MICHIGAN READING JOURNAL

Michigan Reading Journal

Volume 55 | Issue 3 Article 9

June 2023

Using Way-In and Stay-In Scientific Picturebooks To Learn About Science and Scientists

William P. Bintz
Kent State University, wpbintz@gmail.com

Using Way-In & Stay-In Scientific Picturebooks To Learn About Science *and* Scientists

"Storytelling will bring the science to children." (Kaser, 2001, p. 355)

by William P. Bintz

William P. Bintz

This article shares scientific picturebook biographies as "Way-In" texts, scientific informational picturebooks as "Stay-In" texts, and research-based instructional ideas to provide a more balanced portrayal between the science and scientist. Conceptually, "Way-In" texts are texts that can be used as instructional tools to support exploratory curriculum and generate student interest in content area topics when no interest currently exists (Keene & Zimmermann, 1997, p. 98). "Stay-In" texts, as I define them, are informative texts that students can use by to respond to new interests in content area topics sparked by "Way-In" texts.

Integrating Literature and Science

Literacy research indicates that children's literature supports growth and development in literacy and science (Broemmel, Rearden, & Buckner, 2021; Dagher & Ford, 2005; Saul, 2004). In fact, literature "is often a child's first introduction to science" (Barlow, 1991, p. 166) and the "first encounter with the concept of science and the role of scientists" (Owens, 2009, p. 929).

The specific literature that teachers use to teach science concepts also matters (Pappas, 2006). The issue is balance, and the problem is a lack of it. That is, children's literature in science portrays an imbalance between the science and the scientist; it either highlights the life and times of a scientist or provides information about the science, yet usually not both. This is not a new problem. Four decades ago, Hankins (1979) noted this imbalanced portrayal in biographies stating:

> The biographer of a scientist tends to be drawn either to the personal life of his subject or to the technical details of his subject's scientific work. It is difficult to bring these two different aspects together in a harmonious way (p. 2).

More recently, Terrell, (2006) identified the inherent tensions between biography to study both the science and the scientist, stating:

> The biographical form highlights the very real tensions between the study of individuals and the study of disciplines, institutions, cultural movements, rhetoric, and ideology, not to mention ideas and practices (p. 308).

Given this history, I begin with a vignette that inspired this article, followed by a description of the value of scientific picturebook biography to teach science. Then I introduce the notion of Way-In and Stay-In texts and provide examples of both types of texts for each of the disciplinary core ideas in the academic discipline of Life Science, concluding with ideas to help teachers use these texts in meaningful ways.

Vignette

Recently, I was invited to conduct a demonstration of a read aloud session in a sixth-grade science class. At the time, students were learning about concepts in Earth and Space Science. I selected to read the scientific picturebook biography, *Stay Curious: A Brief History of Stephen Hawking* (Krull, 2020) for four major reasons. One, Hawking is an important scientist in the history of earth and space science. Two, he is regarded as an innovative thinker and trailblazer in the international scientific community for unlocking many secrets of the universe. Three, the professional life of Stephen Hawking is fascinating, and his personal life is inspirational. He was diagnosed with Amyotropic Lateral Scleroisis (ALS) and yet he remained mentally, but not physically, strong throughout his life. Four, it is a scientific picturebook biography with much power and potential to spark interest in and questions about earth and space science.

I read aloud from the picturebook, pausing periodically to invite students to turn and talk with a partner. After reading the entire text, I invited students to share responses about the biography. One responded,

> I liked this biography of Hawking. I knew he was a scientist from reading some science articles. I also heard about him on TV. But I had no idea about his personal life. I knew he was in a wheelchair and had difficulty speaking, but I didn't know he really liked to party. He was quite a character. (Paraphrase from student's oral response).

Another responded,

> I liked this book about Hawking's personal life. He was a funny guy. But I was more curious about his interest in the Big Bang and Black Holes. I don't know much about the Big Bang, and even less about Black Holes. Now, after hearing about him in this biography, I'd like to know more about both these things. (Paraphrase from student's oral response).

Afterwards, I reflected on these responses and was struck by the difference between the two. One response focused on Hawking as a person and scientist and the other on his scientific interests in the Big Bang and Black Holes. These two responses, and others like them, sparked an inquiry question: How can scientific picturebook biography and scientific informational texts be used together to support students' learning about science and scientists?

Qualities of Scientific Picturebook Biographies

Scientific picturebook biography is "fundamental and among the oldest in the history of science literature" (Arabatzis, Renn, & Simoes, 2015, p. 268). It is a genre that helps students understand who scientists are and what they do (Lovedahl & Bricker, 2006) and "the struggles, successes, and failures of scientists as they explore and construct knowledge of the natural world" (Nye, 2006, p. 329). This genre provides broader views of science and rich views of the role of science within society (Owens, 2009, p. 930) and a potential of biographical writing for expanding beyond the confines of the individual (Terrell, 2006, p. 307).

Ideally, a scientific picturebook biography integrates the science and the scientist. This genre, however, tends to focus more on the life of the scientist and less on the importance of the science. Using scientific picturebook biographies as Way-In texts, along with scientific informational texts as Stay-In texts, can provide a more balanced portrayal of science and the scientist.

Way-In and Stay-In Texts

"Way-In" texts are high-quality, often award-winning, texts that invite students to inquire, infer, be and stay curious, and pose questions. One purpose of "Way-In" texts is to build background knowledge (schema) and generate student interest in informational topics when little or no interest currently exists. More specifically, "Way-In" texts:

- "include facts that are woven into a more narrative text structure and so are more storylike;
- include factual material for which the reader does have schema;

- may include more photographs and have fewer words on each page;
- may be shorter;
- have fewer concepts introduced less quickly (lower concept load) than their more didactic counterparts;
- include less new terminology on each page (lower vocabulary load) (Keene & Zimmermann, 1997, p. 98).

In many ways, the picturebook biography *Stay Curious* functioned as a Way-In text for students, introducing them to the personal life of Stephen Hawking. For one student it sparked new interests in the personal life of Stephen Hawking as well as scientific discoveries made by Hawking, specifically the Big Bang and Black Holes. After this read aloud session—and based on this student's response and others like it—I developed the idea of "Stay-In" texts. I view Stay-In texts as informative texts that can be used by students to respond to the new interests sparked by a "Way-In" text. Like Way-In texts, Stay-In texts are high-quality, even award-winning, texts that, metaphorically, are instructional tools that lay-in-wait for student interest to spark and then function as resources for students to pursue that interest. In this instance, I view a variety of Stay-In texts, in the form of scientific informational picturebooks, laying-in-wait to respond to this student's new scientific interests about the Big Bang and Black Holes. Among others, some Stay-In texts can include *The Big Bang Book* (Stahl, 2020), *Black Holes* (Than, 2010), and *The Universe: The Big Bang, Black Holes, and Blue Whales* (Wood, 2021).

I highlight informational scientific picturebooks as Stay-In texts for two reasons. One, research indicates that elementary classrooms tend to use more narrative than informational texts (Enfield, 2007; see also Duke, 2000); however, informational texts, especially picturebooks, are valuable tools for inquiry because they help students create new understandings based on their own inquiry questions (Ford, 2004). Two, unlike narratives which use a similar text structure, informational texts use a range of text structures, including cause and effect, compare and contrast, problem and solution, and chronology of events.

An important feature of Way-In and Stay-In texts is that they both have potential to cross genre boundaries. They can take the form of narrative picturebooks, wordless and illustrated picturebooks, informational texts, poetry, plays, short stories, graphic novels, etc. Here, I highlight narrative scientific picturebooks as Way-In texts because these texts have much power to connect reading experiences to spark scientific questions and inquiries, the essential purpose of Way-In texts.

Lastly, in terms of standards, Way-In and Stay-In texts can be used by teachers to address Common Core State Standards (National Governors Association). These standards essentially state:

- Read closely and critically to comprehend text and make logical inferences from it;
- Integrate content presented in language and other forms of media;
- Understand how perspective influences text content.

Stay-In texts can also be used by teachers to address CCSS for Reading (2010) including:

- Interpret main ideas or themes of a text;
- Understand how elements of text develop;
- Evaluate major ideas in a text.
- Analyze intertextual connections between two or more texts.

Way-In texts can be used by teachers to address other professional standards. In science, the professional standards are based on The Next Generation Science Standards (NGSS, 2013). In the next section, I describe how Way-In and Stay-In texts can be used to address the academic discipline, corresponding disciplinary ideas, and crosscutting concepts of Life Science.

Way-In and Stay-In Texts for Life Science

The *Next Generation Science Standards* (2013) identify four major disciplines for learning science: 1) Life Science, 2) Earth and Space Science, 3) Physical Science, and 4) Engineering, Technology, and the Application of Science. The NGSS posit that knowledge of these

disciplines is essential for learning science and identify specific disciplinary core ideas for each discipline. Here, I focus specifically on disciplinary core ideas in Life Science: Molecules to Organisms, Ecosystems, Heredity, Biological Evolution. I identify and describe Way-In texts to spark interest in, as well as Stay-In texts to deepen understanding of each disciplinary core idea. I also include instructional ideas that teachers can use with these, and other, texts in the classroom.

Life Science Disciplinary Core Idea #1: From Molecules to Organisms: Structures and Processes

This Way-In and Stay-In text pairing emphasizes the process of metamorphosis.

Way-In Text: *Summer Birds: The Butterflies of Maria Merian* (Engle, 2010) is the scientific picturebook biography of Maria Merian, who was a naturalist, field scientist, and artist. Born in 1647, she observed that many insects, especially butterflies, go through developmental life cycles. Over time, she discovered metamorphosis, nine new species of butterflies, and two new species of beetles.

Stay-In Text: *Metamorphosis* (Wolflein, 1995) is a pop-up, lift-the-flap, informational picturebook defining, describing, and illustrating the process of metamorphosis in butterflies. It describes the process across four life stages: egg, larva, pupa, and adult. It also includes important information including facts like these: 1) not all animals have a pupal stage, 2) metamorphosis occurs inside and outside of an animal's body, and 3) the role of hormones and environment on metamorphosis.

Instructional Idea: Students can read the biography of a scientist and present an interactive historical vignette (IHV). An IHV is an interdisciplinary instructional strategy that integrates storytelling with discussion (Wandersee & Roach, 2005). A vignette is like an anecdote or little story. It is a short and descriptive, often evocative, piece of writing that captures a brief period in time. In science, vignettes are used to teach and learn about the nature of science and how science has changed over time. They allow students to become actively engaged in short science stories (Roach & Wandersee, 1993). Simply put, interactive historical vignettes are "short, fictional stories based on historical episodes in the life of a scientist" (Roach & Wandersee, 1995, p. 366).

Creech and Hale (2006) provide one example of putting a IHV into action in the classroom. After reading about their favorite scientists, students write and illustrate a short vignette (200-250 words) about an important event in the scientist's life. They can also "dress like their scientist, bring props representing the scientists' work, and read their vignettes in small groups. The 'scientist' asks their peers in small groups to discuss opinions about their work and discoveries" (p. 24).

Table 1 provides additional Way-In and Stay-In picturebooks for LS1: From Molecules to Organisms: Structures and Processes. Teachers can use these picturebooks to anchor their own collections of texts to teach this scientific discipline and these disciplinary core ideas.

Life Science Disciplinary Core Idea #2: Ecosystems: Interactions, Energy, and Dynamics

This Way-In and Stay-In text pairing describes the science behind migration.

Way-In: *The Boy Who Drew Birds* (Davies, 2004) is the scientific picturebook biography of John James Audubon, a man who spent his entire life watching birds. Audubon was curious whether the same birds nesting near his home returned to the same nest the following spring. He developed an innovative technique of banding which, in turn, enabled him to affirm the theory.

Stay-In: *Circle* (Baker, 2016) is a scientific informational picturebook that broadens and deepens student understanding of the science of migration. It uses minimal text and collage illustrations to describe the round-trip migration of the bar-tailed godwit. The picturebook also highlights scientific trip characteristics such as tracking how birds follow invisible pathways and take turns leading the way to reach their destination.

Instructional Idea: Students can read and discuss

biographies about their favorite scientist. Then they can read a variety of Stay-In books and make a scrapbook that represents their understandings of the science behind their favorite scientist. Designing and making scrapbooks is a popular hobby and increasingly used in educational settings, primarily in middle and elementary levels and especially in science and social studies (Burnley, 2004, p. 245).

Designing and developing scrapbooks requires active engagement in the process. It encourages students to be observant, reflective, and to see science as relevant and omnipresent. Scrapbooks can enhance students' understanding of scientific concepts because they represent and reflect students' questions, interests and experiences. Phillips (2007) notes that scrapbooks are valuable because they allow a great deal of flexibility in dealing with special populations, such as Gifted and Talented, Special Education, and English Language Learners.

Table 1

Additional Way-In and Stay-In Picturebooks in Life Science: Molecules to Organisms

Way-In Text	Author	Stay-In Text	Author	Topic
Butterflies for Kids	Davidson, L. (2021)	*How to Raise Monarch Butterflies* *The Amazing Life Cycle of Butterflies*	Pasternak, C. (2012) Barnham, K. (2018)	Metamorphosis
Fabulous Fluttering Tropical Butterflies	Patent, D.H. (2003)	*How Maria Merian's Art Changed Science*	Sidman, J. (2018)	Metamorphosis
Mariposa's Wish	Littlefield, N. (2019)	*Butterfly & Moth: Ta Da!*	Petty, D. (2021)	Metamorphosis
The Leaf Detective: How Margaret Lowman Uncovered Secrets in the Rainforest	Lang, H. (2021)	*The Living Rain Forest*	Kratter, P. (2004)	Rainforest Organisms
Rain Forest	Cowcher, H. (1988)	*Nature's Green Umbrella*	Gibbons, G. (1994)	Rainforest Organisms
My First Book of Microbes	Ferron, S.K. (2022)	*Microbes*	Gallagher, A. (2017)	Microbes
Tiny Creatures: The World of Microbes	Davies, N. (2016)	*Bacteria: Staph, Strep, Clostridium, and Other Bacteria*	Wearing, J. (2010)	Microscopic Organisms
Cells: An Owner's Handbook	Fisher, C. (2019)	*Enjoy Your Cells*	Balkwill, F. (2001)	Human Cells
Body Battles	Gelman, (1992)	*June Almeida, Virus Detective*	Slade, S. (2021)	Viruses & Bacteria
Cutie Sue fights the Germs	Melton, K. (2017)	*Germ Zappers*	Balkwill, F. (2001)	Germs
The Boy Who Drew Birds	Davies, J. (2004)	*The Goose Man*	Greenstein, E. (2009)	Ethology/Interspecies Connections

For their scrapbooks, students can collect or create items such as stories, memorabilia, symbolic motifs, fictional journal entries, postcards, photographs, sketches, keepsakes, mementos, artifacts, news articles, advertisements, and other images of their favorite scientist. Each item can be accompanied by a caption that explains the importance of and connection to the scientists and their science. Students can organize their scrapbooks by listing items and captions under major headings that can then be used to introduce their scientists and highlight significant aspects of their discoveries.

Students can extend beyond traditional notions of cut-and-paste scrapbooks and develop digital scrapbooks. For example, students can use computers, digital cameras, 3-D scanners, desktop publishing software, scrapbook page layout software programs, and home printers to create sophisticated materials, innovative layouts, and design features and elements (Levie, 2004). Technology invites students to experiment with design features like shape, line direction, size, texture, pattern, and color as well as design elements such as focal point, balance, alignment, repetition, contrast, and white space. Whether traditional or digital, or both, student scrapbooks can represent and be used as archives of new understandings about scientists and science (Delacruz & Bales, 2010).

Table 2 provides additional Way-In and Stay-In picturebooks for LS2: Ecosystems: Interactions, Energy, and Dynamics. Teachers can use these picturebooks to anchor their own collections of texts to teach this scientific discipline and these disciplinary core ideas.

Table 2

Additional Way-In and Stay-In Picturebooks in Life Science: Ecosystems

Way-In Text	Author	Stay-In Text	Author	Topic
Is This Panama? A Migration Story	Thornhill, J. (2021)	*Circle*	Baker, J. (2016)	Bird Migration
The Mystery of the Monarchs	Rosenstock, B. (2022)	*When Butterflies Cross the Sky*	Cooper, S.K. (2015)	Butterfly Migration
Great Migrations: Whales, Wildebeests, Butterflies, Elephants, and Other Amazing Animals on the Move	Carney, E. (2010)	*Migration*	Gibbons, G. (2021)	Animal Migration
Amazing Animal Journeys	Marsh, L. (2010)	*Migration: Incredible Animal Journeys*	Unwin, M. (2019)	Animal Migration
Over and Under the Pond	Messner, K. (2017)	*Up in the Garden and Down in the Dirt*	Messner, K. (2017)	Ecosystems
Winter Sleep: A Hibernation Story	Taylor, S. (2019)	*Winter Survival When Crabs Cross*	Hanson, L.R. (2021)	Animal Hibernation
Moonlight Crab Count	Bathala, N. (2017)	*The Sand*	Cooper, S.K. (2015)	Crab Migration
Maps for Penguins and Other Traveling Animals	Turner, T. (2022)	*When Penguins Cross the Ice*	Cooper, S.K. (2015)	Penguin Migration

Life Science Disciplinary Core Idea #3: Heredity: Inheritance and Variation of Traits

This Way-In and Stay-In text pairing focuses on deoxyribonucleic acid (DNA).

Way-In: *Gregor Mendel: The Friar Who Grew Peas* (Bardoe, 2015) tells the scientific picturebook biography of Gregor Mendel, the friar-scientist who applied the scientific method to the field of biology. Mendel planned field experiments to explain how parents pass down traits to their children. His findings changed science forever. Today, he is commonly known as the world's first geneticist.

Stay-In: *Double Talking Helix Blues* (Herskowitz, 1993) is a scientific picturebook of an informational song that introduces the role DNA plays in the formation of new life. The song identifies the structure and function of DNA and includes important scientific terms like chromosome, nucleus, molecule, hydrogen bonds, and A, G, C, T. It ends with a double helix guide extending the information in the song.

Instructional Idea: The NGSS include several Science and Engineering Practices (SEP). One SEP is Developing and Using Models. This practice "offers students a sense-making tool to reason about how real-world events or systems work…and visualize and understand complex systems as scientists do when they explore the natural world" (Park, Rodriguez, & Campbell, 2019, p. 8). Like real scientists, students can develop their own models to illustrate, demonstrate, and explain their new understandings about scientists and science.

After reading about their favorite scientist or science topic, students can sketch and/or make physical models that describe and illustrate important information

Table 3

Additional Way-In and Stay-In Picturebooks in Life Science: Heredity

Way-In Text	Author	Stay-In Text	Author	Topic
Masterminds: Rosalind Franklin	Howell, I. (2021)	*Have a Nice DNA* *DNA: The Marvelous Molecule*	Balkwill, F. (2002) Van Loon, B. (2003)	DNA
Rosalind Franklin	Borgert-Spaniol, M. (2017)	*The Secret Code Inside You*	LaRoccza, (R. 2021)	DNA
James Watson and Francis Crick	Anniss, M. (2016)	*DNA is Here to Stay*	Balkwill, F. (1994)	DNA
Double Talking Helix Blues	Herskowitz, J. (1993)	*Double Helix*	Smith-Llera, D. (2017)	DNA
Gregor Mendel: Genetics Pioneer	Van Gorp, L. (2007)	*Genes & DNA*	Walker, R. (2003)	Genetics
Gregor Mendel: The Friar Who Grew Peas	Bardoe, C. (2015)	*Gene Machines* *Amazing Genes Within Your Genes*	Balkwill, F. (2002) Balkwill, F. (1994)	Genetics
I Got It From My Mama	Professor, B. (2017)	*My First Book about Genetics*	Wynne, P.J., & Silver, D.M. (2020)	Genetics
Karl, Get Out of the Garden	Sanchez, A. (2017)	*Plant Structure and Classification*	Midthun, J. (2016)	Scientific Classification

about the scientist and the science. Park, Rodriguez, & Campbell (2019) identify several representational options that students can keep in mind when developing their own models. These include:

- "Lines can represent connections;"
- "Different colors or thickness can represent emphasis;"
- "Arrows can represent causal relationships;"
- "Symbols and figures can represent concepts;"
- "Numbers can represent quantity or level;"
- "Words and sentences can describe mechanisms and explain processes" (p. 9-10).

In addition, students can attach sticky notes, post-it notes, or 3x5 cards to each model containing additional information about why each object was important to the scientist and science.

Table 3 provides additional Way-In and Stay-In picturebooks for LS3: Heredity: Inheritance and Variation of Traits. Teachers can use these picturebooks to anchor their own collections of texts to teach this scientific discipline and these disciplinary core ideas.

Life Science Disciplinary Core Idea #4: Biological Evolution: Unity and Diversity

This Way-In and Stay-In text pairing highlights the concept of evolution.

Way-In: *Tree of Life: A Book Depicting the Life of Charles Darwin* (Sis, 2003) is the scientific picturebook

Table 4

Additional Way-In and Stay-In Picturebooks in Life Science: Biological Evolution

Way-In Text	Author	Stay-In Text	Author	Topic
Tree of Life: A Book Depicting the Life of Charles Darwin	Sis, P. (2003)	*Darwin's Tree of Life* *Who Will It Be?*	Bright, M. (2019) Vitale, P. (2020)	Evolution
Charles Darwin's Around-the-World Adventure	Thermes, J. (2016)	*The Mystery of Darwin's Frog* *Billions of Years Amazing Changes*	Crump, M. (2013) Pringle, L. (2011)	Evolution
Animals Charles Darwin Saw	Markle, S. (2009)	*Mammals Who Morph* *What Darwin Saw*	Morgan, J. (2006) Schanzer, R. (2009)	Evolution
Our Family Tree	Peters, L.W. (2003)	*Darwin's Rival: Alfred Russel Wallace*	Dorion, C. (2020)	Evolution
Island: A Story of the Galapagos	Chin, J. (2021)	*Mr. Darwin's Birds*	Binney, A.J. (2021)	Natural Selection
When Darwin Sailed the Sea	Long, D. (2020)	*Charles Darwin's On the Origin of Species*	Radeva, S. (2019)	Natural Selection
One Beetle Too Many	Lasky, K. (2014)	*Darwin: With Glimpses into His Private Journal and Letters*	McGinty, A.B. (2009)	Natural Selection

biography of Charles Darwin. It uses text from Darwin's own writings and informational illustrations presented in gatefold spreads. The story describes his life and traces his work as a naturalist and scientist, his field observations and discoveries in the Galapagos Islands, and, ultimately, his development and publication of his theory of evolution by natural selection.

Stay-In: *Animals Charles Darwin Saw* (Markle, 2009) is a scientific informational picturebook that expands on Darwin's theory of natural selection by describing the animals he saw on his journeys. It describes how these animals developed characteristics over time in order to survive and prosper. The picturebook also discusses how Darwin's analysis of samples changed the scientific world forever.

Instructional Idea: As an important part of his scientific work, Charles Darwin drew maps that illustrated his famous voyages around the world on the surveying ship, HMS *Beagle*. He also wrote many letters describing the places he visited and experiences he had collecting rocks, fossils, insects, plants, animals, and fish, as well as the theories he was developing based on the data he was collecting.

In the spirit of Darwin, and many other scientists like him, students can read about their favorite scientists, especially ones who made long journeys, physical or theoretical, on the way to making famous discoveries. Then using the definition of a map as a symbolic representation of a place or location, students can draw a detailed map on a large piece of flipchart paper illustrating the different geographic locations their scientists visited or the progressive intellectual thinking they experienced along their journeys. Students can also create an illustrated travel booklet providing important information about each place and location on the journey and the scientific significance of each. Another option includes creating an illustrated scientific journal tracing important questions, hypotheses, experiments, findings, conclusions, and reflections recorded by their scientists.

Table 4 provides additional Way-In and Stay-In picturebooks for LS4: Biological Evolution: Unity and Diversity. Teachers can use these picturebooks to anchor their own collections of texts to teach this scientific discipline and these disciplinary core ideas.

Final Thoughts on Using Way-In & Stay-In Scientific Picturebooks

This article began with the assertion that storytelling will bring science to children. Science, however, is one discipline. Storytelling can also bring English Language Arts (ELA), social studies, mathematics, and all other disciplines to children. Now, I want to end by reiterating another assertion that "there are no better storytellers than teachers" (Smith, 2014, p. 62). With that in mind, I hope teachers at all grade levels and across all disciplines will tell these, and other, narrative Way-In texts and informational Stay-In texts with students, both to support their literacy growth and development, as well as to develop their knowledge of science and scientists.

References

Arabatzis, T., Renn, J., & Simoes, A. (2015) (Eds.). *Relocating the history of science.* Springer.

Barlow, D.L. (1991). Children, books, and biology. *BioScience, 41*(3), 166-168.

Broemmel, A.D., Rearden, K.T., & Buckner, C. (2021). Teachers' choices: Are they the right books for science instruction? *The Reading Teacher, 75*(1), 7-16.

Burnley, P.C. (2004). An earth science scrapbook project as an alternative assessment tool. *Journal of Geoscience Education, 52*(3), 245-249.

Creech, S., & Hale, G. (2006). Literacy in science: A Natural fit promoting student literacy through inquiry. *The Science Teacher, 73*(2), 22-27.

Dagher, Z., & Ford, D. (2005). How are scientists portrayed in children's science biographies? *Science & Education, 14*, 377–393.

Delacruz, E., & Bales, S. (2010). Creating history, telling stories, and making special: Portfolios, scrapbooks, and sketchbooks. *Art Education, 63*(1), 33-39.

Duke, N. (2000). 3.6 Minutes per day: The scarcity of informational texts in first grade. *Research Reading Quarterly, 35*, 202-224.

Enfield, M. (2007). "Could that really happen?" Elementary inquiry around informational and narrative texts. Paper presented at The Annual Meeting of the National Association for Research on Science Teaching, New Orleans, LA., April 15, 2007.

Ford, D. (2004). Highly recommended trade books: Can they be used in inquiry science? In E.W. Saul (Ed.). *Crossing Borders in Literacy and Science Instruction: Perspectives on Theory and Practice.* International Reading Association.

Hankins, T. L. (1979). In defense of biography: The use of biography in the history of science. *History of Science, 17*, 1-16.

Kaser, S. (2001). Searching the heavens with children's literature: A design for teaching science. *Language Arts, 78*(4), 348-356.

Keene, E.O. & Zimmerman, S. (1997). Mosaic of thought: The power of comprehension strategy instruction. Heinemann.

Levie, E. (2004). Scrapbooking, cyberstyle. U.S. News & World Report, 137(8), 62. Retrieved from: www.usnews.com, January 28, 2022

Lovedahl, A.N., & Bricker, P. (2006). Using biographies in science class. *Science and Children, 44*(3), 38-43.
National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards.* Washington, DC.
Next Generation Science Standards Lead States. 2013. *Next Generation Science Standards: For states, by states.* The National Academies Press.
Nye, M.J. (2006). Scientific biography: History of science by another means? *Isis, 97*(2), 322-329.
Owens, T. (2009). Going to school with Madame Curie and Mr. Einstein: Gender roles in children's science biographies. *Cultural Studies of Science Education, 4*, 929-943.
Pappas, C. (2006). The information book genre: Its role in integrated science literacy research and practice. *Reading Research Quarterly, 41*(2), 226-250.
Park, B., Rodriguez, L., & Campbell, T. (2019). Using models to teach science. *The Science Teacher, 87*(4), 8-11.
Phillips, S. (2007). Using scrapbooks in science. Retrieved from: https://www.nasa.gov/pdf/292341main_Scrapbooks_in_Science.pdf, January 28, 2022.
Roach, L.E., & Wandersee, J.H. (1995). Putting people back into science: Using historical vignettes. *Social Science and Mathematics, 95*(7), 365-370.
Roach, L.E., & Wandersee, J.H. (1993). Short story science: Using historical vignettes. *The Science Teacher, 60*(6), 18-21.
Saul, E.W. (2004). *Crossing borders in literacy and science instruction: Perspectives on Theory into Practice.* International Reading Association.
Smith, F. (2014). *To Think: In Language, Learning and Education.* Routledge
Terrell, M. (2006). Biography as cultural history of science. *Isis, 97*(2), 306-313.
Wandersee, J.H., & Roach, L.E. (2005) Interactive historical vignettes. In Mintzes, J.J. (Ed.), Teaching science for understanding: A human constructivist view. Elsevier Academic Press.

Literature Cited

Baker, J. (2016). *Circle.* Candlewick.
Bardoe, C. (2015). *Gregor Mendel: The friar who grew peas.* Abrams Books.
Davies, J. (2004). *The boy who drew birds.* HMH Books for Young Readers.
Engle, M. (2010). *Summer birds: The butterflies of Maria Merian.* Henry Holt & Co.
Herskowitz, J. (1993). *Double talking helix blues.* Cold Spring Harbor Laboratory Press.
Krull, K. (2020). *Stay curious: A brief history of Stephen Hawking.* Crown Books.
Markle, S. (2009). *Animals Charles Darwin saw.* Chronicle Books.
Stahl, A. (2020). *The big bang book.* Creston Books.
Than, K. (2010). *Black holes.* Children's Press.
Sis, P. (2003). *Tree of life: A book depicting the life of Charles Darwin - naturalist, geologist and thinker.* Farrar, Straus & Giroux.
Wolflein, L. (1995). *Metamorphosis: Animals that change.* Dutton Juvenile.
Wood, M.B. (2021). *The universe: The big bang, black holes, and blue whales.* Nomad Press.

Author Biography

Dr. William Bintz is Professor in Literacy Education in the Department of Teaching, Leadership, and Curriculum Studies at Kent State University. He has taught high school English/Language Arts in Chicago, Illinois, and middle school English/Language Arts in Aguadilla, Puerto Rico, San Juan, Puerto Rico and Dhahran, Saudi Arabia. He earned his Ph.D. in reading education at Indiana University. Prior to joining the faculty at Kent State, he was a Visiting Lecturer at the Armidale College of Advanced Education in Armidale, Australia, as well as an assistant professor at Western Kentucky University in Bowling Green, Kentucky, James Madison University in Harrisonburg, Virginia, and the University of Kentucky in Lexington, Kentucky. His personal experiences and professional interests include literacy across the curriculum, K-12, collaborative teacher research, interdisciplinary curriculum, and using award-winning literature as "Way-In" and "Stay-In" literature to create and sustain student interest in content area topics where no interest currently exists. Currently, his professional interest is the use of Crossover Picturebooks, K-12. He can be reached at <wpbintz@gmail.com>.