# Relating Inquiry to Disciplinary Literacy: A Pedagogical Approach

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# Relating Inquiry to Disciplinary Literacy

*If you tell me, I will listen. If you show me, I will see.*
*But if you let me experience, I will learn.*

—Loa-Tse, Philosopher, 5th-century B.C.

## I. INTRODUCTION

Inquiry is an effective approach to teaching and learning in a world that is exploding with information. In fact, teachers can use inquiry to support students as they delve deep into disciplinary content to provide a rich, nuanced learning experience. In our model, we want students to do more than explore topics during inquiry, we want them to use the tools of a discipline to understand claims and evidences and to create new knowledge. Our aim is that students will engage in authentic, intellectual work so that their products will have value within schools as well as outside of school in their everyday lives.

In this document, we (a) explain our previous work on project-based inquiry, (b) introduce the Model for Inquiry-based Disciplinary Literacy (IDL) with its 5 phases, and (c) illustrate how to read, write, speak, and listen like a disciplinary expert (i.e., literary critic, scientist, historian, and mathematician) within the inquiry process.

## II. A PROJECT-BASED INQUIRY APPROACH TO LEARNING

Project-based inquiry has its roots in problem-based learning (Boss & Krauss, 2007; Buck Institute for Education, 2009), building on a strong orientation to real-world problems. The inquiry approach allows a rich set of technology tools and resources to be put into play as students explore and create new knowledge by answering a compelling question.

The content generated from project-based inquiry activities can be enhanced with Internet resources that enable a wide range of multimedia texts. Internet access also widens the communicative scope of project-based inquiry, allowing learners to share the results of their work with extended and distant audiences while gathering feedback and potential inspiration from others' work.

The aim of the project-based inquiry approach is to provide the opportunity for students to engage in what Newmann, Bryk, and Nagaoka (2001) described as authentic, intellectual work. They described the distinctive characteristics of authentic intellectual work as "construction of knowledge through disciplined inquiry in order to produce products that have value beyond school" (p. 14).

Likewise, elements of project-based inquiry possess what Dewey (1927) referred to as *productive inquiry*, which is deliberately seeking what we need in order to do what we want to do. Through a project-based inquiry process, our aim is to engage students in intellectual work that has depth, duration, and complexity, and to challenge and motivate students toward knowledge creation.

Intellectual development is primarily about learning to use a specific culture's semiotic resources within purposeful activities with others in ways that both conform to cultural expectations and express one's unique perspective. Obviously, reading and writing are central to a student's intellectual development; these processes are augmented through project-based inquiry as students use a variety of online tools as well as digital video to create products of learning.

We have applied project based inquiry in a variety of instructional settings, including the New Literacies Teacher Leader Institutes (Spires, Lee, Young, Leu, Coiro, & Castek, 2009); middle grade classrooms (Spires, Hervey, Morris & Stelpflug, 2012; and our New Literacies & Global Learning graduate degree program at NC State University (Manfra & Spires, 2013). We are using this same project-based inquiry process to scaffold teachers' knowledge and use of video and other digital media for instructional purposes, both in the U.S. (Spires, Hervey, & Watson, 2013) and in China (Spires, Morris, & Zhang, 2012).

## III. MODEL FOR INQUIRY-BASED DISCIPLINARY LITERACY

Building on our work with project-based inquiry, we have designed a Model for Inquiry-Based Disciplinary Literacy (IDL). See Figure 1. Our aim is to engage students in intellectual work that challenges and motivates them toward knowledge creation within a discipline. The IDL process has five phases: (1) Ask a compelling question; (2) Gather and analyze sources; (3) Creatively synthesize claims and evidences; (4) Critically evaluate and revise; and (5) Share, publish, and act.
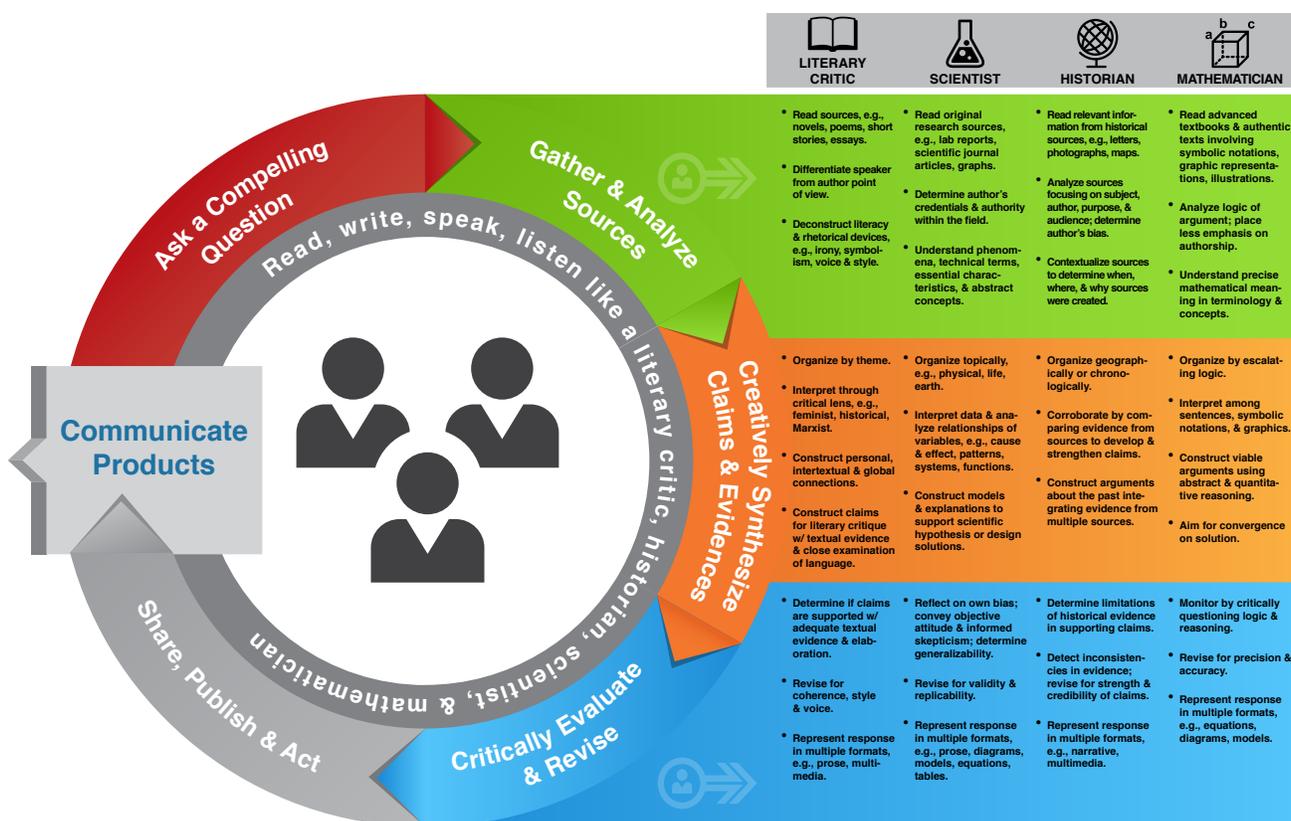


**Figure 1.** Model for Inquiry-Based Disciplinary Literacy. Spires, Kerkhoff, Graham, & Lee, 2014.

### ASK A COMPELLING QUESTION

High quality inquiry demands questions that compel us to seek an answer. In part, compelling questions emerge from our interests. A compelling question should also be an invitation to learn more. The more open ended and provocative, the better the question for inquiry. Likewise, questions should be authentic, which often can be the most compelling aspect of inquiry. The answer to a compelling question needs to be constructed. In other words, students should not be able to answer questions by searching the Web. Rather through an iterative design process students construct a response based on multiple resources and reflections in a creative way that produces an original product. The question may be teacher-generated, student-generated or a collaboration

among teacher and students. We typically have students work in pairs or small groups to explore their question. As teacher facilitators, we guided students to a variety of types of questions, ranging from direct informational questions to open-ended questions, to ill-structured problems to solve. A few sample questions are: What impact does global warming have on our planet and what can we do about it? What challenges has the Internet created for American youth? How did problems associated with the electoral college impact recent presidential elections?

### GATHER AND ANALYZE SOURCES

After students decide on a compelling question, they gather and analyze sources. Students use a wealth of print and digital resources to gather pertinent information to address their question. Notice in our model, we have differentiated how experts (literary critic, scientist, historian, and mathematician) in the four core disciplines gather and analyze sources during inquiry. It is important for the teacher to provide appropriate instruction in how to conduct productive web searches, taking into consideration key informational sites relative to a particular discipline. Students should pay particular attention to the credibility and reliability of information as they gather and analyze their sources. Additionally, we suggest that students conduct at least one close reading of a source that they locate. The source they target for a close reading should be one that is challenging and nuanced, and thus worthy of a close reading procedure.

### CREATIVELY SYNTHESIZE CLAIMS AND EVIDENCES

In order to arrive at a creative synthesis, students creatively synthesize claims that they generate within the disciplinary inquiry process. For example, a literary critic might construct claims with textual evidence and close examination of language, while a scientist might construct models to support scientific hypotheses. It is essential that students do the important work of justifying claims with appropriate evidence. After the claims are constructed and justified, students engage in an iterative design and development process that results in representing their research in a new and original way. The process requires students to demonstrate complex thinking with their content by integrating information across print and digital texts, drawing inferences, summarizing, and making novel connections en route to designing their final product. Based on the nature of their project and their content, students may choose a digital tool to support the representation of their content. For example, students may decide to create a video to represent their new knowledge. In this case, they must also gather necessary music, narration, and images that support their video concept. Using a storyboard, students would organize their resources in a way that promotes intellectual, aesthetic, and technical quality outcomes.

### CRITICALLY EVALUATE AND REVISE

Next, students critically evaluate and revise evidences as they fine-tune their claims within a discipline. For example, a historian might detect inconsistencies in evidence and revise for strength of credibility of claims, while a mathematician might critically question logic and revise for precision. In addition to ongoing teacher scaffolding and to ensure broad-based and high-level feedback for their final products, we suggest that students engage in a three-level evaluation process: self-evaluation, peer evaluation, and outside expert evaluation. The evaluations should be based on a well-developed rubric with elements included that target the intellectual and aesthetic qualities that are important to the teacher. The rubric may be teacher-generated, student-generated or a combination of the two. From our experience, we have learned that a rubric that is jointly developed by teacher and students often helps students stay motivated during the project since they have direct input into the learning goals. Using multiple sources of feedback based on the evaluation rubric, students revise their products accordingly. By combining formative and summative assessment, the teacher is using a powerful pedagogical approach that allows students to enter an iterative design process with important feedback along the way.

### SHARE, PUBLISH, AND ACT

As a culminating activity, students share and publish their inquiry products with class members as well as the larger educational community through the Web. Far too often, teachers are the only ones who see students' inquiry products. Students can produce inquiry products for a variety of audiences both inside and outside the classroom, using social media to connect with audiences from other countries and cultures. In creating their inquiry-learning product and sharing it on the Web, students are afforded the enriched opportunity of engaging in intellectual discourse around their new learning that extends beyond school. Specific outlets for publishing student-generated content are blogs (e.g. http://edublogs.org/), wikis (e.g. www.wikispaces.com), Twitter, or video sharing sites (e.g., vimeo.com). Students enjoy sharing their creative productions with family members and friends in addition to classmates in school. Sharing work with outside audiences has both cognitive and motivational benefits and supports students in their process of seeing themselves as writers, readers, and creators who make contributions beyond school (Jewitt, 2008; Lankshear, Peters, & Knobel, 2002). Additionally, a goal of inquiry is that students not only learn and create new knowledge about a compelling question, but they are emboldened to act with a sense of civic duty.

### MORE ABOUT THE IDL PROCESS

In addition to the 5 phases of the IDL process, the IDL projects:

- Can be any duration—a few hours, a few days, weeks, or months.
- Possess depth and complexity.
- Require that learners make use of a range of cognitive skills within their discipline. We use the modified Bloom's taxonomy to calibrate the types of intellectual processes that students are engaging in, with the ultimate goal being creativity. In Figure 2 we have inverted the model so that more time is spent on create and the other cognitive processes are in service of the act of creation.
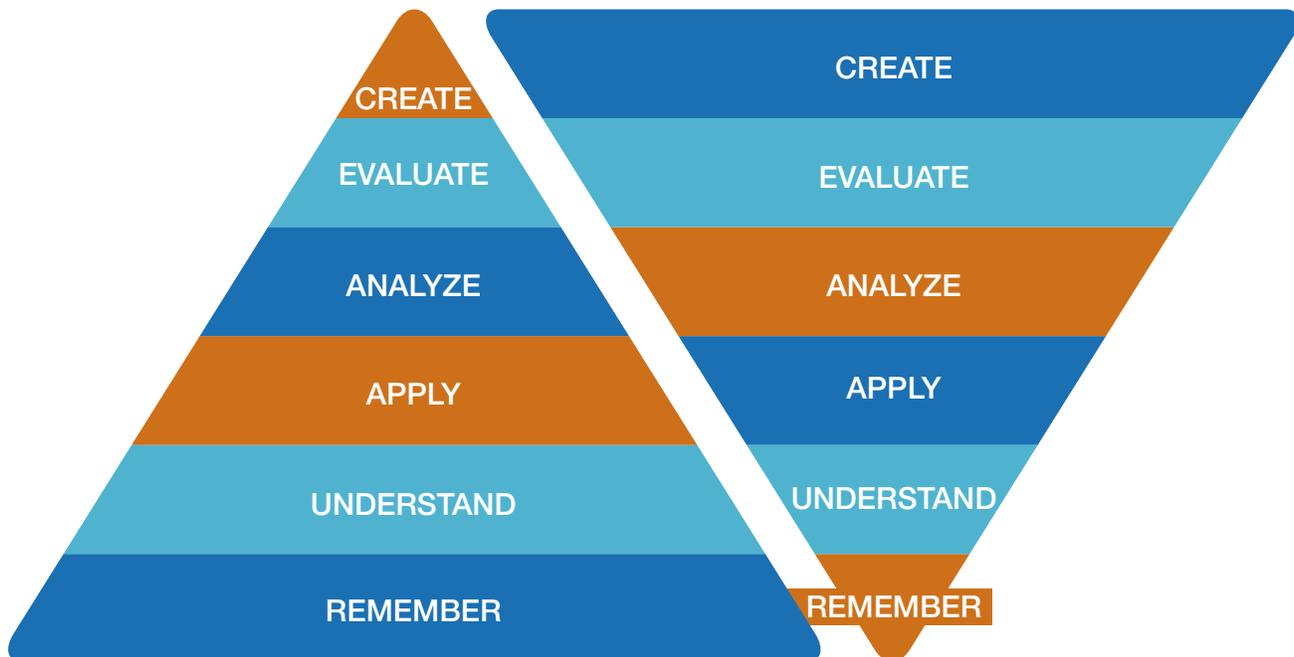


**Figure 2**. Inverted Bloom's Taxonomy. Adapted from Anderson & Krathwohl, 2001; Spires, Wiebe, Young, Hollebrands & Lee, 2009.

# IV. READ, WRITE, SPEAK, AND LISTEN LIKE A LITERARY CRITIC



Reading, writing, speaking, and listening like a literary critic requires students to understand the literal meaning of the text, as well as the implied meaning of the text. In language arts, not only is an understanding of the plot important to how one reads, but it is also important to understand the underlying meaning of the text through an interpretive reading of the text (Rainey & Moje, 2012). When constructing an interpretive reading of the text, the reader must be aware of the author's purpose, as well as the figurative language used throughout. It is important to take into account the aesthetic qualities of a text when reading like a literary critic, and understand one's personal and emotional response to a text. How a reader interprets the text depends partly on the text's structure and rhetoric, both of which impact a text's complexity. Besides reader response, close reading is another strategy used widely in ELA because it focuses students' attention on the language in the text while they construct an understanding of the text during reading.

## CONTEXTUALIZE

- Who is the author? How is he or she connected with this topic or issue?
- Personal Connection: How does this topic connect to me and/or society?
- Prior Knowledge: What do I know or believe about the topic or issue?
- Prediction: What do I predict will be the author's message?

## CLOSE READING

- What is the form of the text?
- Paraphrase: What is the message of the text? What is the literal meaning of the text?
- Who is the audience? Who is the speaker?
- Figurative Language: What kinds of literary devices are used? (imagery, symbolism, metaphors, litotes, allusion, irony) and the effect of sound devices (alliteration, onomatopoeia, assonance, consonance, rhyme, repetition)?
- What is the overall tone of the piece? (i.e., The speaker's attitude toward the subject of the work.)
- What is the theme(s) of the piece? (i.e., The author's message about life)

## CONNECTIONS

- What does the author want me to feel? Why?
- In what ways can I relate to the text?
- What inferences can be drawn from absences, omissions, or silences in the text?

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# V. READ, WRITE, SPEAK, AND LISTEN LIKE A SCIENTIST



A scientist or engineer devotes at least 50% of her time to reading and writing! (National Reading Council, 2011). Becoming literate in science requires more than general reading comprehension strategies. Students must learn the structure of terminology in the discipline and use texts to build background knowledge (Fisher, Grant, & Frey, 2009). Reading and writing are tools of inquiry that a scientist uses to investigate phenomena (Cervetti & Pearson, 2014). In the science classroom, students can use texts in authentic ways to learn about others' investigations of the natural world, build background knowledge, and synthesize ideas in order to discover scientific consensus on an issue.

## READ/LISTEN
- **Language features**
  - Clear and concise
  - New words formed from Latin roots
  - Nominalization
  - Question/Answer or Cause/Effect structure

- **Reliable sources**
  - Credentials of author
  - Funding of source is disclosed and isn't a conflict of interest
  - Most recent data
  - Convergence with scientific consensus
  - Rigorous method
  - Valid and reliable evidence

## WRITE/SPEAK
- **Text types**
  - Lab reports
  - Public announcements
  - Scientific journal articles
  - Instructions/procedures
  - Field guides
  - Handbooks
  - Graphic representation of data

- **Types of textual evidence**
  - Experiment results
  - Observations acquired from scientific method
  - Statistics
  - Scientific consensus as a fact

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# VI. READ, WRITE, SPEAK, AND LISTEN LIKE A HISTORIAN



The SCIM-C method integrates reading, writing, speaking, and listening like a historian with the inquiry process. The SCIM-C (summarize, contextualize, infer, monitor, corroborate) method is based on foundational work by Wineburg (2001).  A historian sources texts while reading and corroborates information with other texts to form a claim.

## SUMMARIZE
- What type of source is it? (cartoon, photograph, letter, map, interview, memoir)
- What is the subject of the source? (information, details, perspective)
- Who is the author? (nationality, ethnicity, race, gender, age, socio-economic status)
- What is the purpose? (to describe, to inform, to persuade)
- Who was the audience? (peers, local government, national government, community, leaders, followers)

## CONTEXTUALIZE
- When and where was the source produced?
- What was happening within the immediate and broader context at the time the source was produce? (tension, conflict, war, peace, victory, reform)
- What might be different in that time and place than your home? (vocabulary, symbols, values, customs)
- Why was the source created? (To describe __, To inform __ of__, To persuade __ of __)

## INFER
- What is suggested by the source?
- What inferences can be drawn from absences, omissions, or silences in the text?
- What initial claims and interpretations can you make? (develop your claim)

## MONITOR
- What were my assumptions before I read/listened? (your predicted answer)

- What additional evidence beyond the source is necessary to answer the historical question? (ideas, images, or terms that need further defining)
- How useful or significant is the source for its intended purpose in answering the historical question? (limitations, credibility, usefulness of the source)

## CORROBORATE
- What similarities and differences between the sources exist?
- What factors could account for these similarities and differences?
- What conclusions can be drawn from the accumulated interpretations? (strengthen your claim)
- What additional information or sources are necessary to answer more fully the guiding historical question? (inconsistencies, gaps)

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# VII. READ, WRITE, SPEAK, AND LISTEN LIKE A MATHEMATICIAN



Disciplinary literacy in mathematics requires students to explain their reasoning, connect to other problems that can be solved the same way, identify patterns, read and represent findings visually, know symbols' and words' definitions, think abstractly, and verify their answers (Hillman, 2013). Reading a mathematics text is complex because it including dense language, numeric symbols that need to be decoded, graphics, and lack of redundancy (Metsisto, 2005). Teaching students to be quantitatively literate requires them to *think* mathematically and *apply* these concepts, which is different than teaching them mathematics (Piatek-Jimenez, Marcinek, Phelps, & Dias, 2012). Guiding students to think like mathematicians requires them to speak using the language of the discipline, which ultimately leads to a deeper understanding of mathematical concepts.

## DIFFERENT PURPOSES FOR READING

- **Reading to make public:**
  Convey meaning, get feedback, make a presentation, demonstrate one's thinking.
- **Reading to comprehend:**
  Make sense of a text, to understand and follow directions, to make a decisions, to make sense of a graphic/visual, to extract specific information.
- **Reading to get an example:**
  Learn how to do something modeled in the text.
- **Reading to generate something new:**
  Create a written response, to spark an idea, to set the stage for the next activity, to revise a text.
- **Reading to remember:**
  Take notes to learn a new mathematical concept.

## DIFFERENT PURPOSES FOR WRITING

- **Writing for rehearsal:**
  Practice with repetition
  Use multiple strategies
- **Writing to problem-solve:**
  Real-world application
  Collaboration
  Problems lead to future problems sequentially
- **Writing to explain:**
  Thinking is made visible
- **Writing to inform:**
  Explain processes and procedures to others

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