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Proposal Summary

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Science Technology Engineering and Mathematics

UMass K-12 Connections

(STEM Connections)

University of Massachusetts Amherst (UMass)

PI/CoPI: Julian F. Tyson (PI), Chemistry; Kathleen S. Davis (co-PI), Teacher Education and Curriculum Studies; Morton M. Sternheim (co-PI). Physics and STEM Institute.

Number of Fellows per year: Ten graduate students (GK-12 Fellows).

Target audience of the project (K-12 grade band): Middle school students in Springfield, MA

NSF supported disciplines involved: all STEM disciplines with emphasis on contributions from chemistry, physics, astronomy, geosciences, and biology.

Brief description: Middle school teachers in a master's degree program will work in teams (six in all--consisting of a UMass faculty participant, one or two GK-12 fellows, and up to three teachers) on the implementation of research projects with their school students. STEM Connections will start with summer workshops for the Fellows and teachers. Teams will then work together for two semesters in a course focused on teacher learning of project-based instruction while concomitantly developing similar projects with middle school students.

Objectives and benefits: The project will provide science teachers in the middle schools in the Springfield school district with opportunities to acquire science content knowledge and training in inquiry- and project-based teaching, including the opportunity to conduct research as a part of a team with GK-12 Fellows, and UMass faculty. The Fellows and faculty will gain an understanding of the needs and culture of the schools, laying the foundations for future collaborations. The project will provide fellows with increased experience in effective pedagogical approaches, and will also provide a diverse population of middle school students with role models and mentors.

Activity Themes: Six UMass faculty participants will work with the GK-12 Fellows on the research themes during the summer, participate in the initial workshop, and work with teams during the remainder of the summer and the academic year. The research topics include the hydrologic cycle, water chemistry, atmospheric ozone, arsenic from pressure-treated decks, factors affecting plant growth (including microgravity), pollen and seed cell growth, and the ecology and behavior of birds. The

teachers involved are working towards a Master's Degree in Science Education, for which STEM Connections will offer a year-long, six-credit course (taught by PI Davis) on Inquiry- and project-Based Learning. The GK-12 Fellows will be prepared for their role in helping implement inquiry-based projects in the middle schools by visiting schools, working with faculty, taking a methods course for pre-service teachers, and planning and participating in the summer workshops. Fellows will join the middle school teachers for the Inquiry-Based Learning course, and also meet as a group at UMass. Both Fellows and teachers will take part in local professional society activities, and prepare manuscripts for submission to relevant journals. The year-long experience will culminate in a middle school science conference in Springfield.

Innovative aspects are (a) the alignment of the program with the Master's program, to give a tighter focus to the professional development aspects for the teachers in line with their expressed needs for real research experiences where inquiry is embedded in content learning, (b) the integration of the preparation of the Fellows with that of pre-service science teachers, and the provision of training in diversity issues by Springfield professional development staff, and (c) the oversight of the activities in the schools by graduate research assistants from the School of Education working with the course instructor (co-PI Davis).