TEACHING AND LEARNING THE PURPOSE OF EVIDENCE FOR KNOWLEDGE AND KNOWING

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Evidence Is Not Tangible

The Common Core State Standards (CCSS) and the Next Generation Science Standards (NGSS) place an emphasis on the ability to recognize and produce evidence. In her previous column, Kay Stahl (2014) reported a disturbing trend in instructional responses to the CCSS. During classroom visits she observed, "Rather than inspiring children to think more expansively about the texts they are reading, prompt[s] for 'text evidence' often require only literal recall, and children resort to plucking words, phrases, or sentences from texts to satisfy the prompt" (p. 103). She recognized that although being able to recognize the literary use of evidence is necessary for reaching the learning goals projected in the CCSS and NGSS, it is not sufficient for meeting those goals.

Despite the heavy emphasis on identifying evidence, the significance of the word *evidence* is not the central topic of any standard, nor is it clearly defined in these documents. These omissions, combined with how evidence is presented in the standards, result in the troubling assumption that evidence is an object—something that is found or exists independently of human action. For example, the CCSS for ELA-Literacy (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) expect students in grades 3–5 to do the following:

- Explain how an author *uses* reasons and *evidence* to support particular points in a text (fourth and fifth grade), *identifying* which reasons and *evidence* support which points (fifth grade; R1.4.8; RI.5.8).

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"These standards... imply that evidence is an object that can be identified."

- *Draw evidence* from literary or informational texts to support analysis, reflection, and research (W.4.9, W.5.9).
- *Identify* the reasons and *evidence* a speaker provides to support particular points (SL.4.3).

As a result, a common interpretation of the CCSS is that instructors should promote the ability to describe superficial argument elements rather than help students develop abilities to understand how explanations, arguments, or persuasive narratives are produced.

Similarly, the NGSS (NGSS Lead States, 2013) call for students to use and identify evidence for purposes associated with learning science:

- Compare and refine arguments based on an evaluation of the *evidence presented*. Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by *citing relevant evidence* and posing specific questions. *Construct* and/or *support* an argument *with evidence*, data, and/ or a model. Make a claim about the merit of a solution to a problem by *citing relevant evidence* about how it meets the criteria and constraints of the problem. (Excerpted from the section "Engaging in Argument From Evidence.")

- Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are *supported by evidence*. (Excerpted from the section "Obtaining, Evaluating, and Communicating Information.")

As a result, one common interpretation of the NGSS is that instructors should promote the notion of best explanation and value particular judgment approaches.

The phrases used in these standards—*use evidence, identify evidence, draw evidence, cite relevant evidence, support with evidence*—imply that evidence is an object that can be identified simply by looking at it. What do fingerprints, toilet paper, a page of quotes from a speaker, and a photograph of indentations on a bone all have in common? To a learner trying to "identify evidence," these objects have nothing in common, yet in appropriate contexts (such as in inferences, arguments, or explanations), these objects could all be used as evidence.

I propose that because the CCSS and the NGSS do not include standards pertaining to the evidence concepts, they ultimately support approaches that simply build on students' and teachers' everyday practical experiences rather than prompt the formation of theoretical representations. This practical approach is what Stahl observed during her school visits. This approach needs to change if students and teachers are to realize the

value in the goals set by the standards. To teach a theoretical representation of evidence, we need show young learners that (1) evidence is not tangible because it is a cultural tool, (2) evidence is a tool constructed by people in their efforts to create knowledge claims about the world, (3) everyone (re)creates evidence every day, and (4) evidence is a fundamental tool for most knowledge production processes.

Evidence Is a Continuously Reconstructed Cultural Tool

The ability to identify the use of evidence is not what makes it possible to evaluate evidence and produce it. The ability to ask (and the willingness to learn) how evidence was created is what makes this possible. In other words, the abilities recommended in the CCSS and NGSS all depend on understanding the purpose of evidence and its production. Without such an understanding, students should be asking, "Why should I explain how an author uses evidence to support or challenge a point?", "Why should I compare and refine arguments by evaluating evidence?", and "It seems like anything goes when it comes to creating evidence. How am I ever going to memorize all the vagaries of its production and its use?" Without an understanding of the purpose of evidence, students are likely to become frustrated with the process and decide, "It's easier to just believe what I am told than to try to figure out if a claim is well founded on evidence." This is not why we became teachers. The point of instruction must be to empower learners

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with tools for learning and acting in the world. Evidence is one of those tools.

So far, I have argued that simply learning to identify evidence is a flawed approach because evidence is not an object. Then what is it? Evidence is a cultural tool constantly being reproduced in every new situation, and learners need to recognize this. Briefly, a cultural tool has three distinct aspects: a problem context (what problem the tool was originally invented to solve), a historical trajectory (the accumulation of the experience of all those who have used and modified the tool in the past, leading to its current form and use), and a transformative aspect (the potential to transform the activity in which the tool is used and the people who use it as well as the potential for the tool to be transformed by that same activity and the users; Kaptelinin, Kuutti, & Bannon, 1995). Cultural tools include concepts (e.g., evidence, democracy, family, ethics), human-made objects (e.g., alphabets and languages, calculators, dictionaries, microscopes), and patterns of action (e.g., rules and norms of behavior in various contexts). Evidence is one of the most powerful cultural tools humans have invented for making knowledge claims about the world. It has been modified and adapted over centuries for the purpose of making inferences, claims, models, conclusions, arguments, and explanations.

Despite its importance, evidence remains mysterious for most learners. The CCSS and NGSS try to spotlight this cultural tool for conscious viewing and consideration, but the attempt is incomplete. How can we remove the mystery and meet the intent of the standards? According to developmental psychologists Stetsenko and Arievitch (2002), cultural tools "can be appropriated by a child only through acting upon and with them; that is,

only in the course of actively reconstructing their meaning and function" (p. 88). In other words, a pedagogically sound approach to teaching any cultural tool must address not only *what* is to be learned, but ought to (1) address *why* it's relevant, (2) reveal that the object of any teaching-learning goal is typically a cultural tool or process for thinking and communicating, and (3) position learners as mindful actors rather than mindless drones. This is the approach we tested in design-experiments conducted as part of the Scientific Thinker Project, which is introduced next.

Scientific Thinker Project: Positioning Students as Researchers of Knowledge and Evidence

How can we inspire children "to think more expansively about the texts they are reading" (Stahl, 2014, p. 103) rather than lose them to the boredom of mindlessly identifying claim-evidence conjectures without purpose? I would argue that we need to teach evidence as a cultural tool, and to do this, we need to recognize that children are eager to learn and they want to know how others "know." In a study with three fourth-grade and three third-grade classes (9 teachers, 126 students), we developed and tested an approach that positioned students as researchers of knowledge-actions and evidence production (Kirch & Amoroso, in press; Kirch & Stetsenko, 2012).

The resulting Knowing and Knowledge Study (KKS) conducted by the students had three major aims:

- To interrogate the everyday practices of saying, "I know," "I agree," "I'm not convinced," and "I trust" for inquiry and analysis in order to learn how people of all walks of

"What do we mean when we say we know something?"

life, including scientific thinkers, achieve these knowledge-acts
- To develop and employ versatile and intuitive research tools and protocols that reflect a learner perspective
- To provide a research infrastructure that supports young student-researchers and their research associates in purposeful and meaningful work, but allows teachers to focus on assessment and instructional design in response to their findings and interests

The KKS was initiated with the question "What do we mean when we say we know something?" The answers we expected when we developed this question were as follows: it means we are confident or sure; we can explain it; we can show it; we can expect to be challenged; we can provide evidence. The responses from students included these and others: you can convince people to believe you; you really saw it; you researched it; it really happened; you know what you are saying is true; you can prove it; you can give examples; you experienced it yourself.

In order to introduce the terms *claim* and *evidence* and prompt reflection on individual and collective knowledge-acts, students were asked to interview various people (peers, friends, relatives, teachers) using the Day 1 interview protocol shown in Figure 1. The next day, after students reported the results of their interviews, they were told that

answers to the first question ("Please tell me something you know about sound.") are called *claims* and answers to the second and third questions ("How did you come to know this about sound? Why do you think this is true?") include what is called *evidence* or *evidence sources*. By having students record claim-evidence conjectures and then introducing them to the vocabulary in this way, students immediately learned that they (and everyone they know) create such conjectures every day.

By the third day, we noticed that students began to develop strategies and tests for identifying evidence in texts as they worked in unison reading groups (McCallister, 2010). These were typically two-part strategies that all started by first identifying a claim and then testing the text for evidence by answering one or more of these group-designed questions: (1) Did the authors prove their claim? (2) Is an alternative possible? (3) How do they know that? (4) Are there any other clues on the page (pictures, drawings, illustrations) that could be used as evidence? This indicated that students were recognizing functional properties of evidence as a tool rather than focusing (incorrectly) on the superficial identity of evidence as an object.

After this initial phase (2.5 hours over three days), the interview answers were analyzed through various questions, including the following:

- How do we decide to trust a source (or how do we decide that a source is trustworthy)?
- What sources do we use most frequently in our knowledge-acts? Why?
- What sources do we use least frequently? Why?
- Do we tend to believe what we read no matter what it says or who writes it? Why?
- Do we tend to believe what we read only when it is consistent with our own personal experience? Why?

- Do we tend to trust what parents, teachers, and older siblings tell us but not younger siblings or peer-group friends? Why?
- Do we tend to trust our senses and experiences over other sources, or do we tend to defer to others? Why?

Although the first three questions were included in the teacher guide as data analysis questions used on Days 3–5 of the module, we were impressed by the remaining questions that emerged during class discussions of the interview data set. Each of these questions had the potential to drive students and teachers to explore, confront, and even change learning habits, beliefs, and assumptions about knowledge and knowing. For example, students and teachers who tended to defer to others or tended to believe everything they read were challenged to rethink their practice and take action to change it. Most notably, they were beginning to discuss whether all evidence is equally useful, valid, and trustworthy.

After a brief period of instruction (approximately six hours over five days), students could not only identify claims and evidence in texts; they also began asking and researching some of the most profound questions that humans face regarding the nature of scientific evidence and how we evaluate it. I believe this approach is one of the few that support learners in this way and, if used by thoughtful reading teachers, can be a powerful teaching-learning approach that exceeds the limited treatment of evidence in the standards.

Closing

Identifying and using evidence as called for in the standards is not enough. Students need to learn the purpose of evidence in knowledge production if the process of identifying and using evidence is to be meaningful. The Knowledge and

Figure 1   An Example of the Interview Protocol Used in the Students' Knowledge and Knowing Study

"Identifying and using evidence as called for in the standards is not enough."

Knowing Study approach can be thought of as a necessary prerequisite module used early in the school year (and prior to any curricula designed to meet the foundational understandings of evidence to which the CCSS and NGSS standards allude) in order to ensure that students are provided with a relevant context that motivates their learning about evidence.

NOTES

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