Information in Action

The Research Base
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This paper provides a summary of the research base regarding effective professional development, project-based instruction, and informational reading and writing development, and explains how that research base is reflected in *Information in Action*.

**Effective Professional Development**

One-shot, sit-and-get workshops or presentations have long been the norm for teacher professional development in the United States (Ball & Cohen, 1999). Indeed, Ball and Cohen (1999) contend that teacher professional development is “often intellectually superficial, disconnected from deep issues of curriculum and learning, fragmented, and noncumulative” (p. 3–4).

Research reviews and recommendations suggest professional development should look very different from that. Effective professional development (for reviews and guidelines see: Darling-Hammond, 2012; DeSimone, 2011; Marx, Blumenfeld, Krajcik, & Soloway, 1997; Learning Forward, 2011; Roth et al., 2011; Wilson & Berne, 1999):

- Is ongoing
- Is focused on a specific pedagogical goal or outcome
- Is consistent with school, district, and state reforms and policies
- Reveals both the why and the how of effective practice
- Provides live or video models of effective practice
- Provides opportunities to attempt new practices and reflect on those attempts, analyze student work, and deliver presentations about new knowledge
- Is supported by coaching, modeling, observation, and feedback
- Fosters collaboration among teachers from the same grade, subject, or school to build interactive learning communities

The most effective professional development is multifaceted, reflecting all or many of those characteristics.

**Learning Through Curriculum**

A growing emphasis in research on professional development focuses on *educative curriculum materials*, or curriculum materials that aim to promote teacher learning as well as student learning. Educative curriculum materials are designed not only to guide teachers in creating specific lessons and units for students, but also to build their knowledge of the content being taught, how children typically develop in relation to that content, how and why that content is best conveyed, and so on. In other words, the very process of implementing a curriculum deepens teachers’ understanding of content and pedagogy. Some time ago, Ball and Cohen (1996) argued for integrating educative curriculum materials into teachers’ professional development. Recently, based on their research on prospective teachers, Drake, Land, and Tyminski (2014) claimed that educative curriculum materials can and should be utilized in teacher preparation to support prospective teachers in developing not only knowledge and practices related to curriculum materials and their use, but also the broader knowledge bases needed for successful novice teaching (p. 155).

Davis and Krajcik (2005) argue that educative curriculum materials can be used by all teachers—not only those who are new to the profession—in their effort to improve their knowledge of
instruction and to apply their knowledge to new situations. Educative curriculum materials provide them with opportunities to strengthen their learning and their capacity to teach the material.

**Professional Development and Project-Based Instruction**

Although high-quality professional development is important for many approaches to instruction, it is acutely important for project-based instruction. Project-based instruction has the potential to impact students' learning in many positive ways (see later discussion). However, in order to overcome potential challenges and realize the full benefits that this approach to instruction has to offer, teachers must receive adequate professional development and support. Research suggests that teachers new to project-based instruction will need professional development support in the following areas (Darling-Hammond et al., 2008; Marx et al., 1997; Thomas, 2000):

- Time management
- Classroom management (e.g., facilitating collaboration among students)
- Support of student learning (e.g., modeling thinking, structuring the situation, providing feedback)
- Technology use
- Assessment

Each of these areas has extensive research and professional literature supporting it that should be reflected in professional development provided.

**Project-Based Instruction**

**What Is Project-Based Instruction?**

Over the years, project-based instruction has been defined in a variety of ways. We define it as an approach in which students work “over an extended time period for a purpose beyond satisfying a school requirement—to build something, to create something, to respond to a question they have, to solve a real problem, or to address a real need” (Duke, 2014b, p. 11). The principles behind project-based instruction date back to the early 1900s, when scholars such as John Dewey and William Heard Kilpatrick advocated for an active, purposeful approach to instruction that is informed by students' interests and curiosities. These scholars proposed moving from a traditional approach to instruction that relies heavily on rote learning to the adoption of a more child-centered one in which the teacher serves as a facilitator and the students are guided to form connections between their prior experiences and their new knowledge (Dewey, 1902; Kilpatrick, 1918).

Some have argued that the instructional principles that characterize project-based instruction have become increasingly relevant with the introduction of the Common Core State Standards (CCSS) (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) and other rigorous standards (e.g., Boss, Larmer, & Mergendoller, 2013). For example, the CCSS call for students to “Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience” (anchor standard #4 for writing) and “Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation” (anchor
standard #7 for writing), both of which are entailed in many instantiations of project-based instruction. Some have argued that project-based instruction has the potential to help students develop the skills identified by the Partnership for 21st Century Skills (http://www.p21.org) as necessary for increasingly complex work and life environments (Bell, 2010; Darling-Hammond et al., 2008; Ravitz, Hixson, English, & Mergendoller, 2012):

• Creativity and Innovation
• Critical Thinking and Problem Solving
• Communication and Collaboration
• Flexibility and Adaptability
• Initiative and Self-Direction
• Social and Cross-Cultural Skills
• Productivity and Accountability
• Leadership and Responsibility

Theoretically, many projects provide opportunities to develop these skills. Research on the effects of project-based instruction is discussed in the following section.

Research on the Effects of Project-Based Instruction

Studies have documented positive impacts of project-based instruction on students’ academic achievement, attitudes, self-efficacy, engagement, and motivation.

PROJECT-BASED INSTRUCTION IN SPECIFIC DOMAINS

Gains in learning have been found across a variety of subject areas, or domains, in a project-based context.

SCIENCE: In a large-scale study of project-based instruction in science, Rivet and Krajcik (2004) collaborated with teachers to design and implement project-based curriculum materials aligned with district, state, and national middle school science standards. Over 2,500 sixth-grade students explored questions such as, “How do machines help me build big things?” and showed statistically significant learning gains in science content knowledge as revealed by pre- and post-test results. Harris, Penuel, DeBarger, D’Angelo, and Gallagher (2014) conducted a randomized controlled trial with sixth-grade students across 42 schools in a large urban school district. Their goal was to study the use of a comprehensive research-based curriculum called Project-Based Inquiry Science. Students who participated in the project-based curriculum outperformed students engaged in traditional science instruction on outcome measures aligned with Next Generation Science Standards. In a meta-analysis of inquiry-based science instruction, which is often characterized as a form of project-based instruction, Furtak, Seidel, Iverson, and Briggs (2012) found a positive effect of inquiry-based teaching on students’ learning of science. They also found that studies involving teacher-led activities had greater effect sizes than those with student-led conditions, which illustrates the importance of the teacher in actively guiding students’ learning.
HISTORY: Parker et al. (2011) found that high school students engaged in a project-based, Advanced Placement (AP) US Government and Politics course developed greater content knowledge. Compared to students receiving more traditional instruction, students in the project-based course scored as well as or better on the AP exam and scored better on a measure of deep conceptual learning. In another study, Hernandez-Ramos and De La Paz (2009) discovered that eighth-grade history students engaged in technology-assisted, project-based learning showed greater knowledge gains and developed more positive attitudes toward learning history and working with peers than a comparison group. Furthermore, the students involved in project-based learning reported that they enjoyed working on the projects and that they would be able to apply the skills learned to future projects. Halvorsen and colleagues (2012) found statistically significant growth in students’ knowledge of two other social studies domains—economics, and civics and government—following project-based instruction. That study is discussed later in this paper.

MATH: In a three-year study of two British high schools, Boaler (1998) found that students in project-based classrooms exhibited greater gains in applying basic-level math skills and answering higher-order conceptual questions on a national standardized examination. Students involved in project-based learning also reported greater enjoyment of the mathematics curriculum. According to Boaler (1998), “Students who learned mathematics in an open, project-based environment developed a conceptual understanding that provided them with advantages in a range of assessments and situations (p. 41).” In another study, the Cognition and Technology Group at Vanderbilt University (Barron et al., 1998) developed a software program that provided a structure for fifth-grade students to work collaboratively on simulated real-world problems that required them to apply mathematical reasoning. Those problems helped prepare students to engage in project-based work, such as using geometric principles to design a playhouse that would be built for a community center. After carrying out that work, students at all achievement levels made significant gains in their ability to use realistic measurements and in their performance on a standards-based geometry test.

ANALYSES ACROSS DOMAINS: In a meta-synthesis of meta-analyses exploring problem-based learning, which overlaps considerably with project-based learning, across a number of academic domains, Strobel and van Barneveld (2009) found that students’ long-term retention, skill development, and satisfaction was higher with problem-based learning than with traditional instruction. Walker and Leary’s (2009) meta-analysis of problem-based learning studies also favored problem-based learning over traditional instruction. In other words, meta-analyses of research on problem-based learning find positive impacts over traditional instruction.
Project-Based Instruction With Specific Populations

Some researchers have focused on the effects of project-based instruction on specific populations.

**ELEMENTARY SCHOOL-AGED STUDENTS**

Although many of the previously discussed studies have focused on older students, some studies have shown that project-based instruction can be beneficial with young children. For example, Kaldi, Filippatou, and Govaris (2011) engaged fourth- and fifth-grade students in a unit on sea animals that was characterized as project-based. Pre- and post-tests revealed increased content knowledge, as well as improved levels of self-efficacy, motivation, and feelings toward group work. Shepherd (1998) examined the use of a problem-based curriculum intervention with fourth- and fifth-grade social studies students. During the nine-week unit, the students worked in groups to investigate and develop possible solutions to housing shortages in six different countries. Compared to the control group, the students engaged with the problem-based curriculum demonstrated a significant increase in scores on a critical thinking test, as well as increased confidence in their problem-solving abilities. In another study, Chu, Tse, and Chow (2011) combined a collaborative teaching approach with inquiry project-based learning. Teachers, parents, and primary school students reported that the approach helped the students improve their information literacy and information technology skills. Tretten and Zachariou (1995) conducted an assessment of project-based instruction in four elementary schools, and teachers reported that the instruction had positive effects on students’ attitudes toward learning, work habits, problem solving, and self-esteem.

**LOW-INCOME POPULATIONS**

Additional studies have found positive results when project-based instruction is used with elementary-aged students from low-income schools. Hertzog (2007), for example, studied two first-grade classrooms in a school with over 90% low-income students and found evidence of improved student engagement during project-based work. One of the teachers involved in the study concluded, “The kids actually question more and enjoy more when they can touch and feel” (Hertzog, 2007, p. 550). Halvorsen et al. (2012) engaged second-grade students from low-income schools in two project-based units focused on social studies and content literacy standards. Pre- to post-test results on standards-based assessments showed statistically significant growth in social studies and content literacy. Post-test results also revealed that the project-based instruction statistically eliminated the achievement gap between low-income students and students from wealthier school districts engaged in more traditional instruction.

**STUDENTS WITH LEARNING DISABILITIES**

Other researchers have focused their project-based research on students with learning disabilities. In a study conducted by Okolo and Ferretti (1996), for instance, twenty-one students with learning difficulties and an average age of 12.3 participated in project-based curricula focused on the American Revolution. Pre- and post-tests revealed that the students significantly improved their content knowledge. In another study, MacArthur, Ferretti, and Okolo (2002) engaged sixth-grade students with and without mild disabilities in an eight-week project-based investigation about early twentieth-century American immigration. Both general and special
education students were engaged in the activities, which increased their knowledge about immigration and their understanding of immigrant and nativist viewpoints. As part of the Kaldi et al. (2011) study previously mentioned, Filippatou and Kaldi (2010) studied twenty-four fourth-grade students with learning disabilities who participated in a unit on sea animals that was characterized as project-based. In addition to improving the students’ academic performance, the study improved their motivation, feelings toward group work and social acceptance, and engagement in the learning process. Furthermore, the students reported that they preferred project-based instruction over traditional instruction.

Project-Based Instruction and Literacy Development

Project-based instruction that involves reading and writing often has characteristics that research has linked to higher literacy growth: integration of reading, writing, and content-area learning; authentic purposes for students’ reading and writing; authentic audiences for students’ reading and writing; and connections to students’ interests.

INTEGRATION OF READING, WRITING, AND CONTENT-AREA LEARNING

Projects often require teachers and students to bridge subject areas. For example, in one first-grade project-based unit from Information in Action, titled “Fitness Forever,” students develop persuasive pamphlets for senior citizens about the importance of exercise. Students read and listen to source material related to the effects of exercise, particularly on seniors. They then use information they glean from that material to write their pamphlets, and use speaking skills to present their pamphlets to the seniors. Thus reading, writing, speaking, and listening are addressed in an integrated fashion, which is widely recommended by researchers as those skills can be mutually reinforcing (Shanahan, 2006). Indeed, in a meta-analysis, Graham and Hebert (2011) found considerable evidence that writing instruction can improve reading development.

There is also considerable support for integrating reading and writing with content-area learning. Anderson (1988), whose study supports the integration of reading and science instruction, found that fifth-grade students who read texts that interested them and conducted related science observations gained more conceptual knowledge than students in three other conditions: conducting observations only, reading texts that interested them only, and a control group that read from their regular classroom science textbook. Similarly, Cervetti, Barber, Dorph, Pearson, and Goldschmidt (2012) studied ninety-four fourth-grade classrooms and found that students who participated in an integrated science and literacy curriculum exhibited significantly greater gains on measures of science understanding, science vocabulary, and science writing than students who participated in traditional science instruction. In terms of history instruction, on the basis of her research, Monte-Sano (2012) advocates “doing history,” which provides students with opportunities to “read historical sources, consider multiple perspectives, evaluate the reliability of sources, and construct their own interpretations or arguments about the past based on this evidence” (p. 63). The Halvorsen et al. (2012) study cited earlier found gains in both literacy and social studies using an integrated approach. Integrating literacy and content-area instruction can lead to significant learning gains across subject areas.
AUTHENTIC PURPOSES FOR READING AND WRITING

In addition to integrating subject areas, project-based instruction as we have defined it provides students with opportunities to read and write for authentic purposes. Research demonstrates that having purposes for reading and writing affects reading and writing (see Duke & Roberts, 2010 for a review). Zhang and Duke (2008), for instance, found that adult readers used different patterns of reading strategies for different reading purposes when reading Internet-based texts, and Narvaez, van den Broek and Ruiz (1999) discovered that the purpose for which readers are reading affects the kinds of inferences the readers generate.

Students who experience authentic or real-world purposes for reading and writing in their classrooms more often exhibit greater gains in literacy outcomes than students who are reading and writing only for the purpose of learning to read and write. For example, in a study involving adult literacy learners, Purcell-Gates, Degener, Jacobson, and Soler (2002) found that authenticity of literacy activities was significantly related to how much students read and wrote outside of class. In a study focused on second- and third-grade science classrooms, Purcell-Gates, Duke, and Martineau (2007) found a strong relationship between authenticity of reading and writing texts and activities, and growth in students’ abilities to comprehend and produce texts. Classrooms in which teachers more often engaged students in reading and writing for purposes observed outside of school—such as preparing an informational brochure for visitors to a local nature center or providing instructions to a friend who is moving to a new home—showed higher rates of student growth than classrooms in which teachers more often engaged students in activities typically seen only in school, such as reading a chapter in a science textbook and answering questions at the end of the chapter. Block (2013) found that when second-grade students were given specified purposes for their writing, they made more content and mechanical revisions than when the purpose for their writing was left unspecified—a particularly important finding given how difficult it can be to get students to engage in meaningful revisions (Graham, MacArthur, & Schwartz, 1995).
AUTHENTIC AUDIENCES

Project-based learning also offers students opportunities to write for authentic audiences. For example, fifth-grade students engaged in a Survive-That-Environment project from Information in Action research potential dangers of various habitats and create informative/explanatory travel cards that explain how to survive those dangers. The cards are shared with customers of a travel agency or a travel-related business such as a hotel. Researchers have worked with several populations of students to reveal the benefits of students writing for authentic audiences, which is compelling considering that most of students’ writing is typically directed toward their teachers (Duke, 2000). Cohen and Riel (1989), for example, compared two pieces of writing produced by seventh-grade students. Both writings addressed the same topic, but one was directed to the teacher for a grade and the other was directed toward a group of peers. Although teachers predicted that the writings directed to them would be of higher quality, the researchers found that the students scored higher on the writings directed toward peers, particularly in the areas of organization, content, and language use. In a study with younger students, Block (2013) found that second graders scored higher on several writing measures when writing to a public librarian than they did when writing for their teachers. The writing directed toward the librarian was more focused and accurate, contained more words and details, more appropriate language, and more illustrations that complemented the writing, and was of a higher quality overall. Providing additional support for these findings, Hernandez-Ramos and De La Paz (2009) observed that students were motivated to do their best work when they presented their project-based multimedia projects to a variety of audiences, including their peers, the school, and the larger community, during an open house.

CONNECTING WITH STUDENTS’ INTERESTS

Projects are often designed to capitalize on students’ interests or to build interest. For example, a teacher might notice students’ interest in a construction site in the neighborhood and develop a project related to that. Or a teacher might establish an authentic purpose and audience so compelling that it generates student interest where it might not otherwise have been. A number of studies have shown that instruction that focuses on students’ interests is associated with increased engagement and greater gains in achievement (Ainley, 2006). Instruction explicitly designed to generate student interest and other motivational supports, such as an approach called Concept-Oriented Reading Instruction (CORI), has been repeatedly shown to be highly effective
at developing literacy skills (e.g., Guthrie, McRae, & Klauda, 2007). In fact, Jiménez and Duke (2014) found that fourth-grade students actually comprehended at a significantly higher level when they were reading about a topic of personal interest.

In sum, projects provide a context in which to enact a number of instructional characteristics associated with higher literacy growth. See Table 1 for some of the ways in which project-based literacy instruction differs from traditional literacy instruction.

Information in Action

Information in Action was developed in response to the promise, and also the challenges, posed by project-based instruction, with a particular eye toward supporting teachers in developing students’ informational reading and writing in that context. In this section, we briefly explain how Information in Action is aligned with research on characteristics of effective professional development. Then, we turn to specific characteristics of effective informational reading and writing instruction, identifying the research base for these characteristics and how they are reflected in Information in Action.

Information in Action is designed to support professional development that is aligned with the characteristics of effective professional development listed at the outset of this paper. It focuses professional development on a specific pedagogical goal: the improvement of elementary-age students’ informational text reading and writing. This is a goal consistent with many current reform efforts, such as those associated with the Common Core State Standards (National Governors Association Center for Best Practices and Council of Chief of State School Officers, 2010), which include a significant focus on informational reading and writing. The professional book in Information in Action, titled Inside Information: Developing Powerful Readers and Writers of Informational Text Through Project-Based Instruction, is designed to provide the why as well as the how for carrying out project-based instruction to develop informational reading and writing. Its accompanying study guide allows teachers to process the book’s content with colleagues in an ongoing way, encouraging them to attempt new practices, reflect on those attempts, analyze student work, and discuss their reflections and analyses. The videos in Information in Action are intended to provide models of effective practice for teachers as well as for colleagues who may be providing teachers with coaching and feedback on their practice.
All of those tools address ways to manage time in project-based instruction with informational text, classroom management opportunities and challenges, issues around the use of technology, and strategies and instruments for assessment. Most importantly, they show how to support students' learning about informational text and strategies for reading and writing it effectively. Research suggests teachers are likely to need professional development support in all of the above-mentioned topics (Darling-Hammond et al., 2008; Marx et al., 1997; Thomas, 2000).

Although using professional books and videos in ongoing professional learning communities can be powerful in and of itself (Darling-Hammond, 2012; DeSimone, 2011; Roth et al., 2011; Wilson & Berne, 1999), *Information in Action* is designed to go a step further by providing educative curriculum materials as a tool for professional development. Specifically, at each grade level, teachers are provided with a teacher's guide and materials for four project-based units to support informational reading and writing development. Those units are written not only to support student learning, but also to help teachers learn to teach informational reading and writing using a project-based approach. Each unit and individual lesson within the unit reflects structures for teaching that are presented in the professional book, *Inside Information*, and videos (e.g., five phases of each project, three sections of each session, three types of text—launch, source, and mentor—of each unit); thus teachers can learn about and become accustomed to using those structures by teaching the *Information in Action* units. Units and lessons include many specific instructional techniques that have been shown to be effective at improving informational reading and writing (see below for detail), building teachers' knowledge of those techniques. Lessons are aligned to Common Core State Standards that are explicitly identified in the lesson itself, providing a form of professional development around standards-aligned instruction. (Although the CCSS are used, correlations to other standards documents can be provided upon request.)

At each grade level, units focus on four important text types—informative/explanatory, persuasive, procedural, and, depending on the grade level, biography or nonfiction narrative, which allows teachers at each grade level to deepen their knowledge of those types of text—their features, strategies for reading and writing them, and challenges students might face. Finally, each grade level includes one author study unit, which helps teachers focus students' attention on characteristics of a particular author's work, and students use what they learn to improve their own reading and writing skills. In other words, the *Information in Action* units are designed as a tool for extended teacher professional development. Teaching its units is intended to position teachers to then create their own projects, units, and lessons that are appropriate for their context and their students' needs.
Effective Informational Reading and Writing Instruction

Reading and writing instruction at the elementary level has been extensively studied, providing a great deal of information about effective (and ineffective) practices. A comprehensive review of this research is beyond the scope of this paper; some findings of particular relevance to the instruction emphasized in Information in Action’s professional book, videos, and project-based units are included here.

Research-Supported Practices Within a Unit Structure

We believe that project-based instruction for reading and writing informational text should occur in five phases: project launch, reading and research, writing and research, revision and editing, and presentation and celebration. We briefly describe each phase and the research undergirding it.

THE PROJECT LAUNCH

The Project Launch, which typically takes place early in the unit, establishes the purpose, format, and audience for the project. It also serves to engage students in the project and can provide a way to connect with students’ interests and everyday lives. This phase is supported by research that demonstrates that providing students with a purpose for reading and writing beyond just learning to read and write, with an audience for students’ writing beyond the teacher, and with instruction that builds on students’ interests is associated with greater literacy growth. It also supports the Common Core State Standards’ anchor standards for writing, which advocate for students to engage in writing “for a range of tasks, purposes, and audiences” (National Governors Association Center for Best Practices and Council of Chief of State School Officers, 2010, p. 18).

THE READING AND RESEARCH PHASE

After students learn about the project, they begin the Reading and Research phase. During this phase, students have opportunities to build their background knowledge of the topic and target audience and to collect information for the project. In order to accomplish these goals, they listen to and read a variety of written, visual, and oral texts. Thus the Reading and Research phase provides a context in which to provide instruction that builds content knowledge, reading skills, and listening skills. The following are among the research-supported instructional foci during the Reading and Research phase:

IMPORTANCE OF CONTENT KNOWLEDGE: The value of building content knowledge to support literacy development has long been established. For example, in one classic study, seventh- and eighth-grade students read a passage about a baseball game. When the students were asked to recall what they read, the researchers found that students with high knowledge of baseball performed better than students with low knowledge of baseball, regardless of the students’ reading ability (Recht & Leslie, 1988; see also review in Duke, Pearson, Strachan, & Billman, 2011). Every unit within Information in Action addresses social studies or science...
content so that students are building content knowledge at the same time that they are developing reading and writing skills.

**USE OF COMPREHENSION STRATEGIES:** A large body of research has shown that teaching comprehension strategies, such as previewing, monitoring, inferring, questioning, and summarizing, improves students' reading comprehension (e.g., Shanahan et al., 2010). In a review of research, Gersten, Fuchs, Williams, and Baker (2001) found that explicit strategy instruction is particularly valuable for struggling readers and learners. The Reading and Research phase provides a context for teaching comprehension strategies. For example, in *Information in Action* units, students are often summarizing sources they have read in order to garner usable information for their writing/projects.

**IDENTIFICATION AND USE OF TEXT STRUCTURE:** The benefits of identifying and using text structure also have a strong research base (e.g., Dickson, Simmons, & Kameenui, 1995). Members of the What Works Clearinghouse Panel on Improving Reading Comprehension in Kindergarten through Third Grade recommend teaching even young students “to identify and use the text’s organizational structure to comprehend, learn, and remember content,” noting a moderate level of research evidence for this (Shanahan et al., 2010, p. 9). Some of the structures that organize many informational texts include: description, sequence, problem and solution, cause and effect, and compare and contrast. In *Information in Action* units, graphic organizers are often used to help support students in organizing information from informational texts. They’re also used to help students organize information for their writing/projects.

**USE OF GRAPHICS AND OTHER TEXT FEATURES:** Graphics, such as diagrams, tables and timelines, represent an important component of many texts (Carney & Levin, 2002). In one study, Fingeret (2012) analyzed informational texts for second- and third-grade students and found that sixty percent of the 12,238 graphics contained information beyond what was in the written words. In another study, Duke et al. (2013) studied children in Grades PreK to 3 and found that students varied widely in their understanding of graphics. Furthermore, many of the students were not aware that they could learn information from graphics that is not contained within the written text. Indeed, Norman (2012; see also Roberts, Norman, & Cocco, 2015) found that graphical comprehension is associated with reading comprehension. These studies highlight the promise of spending instructional time teaching students how to use graphics to aid their understanding of texts. *Inside Information*, the professional book included in *Information in Action*, provides definitions and examples of several key graphical devices in informational text, and *Information in Action* units often focus on graphics. For example, in one unit, students receive a text with a number of graphs and engage in interpreting those graphs in writing.

**EMPHASIS ON VOCABULARY:** A number of researchers have shown that vocabulary instruction is linked to improved reading comprehension and reading proficiency. Lesaux, Kieffer, Faller, and Kelley (2010), for example, found that a vocabulary intervention program carried out with a group of linguistically diverse sixth-grade students resulted in higher scores on measures of vocabulary knowledge, as well as reading comprehension. In a meta-analysis exploring the impact of vocabulary instruction on comprehension for students in Grades PreK to 12, Elleman, Lindo, Morphy, and Compton (2009) found that vocabulary instruction had a positive effect on students' reading comprehension, particularly for struggling readers. *Information in Action* units include instruction in specific words. For example, in one third-grade unit, the terms problem, hypothesis, data, and procedure are explained and used a number of times in students' project work. Units also
include a number of lessons on strategies for ascertaining the meaning of unfamiliar words from context, with students working on those strategies within texts they are using as sources of information for their projects.

**LOCATION AND EVALUATION OF SOURCES:** A key set of twenty-first century skills stresses the ability to locate sources and evaluate their trustworthiness and appropriateness. *Information in Action* gradually increases expectations for students to search for sources. In Grade 5, three of the *Information in Action* units engage students in using a framework called WWWDOT for evaluating the trustworthiness of websites as sources of information. Research suggests that students tend to be overly trusting of information they encounter online (e.g., Killi, Laurinen, & Marttunen, 2008), but Zhang and Duke (2011) found that fourth- and fifth-grade students randomly assigned to learn the WWWDOT framework gained a greater awareness of the importance of evaluating websites and a deeper understanding of elements to evaluate.

**OTHER SKILLS:** The Reading and Research phase presents a context to address a number of other instructional targets. In the fifth-grade Survive-That-Environment project, for example, instruction targets the following Reading Standards for Informational Text:

- **RI.5.1** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RI.5.6** Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
- **RI.5.7** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

This phase can also address a number of Foundational Reading Skills, Speaking and Listening, and Language Standards. Some of the Writing Standards can also be addressed during this phase, as they focus on the research process.

**THE WRITING AND RESEARCH PHASE**

During the Writing and Research phase, students plan and draft the text for their project, conducting additional research as needed. This phase also provides a context for research-supported instruction:

**FOCUS ON THE WRITING PROCESS:** Engaging students and providing instruction in a writing process has been shown to improve the quality of students’ writing (see meta-analyses by Graham & Sandmel, 2011; Graham, McKeown, Kihara, & Harris, 2012a). The What Works Clearinghouse Practice *Guide Teaching Elementary School Students to Be Effective Writers*
(Graham et al., 2012b) gives a rare “strong evidence” rating to the recommendation “teach students to use the writing process for a variety of purposes” (p. 12–13). Planning and drafting are the foci of the Writing and Research phase and important components of a writing process.

**APPLICATION OF WRITING STRATEGIES:** Researchers have found that teaching a writing process alone is not always sufficient (Graham & Sandmel, 2011). Some students, including struggling writers, benefit from specific strategy instruction. In a meta-analysis of 115 studies, Graham et al. (2012a) found that of 13 writing interventions evaluated, strategy instruction had the greatest positive effect on the quality of students’ writing. *Inside Information*, the professional book for *Information in Action*, identifies a number of specific writing strategies (Duke, 2014b, pp. 121–128). *Information in Action* units recommend strategies that are appropriate to particular types of text, such as using timelines to plan biographical or nonfiction narrative texts, and taking notes as one conducts a procedure to inform writing procedural texts.

**IDENTIFICATION AND USE OF TEXT FEATURES:** Researchers have begun to document the features of different kinds of informational text (e.g., Pappas, 2006; Purcell-Gates, Duke, & Martineau, 2007). Although there is relatively little research on the impact of teaching the features of specific kinds of informational text, much of the research that does exist suggests it supports students’ literacy development. For example, Harris, Graham, and Mason (2006) found that teaching second-grade struggling writers strategies for composing persuasive texts (as well as strategies for composing stories) that emphasize specific parts of persuasive text had a positive effect on their writing development. The Common Core State Standards, and a number of other standards documents, identify specific parts of texts that should be included in students’ writing at each grade level. For example, the CCSS for writing opinion pieces for the end of grade one indicate that students should be able to:

**W.1.1** Write opinion pieces in which they introduce the topic or name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure.

By the end of grade four, students should be able to:

Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

a. Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer’s purpose.

b. Provide reasons that are supported by facts and details.

c. Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition).

d. Provide a concluding statement or section related to the opinion presented.

In *Information in Action*, one method for teaching text features is using mentor texts. A mentor text provides a model of the type of writing that students will create for their final projects. High-quality mentor texts can make a difference for students’ writing. Dressel (1990) found that fifth-grade students who listened to and discussed high-quality literature wrote better stories and developed a stronger understanding of genre than students who listened to and discussed lesser quality literature.
USE OF DIGITAL TOOLS: Although students can use paper during writing and research, evidence supports using digital tools as well. According to the WWC Practice Guide referenced earlier, “... integrating the use of technology into writing instruction is critically important (Graham et al., 2012b, p. 7).” In a meta-analysis of studies that focused on weaker writers, Morphy and Graham (2012) found that the work of students who used word processing software was stronger in the following areas: writing quality, length, development/organization of text, and mechanical correctness. The students were also more motivated to write. Furthermore, Hung, Hwang, and Huang (2012) found that using a web-based information-searching system to collect information from the Internet and then using a digital software program to create movies for storytelling in a project-based context improved fifth-grade students’ motivation to learn science, problem-solving competence, and learning achievement more than in a project-based context without digital storytelling. Each Information in Action unit includes, in the To Prepare section, ways in which teachers can incorporate digital tools for research and writing if the technology infrastructure within the school allows that.

THE REVISION AND EDITING PHASE
As noted earlier, research supports the teaching of a writing process, which typically includes planning and drafting, as discussed in the previous section. It also includes sharing, evaluating, revising, and editing (e.g., Graham et al., 2012b). In Information in Action units, students engage in those latter stages of the writing process in the Revising and Editing phase. Research suggests that students will engage in more revision and editing when provided with a specific purpose for their writing (Block, 2013), as in a project-based approach. Research also suggests students benefit from working with one another during their writing time (Yarrow & Topping, 2001). In Information in Action units, students engage in peer-to-peer feedback beginning in kindergarten and in each grade level thereafter. In part because peer feedback is often too general to be helpful (e.g., Fitzgerald & Stamm, 1990), feedback forms include specific items for evaluation and editing checklists are also used to guide students.
THE PRESENTATION AND CELEBRATION PHASE

In the final phase of the five-phase approach to project-based instruction for informational reading and writing, students deliver their products to the intended audience and celebrate what they have accomplished. For example, for the Fitness Forever project discussed earlier, students visit or are visited by senior citizens in the community, or ceremonially collect and send their pamphlets to that community, which embraces the “Publishing” phase of a writing process (see research discussed earlier). Publishing is likely to be necessary to realize fully the benefits of writing for an authentic purpose and audience, which research has shown to be influential.

Research-Supported Practices Within a Lesson Structure

Each lesson within the suggested five phases of a project-based approach should have three research-supported components: whole-class lesson; small-group, partner, and/or individual work; and whole-class wrap-up.

WHOLE-CLASS LESSON

At the beginning of each lesson, the teacher provides instruction on one or more teaching points aligned with the standards and related to the unit project. As indicated in several places in this paper, there is substantial evidence supporting the importance of taking time to provide explicit instruction around reading and writing (e.g., Elleman et al., 2009; Gersten et al., 2001; Graham, et al., 2012a; Harris et al., 2006; Shanahan et al., 2010).

The whole-class lesson also provides time for the teacher to read aloud texts that develop students’ content knowledge and/or provide students with a model of writing. Reading aloud also provides students with access to texts they might not be able to comprehend on their own and, indeed, the research base for the benefits of reading aloud to students is vast (e.g., Snow, Burns, & Griffin, 1998). Reading aloud also provides opportunities to engage in classroom discussion about
texts. In one meta-analysis, Murphy, Wilkinson, Soter, Hennessey, and Alexander (2009) found that classroom discussion results in improved reading comprehension. As previously mentioned, text-based discussion of mentor texts can positively influence students' reading and writing abilities (Dressel, 1990).

**SMALL-GROUP, PARTNER, AND/OR INDIVIDUAL WORK**

This portion of the lesson provides time for students to apply to their project what was taught in the whole-class lesson. In addition, it provides time for the teacher to support needs-based groups and/or circulate among students. A number of research studies provide support for this lesson component:

1. Students are given the daily time they need to engage in reading and writing (Graham et al., 2012b; Shanahan et al., 2010).

2. Effective teachers have students in small groups for longer periods of time and place considerable emphasis on coaching and scaffolding students as they read and write (e.g., Pressley et al., 2001; Taylor, 2011).

3. Cooperative or collaborative activities that can occur in small-group time have a positive effect on students' vocabulary, comprehension, and reading achievement, particularly struggling readers' (see meta-analysis by Puzio & Colby, 2013).

4. Teachers are given the opportunity to differentiate instruction based on student needs and interests. *Inside Information*, the professional book in *Information in Action*, offers a number of strategies for providing additional support to students who need it (e.g., pp. 108 and 155). The lessons in *Information in Action* units offer specific suggestions for providing additional support, for providing additional challenge, and for reaching dual language learners; many of the lessons are based on specific research studies and reviews of research (e.g., August & Shanahan, 2006). For example, interactive writing is described and suggested as a strategy to provide additional support to kindergarten writers; Craig (2003) found that using interactive writing with kindergarten students resulted in improved word reading and reading comprehension. Roth and Guinee (2011) found that first-grade students who participated in an average of 10.5 minutes of interactive writing a day showed greater growth in many aspects of writing than students who did not participate in interactive writing.

5. Small-group, partner, and/or individual work time is necessary in the Gradual Release of Responsibility Model. This model, first introduced by Pearson and Gallagher (1983), asserts that students should gradually assume more responsibility for their use of a strategy as the teacher assumes less responsibility. After the teacher provides an explicit description of
the strategy and models the strategy in action, the teacher and the student use the strategy collaboratively. The student then moves from using the strategy with guided practice to using the strategy independently. The collaborative, guided, and independent practice phases of the Gradual Release of Responsibility often occur during small-group, partner, and/or individual work. Use of the Gradual Release of Responsibility model is recommended by both the What Works Clearinghouse panel on Improving Reading Comprehension in Kindergarten through Third Grade (Shanahan et al., 2010) and the What Works Clearinghouse panel on Teaching Elementary School Students to Be Effective Writers (Graham et al., 2012b).

WHOLE-CLASS WRAP-UP

*Information in Action* recommends the teacher gather the students back together at the end of each lesson to review key instructional points from the whole-class lesson and lead a share of student work that captures those points. The general value of review has long been established. Evidence supporting whole-class wrap-up can also be found in a recent study conducted by Stefano, Gino, Pisano, and Staats (2014). Those researchers found that reflecting after a lesson increases students’ performance in subsequent encounters with the material.

Summary

Research provides many insights into characteristics of effective professional development and effective reading and writing instruction. That research has informed the development of *Information in Action*, including its professional book, professional videos, and project-based units. It is important to note that the research-supported practices emphasized in those resources are not all typical of project-based instruction. For example, *Information in Action* emphasizes explicit instruction more than typical project-based approaches (Duke, 2014a). Similarly, research-supported instruction around informational reading and writing has typically not been placed in the arguably more engaging context of project-based instruction. *Information in Action* is an attempt to bring together different lines of research to make instruction in informational reading and writing more effective and more engaging.
References


