



# What Research Says about Leveraging the Literacy Block for Learning

HyeJin Hwang, Florida State University  
Sarah M. Lupo, James Madison University  
Sonia Q. Cabell, Florida State University  
Sen Wang, Florida State University

When literacy instruction is designed to support students' knowledge about nature and social world, it can foster both literacy and knowledge development. In this article, the authors describe how to design knowledge-building instruction in the literacy instructional block using four steps to guide the process. First, plan units around content concepts. Second, use conceptually coherent text sets thoughtfully ordered to build concept knowledge. Third, design hands-on activities in connection with reading, writing, and discussion. Fourth, teach vocabulary using categorical relationships among words around content concepts. Examples and common pitfalls are illustrated for each step to help teachers design their literacy instruction to maximize both literacy development and support content learning in science and social studies.

## Literacy Block for Learning

Over the past two decades, U.S. elementary schools have increased the length of the literacy block in an effort to improve literacy scores, leaving disproportionately less time for content-area instruction (Teale, Paciga, & Hoffman, 2007). Specifically, a national survey indicates that the average time spent in English Language Arts (ELA) instruction in first through fourth grades is 11.4 hours each week, whereas only 2.5 hours each week is spent in science and social studies instruction (Cox, Parmer, Strizek, & Thomas, 2016). Yet, despite the increased time spent in literacy instruction, our most recent Nation's Report Card demonstrates that approximately two thirds of fourth-grade students did not

reach a proficient level of reading achievement (National Assessment for Educational Progress [NAEP], 2019).

The claim that content knowledge, or rather, the lack thereof, is one of the critical factors that may be influencing the decreasing literacy scores has been highlighted in recent years (see Cervetti & Hiebert, 2019). Although knowledge is a broad term encompassing many different kinds of things that children know (e.g., Alexander, Schallert, & Hare, 1991), we are focusing specifically on *content knowledge*, in particular, the understanding of nature and social world related to science and social studies. Content knowledge is a critical aspect of reading as it helps readers draw inferences (Fincher-Kiefer, 1992) and learn vocabulary (Neuman & Wright, 2014). Traditionally, content-area instruction in elementary school has been regarded as the time to build students' science and social studies knowledge, while the ELA block has been viewed as the place to develop literacy skills and strategies (Palincsar & Duke, 2004).

However, cultivating students' content knowledge during the ELA block has significant advantages for students' literacy and knowledge development (Hirsch, 2006). Incorporating social studies and science content into the literacy block provides a meaningful and engaging context for literacy learning. That is, reading and writing to acquire new information about nature and the social world can make literacy activities purposeful, which can support students' motivation to engage in literacy activities (Guthrie, Anderson, Alao, & Rinehart, 1999). In contrast, focusing on teaching literacy skills with little attention to building knowledge may be less effective in supporting literacy development because reading and writing may be disconnected from meaningful purpose (Barber & Cervetti, 2019). In the current context of reduced instructional time for content area instruction, supporting students' content learning during the ELA block can also serve as a necessary complement for science and social studies learning.

*When literacy instruction is designed to support students' knowledge about nature and the social world, it can foster both literacy and knowledge development.*

Teachers can effectively integrate knowledge building into the literacy block to simultaneously support literacy development *and* content knowledge. However, it is not as simple as providing opportunities for students to read science or social studies texts. For example, a common challenge with attempts to infuse social studies into the literacy block is that selected texts sometimes misrepresent, distort, or minimize the content objectives (e.g., Brophy, Alleman, & Halvorsen, 2013). Science educators have found that many science texts used during literacy instruction may contain misconceptions or visuals that do not accurately depict the scientific concepts being taught (e.g., Justi & Gilbert, 2002). Moreover, teachers may focus on teaching discrete factual information, rather than systematically building students' knowledge of important concepts (Hirsch, 2006).

Building content knowledge while simultaneously supporting literacy development is no easy task. Knowledge-building techniques that can *both* support content learning *and* literacy look different than knowledge-building techniques that may occur during a content block. Thus, given the increased emphasis on building knowledge alongside a desire to avoid watered down or inaccurate content instruction, we (former teachers, teacher educators, and researchers) wanted to explore how to build content knowledge during literacy instruction. We identified four studies that examined content knowledge-building instruction that supplemented or took place within the ELA block. In this article, we describe four steps for teachers to design their own content-focused literacy instruction, which were all parts of two or more effective programs. By closely examining these successful practices from the research, we argue that

***Content knowledge is a critical aspect of reading as it helps readers draw inferences (Fincher-Kiefer, 1992) and learn vocabulary (Neuman & Wright, 2014). Traditionally, content-area instruction in elementary school has been regarded as the time to build students' science and social studies knowledge, while the ELA block has been viewed as the place to develop literacy skills and strategies (Palincsar & Duke, 2004).***

supporting content knowledge during ELA can complement existing content-area instruction.

## **Promising Content Knowledge-building Practices in ELA**

To identify common practices that can support both literacy and content knowledge during the literacy block, we conducted a systematic search of previous experimental studies, published in refereed journals. We found 29 studies that examined integrated instruction between literacy and content areas that occurred during the ELA and/or content-area sessions in K-5 grades (Hwang, Cabell, White, & Joyner, 2019). Here, to provide teachers with evidence-based and more relevant descriptions about how to support content knowledge and literacy *during* the ELA block, we focused on four studies that (1) supplemented or took place as part of ELA instruction, (2) tested students' literacy development (vocabulary and/or comprehension) and content knowledge, (3) and focused explicitly on knowledge building.

All four of the studies showed positive effects for content knowledge building in the ELA block, improving either students comprehension, vocabulary, and/or content knowledge in K-5 grades (see Table 1). That is, the studies reported that students who received content knowledge building instruction during ELA generally outperformed students who did not receive this support. Importantly, content knowledge building instruction appeared beneficial for economically disadvantaged students (Connor et al., 2017; Neuman & Kaefer, 2018), as well as for students who are learning English as a second language (Neuman & Kaefer, 2018).

Although these studies varied in their instructional approaches, we identified four high-impact content knowledge building practices that occurred across multiple studies. We have ordered the four suggestions as steps to support teachers in designing instruction to build science and social studies knowledge during the literacy block (Figure 1). The following sections will first explain each step using examples from the four studies and other relevant literature. Then, we will provide examples of what instruction looks like during the literacy block created by the second author in collaboration with practicing teachers.

### **Step 1: Plan Units Around Content Concepts**

Teaching a science or social studies *concept* can be characterized as teaching connected ideas within a topic and the organization among these ideas. This step occurs at the unit-planning level, not the lesson-planning level. Planning a unit for literacy instruction centered around concepts starts

with identifying concepts to teach using science and social studies standards and students' interest and prior knowledge. For example, Connor and colleagues (2017) found that when teaching students about the economic concept of goods and services (the Next Generation Sunshine Standards Social Studies [NGSSS], SS.1.E.1.1), this required that students also understand that people have different needs and wants. After selecting a content concept, teachers can organize a unit to teach students the connection between ideas related to the concept (e.g., lessons focusing on wants/needs followed by lesson on goods/services). This allows students to build new knowledge upon their prior knowledge.

**What does this look like?** The second author worked with a third grade teacher, Ms. Thomas (all names are pseudonyms), and together they designed and implemented a unit around the concept of electric and magnetic forces (see standard 3-PS2-3 in the Next Generation Science Standards [NGSS]). The intent of this standard (see Table 2) is to teach students about how magnets work, focusing on the idea that magnetic objects do not need to touch each other to interact, but the properties of magnetism, such as distance and orientation, can influence their magnetic interaction (see NGSS Lead States, 2013). By first selecting this concept, the second author and the teacher designed literacy instruction around texts and writing activities that also supported students' conceptual knowledge about prop-

*In the current context of reduced instructional time for content area instruction, supporting students' content learning during the ELA block can also serve as a necessary complement for science and social studies learning.*

*Teachers can effectively integrate knowledge building into the literacy block to simultaneously support literacy development and content knowledge. However, it is not as simple as providing opportunities for students to read science or social studies texts. For example, a common challenge with attempts to infuse social studies into the literacy block is that selected texts sometimes misrepresent, distort, or minimize the content objectives (e.g., Brophy, Alleman, & Halvorsen, 2013).*

erties of magnets and the influence of those properties on the magnetism of the two objects. See additional examples of different concepts in Table 2.

**Pitfalls to Avoid.** In many schools, teachers often design units around literacy skills, while leaving less room for content during the ELA block (Wexler, 2019). For example, a teacher may design a unit around identifying the main idea. As such, she selects texts that are not conceptually connected to each other but are perceived to support students in identifying the main idea of texts. However, previous research has found that an integrated approach between literacy and knowledge building can be more effective for comprehension and vocabulary development than teaching these literacy skills in isolation (e.g., Cervetti, Wright, & Hwang, 2016; Neuman & Kaefer, 2018), with the additional benefit of building students' knowledge. Thus, we suggest designing units that are centered around important concepts and teaching comprehension and vocabulary in the context of knowledge building.

### **Step 2: Use Conceptually Coherent Text Sets**

After identifying content concepts to teach, we suggest that teachers select texts around the concepts, ordered specifically to support conceptual knowledge. Connected text sets have been found to support students' comprehension and knowledge development because students can make informed inferences to understand new texts by leveraging information from previously read texts. For example, Cervetti et al. (2016) found that fourth graders used information they learned from previously read science books (e.g., birds need different materials to build different nests) to understand a book about threats to bird survival (e.g., chicks cannot survive if their parent birds cannot find the right materials to build their nests). In this way, ordering texts to support science and social studies concept development can support students' knowledge building (see also Lupo, Berry, Thacker, Sawyer, and Merritt [2019] for selecting and ordering connected texts using the quad text set framework).

Additionally, in social studies, we suggest that teachers use text sets that consist of both primary source materials, created by people who had a direct connection with historical events (e.g., diaries, interview transcripts), and secondary source texts, written for the interpretation of events by people who did not have a direct connection with events (National Council for the Social Studies [NCSS], 2013). For example, Connor and colleagues' (2017) *Content Area Literacy Instruction* program, which improved students' ability to comprehend texts, used primary source texts in social studies (e.g., letters, Bill of Rights) with artifacts (e.g., photographs) before reading secondary source texts (e.g., trade books).

**What does this look like?** The second author worked with a fifth grade teacher, Mr. Williams, to develop a conceptually coherent text set around the concept of how goods and services are exchanged and how people can make investments to earn money (see standard D2.Eco.6.3-5 in the NCSS). They first selected a challenging text that covered the most complex part of the standard, *Economix: How and Why Our Economy Works (and Doesn't Work) in Words and Pictures* by Michael Goodwin. This text illustrates the larger picture of how the economy works through exchanges of goods, services, and people making investments.

They then selected three additional texts to build knowledge and garner students interest in the topic and provide relevance. They decided to start with an excerpt from *Lawn Boy* by Gary Paulsen, which provides a funny story in which a child starts a lawn mowing services and accidentally ends up investing money in stock and becoming rich. Then, they selected a simple text that introduces the concepts of money and how it works called *National Geographic Kids Everything Money* by Kathy Furgang. Finally, Mr. Williams used a text called *Let's Chat About Economics: Basic Principles Through Everyday Scenarios* by Michelle Balconi to help students understand the basic principles of goods, services, and how they are exchanged.

Lastly, texts were ordered from simplest to most complex and literacy standards were selected to accompany each text. See Table 3 for a description and additional examples.

**Pitfalls to Avoid.** One pitfall to avoid when selecting connected texts to build science and social studies knowledge is not sequentially exposing students to more challenging aspects of a concept. For example, selecting three different texts that explain how money works and no texts that deepen students' understanding of the core concept (e.g., how the economy relies on exchanges of goods and services and people making investments) would not help students fully understand the concept.

Additionally, fostering conceptual knowledge with conceptually connected texts can support comprehension more effectively than teaching discrete ideas with unrelated texts. For example, selecting a text related to presidents one day, then selecting a text related to money the next day, is not an optimal way to build students' social studies knowledge. Conceptually coherent text sets allow students to leverage what they know to comprehend new texts alongside building new knowledge.

Another pitfall to avoid is holding students off from engaging in conceptually connected texts until students can read

by themselves. Teachers can read aloud conceptually connected, complex texts to build students' knowledge on important concepts. In a recent study, teachers' read-alouds of conceptually connected texts, as part of the *World of Words* program, enhanced vocabulary and conceptual knowledge in kindergarteners (Neuman & Kaefer, 2018).

### **Step 3: Design Hands-on Activities in Connection with Reading, Writing, and Discussion**

*Hands-on activities* involve students in manipulation and/or careful observation of concrete materials (Zahorik, 1996). Bringing hands-on activities related to science and social studies and literacy activities together can bolster students' literacy skills and conceptual knowledge because it provides students with authentic learning experiences and supports their interest in learning (Barber & Cervetti, 2019). To make hands-on activities meaningful to students and beneficial to their literacy and knowledge development, teachers can link hands-on activities with reading, writing, and discussion within the context of building knowledge (Guthrie et al., 1999).

Hands-on activities are useful to introduce a concept before students read about it because hands-on activities can stimulate students' relevant knowledge and experiences. For example, teachers in the study by Connor and colleagues (2017) had first-grade students sort pictures of different items by things they would like to purchase and things their parents would like to purchase before they read about economic concepts. The activity prompted students' relevant knowledge and experiences about purchasing goods and helped students understand economic concepts during reading that people have different wants and needs and make different decisions to use money based on their wants or needs.

Further, reading can be a springboard for hands-on activities. For example, Connor and her colleagues (2014) reported that after students read about economic concepts, wants/needs and goods/services, students collaboratively made a business plan for their own lemonade and snack stand. Based on the idea that people buy goods or services they want or need, students inferred what their potential customers would like to buy and decided products to sell to meet their customers' wants and needs.

Hands-on activities related to science and social studies also provide meaningful contexts for students to engage in discussion and writing. For example, Connor and colleagues (2017) reported that students involved in discussion and writing for the purpose of making and recording a business

plan for the snack stand. The teachers helped students apply what they learned from reading to plan the business during discussion and throughout the writing process. Similarly, Vitale and Romance (2012) reported that first- and second-grade students recorded steps to conduct experiments and results of experiments in their science journals. Encouraging students to frequently revisit their writing during hands-on activities can help students understand the purpose of writing in building conceptual knowledge. Students can refer to their writing about the concept to remember what they have learned and build up new knowledge. In this way, writing can serve as a tool for cumulative review on the concept learned.

**What does this look like?** In the same unit discussed earlier about economic principles, Mr. Williams engaged his fifth grade students with a simulation in which students played businessmen and investors (see Table 4). Prior to the simulation, the students discussed characteristics of a successful business (e.g., making profits, providing services people want) to develop their ideas to invent a product/service. Students also read *Let's Chat About Economics: Basic Principles Through Everyday Scenarios* to learn how to create a successful business pitch that can persuade their investors. During the simulation, students presented the business pitch as a businessman to persuade the investors (other students), who made decisions about products or services in which to invest their money. After the simulation, the class discussed what pitches were effective to make them want to invest in the product/service.

**Pitfalls to Avoid.** We recommend that teachers avoid using hands-on activities that do not cultivate conceptual knowledge. For example, engaging students in superficial activities, such as designing a coin with their face on it, does not improve students' knowledge about value of money. In addition, when the connection between hands-on activities and what students read is not explicitly discussed, hands-on activities do not develop conceptual knowledge (Barber & Cervetti, 2019). For example, let's take a teacher who engages students in conducting an experiment about mixing different liquids with various colors to teach about the density of liquids. If the teacher does not explain how the experiment is related to previous readings about liquids, then after the experiment, students are likely to report that they learned how to make a rainbow in a glass instead of density of liquids.

#### **Step 4: Teach Vocabulary Using Categorical Relations Among Words**

The fourth step for designing instruction that builds con-

ceptual knowledge during ELA instruction is to teach the relations among words. Teaching students how words are related to one another around content concepts can enhance students' conceptual knowledge (Nesbit & Adesope, 2006). For example, students who know that *Senate* belongs to the category *legislative branch* are more likely to develop rich conceptual understanding about the function of *Senate* than students who are not aware of this relationship. In addition, teaching relations among words around content concepts can enhance vocabulary because students can develop well-organized semantic network (Willingham, 2017). Strong semantic networks can facilitate retrieval of word meanings (Mezynski, 1983) and foster depth of word knowledge (Neuman, Kaefer, & Pinkham, 2014). Hiebert (2019) argues that teaching how words are related is one of the most important vocabulary changes that a teacher can make. Indeed, Neuman and Kaefer (2018) found that teaching words (e.g., camels, scorpions) with the higher category (e.g., animals living in the desert) deepened kindergarten students' conceptual knowledge (e.g., important properties of animals living in the desert) and their understanding of word meanings.

Semantic maps and word pictures are useful to teach how words are connected. For example, for the concept "plants and where they grow," students can identify the following word categories: types of vines, types of trees, fruits, and vegetables (see Hiebert, 2019). As students read various texts, they can add words to a semantic map under the categories (e.g., under types of trees they add maple, pine, and oak). They can also add categories as their conceptual knowledge grows (see [textproject.org](http://textproject.org) for additional examples).

**What does this look like?** When Ms. Thomas implemented the magnetism unit, she frequently stopped while reading to explain and ask questions about the meanings of important words and point out how the words were related to each other. For example, when reading *The Power of Magnets*, Ms. Thomas read the word *attracts* and asked students if this word is a characteristic or type of magnet. Using discussion, she helped students understand that one characteristic of magnets is that it *attracts* other magnets.

After reading, Ms. Thomas focused her instruction around the relationships of the magnetism words. She used a concept of definition map (Schwartz & Raphael, 1985) to allow students to see the relationships among the words and provide a visual representation. This technique illustrates relations among words connected to the main concept, in this case a magnetic object (see Figure 2). Ms. Thomas demonstrated to her students that magnetic objects fall under the

larger category of magnetism. Next, students identified the characteristics of the main concept, *magnetic objects*. This included the properties of *magnetism* such as *repel* and *attract*, as well as important components of a magnet such as *poles* and *conductor*. Ms. Thomas also added to a concept of definition map *electricity* as a non-example to solidify students' understanding of the characteristics of *magnetic objects*. Lastly, Ms. Thomas supported students in identifying examples of the main concept. Here, differentiating between *permanent* and *temporary magnets*, which are dependent on whether magnetic properties remain when the object is in a *magnetic field*. Providing specific examples (e.g., a paperclip can be a temporary magnet) helped solidify her students' understanding of the concepts. While making a concept of definition map, Ms. Thomas also asked students to think about what they learned from texts and hand-on activities. See additional examples of words that have categorical relationships around a concept in Table 5.

**Pitfalls to Avoid.** Engaging in traditional vocabulary instructional practices, such as matching activities or writing dictionary definitions, may not support students' word knowledge related to concepts (Cobb & Blachowicz, 2014). For example, asking students to highlight words they do not know about magnetism and then copy the definition from the dictionary does not allow students to see how the various magnetism vocabulary words are connected to one another. Further, not providing opportunities for students to see the words in context and read a variety of texts containing the words can impede students' ability to truly learn the words (Eller, Pappas, & Brown, 1988).

**Content knowledge is a critical aspect of reading as it helps readers draw inferences (Fincher-Kiefer, 1992) and learn vocabulary (Neuman & Wright, 2014). Traditionally, content-area instruction in elementary school has been regarded as the time to build students' science and social studies knowledge, while the ELA block has been viewed as the place to develop literacy skills and strategies (Palincsar & Duke, 2004).**

## Conclusion

Current elementary ELA instruction takes a substantial portion of the school day, leaving less time for content-area teaching. Yet, a focus on building students' knowledge of science and social studies topics during the ELA block can facilitate both content-area and literacy learning. Research has identified the positive benefits of content knowledge on vocabulary and comprehension, with studies suggesting specific approaches that teachers can take to support content knowledge building during literacy instruction. Through engaging in our four-step plan, teachers can make a positive impact on students' vocabulary, comprehension, and content knowledge. This instruction can be implemented using read-alouds or by having students independently reading conceptually coherent texts in order to build knowledge. By developing students' content knowledge during ELA instruction, teachers are utilizing a more integrative approach that can simultaneously advance multiple areas of literacy development and learning.

## References

- Alexander, P. A., Schallert, D. L., & Hare, V. C. (1991). Coming to terms: How researchers in learning and literacy talk about knowledge. *Review of Educational Research*, 61(3), 315-343. doi:10.3102/00346543061003315
- Barber, J., & Cervetti, G. N. (2019). *No more science kits or texts in isolation*. Portsmouth, NH: Heinemann.
- Brophy, J., Alleman, J., & Halvorsen, A. (2013). *Powerful social studies for elementary students* (3rd ed.). Belmont, CA: Wadsworth: Cengage Learning.
- Cervetti, G. N., Wright, T. S., & Hwang, H. (2016). Conceptual coherence, comprehension, and vocabulary acquisition: A knowledge effect? *Reading and Writing: An Interdisciplinary Journal*, 29(1), 1-19. doi:10.1007/s11145-016-9628-x
- Cervetti, Gina N., & Hiebert, E. H. (2019). Knowledge at the center of English language arts instruction. *Reading Teacher*, 72(4), 499-507. doi:10.1002/trtr.1758
- Cobb, C., & Blachowicz, C. (2014). *No more "look up the list" vocabulary instruction*. Portsmouth, NH: Heinemann.
- Connor, C. M. D., Dombek, J., Crowe, E. C., Spencer, M., Tighe, E. L., Coffinger, S., ... Petscher, Y. (2017). Acquiring science and social studies knowledge in

- kindergarten through fourth grade: Conceptualization, design, implementation, and efficacy testing of content-area literacy instruction (CALI). *Journal of Educational Psychology*, 109(3), 301–320. doi:10.1037/edu0000128
- Connor, C. M., Phillips, B. M., Kaschak, M., Apel, K., Kim, Y., Otaiba, S. A., ... Lonigan, C. J. (2014). Comprehension tools for teachers: Reading for understanding from prekindergarten through fourth grade. *Educational Psychology Review*, 26(3), 379–401. doi:10.1007/s10648-014-9267-1.Comprehension
- Cox, S., Parmer, R., Strizek, G., & Thomas, T. (2016). *Documentation for the 2011–12 schools and staffing survey (NCES 2016-817)*. Washington, DC: National Center for Education Statistics.
- Eller, R. G., Pappas, C. C., & Brown, E. (1988). The lexical development of kindergarteners: Learning from written context. *Journal of Literacy Research*, 20(1), 5–24. doi:10.1080/10862968809547621
- Fincher-Kiefer, R. (1992). The role of prior knowledge in inferential processing. *Journal of Research in Reading*, 15(1), 12–27. doi:10.1111/j.1467-9817.1992.tb00018.x
- Flick, L. B. (1993). The meanings of hands-on science. *Journal of Science Teacher Education*, 4(1), 1–8. doi:10.1007/BF02628851
- Florida Department of Education. (2008). *Next Generation Sunshine State Standards*. Retrieved from [https://www.flrules.org/gateway/readRefFile.asp?refId=4239&filename=FINAL\\_FINANCIAL\\_LITERACY\\_STRAND-FINAL.pdf](https://www.flrules.org/gateway/readRefFile.asp?refId=4239&filename=FINAL_FINANCIAL_LITERACY_STRAND-FINAL.pdf)
- Guthrie, J. T., Anderson, E., Alao, S., & Rinehart, J. (1999). Influences of Concept-Oriented Reading Instruction on strategy use and conceptual learning from text. *The Elementary School Journal*, 99(4), 343–366. doi:10.1086/461929
- Hiebert, E. H. (2019). *Teaching words and how they work: Small changes for big vocabulary results*. Teachers College Press.
- Hirsch, E. D. (2006). The case of bringing content into the language arts block and for a knowledge-rich curriculum core for all children. *American Educator*, 30(1), 8–17. Retrieved from <http://www.aft.org/periodical/american-educator/spring-2006/building-knowledge>
- Hwang, H., Cabell, S. Q., White, T. G., & Joyner, R. (2019, December). *A systematic review of the research on the effect of knowledge building in literacy instruction on comprehension and vocabulary in the elementary years*. Paper presented at the annual meeting of the Literacy Research Association. Tampa, FL.
- Justi, R., & Gilbert, J. (2002). Models and modeling in chemical education. In J. K. Gilbert, O. de Jong, R. Justi, D. F. Treagust, & J. H. van Driel (Eds.), *Chemical education: Towards research-based practice* (pp. 47–68). Boston, MA: Kluwer Academic Publishers.
- Lupo, S. M., Berry, A., Thacker, E., Sawyer, A., & Merritt, J. (2019). Rethinking text sets to support knowledge building and interdisciplinary learning. *The Reading Teacher*, 0(0), 1–12. doi:10.1002/trtr.1869
- Mezynski, K. (1983). Issues concerning the acquisition of knowledge: Effects of vocabulary training on reading comprehension. *Review of Educational Research*, 53(2), 253–279.
- National Assessment for Educational Progress (NAEP). (2019). *Results from the 2019 mathematics and reading assessments*. Retrieved from [https://www.nationsreportcard.gov/mathematics/supportive\\_files/2019\\_infographic.pdf](https://www.nationsreportcard.gov/mathematics/supportive_files/2019_infographic.pdf)
- National Council for the Social Studies. (2013). *The College, Career, and Civic life (C3) framework for social studies state standards: Guidance for enhancing the rigor of K-12 civics, economics, geography, and history*. Silver Spring, MD: NCSS.
- National Governors Association Center for Best Practices & Council of Chief State School. (2010). *Common Core State Standards for English language arts and literacy in history/social studies, science, and technical subjects*. Washington, DC: Authors.
- Nesbit, J. C., & Adesope, O. O. (2006). Learning with concept and knowledge maps: A meta-analysis. *Review of Educational Research*, 76(3), 413–448. doi:10.3102/00346543076003413
- Neuman, S. B., & Kaefer, T. (2018). Developing low-income children's vocabulary and content knowl-

edge through a shared book reading program. *Contemporary Educational Psychology*, 52, 15–24. doi:10.1016/j.cedpsych.2017.12.001

Neuman, S. B., Kaefer, T., & Pinkham, A. (2014). Building background knowledge. *Reading Teacher*, 68(2), 145–148. doi:10.1002/trtr.1314

Neuman, S. B., & Wright, T. S. (2014). Teaching vocabulary in the early childhood classroom. *American Educator*, Summer, 4–13.

NGSS Lead States. (2013). *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press.

Palincsar, A. S., & Duke, N. K. (2004). The role of text and text-reader interactions in young children's reading development and achievement. *The Elementary School Journal*, 105(2), 183–197. doi:10.1086/428864

Schwartz, R. M., & Raphael, T. E. (1985). Concept of defini-

tion: A key to improving students' vocabulary. *Reading Teacher*, 39, 198–205.

Teale, W. H., Paciga, K. a, & Hoffman, J. L. (2007). Beginning reading instruction in urban schools: The curriculum gap ensures a continuing achievement gap. *Reading Teacher*, 61(4), 344–348. doi:10.1598/rt.61.4.8

Wexler, N. (2019). *The knowledge gap: The hidden cause of America's broken education system—and how to fix it*. New York: NY: Avery.

Willingham, D. (2017). *The reading mind: A cognitive approach to understanding how the mind read*. San Francisco, CA: Jossey-Bass.

Zahorik, J. A. (1996). Elementary and secondary teachers' reports of how they make learning interesting. *Elementary School Journal*, 96(5), 562–564



**Table 1**

Four studies that showed positive effects of building knowledge on comprehension, vocabulary, and/or knowledge

Author (Year)	Grade	Knowledge-building practices			Compared to the ELA without knowledge building, students who received knowledge-building support did better on			
		Focusing on concepts & using connected texts	Regularly engaging students in	Providing hands-on activities	Categorical relationships between words	Comprehen-sion	Vocabulary	Knowledge
Authors (2016)	4	Yes (science)	reading and discussion	minimal	No	Yes	Yes	Yes
Connor et al. (2017)	K-4	Yes (science and social studies)	reading, writing, and discussion	Yes	No	Yes (Grade 4)	Yes (Grade 4)	Yes (K-4)
Neuman & Kaefer (2018)	K	Yes (science)	reading and discussion	No	Yes	not assessed	Yes	Yes
Vitale & Romance (2012)	1-2	Yes (science)	reading, writing, and discussion	Yes	Yes (conceptual map)	Yes	not assessed	Yes

**Table 2**

Examples of Concepts at Different Grade Levels

Grade Level	Concept Taught	Content Standard
Grades K-1	How characteristics of animals develop based on their needs	NGSS 1-LS1-1: "Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs" (NGSS Lead States, 2013).
Grades 2-3	The properties of electric and magnetic forces that increase or decrease the magnetism between objects	NGSS 3-PS2-3: "Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other" (NGSS Lead States, 2013).
Grades 4-5	The role of money in exchange of goods and services and how to invest to increase money earned	C3 Framework D2.Eco.5.3-5 "Explain the role of money in making exchange easier" D2.Eco.6.3-5 "Explain the relationship between investment in human capital, productivity, and future incomes"(National Council for Social Studies, 2013).

**Table 3***Examples of texts and literacy standards that support conceptual knowledge development*

Grade Level & Concept	Simplest Texts & Literacy Standards	More Complex Texts	Most complex text(s)
Grades K-1 How characteristics of animals develop based on their needs	A Home for Pearl Squirrel by Amy Crane Johnson  Welcome to the Neighborhood by Shawn Shelby  RI 1.2: "Identify the main topic and retell key details of a text" (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School [CCSSO], 2010).	Basic Needs by Dr. Jean Feldman  RI 1.3: "Describe the connection between two individuals, events, ideas, or pieces of information in a text" (NGA Center & CCSSO, 2010).	Where in the Wild by Johnny Lambert  RI 1.4: "Ask and answer questions to help determine or clarify the meaning of words and phrases in a text" (NGA Center & CCSSO, 2010).
Grades 2-3 The properties of electric and magnetic forces that increase or decrease the magnetism between objects	What Makes a Magnet? by Dr. Franklyn M. Branley  Magnet Max by Monica Hughes  RI 3.2: "Determine the main idea of a text; recount the key details and explain how they support the main idea" (NGA Center & CCSSO, 2010).	The Power of Magnets (Science A-Z)  RI 3.5: "Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently" (NGA Center & CCSSO, 2010).	What's the Attraction by Home Science Learning  RI 3.7: "Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text" (NGA Center & CCSSO, 2010).
Grades 4-5 The role of money in exchange of goods and services and how to invest to increase money earned	Lawn Boy by Gary Paulsen  National Geographic Kids Everything Money by Kathy Furgang  RI 5.2: "Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text" (NGA Center & CCSSO, 2010).	Let's Chat About Economics: Basic Principles Through Everyday Scenarios by Michelle Balconi  RI 5.3: "Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text" (NGA Center & CCSSO, 2010).	Economix: How and Why Our Economy Works (and Doesn't Work) in Words and Pictures by Michael Goodwin  RI 5.8: "Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s)" (NGA Center & CCSSO, 2010).

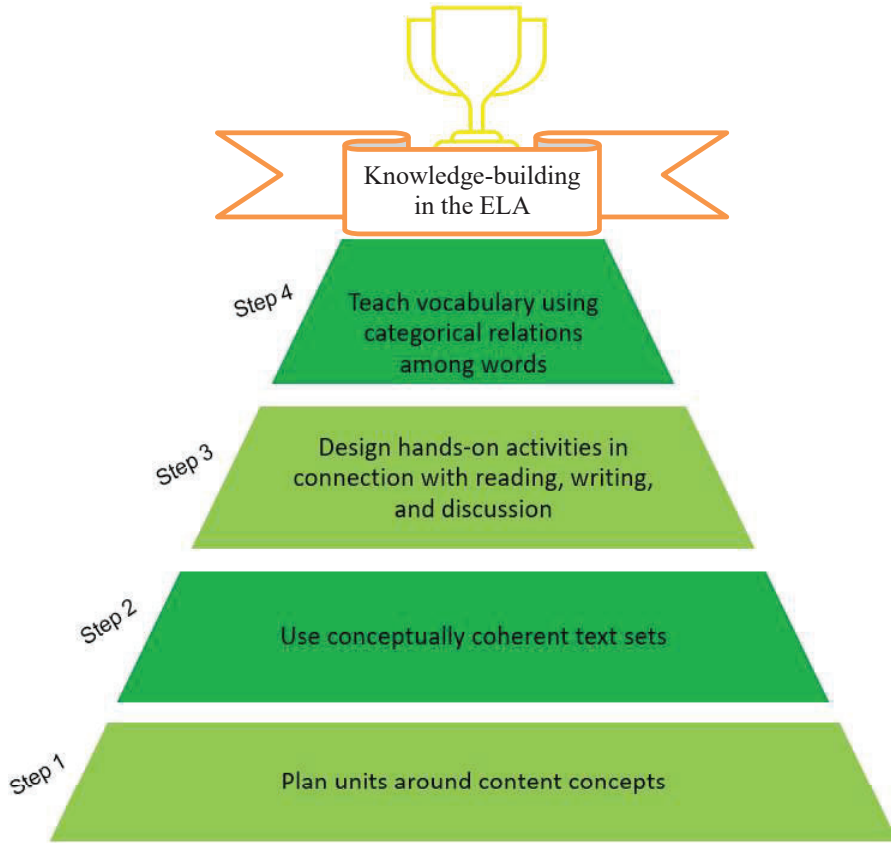
**Table 4***Examples of Hands-on Activities and Accompanying Literacy Activities*

Grade Level & Concept	Hands-on Activities	Connection to Reading	Connection to Writing	Connection to Discussion
Grades K-1 How characteristics of animals develop based on their needs	Students participated in observation of realia of maple leaves in different colors	Students made predictions throughout the read-alouds <i>Leaves Fall Down</i> by Lisa Bullard.  SL 1.2: "Ask and answer questions about key details in a text read aloud or information presented orally or through other media. Writing: a poster to explain something" (NGA Center & CCSSO, 2010).	Students made a poster that explains the life cycle of maple trees by season with photos.  W 1.2: "Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure" (NGA Center & CCSSO, 2010).	During the read-alouds, students discussed why maple leaves have different colors.  SL 1.1: "Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups" (NGA Center & CCSSO, 2010).
Grades 2-3 The properties of electric and magnetic forces that increase or decrease the magnetism between objects	Experiment where students tested magnets with different properties and identified how the force of magnetism changes.	Students made hypotheses about what will happen in the experiment after reading <i>What's The Attraction</i> .  RI 3.1: "Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers" (NGA Center & CCSSO, 2010).	Students recorded observations of the magnets throughout the experiment.  W 3.2: "Write informative/explanatory texts to examine a topic and convey ideas and information clearly" (NGA Center & CCSSO, 2010).	Students shared their findings and whether their hypothesis was proved or disproved.  SL 3.1: "Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly" (NGA Center & CCSSO, 2010).
Grades 4-5 The role of money in exchange of goods and services and how to invest to increase money earned	Students participated in a simulation where the students had the opportunity to invent a product or service, write a pitch to land an investment deal, and use money to invest in/buy one another's good/services given a certain budget.	Students researched what must go into creating a successful business pitch through reading <i>Let's Chat About Economics: Basic Principles Through Everyday Scenarios</i> .  RI 5.8: "Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s)" (NGA Center & CCSSO, 2010).	Students went through the writing process to create their pitch for fellow classmates to invest in their product or service.  W 5.1: "Write opinion pieces on topics or texts, supporting a point of view with reasons and information" (NGA Center & CCSSO, 2010).	Before the simulation, the students discussed what the qualities and characteristics are of a successful business. After their pitches, they discussed what their classmates included in their pitches that made them want to invest in the product/service  SL 5.1: "Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others' ideas and expressing their own clearly" (NGA Center & CCSSO, 2010).

**Table 5***Examples of Categorically Connected Words*

Grade Level & Concept	Categorically Connected Vocabulary	Vocabulary Activities
Grades K-1 How characteristics of animals develop based on their needs	characteristics, adaptations, survival, camouflage, webbed feet, blubber, habitat, body coverings, behaviors, body parts, beak	After reading the texts <i>A Home for Pearl</i> and <i>Basic Needs</i> , students list words related to animal adaptations, then group and label those words.  L.1.5: "With guidance and support from adults, demonstrate understanding of word relationships and nuances in word meanings" (NGA Center & CCSSO, 2010).
Grades 2-3 The properties of electric and magnetic forces that increase or decrease the magnetism between objects	magnetic object, magnetic field, and temporary magnet, permanent magnet, repel, attract, electric current, poles, conductor	Students create a concept of definition map around the concept of magnetic objects under the heading "Magnetism." Students list the characteristics of magnets, including magnetic field, repel, attract, poles, conductor as well as examples of different kinds of magnets, temporary and permanent magnets.  L.3.5: "Demonstrate understanding of figurative language, word relationships and nuances in word meanings" (NGA Center & CCSSO, 2010).
Grades 4-5 The role of money in exchange of goods and services and how to invest to increase money earned	goods, services, supply, demand, investment, currency, opportunity cost, profit, budget, economy, economic choices	Students create a flow chart to show how the vocabulary words connect to one another.  L.5.5: "Demonstrate understanding of figurative language, word relationships, and nuances in word meanings" (NGA Center & CCSSO, 2010).

**Figure 1**  
*Four Steps for Planning a Unit for Knowledge-Building ELA Instruction*



**Figure 2**  
*Concept of Definition Map for Magnetism Words*

