

TEACHING PHILOSOPHY

My teaching philosophy is based on two principles supported by extensive education research:

1. Outstanding teaching requires a deep understanding of the subject matter and its structure, and an equally thorough technical understanding of how students think and learn.
2. Learning gains are strongly influenced by the quality and quantity of student interaction with the instructor and with peers.

General Teaching

- The goal of instruction is deep and sustained understanding, not the communication of information or administrative efficiency.
- Undergraduate students should be treated as mature, capable adults.
- Each student is unique, with distinctive talents and experiences. It is my job to help them sort out and enhance their unique abilities.
- The vast majority of students are capable of reaching high-academic standards. Students, however, are not often motivated to reach their potential.
- My role is to motivate students to learn through my genuine love of the subject. The most successful classes are those where the students are supported by peers and encouraged by the instructor.
- Learning is a partnership between the instructor and student. My behavior influences mood, receptivity and motivation of the student. If students succeed, I succeed.
- Effective teaching takes deliberate account of known student prior knowledge and experiences, and assessment.
- An optimal learning environment is created when students dialogue with one another, and carefully examine opposing views or models.
- At all times, I must respect the students, the students must respect me, and the students must respect each other.

Graduate Teaching

- Every graduate student is a unique individual. Hence, every graduate program should be tailored to fit the goals, aspirations and talents of that person.
- The graduate school experience should be marked by an increasing intellectual independence.
- Graduate students must be selected carefully with regard to aptitude and motivation to avoid unnecessary delays in their careers.
- As a graduate research advisor, I must be approachable and flexible. Students must feel comfortable to talk with me and question me.

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Physics Teacher Education

- Teachers should be treated as professionals.
- Effective teacher development programs connect teachers with each other, with teaching organizations, and with the education-research community.
- Graduate courses for teachers should provide opportunities to strengthen their content knowledge, sharpen their teaching skills, and learn new classroom technology.
- Teachers should acquire skills to design and implement course- and curricular-level changes, and conduct classroom-based research.
- Teachers should gain significant experience in the use of computer-based data collection and analysis tools, simulation programs, and other emerging technologies.

Physics Teaching

- Physics teaching should promote general critical-thinking skills, intellectual perseverance, and a better understanding of the nature, basis, limits, and validity of scientific knowledge.
- Physics students should be actively engaged in the scientific activity of modeling, including model development, validation, and revision. In particular, they should be given the opportunity to articulate and defend multiple competing models with peers.
- Students come to physics with many commonsense ideas about the physical world that are in conflict with the “accepted scientific view.” These pre-conceptions, or misconceptions, are tenacious and resistant to extinction by conventional teaching methods. Effective physics teaching takes these conceptions explicitly into account.
- Effective physics teaching makes effective use of tools of perceptualization. Physics students need experience in reasoning with mechanical models. For introductory students, effective teaching employs activities that activate the senses of sight, touch (e.g., body-kinesthetic activities) and hearing.
- The scope, sequence, and coordination of physics instruction is critical to the success or failure of a physics course. Every attempt should be made to tie the instruction to the students’ prior knowledge, and develop physical ideas and concepts gradually.
- Effective instruction presents problems and situations where cognitive conflict is likely to occur. Learning occurs when students compare and evaluate competing models.
- An effective physics program promotes skills in science writing, science reading, and mathematical problem solving.
- Physics students must develop skills and confidence in the communication of scientific knowledge.
- All physics students should gain experience in computer programming, and in the development and manipulation of computer simulations.