JENNIFER L. DOCKTOR

Teaching Philosophy

Physics has a reputation for being highly technical and quantitatively difficult. As a result, the physics instructor faces a challenge to make course material meaningful and accessible to students at a variety of levels. Physics teachers have a unique opportunity to excite students about the nature of the universe that surrounds them, but also the means to prepare students for living and working in a technological society. Physics provides an ideal environment in which to engage in critical thinking and practice problem solving skills, in addition to learning to work collaboratively with peers.

As a Physics Education researcher and instructor, problem solving is a strong focus of my work. *True* problem solving in physics requires strong conceptual understanding, mathematical means of representing principles, and domain-specific strategies for approaching problems. Problem solving is also a means to acquire cooperative skills through group tasks that require students to contribute ideas, ask questions, justify their reasoning, and negotiate to reach a consensus. Contrary to what students might think, physics is much more than the memorization and manipulation of formulas.

In my classroom, it is my goal that students will develop a strong conceptual understanding of physics principles and apply them to real-world contexts, solve problems using analytical skills and logical reasoning, express clear, coherent arguments in written reports and oral presentations, formulate and carry out experiments, analyze data from physical measurements, overcome misconceptions about the physical world, and learn to work cooperatively in teams.

To achieve these broad learning goals, I utilize research-based teaching methods such as modeling a general framework for solving physics problems, using context-rich problems in cooperative groups and as homework, and computer-based problem-solving labs. My teaching practice places the instructor in a "facilitative guide" role and encourages significant student participation. This is accomplished through integrating personal response systems ("clickers") with interactive lecture demonstrations, think/pair/share activities, and whole-class discussions.

Assessment in my courses includes exams that balance both a conceptual understanding of physics topics with context-rich problem solving, written laboratory reports, cooperative group problem solving tasks, and online homework tutorials. My research experience with the design and implementation of rubrics facilitates the use of criterion-referenced evaluation tools; students know precisely what is expected on each assignment, and receive prompt feedback.

For me, teaching physics is an opportunity to apply my research interests to the practical classroom setting. I am continuously learning from the students I teach, as they develop an appreciation for the nature of the physical world and the critical thinking and problem solving skills that will enhance their lives in a technological society.

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Teaching Interests – *Undergraduate Level*

I am most interested in teaching introductory physics courses for undergraduate students, either algebra-based courses or a calculus-based course for scientists and engineers. My experiences as a teaching assistant and researcher in physics education have prepared me to excel in this classroom environment, and I look forward to implementing research-based teaching approaches into my classroom. As a result of my Master's research in elementary particle physics, teaching an introductory modern physics course would also be an experience of interest to me, as would an introductory course and/or freshman seminar on nuclear and particle physics.

I am also qualified to co-teach an undergraduate science methods course for future secondary science teachers since I could contribute knowledge of physics teaching methods. My core coursework in physics also prepares me to teach advanced undergraduate courses such as quantum mechanics, classical mechanics, electrodynamic theory, and statistical/thermal physics. However, my interest in teaching such courses is not as strong as my interest in introductory physics courses, secondary science teacher education, and graduate courses in STEM education.

Teaching Interests – *Graduate Level*

As a graduate student at the University of Minnesota, I have taken several courses in the departments of Curriculum & Instruction and Educational Psychology that are applicable to a graduate program in STEM education. In particular, I could teach courses related to teaching theory such as educational psychology, conceptual change theory (with applications to science education), and teaching theory and research. Although it does not appear on my transcript, I also attended a course on cooperative learning by David & Roger Johnson in the spring of 2007 and am capable of facilitating a course or workshop on cooperative learning.

I am also qualified to teach courses on quantitative and qualitative research methods in education. Courses I have taken pertaining to quantitative methods include survey design and sampling, and advanced statistical methods for social science using SPSS software (Statistical Package for the Social Sciences). I have taken two courses which gave an overview of major qualitative research traditions, including case study, ethnography, phenomenology, biography, and grounded theory. In addition, my research experiences include student interviews or "think-aloud" protocols and their analysis, and this hands-on knowledge could contribute to a research methods course. As an active researcher in Physics Education Research (PER), I am prepared to lead seminars and workshops on PER and the integration of this research into classroom settings.