Collaborative Research: Resource of Open Problems for Education (ROPE)

This proposal seeks to develop an on-line, electronic library that will provide a large number of innovative, well-tested and documented problems that instructors and students may use in a wide range of courses and for a wide range of assignment types. Any user will be able to search this library for problems by course, topic, type of problem (e.g., computational, conceptual, etc.), level of difficulty, and other characteristics. Problems will be contributed by the community of users and will have associated descriptive information that will include user feedback and comments, as well as statistics on the frequency of the problem's use. Users will be able to rate problems using a commonly understood "like" feature (similar to those used on social networking sites), create and share collections of problems they may refer to later for homework, quizzes or exams, and comment on problems for the benefit of other users. The library will support different problem formats, the ability to translate between them, and will be able to interact with other applications (for example, on-line homework systems) to provide problems for them.

Intellectual Merit

The Open Problem Library (OPL) will address a current need in undergraduate mathematics education: the need for a widely available source of good problems that instructors can use in a variety of educational venues. Much of the learning that takes place in mathematics is driven by students' work, and the success of that learning is fundamentally dependent on the types of problems on which they work. We therefore expect the OPL to be a significant and widely used tool for mathematics educators. Its search interface, open nature, user feedback, and extensibility will result in it being a resource that is easy to use by mathematics faculty, that will be widely used by them, and it will accordingly have a significant impact on student learning of undergraduate mathematics.

Broader Impacts

The broad impact of the OPL will stem from its accessibility, ease-of-use and extensibility. We expect that the largest group of users of the OPL will be faculty who are browsing for additional homework, test or quiz problems for their courses. The OPL will provide problems for users and authors of open-content and conventionally published textbooks, and will be particularly useful for open-content texts. Because the OPL will be designed from the outset to be flexible and extensible, it will be able to meet the changing needs of faculty in the future and make connections with other software projects for which a library of open problems will be useful. All told, we expect that the OPL will have broad impact, reaching instructors at all types of colleges and universities who are teaching any standard mathematics course in any of a number of different ways. We further expect

that as the OPL develops we will be able to extend it to include other disciplines, further increasing its impact.