Project Summary: Engaging Middle School Students in Student-Directed Inquiry through Virtual Environments for Learning

The Information Technology in Science Center for Teaching and Learning (ITS) at Texas A&M University and The Center for Innovative Learning and Assessment Technologies (CILAT) at the University of Louisiana at Lafayette propose the development of five web-based modules for middle school science that engage students in student-directed inquiry and provide teachers with professional development in facilitating this inquiry. These modules will immerse students in virtual environments for learning (VELs) where they will take on the role of scientists engaged in a complex task. The virtual settings presented in the VELs will support students in designing and carrying out their own investigations. All resources needed to complete the task posed in each module will be provided within the context presented in the VEL. Like scientists, students will identify questions, design and conduct scientific investigations, use virtual versions of the tools used by scientists to gather and analyze data, develop products in which they use evidence to support their reasoning, and collaborate with peers to analyze alternative arguments. The proposed modules will be integrated into Falcon, an assessment management system originally developed by CILAT. The proposed modules will also support teachers' professional development through components embedded in Falcon. Each module will address the National Science Education Standards for grades 5-8 and will integrate grade-appropriate mathematical skills. The design model for VELS builds on research on authentic inquiry and problem-based learning and on lessons learned through the design and implementation of Alien Rescue, an award-winning software program developed as a prototype for the proposed modules. Each VEL will be designed by an interdisciplinary team consisting of a scientist, science educator, district-based science curriculum specialist, and instructional designer.

Intellectual Merit. This project addresses the need for new models of instructional materials capable of engaging students in authentic inquiry in order to enhance their abilities to do scientific inquiry, as specified by the National Science Education Standards (NRC, 1996). The proposed modules will be used to test the innovative use of technology to immerse students in rich contexts where they address the types of tasks that confront scientists and use the types of tools that scientists use. Additionally, the materials developed will inform new approaches to supporting professional development of teachers through the use of educative components embedded in the modules.

Broader Impact. This project will result in the design and development of standards-based modules for national dissemination. Pilot testing of the modules will examine their impact on learning and interest in science as a career. This pilot testing will be conducted in Waco Independent School District, which has a diverse study body (48% Hispanic, 36% African American, and 15% White). A comparison of pilot test outcomes by race, ethnicity, socio-economic level, and gender will be used to examine whether VELs show promise as a means by which to decrease the achievement gaps currently found in science education. The modules will also support a rich research agenda on the design of a new type of educational software and will result in research-based specifications for instructional designers and software developers.