PICUP Visioning WORKshop Overview

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There are two goals for this workshop;

1. A collection of instructional proto-modules that use computation as an integral part of their learning objectives;
2. A record of critical discourse to support creation of a white paper laying out strategic guidelines for systematic development of a full body of instructional resources that integrate computation into undergraduate physics.

The proto-modules will illustrate how computation can reshape students' understanding of physics when computation becomes an essential tool for expressing, visualizing and applying physical theory. The particular illustrative collection from this workshop consider the topical area of electromagnetic physics at four different levels of expression:

1. The large introductory service course taught to other science and engineering majors
2. The small introductory course taught to physics majors
3. The upper division course(s) taught mainly to physics majors
4. The advanced courses – *e.g.* dedicated computational science course taught alone or partnered with another department, special (senior) projects supervised by physics faculty, *etc.*

These modules will attempt to address the question: If limitation of access to computational resources were not a question, how could this topic be taught.

The critical discourse will consider the concrete experiences of the module development work within the framework of a number of issues that inevitably circumscribe the development and implementation of any curricular innovation, but in this case referring to the innovation of integrating computational into undergraduate physics courses. What is at issue includes:

1. Physics department cooperation and support
2. Other departmental cooperation – those that physics services
3. Institutional support
4. Funding agency priorities
5. Partnering with NSDL collections – ComPADRE and CSERD
6. Divergent pedagogical approaches
7. Employment realities
8. Professional society support
9. Dealing with data – in the laboratory and of large scale
10. The emergence of high performance computing

The activities of the workshop will consist of alternating small group and plenary sessions intended to iteratively develop critical analysis between practical and issues-based work. It is because its focus will be on work that we are naming this a WORKshop and not a workSHOP.