

Engaged Scholars Academy
Project Information Report
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1. **Project Title:** Advancing Science – Analytical Equipment Training and Loan Program for Teachers

2. **Project Description:** The Advancing Science Project is one of the Leitzel Center's first programs and is a signature offering of the center. It provides a mechanism for outreach from the University to science teachers throughout the state of NH. This project is a small, but representative example of the much larger national toward transformation in education and pedagogy in the K-16 teaching and learning levels. More specifically, this project partners University expertise and resources in analytical instrumentation and pedagogical best practices to improve the content knowledge and pedagogy of NH science teachers – moving middle and high school instruction for NH students toward 21st century skills supported by a culture of enriched student-driven inquiry.

This project helps UNH meet some of its goals in its newly released Strategic Plan. Specifically, Advancing Science develops mutually beneficial partnerships with the grade 8- 12 school communities and teachers. The program models pedagogical change that should ultimately infiltrate and transform teaching even at the university-level, and as such reinforces the interconnections between teaching, research, and engagement.

3. **Background:** The Advancing Science program is not new; it was created and established by Barbara Hopkins as part of her Christa MacAuliffe Fellowship Sabbatical Award - 1998. Barbara's vision developed into a scientific equipment and instrument loan program. Advancing Science became situated at the intersection of industry, public schools, and the University partners and provided affordable access through a system of equipment loaning. Because modern analytical equipment is expensive, most schools do not have the financial means to make these types of instrument purchases for their students, at a time when the STEM learning needs and preparation for students calls for this type of analytic instruction and experience. Moreover, in addition to loaning the equipment, this program provided essential instrument training to teachers and featured ways for them to integrate the instruments capabilities into inquiry-rich lesson plans.

Problem Statement: From its inception, participating teachers enrolled in a week-long Summer Institute that trained them how to use a range of diverse instruments and methodologies, including gas chromatographs (GC), High-pressure Liquid Chromatographs (HPLC), UV/VIS Spectrometers, DNA Finger-printing – Thermocyclers, Polymerase Chain Reaction, gel electrophoresis, and a variety of Vernier probes. After its initial years of Summer Institutes, teacher enrollments continually fell to the point that Summer Institutes had to be cancelled and the growth of the loan program peaked and receded to a core group of “regular” teacher-borrowers.

4. Project Details: In 2008, Leitzel Center staff led by the efforts of Steve Hale and Erik Froburg embarked on an informal (i.e., non-random, non-statistical) Needs Assessment for teachers showing interest in the Advancing Science program. Specifically, teachers were asked if they thought Advancing Science performed a valuable service to teachers and students, and it queried them about some of the specific obstacles to their participation. Overwhelmingly, teachers reported that the Advancing Science program would be valuable to their students' training and preparation and help the students to achieve some of the NH science learning frameworks goals relating to science inquiry and technology/instrumentation. The Needs Assessment further revealed that the major reason new teachers were not enlisting in our program was because of 1) some inherent inflexibilities related to scheduling training institutes in the summer, and 2) training on multiple instruments that teachers did not really have much interest or need. For example, there are many biology teachers that were interested in the biotechnology equipment training and loan, but not interested in the chemistry instrumentation (e.g., GC, HPLC, UV/VIS).

Goals and Objectives: This project aims to reinvigorate what has been a highly-visible offering of outreach and teacher professional development by the Leitzel Center (and by extension UNH). Based on the Needs Assessment, Hale and Froburg had written and were awarded a \$17,000 grant by the NH Department of Education to investigate alternative methods for structuring the Advancing Science teacher training components to attract more teachers and to increase the amount of instrument loan activity. Ultimately the goal is to produce a teacher-participation growth trajectory of at least +10% per year.

Target Population/Audience: The target population for the Advancing Science partnership includes, generally speaking, the science and mathematics teachers from NH, MA, and ME (three states that our infrastructure could potentially serve). More specifically speaking, the grant award includes high school teachers from Berlin High School, Hillsboro-Deering Cooperative High School, Raymond High School, and Sanborn Regional High School.

Methods

Evidence of External Collaboration and Partnership: In December 2008, Hale and Froburg submitted their grant proposal to fund the Advancing Science program with NH Department of Education funding through the Mathematics and Science Partnership program. This proposal was a result of several months of communication and partnership building (= engagement) with a large number of Schools In Need of Improvement (SINI), and eventually we entered into agreements, formalized by a Memorandum of Understanding (MOU). The MOU was crafted structured by the Needs Assessment and the SINI partners that had teacher involvement sufficient to be engaged with us in our partnership, ultimately joined us in our proposal. Through this partnership the SINI benefits by having teachings participate in a professional development program that advances their content and pedagogical knowledge in analytical instrumentation, which they can transfer to their students. Additionally, the SINI benefits by being able to borrow the equipment they were trained on, use it in their schools, and teach their

students how to effectively operate the equipment and analyze the data returned. The Leitzel Center benefits by 1) this partnership helping to fulfill the Center's mission of enhancing STEM education and outreach, 2) helping to grow and extend the life of the mainstay Advancing Science program, and 3) helping UNH achieve its strategic plan, so its "faculty, students, and staff will be committed to being engaged in our communities."

Expected Impact: There are two impacts expected from the teachers that participate in this program. First, we expect they will continue to request, borrow, and utilize the instruments they were trained on in their classrooms. Second, we expect they will utilize the instruments to create new lesson plans or modify existing lesson plans to be infused with inquiry-rich teaching and learning styles – ultimately leading to a transformation of their curriculum. Evidence for impact will be collected through anonymous online-surveys that solicit responses to questions to reveal if and how the teachers have continued to use the instruments, and how it has transformed their curriculum. For evidence of even broader impact, the survey will determine if the teachers have had any influence or shared their gained experience with any of their teacher peers. Plans for public dissemination include posting and featuring the outcomes of this project, as evidenced from the surveys, on the Advancing Science website. If our expectations are met, it gives us cause to move forward with attempts to sustain our offering. If our expectations are not met, then we must consider the larger need for this kind of programming. Either way, the outreach and teacher engagement community will benefit from learning from our experiences in this equipment loan project – as it is a model for reaching out to teachers that sounds good, but must be tested in a variety of state and school circumstances.

Scholarly Connection: This project benefits me (and other Center staff) personally by full engagement with the external partners that the Center serves regularly as part of its mission. That is it contributes to our development and participation in professional learning communities linked to UNH. Through these learning communities, opportunities for real scholarship emerge that more fully solidifies and formalizes the connections with our partners and elevates the reputation and prestige of the Leitzel Center. This in turn has large benefits when preparing future proposal efforts aimed at serving our existing teacher partners and any new potential partners. To be able to document efficient and effective engaged partnerships, through scholarly publications and presentation, provides the service capital that will help sustain centers and organizations similar to the Leitzel Center.

5. ***Evaluation Plan:*** The evaluation plan for this (relatively) small project is directly linked to the measurement of its impacts (section 4. Expected Impact). That is, if the needs of the teachers have been met – and this is borne out through the survey assessment instruments - then I think the project realized successful Engagement of both parties. However, if the instruments demonstrate that the needs for teachers seeking instrument was not met, then the Engagement plan will have failed. A forensic look at the structure and function of the engagement strategies would need to be examined to determine if and what alternative strategies could be taken – perhaps the particular partners was at issue, perhaps it was the training providers, or the venue, etc. The scholarship aspects of the

partnership will be evaluated based on the type and number of dissemination strategies (e.g., workshops, webpage communications, publications, public reports) that get implemented and realized.