

## Background

The *American Recovery and Reinvestment Act of 2009* (ARRA) included a \$650 million allocation in ESEA Title II, Part D, commonly referred to as the *Enhancing Education Through Technology* program (EETT). This case study was prepared by the State Educational Technology Directors Association (SETDA) – the principal association representing the technology leadership of state and territorial departments of education – to provide an example of ARRA funds working at the district and classroom level that creates effective, viable, and robust reform in education, and improves the way teachers teach and students learn.

## New Hampshire's EETT Competitive Grants

In New Hampshire, the 21st Century Classrooms Initiative provided grants to school districts and/or consortia of school districts for innovative integration of educational technology and information literacy to advance student learning. To transform traditional models of schooling into 21st century learning environments, students, teachers, and administrators were immersed in projects that focused on media-rich teaching and learning resources and strategies.

## Transforming Classrooms Through Technology New Hampshire School Administrative Unit #53 December 2009-September 2011

The purpose of the Transforming Classrooms Through Technology grant was to increase student achievement in science with a hands-on, inquiry-based approach in K-12 while integrating technology. Through equipment purchases, professional development, in-depth curriculum alignment, and a commitment to higher order cognitive processes, this program revamped the science curriculum.

## Demographics

School Administrative Unit (SAU) #53 is comprised of 10 schools in the school districts of Allenstown, Chichester, Deerfield, Epsom and Pembroke, New Hampshire. The SAU provides PK-12 educational experiences for approximately 3,500 students. SAU #53 schools are in the suburbs of Concord, the state capital.

## Project Description

The Transforming Science Classrooms Through Technology project focused on science education in nine schools, with mandatory participation from all five high school science teachers and voluntary participation by the elementary and middle school science teachers. Recent revisions to the New Hampshire Science Frameworks, provided the opportunity to infuse technology and encourage new professional development. The equipment purchased included two lab stations per school and five lab stations for the high school. The lab stations included a laptop, an interactive whiteboard, video

cameras, science probes (including electronic, motion, temperature, biology, and chemistry probes), a document camera, digital microscopes, a weather station, high speed digital cameras, and the appropriate software. Participating teachers engaged in professional development and developed lessons using the Understanding by Design (UBD) model, which included incorporating the new equipment. The professional development also established a learning community for the science teachers. As part of the process, teachers analyzed the effectiveness of technology-enriched lessons by comparing them to traditionally delivered lessons using experimental and control groups.

ARRA EETT Grant Details	
Grant Focus	Content Standards and High-Quality Assessments and High-Access, Technology-Rich Learning Environments
Beginning/End Date of Grant	December 10, 2009-September 30, 2011
Locale	Town/Rural
Funding	\$534,066
Grade Level (s)	K-12
Number of Teachers Impacted	27
Number of Administrators Impacted	10
Number of Students Impacted	482

## Project Implementation

During the spring and summer of 2010, materials and equipment were ordered and set up in the participating classrooms. In preparation, teachers conducted technology literacy pretests to establish a baseline. Project leaders attended statewide meetings, and monthly meetings were held for all SAU #53 participating teachers and administrators to discuss project goals and activities, equipment use (i.e., interactive whiteboards, probes, and weather equipment), and experiment and evaluation strategies.

A full-time integration specialist was employed as part of this project. She guided the classroom teachers to integrate the technology tools into the curriculum based on the New Hampshire Science Frameworks and ISTE standards. This specialist also assessed individual professional development needs and aligned the professional development with

district technology plans and the science grade-span standards. She visited each participating classroom on an almost weekly basis to help with integration and collaboration. She organized the template used for sharing lessons in the learning community's online site, which was hosted by Sakai, New Hampshire's content management system. She also organized monthly meetings and disseminated information locally, across the project, and statewide.

Teachers were well versed in developing lessons using UBD principles through previous professional development. Each participating teacher was responsible for developing a minimum of two lessons using a UBD template to share via the learning community's site. In addition, a wiki was part of this site, and teachers communicated with each other via the wiki throughout the school year. A listserv provided another opportunity to communicate information to and between the participants. Many of the participants also attended regional and national conferences.

### Classroom Examples

- In two first grade classes, students studied plant growth. Two separate classrooms were established, a control and treatment (with technology-enhanced instruction) classroom. In the control class, students studied plant growth as they have in the past, planting a seed in soil, documenting the plant's growth, and labeling diagrams. In the technology-rich classroom, students planted seeds and observed growth but also used probes and technology tools to vary sunlight and water to manipulate and observe their effect on simulated plants. Students viewed video clips to show plant growth from a seed to a full plant in fast time. They also used interactive sites on the computers to alter plant growth via simulations. Pre- and post-test scores on a plant growth assessment were collected for both the control and treatment classes and showed higher scores for the treatment group (87% versus 82%). Teacher observations indicated that students were significantly more engaged when using technology. The simulation for the plant growth was especially beneficial and fun for the students.
- In a sixth grade science unit on sound, the objective was to have students explain that sound vibrations move at different speeds and frequencies and have different wavelengths. Two classes, a control and treatment (with technology-enhanced instruction) completed activities to study sound. A different teacher taught each class. Both teachers developed the lessons and tried to make the experience, with the exception of the technology, similar for the students. Students determined what a wave looked like if a sound was loud or soft and what it looked like if a sound has a high pitch or a low pitch. In the technology-rich classroom, students used an MP3 player, tuning forks, and additional instruments to create different sounds and used

The integration of technology in the first grade classroom has been positive. The students are significantly more engaged. They regard the lessons as fun and can't wait to have their turn with the tools.  
-Barbara Nelson, First Grade Teacher

probes to record the wavelengths. Students uploaded the sound files to a computer and used Audacity software to view and edit the sound waves. In the control classroom, students worked with tuning forks and probes but did not have the MP3 players using textbooks and diagrams as reference. At the end of this activity, all students took a quiz. Students matched diagrams of six different waves with its type: loud and high-pitched, loud and low-pitched, soft and high-pitched, soft and low-pitched, loud and medium-pitched, or soft and medium-pitched. The average score of the treatment group was 5.29 out of a possible 6. The average of the control group was 3.88 out of 6 points. In addition, 70% of the students in the treatment group answered all the questions correctly on the quiz while only 47% of the students in the control group answered all the questions correctly.

### Evaluating Effectiveness

All districts receiving ARRA Ed Tech grant funds were required to complete evaluation instruments/surveys created by Hezel Associates and instruments created by NHDOE, including a Walkthrough Observation Tool, Educator Survey, Student Survey, NH School Technology and Readiness (STaR) Chart, NH District Technology Survey, and NH School Technology Surveys. See "Resources" below for access to the full evaluation report.

The program had multiple benefits for both students and teachers. Students benefited from an engaging and interactive 21st century learning environment. Informal observations and data collection by the science/technology integration specialist and administrators concluded that the integration of technology helped to increase student comprehension and engagement. Teachers believe that their productivity and efficiency increased, as they were able to utilize the new technology in their daily plans and share plans with other teachers.

### Moving Forward

As other classroom teachers saw the technology used by their colleagues and the gains in comprehension and engagement with students, there was a demand in other classes for increased technology. At Epsom Central High School, all other classrooms were equipped with interactive whiteboards. At Hill School, additional student labs were installed, and local funds were used to rehire the project's integration specialist on a part-time basis. The online management system, Sakai, continues to support professional learning, and teachers continue to meet to share ideas.

### Resources

New Hampshire School Administrative Unit #53

<http://www.sau53.org>

State-wide Evaluation of the New Hampshire ESEA Title II, Part D Grant Program Final Report, October 2011

<http://tinyurl.com/8yz3l5k>

New Hampshire Department of Education

<http://www.education.nh.gov/>

SETDA ARRA Information and Resources

<http://setda.org/web/guest/ARRAresources>