1) Disciplinary Literacy in Mathematics

A. Types of questions:

I. Description of the types of questions that are common in mathematics:
   A. Are engaged through critical thinking
   B. Can be answered or proven through mathematical process
   C. Can be interpreted through multiple strategies
   D. Open - ended
   E. Quantitative
   F. Use mathematical discourse and vocabulary

II. Examples of such questions
   A. "What method did you use to solve this problem?"
   B. "Can you show the same answer in a different way?"
   C. "Could you solve this word problem in more than one way? If so, what are the others way(s)?"
   D. "What is the problem asking you to solve?
   E. "What is the total quantity of this set of data"
   F. "Can the solution be represented in a different quantitative form?"
   G. "How did you come up with that answer? Explain."
   H. "Why did you use multiplication, division addition or subtraction?"
   I. "Did anyone solve this problem using a different method? If so, what method did you use?"
   J. "How could you apply this game to a real world scenario other than the ones in the problems?"
   K. "Why do you think solving word problems is important?"

III. Citations from relevant sources

Moss, J., & Case, R. (1999). Developing children's understanding of the rational numbers: A new model and an experimental curriculum. *Journal for Research in Mathematics Education*, *30*, 122-147.

(2016, November 29). Guiding Questions for Math Tasks. Retrieved from [https://www.create-abilities.com/blogs/create-abilities-blog/guiding-questions-for-math-tasks]

B. Methods of Inquiry

I. Description of the standards and expectations of how disciplinarians in your field answer their question.
    A. Mathematics is the science of patterns. It consists of "codifying and observing abstract symbolic representations" (Schoenfeld).
    B. Mathematicians are expected to communicate their results and findings. It is a social discipline.
    C. Proving the answer is correct through measurement, formulas, graphs, charts, equations, and proofs.

II. Citations for Relevant Sources
Schoenfeld, A. H. (1994). Reflections on doing and teaching mathematics. *Mathematical thinking and problem solving*, 53-70.

III. What does it look like?
    A. Written explanations, written mathematics, proofs, formulas, graphs, charts, tables, equations, and proofs.

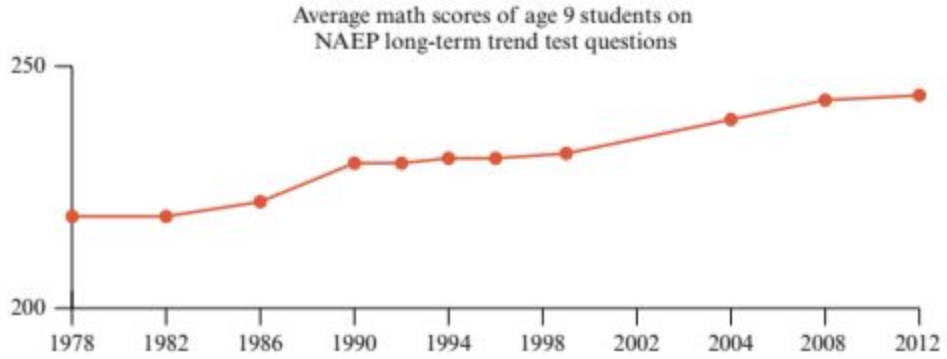
IV. Citations from relevant sources

C. Types of texts

I. Different disciplines value and engage with different types of texts, describe the range of texts valued in your disciplines. What are the characteristics of these texts? How are they produced?
    A. Graphs
    B. Line Graphs
    C. Charts
    D. Line Plots
    E. Math textbook
    F. Formulas
    G. Scholarly articles created by mathematicians

II. Give examples that illustrate what make these texts valued in your discipline.
    A. Graphs, line graphs, charts, line plots and plots prove a change over time or show data.
    B. Mathematics textbooks provide information on mathematics concepts and how to solve problems.
    C. Formulas provide guidance on how to solve mathematical problems and equations.
    D. Scholarly articles provide both general and specific information on the field of mathematics.

III. Citations from relevant sources



Beckman, S. (2018). *Mathematics for elementary teachers with activities.* [Kindle version]. Retrieved from Amazon.com.

D. Disciplinary literacy practices

I. What do disciplines actually DO with these texts
   A. Analyze and find patterns
   B. Produce conjectures or rules

II. Give examples of these practices in detail
   A. Mathematicians find patterns within mathematical equations and data to find connections in order to solve other problems and interpret data.

III. Citations from relevant sources.
   Schoenfeld, A. H. (1994). Reflections on doing and teaching mathematics. *Mathematical thinking and problem solving*, 53-70.

2.) Ideas for teaching

a. Engaging Students in Cycles of Inquiry

i. What specific ways can teachers engage students in authentic disciplinary cycles of inquiry (think back to the videos you've watched)
   A. Teachers should focus on the importance of conceptual understanding of mathematical concepts rather than memorization and procedures. This way, students are able to problem-solve in new situations that would require more than just a basic understanding of operations. Moss and Case developed a program for developing strong conceptual understanding of rational numbers. It is as follows:
      - A greater emphasis on meaning rather than procedures when manipulating rational numbers.
      - A greater emphasis on proportional nature of rational numbers

- A greater emphasis on children's natural way of viewing problems
- The use of alternative forms of visual representations

ii. What are the benefits and limitations of the specific examples you provide?
   A. Students are able to gain an understanding of meaning that will construct a strong mathematical framework.
   B. This promotes strong problem-solving skills
   C. A limitation is the lack of regard for differentiated learning.

B. Video on Pentominoes
- Teacher engages students through an investigation to solve a problem
- Students use manipulatives, such as pentominoes, to answer a question
- The teacher blatantly states the goal of the lesson to the class

Moss, J., & Case, R. (1999). Developing children's understanding of the rational numbers: A new model and an experimental curriculum. *Journal for Research in Mathematics Education*, 30, 122-147.

Annenberg Learner. Classroom Case Students 3 - 5 Exploring Perimeter and Area. (Retrieved Oct. 2019) http://www.learner.org/courses/learningmath/measurement/session10/35video.html#

b. Engineering and scaffolding success

i. What specific ways have you seen teachers engineer and scaffold student's success as they invite them into disciplinary practices? (video may have some, but I imagine the articles will be more helpful here)
   A. Asking guiding questions
   B. Working through problems with collaboration
   C. Provide students with a variety of mathematical texts to expose them to the discourse of the discipline (Borasi, Siegel, and Fonzi 1998).
   D. Promote the use of relevant real world application

ii. What are the benefits and limitations of the specific examples you provide?
   A. The questions cannot give away the answer
   B. Collaboration can be harmful if students are off task

Borasi, R., Siegel, M., Fonzi, J., & Smith, C. F. (1998). Using transactional reading strategies to support sense-making and discussion in mathematics classrooms: An exploratory study.*Journal for Research in Mathematics Education, 29*(3), 275-305.