

Building a National Digital Library for Computational Physics Education

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Background. Over the past dozen years we have produced some of the most widely used interactive curricular materials for the teaching of introductory and advanced physics. These materials are now hosted on and distributed from the Open Source Physics (OSP) Collection of the ComPADRE National Science Digital Library. This talk outlines the pedagogical and technical features of our learning platform and describes our current efforts to align this material with national and state standards for science teaching.

Methods. Current technologies allow educators the ability to combine traditional instruction with computational modeling. However, the implementation of computational modeling requires a considerable programming effort for teachers and students. This talk describes a modeling-cycle pedagogy that limits the amount of programming when designing, implementing, distributing, and using computer models. It is based on the integration of the Easy Java Simulations (EJS) modeling tool with the ComPADRE OSP Collection <<http://www.compadre.org/OSP/>>.

Results. The combination of EJS with Internet technologies allows teachers to easily incorporate computer-based modeling into their curriculum by providing an open and extensible solution for the creation and distribution of educational software.

The advantage of a modeling-cycle pedagogy for computational physics teaching is that it forces students to separate the model into logical parts and to separate the model from its representation. Although instructors and students can download and use our ready-to-run models without modification, we encourage them to examine these models to learn the logic of programming and to study the relevant algorithms when building their own models. Studying and implementing algorithms can teach much physics, but little user-interface coding is required because the interface is created automatically by EJS.

Conclusion. The OSP-EJS-ComPADRE learning platform removes many of the barriers involved in integrating computation into the classroom thereby allowing teachers to focus on the science. OSP provides the computational structure, including a computational physics textbook, for our project. The ease with which models can be examined and modified in the EJS environment allows learners to explore new physics and test the limitations of the models being used. ComPADRE encourages the sharing of curricular materials and allows instructors to find and adapt existing models to their particular needs.

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