Paper Assignment:
Critical Analysis of Instructional Materials on Force and Motion for Middle School Students
Due Friday, April 15, 2016

In the first six sections of *Kinematics,* we examine both uniform and non-uniform motion and develop the ideas of position, displacement, velocity, and acceleration. In the first three sections of *Dynamics,* we develop the ideas of force and net force, and we begin to explore the relationship between net force and changes in motion.

In *Physics by Inquiry,* concepts are developed from the ground up, and the materials emphasize the logical development of ideas and help refine notions of what it means to know/understand physics. In addition, each module is explicitly designed to foreground and address common conceptual and reasoning difficulties that many students (at all levels) experience with the subject matter. As a result, prospective teachers of physics and physical science at all levels have the opportunity to develop a robust, coherent conceptual framework for the subject matter along with considerable insight into both common student difficulties and effective, research-based strategies for addressing such difficulties. This knowledge helps teachers become critical consumers of instructional materials and science education standards, recognizing logical gaps and potentially ineffective approaches.

For this paper, you will review and critically evaluate three sections from *Project-Based Inquiry Science: Vehicles in Motion*[i], instructional materials on force, motion, and engineering design for middle-school physical science courses:

Section 1.1	Think about How to Make Your Coaster Car Go Straight and Far
Section 1.7.	Speed Trials
Section 1.9	Combining Forces (through page 81 only)

Section 1.1 introduces concepts from both kinematics and dynamics, Section 1.7 focuses on the measurement of speed, and Section 1.9 serves as an introduction to "adding" forces. While it is always challenging to examine a few sections from a larger set of instructional materials, you should identify the strengths and weaknesses of these three sections, drawing upon what we have covered in the first six sections of *Kinematics* and the first three sections of *Dynamics.* In particular, you may wish to focus on the presence or absence of logical gaps as well as the extent to which you believe student difficulties may be adequately addressed. You will notice that there is a very explicit emphasis on engineering design (which is a real strength of these materials), but these materials were also developed to support student learning of concepts in kinematics and dynamics.

In addition, for one of the sections, describe some modifications that you would make with the goal of enhancing student learning of kinematics and/or dynamics.

Make sure your writing is clear and concise, and that it flows smoothly. Diagrams and tables may be an important part of your paper, but they should not replace clear descriptions of procedures and experimental results.

Your paper should be approximately seven to nine pages in length (not including tables and diagrams), but this is only given as a guideline. The right length depends on your writing style and what you have to say. Papers must be typed (double-spaced) with margins wide enough for written comments.

You should not need to quote from *Physics by Inquiry* or any other book, but if you do so, include a footnote (in standard footnote format) citing the source.

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[i] J. L. Kolodner, J. S. Krajcik, D. C. Edelson, B. J. Reiser, and M. L. Starr, *Project-Based Inquiry Science: Vehicles in Motion* (It's About Time, Herff Jones Education Division, Armonk, NY, 2009).