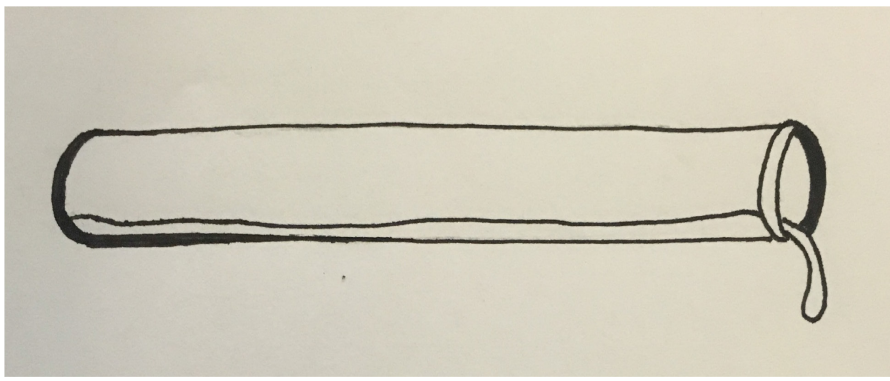
REFERENCES

Fang, Z. (2012). Approaches to developing content area literacies: A synthesis and a critique. *Journal of Adolescent & Adult Literacy*, *56*, 103–107. doi:10.1002/JAAL.00110

Molina, C. (2012). *The problem with math is English: A language-focused approach to helping all students develop a deeper understanding of mathematics*. San Francisco, CA: Jossey-Bass.

SECTION I

EXPLORING THE SCIENTIFIC WORLD (SCIENCE)



SARA RAVEN

1. PROMOTING CREATIVITY THROUGH WRITING IN SCIENCE

The greatest scientists are artists as well.
– Albert Einstein

ABSTRACT

Writing is an essential aspect of science, yet in science classrooms, the writing tasks usually assigned stem from written lab reports, which emphasize neither the creative nor personal aspects of science. In this activity, students will display their knowledge of science by creating a children's book that distills a complicated science concept into an easily understandable text. This activity provides students with an opportunity to create, engage, and discover their own misconceptions.

BACKGROUND AND PURPOSE

Writing is an essential aspect of science: we document and interpret data, communicate with colleagues, organize and record thoughts, and disseminate written results. In middle and secondary science classrooms, science-writing tasks usually revolve around lab reports. Reports are an important aspect of writing in science, as they are one of the most common documents that postsecondary science students will be asked to create. However, while lab reports can help students focus on some essential aspects, other forms of writing can provide additional learning opportunities. Writing helps students learn in multiple ways: As they try to explain the concepts they are learning, they may discover gaps in their knowledge. When they use analogies to describe how something new is like something they already know, they link new knowledge to prior knowledge, strengthening both. In translating between everyday language and scientific language, they clarify their ideas (Wheeler-Toppen, 2011).

Most importantly, writing gives students permission to be creative in science and to uncover how their personal experiences connect to the content (Montgomery, 2005), two aspects of science that are notoriously difficult to address.

There are many ways that science teachers can address these essential aspects through writing. Turner and Broemmel (2011), describe several writing tasks that provide "legitimate, purposeful writing practice while promoting solid science learning and review" (p. 18), including: writing hypothetical letters to a scientist, writing technical or scientific directions, scientific reporting, writing fictional

J. Kilgour Dowdy & Y. Gao (Eds.), Pump It Up, 3–8.

explanations of scientific phenomena, or news clip observations. Although each of these activities is useful, I wanted to focus on providing students not only with opportunities to practice writing, but to practice seeing the creative side of science. Focusing on the creative aspect in science is immensely useful. The Next Generation Science Standards address creativity in both the section on scientific practices ("… the work of scientists and engineers is a creative endeavor—one that has deeply affected the world they live in") and the nature of science ("Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination and creativity") (NGSS Lead States, 2013). In addition, leading students to create engages higher order thinking processes (Krathwohl, 2002).

In this activity, each student is asked to choose a science concept from the unit that they self-identify as difficult or challenging. They are then tasked with creating a children's book, including illustrations, that explains the concept(s) in a way that an elementary school-level student could understand. This activity can be used as a formative or summative assessment for students in grades 7–12 with a wide variety of science units (examples provided in Table 1). In the sections that follow, I outline the learning objectives, procedure, and provide an example of the outcome.

LEARNING OBJECTIVES

Students will be able to:

- Explain a science concept through writing;
- Create illustrations that explain a scientific concept;
- Uncover lingering misconceptions about a particular science concept; and
- Practice the creative aspect of the nature of science.

PROCEDURE

The following procedure depends on the grade level and unit in which the activity is being used. Each step is designed for individual students to follow, with prompts for teachers to assist:

1. *Select a concept from the science unit* that proved difficult or challenging to understand. The concept should be something that is discussed at both the middle/high school level and the elementary school level. For instance, the Next Generation Science Standards focus on plant needs for growth in the grade 2 standards and the high school standards: "Plants depend on water and light to grow. (2-LS2-1)" and "Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)"
2. *Create a concept map or graphic organizer* to break down the details of the topic and highlight the important aspects. For this step, prompt students to think about the ways in which they would explain the concept to a fellow student or to a member of their family.

3. *Examine examples of children's books* to understand how to distill complicated information and use illustrations to reach a younger audience. Some examples of science books for children include: The Magic School Bus series by Joanna Cole and the Let's-Read-and-Find-Out-Science series by Franklyn M. Branley.
4. *Brainstorm creative ways to explain the concept* through narrative structure. The goals of creating the children's book are twofold: to be creative and to break down a complicated topic. Prompt students to think about both of these aspects when brainstorming.
5. *Outline a draft* of the children's book by listing the major points. Be sure to have students include ideas for illustrations. The illustrations should be used to supplement the explanations in the book.
6. *Create the children's book* by letting students choose a format (i.e. making a physical copy, using digital tools, etc.) and giving them time to create. Guide students through this process with periodic checks of their progress.
7. *Evaluate the product* either by using the rubric provided (Table 2) or by modifying the rubric for your class. If possible, allow students to provide feedback about the process and their peers' books.
8. *Extend the activity* by setting up a time for the students to visit an elementary school and share their efforts. This collaboration will help the older students modify their books for easier comprehension, and will provide the younger students with information about a topic they will learn in the coming years, scaffolding their learning.

ADDITIONAL INFORMATION

Table 1. Examples of aligned standards between elementary and middle/high grades

Standard	*Elementary drades description*	*Middle/High grades description*
PS1.A: Structure and Properties of Matter	Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. (2-PS1-1)	In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations. (MS-PS1-4)
PS2.A: Forces and Motion	Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1), (K-PS2-2)	Newton's second law accurately predicts changes in the motion of macroscopic objects. (HS-PS2-1)

(Continued)

Table 1. (Continued)

Standard	*Elementary drades description*	*Middle/High grades description*
LS2.A: Interdependent Relationships in Ecosystems	Plants depend on water and light to grow. (2-LS2-1)	Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
LS2.B: Cycles of Matter and Energy Transfer in Ecosystems	Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)	Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5)
LS4.B: Natural Selection	Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)	The traits that positively affect survival are more likely to be reproduced, and thus are more common in the population. (HS-LS4-3)
ESS1.A: The Universe and its Stars	Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)	Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
ESS2.A: Earth Materials and Systems	Wind and water can change the shape of the land. (2-ESS2-1)	All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
ESS3.C: Human Impacts on Earth Systems	Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impact on the land, water, air, and other living things. (Secondary to K-ESS2-2)	The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)

Table 2. Example rubric

	Exceeds standards	*Meets standards*	*Almost meets standards*	*Does not meet standards*
	4 Points	*3 Points*	*2 Points*	*1 Point*
Creativity	Writing is extremely creative. Ideas and style are refreshing and imaginative. Talented writing.	Writing is somewhat creative. Some new and imaginative ideas. Good writing.	Writing contains a few creative ideas but style is mostly uninspired.	Writing contains many cliché ideas and an uninspired style.
Content Understanding	Evidence of strong understanding of the concept. Provides detailed breakdown of the concept that is appropriate for the target age level.	Evidence of moderate understanding of the concept. Provides detailed breakdown of the concept that is appropriate for the target age level.	Evidence of some understanding of the concept. Does not provide detailed breakdown of the concept that is appropriate for the target age level.	Little evidence of understanding of the concept. Does not provide detailed breakdown of the concept that is appropriate for the target age level.
Illustrations	Illustrations properly supplement the descriptions in the book. They are colorful and appropriate for the target age level.	Illustrations somewhat supplement the descriptions in the book. They are colorful and appropriate for the target age level.	Illustrations somewhat supplement the descriptions in the book. They lack color or are inappropriate for the target age level.	Illustrations do not supplement the descriptions in the book. They lack color or are inappropriate for the target age level.
Spelling and Grammar	Proper use of spelling and grammar is employed consistently throughout the writing assignment.	There are a few spelling and grammar errors, however they do not take away from the overall quality of the writing assignment.	Poor spelling and grammar muddle the overall effectiveness of this piece.	There are so many spelling and grammar errors that it is difficult to comprehend the meaning.

(Continued)

Table 2. (Continued)

	Exceeds standards	*Meets standards*	*Almost meets standards*	*Does not meet standards*
	4 Points	*3 Points*	*2 Points*	*1 Point*
Fluidity	There is a strong rhythm and flow of language. Sentence structure is varied throughout piece.	There is a rhythm and flow of language. Sentence structure is often varied.	An obvious attempt to create a rhythm and flow. Sentence structure not varied.	No attempt to create a rhythm. Sentence structure not varied.
Organization and Development	Excellent idea /creativity. Organization and use of supporting details evident in the work.	Good idea. Creativity, organization and use of supporting details evident in the work.	Some idea/ creativity. Attempted organization and use of some supporting details evident in the work.	No creativity, poor organization and no attempt to supply supporting details.

REFERENCES

Krathwohl, D. R. (2002). A revision of bloom's taxonomy: An overview. *Theory into Practice*, *41*(4), 212–218.

Montgomery, M. (2005). Authentic science writing. *Principal Leadership: High School Education*, *5*(6), 28–31.

NGSS Lead States. (2013). *Next generation science standards: For states, by state*s. Washington, DC: The National Academies Press.

Turner, T., & Broemmel, A. (2011). 14 writing strategies. In J. Wheeler-Toppen (Ed.), *Science the "write" way*. Arlington, VA: NSTA Press.

Wheeler-Toppen, J. (2011). Introduction. In J. Wheeler-Toppen (Ed.), *Science the "write" way*. Arlington, VA: NSTA Press.

JESSICA WILSON

2. CREATING CHARACTERS THROUGH THE USE OF VOCABULARY WORDS

ABSTRACT

This activity is devised to demonstrate how literacy and creativity can be achieved through all disciplines including science. Students are asked to write about the community and surroundings of one of the animal props that they have chosen in class. In their piece of writing, they will be required to use important key words from the chapter in order to indicate that they can provide correct syntax and/or discourse for each vocabulary term. This lesson will also fuel the student's originality and allow them to reach a higher level of thinking while grasping important concepts and vocabulary words. This literacy activity will be transferred into a biome project where students will actually portray the animals in their writing connecting them to their own habitats. These places will include features like the water sources, shelter, and food supply. Creating characters through the use of vocabulary words will essentially allow students to read and interpret texts, as well as expand on those concepts with their own ideas.

BACKGROUND AND PURPOSE

Incorporating literacy and analysis into science-related concepts is crucial for student development and understanding. Literacy within science should be implemented as much as possible and should often demonstrate the linkage between content areas or disciplines. "Curricular features that can support students in developing literacy in the context of science: linking new ideas to prior knowledge and experiences, anchoring learning in questions that are meaningful in the lives of students, connecting multiple representations, providing opportunities for students to use science ideas, and supporting students' engagement with the discourses of science" (Krajcik & Sutherland, 2010, p. 456). Presenting opportunities for students to use science concepts to do a project with a procedural task that is unrelated to science allows students to make a place for science outside of the classroom.

The purpose of this activity is for students to show complete understanding of vocabulary terms by interpreting their meaning and using it in turn to make a short story involving this animal or about this animal prop. "This area of learning in science is surely one where most learning difficulties are encountered, for concept words denote ideas at gradually ascending levels of abstraction. The difficulty is magnified

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because these words cannot be understood in isolation" (Wellington & Osbourne, 2001, p. 21). By using an alternative point of view, placing themselves in the life of the animal, it enhances students' understanding of various roles and situations. This allows students to express and develop creativity and critical thinking by placing them in thoughtful situations in which they may not have otherwise participated. "The idea that writing is a core science activity stems from theories of the relationship between language and learning" (Wallace & Hand, 2004, p. 2). Methods can be used within other disciplines besides English to foster creativity and encourage reading comprehension. Promoting writing and writing exercises within the science classroom enables students to identify important context words and relate them to their lives.

LEARNING OBJECTIVES

- Students will be able to interpret key vocabulary words by writing them within a different context.
- Students will be able to develop appropriate syntax and discourse of key terms in order to portray a story about their personal prop.
- Students will be able to construct a biome of their animal prop based upon their writing.

PROCEDURE

1. Display animal props on a few desks in the room allowing the class to see the wide array of different animals and the different kinds of props to consider.
2. Allow students to wander up to the desks and look at the animals and choose one for this activity. They are then to return to their desks.
3. On the board, write down the important key vocabulary words that the class has been learning from that specific lesson or chapter.
4. Students should then start free writing about the animals they have chosen using the specific key vocabulary words written on the board. Students should underline these important words when used throughout their paper.

5. When students have written a page worth of details and descriptions about their animals ask them to flip over their papers and trade animals with the student sitting to the left of them.
6. Ask the students to write a shorter description about this animal, not necessarily using the vocabulary words, but focusing more on their habitat, food supply, and where they live.
7. Have the students hand back the animal to the person it came from as well as the shorter description that they wrote about the other student's animal.
8. This will allow the students to see if their information about the animal is accurate and if others agree with their choice of biome or habitat.
9. Each student takes 1–3 minutes to compare their findings and write notes. This will later help them on their biome project.

Example (see picture of polar bear)

Polar bears are vital to their *ecosystems*. They are the largest *carnivores* in the world, meaning that they eat meat. The polar bears are on top of the *food chain* in the Artic, which just happens to be included in the *tundra biome*. The *tundra* is the coldest of the *biomes*. It has extremely low temperatures, little precipitation, and short growing seasons. *Permafrost* exists in the *tundra*, which is a layer of permanently frozen subsoil. Polar bears live between twenty to twenty five years. Their *adaptations* make it easier for them to withstand the weather of the *tundra*. Their fur is thicker than any other bear's and covers their feet for warmth. They eat seals and walrus. They barely eat *vegetation*. They travel great distances in search of *prey*.

REFERENCES

Krajcik, J., & Sutherland, L. (2010). Supporting students in developing literacy in science. *Science*, *328*(5977), 456–459.

Wallace, C., & Hand, B. (2004). Writing as a means of doing science. *Writing and learning in the science classroom* (p. 2). Dordrecht: Kluwer Academic.

Wellington, J., & Osborne, J. (2001). Looking at the language of science. *Language and literacy in science education* (p. 21). Buckingham: Open University.

AMBER POPONAK

3. KEY STEPS TO A SCIENTIFIC METHOD

An Exploration through Drama

ABSTRACT

This activity allows students to explore the relative nature of science and discover key steps employed when solving complex problems or conducting scientific investigations. It allows the students to determine which steps they believe are most important, and provide a rationale for their choice, allowing the instructor to evaluate their understanding of the content in question. Finally, the activity allows for a variety of assessment types, which gives students the opportunity to deliver their content understanding in a way that authentically demonstrates their abilities.

BACKGROUND AND PURPOSE

In this scientific drama activity, students will create skits that explore the steps in a scientific investigation. The scientific method is a topic introduced in younger grades; however, this activity allows students to role-play characters and have fun creating their own portrayal of common key steps. This drama procedure will allow students to creatively review, or become familiar with, the scientific method before using it to investigate content that is more complex. The activity and the discussion that ends it will allow the instructor to determine student understanding of the scientific method. After watching a clip on the scientific method from a popular television show, the Big Bang Theory, students will work in a group to create their own clip demonstrating steps they believe are important (Couch, 2012). They are given the option to participate by writing dialogue, drawing storyboards, or merely vocalizing their ideas to the group. This variety allows for success and inclusion of all students within the classroom (Kilgour Dowdy, 2011). Participants will then act out their created "video clip," and watch the other group performances. By allowing the students to respond in a non-print manner, meaningful interactions may be fostered in the classroom and students who may struggle with literacy are not at risk during the activity (Iverson & Filipan, 2011). In addition, by discussing the reasons for the chosen steps, students provide their own rationale for the importance of the steps in question. This leads to deep learning, as the students determine what is "important to them." Finally, this movie script and dialogue activity can be modified for virtually any content area, as well as grade level. This adaptability makes this

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activity a very useful way to approach many topics in the classroom (Kirk, 2009). The purpose of this drama process is to provide students with a review model of key steps within scientific investigations that provides adequate learning opportunities for each learner in a diverse classroom.

LEARNING OBJECTIVES

- The students should be able to identify concepts guiding scientific investigations;
- The students should be able to formulate models of scientific investigations;
- The students should be able to justify conclusions with evidence; and
- The students should be able to communicate arguments.

PROCEDURE

1. As a class, watch the selected clip from the television show *The Big Bang Theory* demonstrating steps of the scientific method.
2. Divide students into groups, preferably three or more students to each group.
3. Briefly explain the activity to the students.
    - As a group, they are to create their own short skit demonstration steps of the scientific method. The skit can relate to something in class, something they have previously learned, or an example from everyday life (as demonstrated in the clip above).
4. Allow students time to create their skit (through written dialogue *and/or* storyboards) and practice briefly.
5. Groups of students will take turns presenting their skits to the classroom, while presentations are occurring students should pay attention to important steps evident in each skit.
6. After presentations, instructor will conduct a class discussion to list the steps of the scientific method. Responses should be similar to answers below:
    - Ask a question, background research, hypothesis, experiment, analysis, conclusion, state results
7. Instructor may choose to extend the activity by allowing students to extend their script, create their own activity following the steps of the scientific method, create a non-print representation of the scientific method, and many other modifiable possibilities.

Materials

- Computer/projector/laptop/etc. with the ability to play clip from *The Big Bang* Theory
- Blank paper for students to create skits

- Space in classroom to act skits out
- Necessary materials to complete chosen activity extension, including coloring supplies/extra paper/magazines/etc.

Sample Discussion Prompts

- What steps were present in most of the skits?
- What seem to be the most important steps?
- Based on your previous knowledge, what steps did we miss?
- Logically, what steps should we add?
- Have we included a beginning, middle, and end for our process?

Example

David "Mike, I think that every time you hit your cleats three times before batting you get a home run!"

Mike "What makes you think that, David?"

David "I have watched you each time you get ready to bat, every time you got a homerun you hit your left cleat once and your right cleat twice. Let's test my hypothesis by experimenting with your next at bat!"

Mike "Okay, I guess." *(Mike hits his left cleat once, then his right cleat twice as instructed by David, gets up to bat, and hits a homerun off the first pitch)*.
(Back in dugout) "I can't believe it, man, you're right, this is a batting average gold mine!"

David "Well, let's not get ahead of ourselves, we have to keep repeating our experiment."
(Scene jumps ahead to the next game, Mike is yelling at David after striking out his past three at bats)

Mike "I can't believe this, man, you told me that hitting my cleat three times was the key to my homeruns! I have struck out three times in my past three at bats! I just keep hitting my cleats for nothing!"

David "Hey that was only a hypothesis! We had to repeat our experiments before analyzing and stating our results, and, well, I think we have to reject this hypothesis. Hitting your cleats does not affect your batting. But hey – what about chewing bubble gum?"

REFERENCES

Couch, A. (2012, December 2). *The big bang theory scientific method clip season 6 episode 5* [Video file]. Retrieved from http://www.youtube.com/watch?v=_7sSuhQ1_24

Iverson, S. V., & Filipan, R. S. (2011). Scripting success: Using dialogue writing to help students find their voice. In J. Kilgour Dowdy & S. M. Kaplan (Eds.), *Teaching drama in the classroom: A toolbox for teachers* (1st ed., pp. 123–131). Rotterdam, The Netherlands: Sense Publishers.

Kilgour Dowdy, J. (2011). Movie scripts. In J. Kilgour Dowdy & S. M. Kaplan (Eds.), *Teaching drama in the classroom: A toolbox for teachers* (1st ed., pp. 113–119). Rotterdam, The Netherlands: Sense Publishers.

Kirk, R. D. (2009). Science through drama: A multiple case exploration of the characteristics of drama activities used in secondary science lessons. *International Journal of Science Education*, *31,* 2247–2270. doi:10.1080/09500690802712699