HSSE Online 1(1) 1-6

"Their Minds Must Be Improved to a Certain Degree": A Learning Cycles Approach to Inquiry

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The central idea of this article is that inquiry is *not only an instructional method, it is also a curriculum objective.* It is important in its own right. Teaching students to inquire—to arrive at well-supported claims using evidence and reason—is what education is mainly for.

Introduction

This article introduces a learning cycles model of conducting inquiries with students. It is based on the thinking of philosopher John Dewey (*How We Think*, 1910) and also on insights from contemporary learning science (e.g., John Bransford et al., *How People Learn*, 2000). It is applicable in school settings from kindergarten through high school, college, and graduate school; it is also applicable in non-academic settings: everyday life, at work and play.

This model takes inquiry seriously, which is to say it takes evidence, reasoning, and argumentation seriously. It lets inquiry be what it is: a rigorous, enjoyable, sometimes exhilarating, and, above all, useful process for anyone who deploys it. It is both an intellectual training and an intellectual tool: It is a sharp instrument we use to cut through a problem, but in the process we ourselves are sharpened, too. This is because inquiry is a particular way of being intelligent, a method of intelligence. Furthermore, it is also a literacy training and a literacy tool. This is because *writing* is its primary medium of communication while *reading*—close, interpretive reading—is its primary means of perception.

Thomas Jefferson, if I may draw a rough analogy, is the Lee Kuan Yew of American society. Jefferson is responsible for America's independence from England and helped set the new nation's early course. I mention him here because he was America's first great advocate for public education's role. He wrote, "Every government degenerates when trusted to the rulers of the people alone. The people themselves therefore are its only safe depositories. And to render them safe *their minds must be improved to a certain degree*. This indeed is not all that is necessary, though it be essentially necessary. An amendment of our constitution must here come in aid of the public education."

Theory

To "do inquiry" is to use the mind well and, thereby, to improve it. To do inquiry is to read, write, and think critically about something. That something is a problem or curiosity: Why does she not like me? What sorts of people become religious zealots? How long will Singapore's prosperity last? Will it become more or less democratic? Will the U.S. decline and fall as did Rome? When? Why are small nations so often strong nations? How do you find a ripe pear at the market? Is now the right time to buy an electric car? Can humans learn to live sustainably?

Inquiry is the methodical building of evidence-based answers (claims, explanations, theses, theories). Inquiry is simultaneously key democratic work, hard scientific work, and authentic intellectual work. Importantly, it surpasses the primary document fetish at which inquiry too often stops in history and

social studies classrooms, as though source work were the ultimate goal. In the context of inquiry, primary sources are not ends in themselves but data sets—bunches of information—that are useful for building and evaluating claims. "Sources," as they're called, must be properly perceived and analyzed, of course. But source work is *not* important by itself, only when in service of a larger purpose. That larger purpose is building a claim and arguing effectively for it. Corroborating and contextualizing evidence are key activities, of course. And consideration of rival hypotheses is paramount.

But revision is the first order of business. "Doing inquiry" means doing it again and again—cycling through repeated rounds of data-gathering and claim-building. The claim is revisited and refined based on additional evidence or experience. At first, it is only a guess, but eventually it becomes a well-supported claim. The process is iterative, spiralling, and recursive, or in Dewey's lyrical phrase "the double-movement of reflection" (1910). It is a mundane, everyday activity and a scholarly, scientific activity. We humans observe things, and we reflect on—theorize—what they mean. We then test our theories (claims) in new observations, and then we use these new experiences (evidence) to revise our theories again. We use new experiences to revise our hypotheses, and in this way theory and practice alternate continually and interdependently, one fueling the other. This is the "double movement of reflection." We do this whether we are looking for ripe pears at the market, sitting on a jury, raising children, testing a hypothesis in a laboratory, or trying to figure out whether a particular 'conspiracy theory' has any merit. We engage in this double-movement until we stop for whatever reason: we've "made up our mind," the theory is no longer challenged by new evidence, our resources dry up, we get lazy. When we joke, "Don't bother me with the facts, I've already made up my mind," we acknowledge that our inquiry has ended, that we are committed to a particular theory and aren't going to pay attention to experience or evidence anymore. When we say, "I'm a practical sort of person and I don't put much stock in theories," we mean that we're not thinking about what we're doing. Of course, that isn't true. Actually, we are, all of us, loaded with theories *and* experiences.

Baildon and Damico (2011) emphasize three critical reading practices in the inquiry process: multiple traversals across a problem space, dialogue across differences, and perspective building. Each of these invites additional, intelligent claim-building and revision, but it is the first of these—multiple returns to the problem space—that lies at the heart of inquiry and provides a platform for the other two. This recursive movement between theorizing and experiencing is known to contemporary learning scientists as the "learning cycles" approach (Bransford et al., 2000). Expertise in any domain, from playing football to cooking dosa or making public policy, generally is both deepened and broadened with the right sort of practice—with 'trying again' under somewhat different conditions. This is also known as "quasi-repetitive learning cycles," because no two iterations are exactly the same: the situation is always somewhat different (Bransford et al., 2006; Parker et al., 2011).

Procedure

Even the youngest children *already* engage in inquiry; their incessant "why" questions reveal that the motivation to inquire is fully present. And their persistent experimentation with all manner of things shows that not only the motivation but the actual activity of inquiry—*doing* inquiry—is already a part of their everyday life. Teachers, then, don't need to teach inquiry so much as they need to help children become *more skillful* inquirers. They can do this by (a) engaging them in inquiry often, both as part of daily classroom life and as a way of learning humanities and social studies subject matter, and (b) scaffolding their inquiry so that they learn to more skillfully form hypotheses and seek and use evidence to find out whether they are true.

The general inquiry procedure is this: The teacher engages students' interest in the problem for study and then has the children pose hypotheses about it. Next the teacher designs learning cycles in which students gather information (evidence) and compare it to these hypotheses. As they do the comparisons, the children learn, between cycles, to discard, add, and revise hypotheses

as the facts require. Eventually, they draw conclusions (claims), and the teacher may have them develop full arguments: claims, support, and logical reasoning. Let's look at the process step-by-step.

1. The teacher engages students in a problem related to a curriculum objective. This is accomplished using a few photos, a newspaper headline, a film, a compelling story, or some other interest-building technique. The problem is usually decided by the teacher, because he or she is trying to address a key curriculum objective or standard; but students also can be involved in deciding on the problem.

Problem	Curriculum Topic
Why did the *Titanic* tragedy occur?	Transportation; Industrial Revolution
Why is there poverty in rich nations?	Comparative economic systems; social class
Who benefits from advertising?	Media literacy; production and consumption

2. The teacher elicits hypotheses (reasonable guesses) from students about the problem and records them on the whiteboard or paper taped to the wall. A teacher might say to students, "We know that the Titanic hit an iceberg, but why do you think this great 'unsinkable' ship did that?" He or she draws hypotheses from the students and writes them in large print on paper taped to the wall.

3. Students gather information (evidence, data) through textbook reading, oral reports by classmates, fieldwork, guest speakers, interviews and surveys, the Internet, paintings, teacher read-alouds lectures, and the like. This data gathering can take anywhere from a day to a few weeks, depending on the amount of data available and the number of learning cycles in which the teacher wants (and can afford, time-wise) students to engage. Each cycle requires data-gathering and analysis.

4. Students organize and interpret the information and draw conclusions. The most efficient way to do this is to organize the information around the hypotheses. That is, students evaluate the hypotheses using the information that has been gathered and draw conclusions as to which hypotheses are most or least supported by the evidence. As with any scientific study, there will be disputes among the researchers. This is good! Challenging one another's claims and conclusions is absolutely central to the activities called "history" and "science." At this point, students can be directed to make graphic organizers featuring the two hypotheses they believe are best supported by the evidence.

5. The claims are published—they are made public. Whether in the classroom newsletter, a report to the school principal or town mayor, or a presentation to younger students, the results of inquiry are always shared. The audience members can then accept or reject the conclusions presented based on their own interpretation of the evidence. This is how knowledge is constructed, corrected, and reconstructed over time.

Example: What Caused the Titanic Tragedy?

The teacher shows students the headline in the local newspaper dated April 15, 1912. It reads, "'Unsinkable' Greyhound Sinking Off Newfoundland." She tells her students that the headline is referring to the sinking of the luxury ocean liner, the *Titanic*. Due to the popular 1997 film by James Cameron, who later made *Avatar*, some students bubble with recognition. She asks them why they think such ocean liners were called "greyhounds" and why the present tense, "sinking," was used. Then she shows them a 10-minute film clip from the Cameron film of the *Titanic* tragedy and another from the earlier (1958) film *A Night to Remember*, or from one of the several documentaries now available. This accomplishes Step 1—engaging their interest in the inquiry. Then she has students hypothesize about the causes of the tragedy. She develops the inquiry's focus question:

"Why did the *Titanic* tragedy occur? We know it hit an iceberg, but why?"

What follows is the lesson plan she used. Notice that she provides the information to students rather than having them conduct research themselves. Why? She wants to familiarize them with the basic inquiry process, using a highly motivating topic. In the next unit, she will help them to use the inquiry process again, following the same five-part plan, but they will do Internet and library research. With this scaffold, they gradually build their inquiry skills throughout the year. Again, inquiry is not only an instructional method, cut a curriculum objective.

Note also that in this lesson plan the teacher provides information a little bit at a time—in chunks, or data sets. This is crucially important. This way, children can be helped to evaluate their hypotheses and draw tentative conclusions *after each data set*. This is the quasi-repetitive learning cycles approach. And it is authentic—it is what scientists and historians do. It is a vivid way to give children a memorable experience of the power of data, a little at a time, for they see hypotheses vanish from the whiteboard, and others added, as each new chunk of data is considered.

Causes of The *Titanic* Tragedy: An Inquiry[1]

Grades

4–8

Time

Two to four class periods

Objectives

Students will learn how to formulate hypotheses and then revise them as new information is encountered, and learn how to draw conclusions (claims) based on evidence.

Interest Building

Show a 1912 headline of the sinking of the *Titanic* and a clip from a documentary or fiction film of the tragedy, or photos of the *Titanic* gathered from magazine articles about the sinking of the ship and recent expeditions to explore it at the bottom of the sea. Tell students the story of the *Titanic*—where it was built, the distinct social classes on board, that it was billed as luxurious and unsinkable but, nonetheless, hit an iceberg and sank in the cold northern Atlantic on its first voyage.

Lesson Development

1. Ask students why they think a ship this great with a captain so skilled might have hit an iceberg on its maiden voyage. What caused the tragedy? List their reasons on the board under the title "Hypotheses." If needed, suggest some possibilities: captain was asleep, terrorism, lookouts were at a party, crew bad weather, captain was overconfident, design flaws in the ship.
2. Ask each student to jot down the hypothesis that he or she thinks might be true. Then ask everyone to share his or her favored hypothesis with the class.
3. Give students more information, one chunk (5 to 10 minutes) at a time. Begin with a set of information on the ship's design; then move to such things as the weather conditions that night, the captain's experience taking new ships across the Atlantic, the Titanic's sister ships, the way ships communicated and received warnings in those days, icebergs, social classes aboard the ship, the lifeboats, the ship's cargo, and the competition between the two shipping lines, Cunard and White

[1] Excerpted from Parker, W. C. (2011). *Social studies in elementary education* (14th ed.). Boston: Allyn and Bacon.

Star.

4. Important: Between each set of data, pause and ask students to examine the list of hypotheses on the board. Have them remove, add, and revise hypotheses in light of the information they are getting. This is the core activity of the lesson.

5. Draw the inquiry to a close. Ask students to return to the hypotheses they jotted down at the beginning of the lesson. Have them revise these as needed to reflect what they now believe to be true. These new statements are conclusions that are based on data; in other words, they are claims. Have them begin their claims as follows: "I conclude that the main reasons the Titanic tragedy occurred are. . . ." Encourage them to build multiple causes, not just one, into their conclusions.

Summary

Tell the class that this process of revising conclusions ("changing our minds") in light of new data is the essence of science. It is the meaning of *open-minded* and it is the opposite of *jumping to conclusions*. Now ask students what information they can imagine that would cause them to revise their conclusions yet again.

Assessment

Collect and read the claims students wrote at Step 5 and evaluate them on the extent to which they were based on data gathered in Step 3. Ask students to place these conclusions in their portfolios and to begin a sub-section called "inquiries."

It will be interesting to find out what students now perceive to be the meaning of such phrases as "jumping to conclusions" and "closed-minded." Also, see if they can write down the inquiry sequence they used in this lesson (see list below). Listen to their responses and provide assistance as needed.

1. Become familiar with the problem.

2. Develop hypotheses.

3. Gather and organize information.

4. Use the information to test each hypothesis.

5. Draw conclusion based on the information gathered.

Follow-up

Repeat the inquiry sequence with other, more specific questions that will surely arise: Why were there not enough lifeboats? What was the last music played by the band? Why did rescue ships not arrive sooner? What difference did social class make and why? Begin to teach students ways to evaluate the quality of information: What was the source? What was the author's bias? Which information on the *Titanic* is most reliable and credible?

Materials

Titanic websites (e.g., www.encyclopedia-titanica.org), the textbook, encyclopedias, magazine articles, books about its sinking and the expeditions to find it, film clips from *A Night to Remember* (1958) or the more recent James Cameron film, *Titanic* (1997).

Integration

Music. The heroism of the eight band members who kept playing to calm the passengers as the ship foundered is a study in itself. The funeral of their leader, Wallace Hartley, was attended by 30,000 (!) mourners in his home town of Colne, Lancashire (England). A mystery remains: What was the final music they played? Primary sources disagree. The contenders are "Autumn" and "Nearer, My God, to Thee." Invite a music teacher (or a musical parent) to visit the class and help students listen to

recordings of both.

Literature. There are many trade books, fiction and nonfiction, narrative and informational, on the *Titanic* tragedy. See *Titanic: The Disaster That Shocked the World*, by Mark Dubowski for younger children and, for older children, *Titanic: Destination Disaster* by John Eaton and Charles Haas. The latter deals with the music question in detail.

Conclusion

Students who have developed their inquiry abilities are able to draw conclusions based on evidence and judge whether conclusions drawn by others are supported by evidence. This is the essence of inquiry. When they learn to inquire skillfully, students learn to explore historical (and other social) problems by making an educated guess about the problem and then searching for evidence that would justify one conclusion over another. More specifically, they learn to hypothesize, search for evidence, evaluate the quality of evidence, use this evidence to test their hypotheses, draw conclusions, and evaluate the strength of conclusions. For this reason, the inquiry process is exalted as the highest form of higher-order thinking or critical thinking. Students learn that evidence varies in its credibility and that there are usually competing accounts and perspectives on any one event. Their teacher is forever pestering them with the questions "How do you know that's true?" and "Do your sources agree?" And, "If not, how did you decide?" Gradually, thanks to such teachers, students ask these questions themselves. They develop a healthy respect for facts, a steadfast aversion to jumping to conclusions, and an eagerness to spot prejudices and root them out.

These habits are among the most valued *cognitive* goals that we have for student's learning, but also they are among the most valued *democratic citizenship* goals. Why? Democracies rely on citizens who can think well. As Jefferson said, "their minds must be improved to a certain degree": citizens who can distinguish between evidence and opinion, between good arguments and good stories, between well-reached conclusions and outright lies. For these reasons, even beginning teachers, whether in kindergarten or college, should make it a priority to involve students in inquiry experiences. *Inquiry is not only an instructional method, it is a curriculum objective.*

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