Disciplinary Knowledge Paper:
Understanding Your Field as a Discipline[1]

GUIDELINES

Length: 5-7 pages

Each of you majored in a particular scientific field, one that seeks to understand and make meaning of the world through a particular approach. This paper asks you to describe that approach in terms of ways of being and knowing in your field. What does it mean to be a scientist from your perspective? The goal is to demonstrate that you know your subject matter well enough to be able to articulate its underpinnings and then make connections to how you might structure learning experiences for your students that are relevant to your discipline. If learning is a change in how one participates in culturally relevant activities (Rogoff, 2003) then how will you students learn to participate in your field? In other words how will you structure a classroom that teaches students to participate as biologists, chemists, etc.?

Howard Gardner (1994) writes," Disciplines consist of approaches devised by scholars over the centuries in order to address essential questions, issues and phenomena drawn from the natural and human worlds; they include methods of inquiry, network of concepts, theoretical frameworks, techniques for acquiring and verifying findings, appropriate images, symbols, vocabularies, and mental models. Over the centuries, human beings have developed these particular ways to look at the past, to understand biological beings, or to understand ourselves, which now proceed under the label of history, biology, or psychology. Disciplines are dynamic. Their objects, methods, theories, or accounts stimulate controversy and evolve over time."

Gardner is referring to the social nature of disciplinary knowledge. Some recent work has pushed to unpack the value of subject knowledge by building of the work of Lee Shulman. Shulman initiated a concept known as pedagogical knowledge. He was seeking to capture the use of content that enabled student learning, or to quote Ball's work in math, "teacher's use of math knowledge." Knowing the subject is still important – you cannot use something you do not know. But this is clearly a case of necessary but not sufficient. You need to have a particular understanding of that knowledge, one that is useful for student learning.

Ah, so easy to state, but so difficult to pin down. What then constitutes "useful" knowledge? There have been two different research thrusts in answering this, both of which are important for our efforts as teacher educators. The first direction consists of teachers' substantive understandings of their subject matter. This does include content (e.g. fractions, trigonometry, calculus) and procedures (long division, factoring) but also includes an understanding of concepts (parallelism, infinity, zero) and well as the relationship between each of the three. Try this in history: content (American Revolution, Renaissance), procedure (document based analysis) and concepts (federalism, nationalism). The key is that teachers are able to hook content onto larger, core concepts and students see how the tools give them the ability to do the work of an historian or a scientist.

The second direction is in understanding the nature of science. That is, where does the discipline come from, how does it change, how is truth established, what does it mean to know and do the disciplinary work, what are the relative centrality of different ideas, what are the important debates? What do people in the field generally agree on and what is highly contested? How do they resolve philosophical conflicts? Think of global warming. How do scientists frame this issue? How is it studied? What is contested amongst scientists? How does the issue get politicized?

The goal of this paper is to provide an opportunity to demonstrate how well you know the subject that is your primary certification discipline. How well do you know the deep questions that people in your

[1] Basic structure of this assignment designed by Brian Bailey, Yale University (2006).

field are struggling with and how will you use these deep questions to inform the ways in which you teach your students. To know well, for example, science, one needs to not just know facts about science; rather it is imperative that one also knows what it means to be a scientist. Absent such an understanding, teaching science becomes little more than giving out facts. **Use this paper to explore and articulate essential questions in your field and how they should play out in secondary classrooms.** Compare your understandings of your particular field to experiences that you have had in science classes during you undergraduate program or in high school.

Specifically your paper should demonstrate your understandings of…
…your discipline, including:

- The major concepts, principles, theories, laws and interrelationships of your field and supporting fields;
- Important personal and technological applications of science in your field of licensure
- The historical and cultural development of science and the evolution of knowledge in your discipline;
- Socially important issues related to science and technology in your field of licensure, as well as processes used to analyze and make decisions on such issues.

…science more generally, including:

- The unifying concepts of science delineated by the National Science Education Standards
- The philosophical tenets, assumptions, goals and values that distinguish science from technology and from other ways of knowing the world (nature of science);
- The processes, tenets, and assumptions of multiple methods of inquiry leading to scientific knowledge;
- The principles and concepts delineated in professional and New York State standards.

…and the teaching of these ideas:

- What is necessary to create learning experiences that make the subject matter meaningful and relevant for all students

Gardner, H. & Dyson, V. (1994). Teaching for understanding in the disciplines – and beyond. *Teachers College Record*, 96 (2), 198-218.
Rogoff, B. (2003). *The Cultural Nature of Human Development*. Oxford: Oxford University Press.