"ITR: Catalyzing & Nurturing Online Workgroups to Power Virtual Learning Communities"

Project Summary

The Math Forum website (www.mathforum.org) combines educational activities, a digital library of resources, automated and manual mentoring, discussion forums and other mathematics-related services for students, teachers and the public. As an intellectual haven for about a million people, it demonstrates how the Internet can host large global learning communities. However, learning here has been primarily oriented toward individual learning. The Math Forum now aims to bring together some of its visitors with similar interests to work on common issues: students exploring a math issue together, teachers developing curriculum, or technologists and educators designing interactive math applets and support tools.

Collaborative learning in small workgroups can be particularly effective in motivating interest in math and in building and communicating deep understanding. A proliferation of small groups will heighten the sense of a vital community and increase its ability to become self-sustaining and vigorous. The groups will help people increase their community participation and their interest in mathematics.

Problem: How can one catalyze the formation of online workgroups? If there are a couple thousand users logged into the Math Forum when you log in, how can you automatically be put in touch with an optimal selection of 4 to 6 of those people whose interests and abilities best complement yours? Once formed, how can your group be nurtured with online tools, processes, structures and mentoring to maximize group success and collaborative learning? How can networks of different kinds of small groups contribute to the vitality of a larger community?

The Project will investigate these questions and related issues through a series of pilot studies, controlled experiments, prototypes and field studies using group-formation and group-scaffolding software that is designed, implemented and assessed in collaboration with an international, multidisciplinary group of leading HCI, CSCW and CSCL researchers. In particular, three different kinds of groups will be formed and supported: (a) groups of students who visit the site and work on a "collaborative problem of the month", (b) groups of teachers, student teachers and mentors who develop new problems and curricular approaches, and (c) multidisciplinary groups of international researchers and developers who design and assess the technologies and interventions of the Project.

Intellectual Merit: This Project explores a primary open challenge of the Internet – with detailed and rigorous methods, under controlled and real-world global conditions: how to foster effective collaborative online learning. It joins the multidisciplinary expertise of the international CSCL community with the practical success of the Math Forum to study how to mediate the growth of a large virtual learning community, and to design, develop and assess tools for the automated support of small workgroups acquiring, managing and negotiating knowledge.

Innovation in IT: An unfulfilled promise of the Internet is to bring together systematically people who do not live close by, but who could benefit from interacting within knowledge-rich contexts. This Project addresses core issues of computer support for collaborative learning (CSCL): how best to form and structure intimate learning workgroups within global knowledge-building communities and how to effectively scaffold their interactions.

Integration of Research & Education: The Math Forum is a major practical success of prior NSF research, forming a virtual community of about a million students, teachers and mathematicians. This Project will systematically initiate and support efforts to form small collaborations within the large body of users who now interact as individuals with the site. This fundamental research into innovative support for small group collaborative online learning will take place within a vibrant and realistic large-scale context and will impact all levels: student motivation and learning, teacher development, and community evolution – generating a new model of global virtual learning communities, incorporating the power and motivation of small-group collaboration.

Broader Impacts: The Math Forum model, with automated formation of small groups and support for interactions developing deep understanding of mathematics, will be suggestive for virtual learning communities in other domains, taking advantage of other digital libraries. This model provides opportunities for students and teachers excluded from collaborative learning due to geographic isolation, disadvantaged schools, physical disability, discrimination and other physical or social factors. The model stimulates both student motivation and teacher development, transforming interest in mathematics from a social stigma into a bridge to global friendships.

Integrating Diversity: A central Project hypothesis is that groups integrating specific kinds of diversity learn better.

International Collaboration: The Project builds on the PI's prior work on an EU grant. Core aspects of the Project – including technology design, pedagogy and assessment – will be conducted by workgroups of American and European leaders of the CSCL community in collaboration with Project staff. Annual week-long intensive workshops will bring these collaborators together with each other and with teachers and Project staff.