PROJECT SUMMARY
BRAID: Bridging the Disciplines with Authentic Inquiry & Discourse

Objectives, Expected Outcomes and Procedures: The Investigators and faculty collaborators of this proposal are part of a multi-disciplinary team of faculty from the Lyman Briggs School of Science at Michigan State University (MSU). We propose to build upon an MSU-funded pilot program which created new instructional materials to now deploy them in a coordinated innovative curriculum that will weave a “braid” among freshman undergraduate STEM courses (in particular: Biology, Chemistry, Mathematics, and HPS) in the Lyman Briggs residential college. The proposed curriculum will explicitly tie the lecture and laboratory portions of Biology and Chemistry with each other and to Mathematics and History, Philosophy, and Sociology of Science (HPS) courses. This proposal responds to national reports the have called for reform in undergraduate science, mathematics, and technology education (AAAS, 1990; NRC, 1996, 1997; NSF, 1996; Project Kaleidoscope, 1991). This proposal for the National Science Foundation (NSF) Course, Curriculum and Laboratory Improvements, Phase I Exploratory Projects, will initially deploy a full coordinated “BRAID’ed” curriculum in year one. The subsequent two years will focus on extensive longitudinal studying of the cohort of students who passed through the BRAID curriculum as they continue in their upper-level courses. We expect the participating students to show improved scientific experimental design skills and improved content knowledge performance in subsequent courses. Student learning gains during the BRAID year and following in the tracking years will be examined via expert interviews, surveys and course performance. This three-year study will be used to better inform faculty on the creation of, and study of, student learning in a interdisciplinary STEM curriculum.

Intellectual Merit of the Proposed Activity: In the Shaping the Future report (NSF, 1996) a recommendation made by the Advisory Committee advocated that the undergraduate education community who teach STEM courses must “develop more effective curricula and pedagogy – drawing on research knowledge about human learning and on technology” (p. 51). Yet it is striking to note the paucity of substantive research that has actually influenced the development of curricular materials, technological tools, and accompanying instructional design of undergraduate science courses. This lack of research can be explained, in part, by the background and training of the majority of faculty who teach science. They know and practice scientific research; however they are not familiar with research on learning (Wood and Gentile, 2003). Furthermore, this unfamiliarity often leads to a rejection of science education research published in journals such as the Journal of Research in Science Teaching or the American Educational Research Association. Therefore, we propose to strategically contribute to research on undergraduate learning science and technology and to the need for scientists to conduct and disseminate the research in ways that are accessible and acceptable to their peers.

Broader Impacts These results will have direct applications for improving educational practice in undergraduate science and technology courses. We will collaborate with other scientists and universities to conduct this research and use its data for a Phase 2 study.