Montshire Museum of Science

Annual Progress Report
For
Science Education Partnership Award
National Institutes of Health

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Introduction
The "Connecting Classrooms and Community with the Health Sciences" SEPA project is a five-year award to provide the development, piloting, and implementation of a series of health curriculum modules and teacher professional development activities aimed at students and teachers in grades 5-8. Specific topics explored in this work are those of high interest in young adolescents and related to current research at Dartmouth Medical School. The programs are targeted at reaching rural youth and their teachers in Vermont and New Hampshire. The project creates a unique collaboration between a science museum, with its rich science education teaching resources and curriculum development expertise with a medical school and its research staff and expertise in adolescent health issues.

A. Specific Aims
The Specific Aims of the project have not been modified from the original proposal and work during the current budget year has been based on meeting those aims.

B. Studies and Results
Year four of this five-year project saw several new additions to the health science programming both at the Museum and in schools and communities in Vermont and New Hampshire. In addition, curriculum materials continue to be developed and implemented in schools, new schools have been added to the project, and we hosted the third and final summer institute. Specific project activities and results are detailed below.

Health Curriculum Development and Piloting:
We have completed the development of all curriculum support materials for the project. The first topic we developed curriculum material for was on nutrition and diet. *Investigations in Diet, Nutrition, and Activity* is now a completed teacher guide and is available for free to teachers. Year 3 saw the piloting of the student instructional material on skin health with the curriculum module *Student Investigations into UV Light and Sun Protection.* This module was then revised in Year 4 based on teacher feedback and project evaluation. During the past year we focused our curriculum development efforts on the refinement, piloting, revision and final editing of the module *The Choices We Make: Behavioral Research for Middle School Students.*

The Choices We Make focuses on social behavior research – giving students the tools they need to begin to develop their own research questions around a variety of adolescent health issues that can be answered through the lens of behavior research. The module begins with a study of the students' own behaviors and the potential influences to certain risk behaviors. The student research component furthers their understanding of behavior by using themselves, their school, and their community as the research focus. Risk behaviors may have a serious impact on health, both in the short- and long-term. By focusing on behavior, research design, and health science content, we strive to create a deeper understanding and give students more control in dealing with important adolescent health issues. Through student designed and implemented research, middle school students have the opportunity to investigate their own, and that of their peers, decision making processes related to healthy, and unhealthy, adolescent behaviors. Examples of student research questions explored while piloting this module during the 2012/2013 school year ranged from "accessing helmet use among 6th and 7th graders in five activities: snowmobiling, dirt biking, downhill skiing, bicycle riding, and skate boarding" to "Does the presence of 8th graders eating healthy vegetables influence the food choices of 6th graders in the cafeteria?" *The Choices We Make* module has thus been shown to provide students with the background needed to research a variety of health behaviors. This unit is currently being revised based on teacher evaluations, and will be release for teacher use for the fall 2013 school semester.

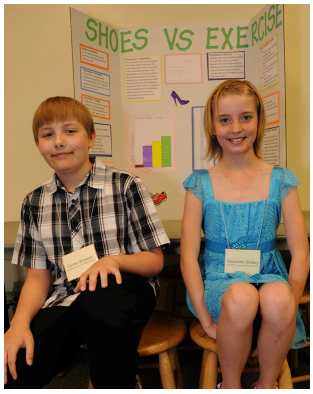
School Technical Support and Implementation:
Three new partner schools were added during Year 4: Barnet Elementary (K-8), Barnet, VT; Danville School (K-12), Danville, VT; and Walden School (K-8), Walden, VT. All three of these schools are located in Vermont's rural Northeast Kingdom, a region with the state's highest of unemployment rate and low educational attainment. The addition of these three schools bring the total number of schools supported by the project to 13. Support strategies continued to included multiple site visits to each school to work with teaches and students; providing classroom teaching equipment and materials – including materials needed for students to measure UV levels in their school yard, use of appropriate education technology such as Vernier Lab Quest computers and sensors, and email and phone support with teachers during the program's implementation in their classrooms.

In addition, project staff also supported teachers of younger grades in implementation of a variety of science lessons focused on experimental design and inquiry. The goal of this work was to excite students in younger grades about science, help their teachers better provide rich inquiry learning experiences for their students, and thus better prepare students, beginning in the elementary grades, to be actively involved in the scientific process and to successfully develop and implement their own student designed research in the middle school years. Combined, project staff spent a total of 63 days in schools and classrooms across Vermont and New Hampshire as part of this project.

Researchers Talking About Research Classroom Video:
We were hoping we would have this video completed for use in the classroom during the spring of 2013. However, the move of two of our research associates from Dartmouth Medical School to University of Connecticut delayed the taping of our final interview. Windy Bluff Productions, our videographers on the project, are currently in the final editing phase and expect the video to be completed by the end of September, 2013. This video will be used by teachers in their classrooms to explain different aspects of research design, and will also introduce health researchers to the students.

Student Research Symposium:

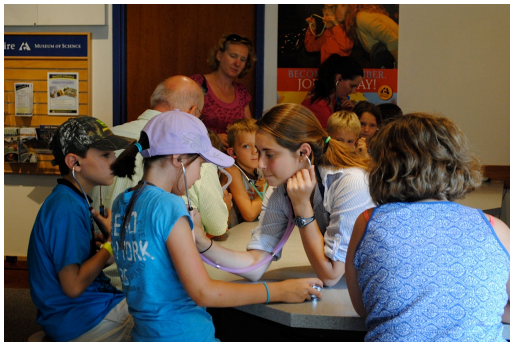
As reported in our Year 3 annual report, this project highlights the emphasis on student-designed research through the Museum's hosting of the annual *Student Health Sciences Research Symposium* each spring. The third annual symposium was held at the Museum on May 9, 2013. A total of 130 participants representing 45 student research groups from Vermont and New Hampshire presented their findings to their peers, teachers, parents, and health researchers. An example of some of the student research questions investigated by these young research teams and presented at this year's symposium are listed below.



Examples of student research questions presented at the Annual SEPA Student Health Science Symposium, held annually at the Montshire Museum of Science
Does having a garden affect what vegetables kids eat?
Does going outside affect how often you are sick?
Do the type of shoes people normally wear affect how much they exercise?
Can 7th graders identify the correct serving size of different foods?
Which activity has kids being the most active in PE class: rope climbing, archery, or soccer?
What will fifth and sixth graders choose for a snack first, candy or fruit?
Do people know what foods are healthy and unhealthy for their heart?
How does the amount of calories in organic foods compare to the amount in non-organic foods?
How do two different activities, shooting hoop and playing video games, affect heart rate?

Community Engagement and Informal Learning:

In addition to our work with teachers and students, *Connecting Classrooms and Community with the Health Sciences* strives to engage the community through informal science education programs in out-of-school times, both at the Museum and in the communities. During Year 3 a new family workshop was developed for use at the Museum's *Science Discovery Lab* workshop space: *Heart Smart for Kids,* a program in which families use stethoscopes to listen to their own heart, while learning how being active and eating healthy are important to your heart's health.



A new family activity is being developed and piloted during the summer of 2013 on "Building a Healthy Snack." In this activity, families learn about healthy eating, portion size, and are introduced to the concept of energy balance. This program also incorporates a *Concept II Rowing Erg*, an indoor rowing machine that allows users to 'feel a calorie', and better understand how much energy is expended in typical exercise activities.

The project is now taking these family-friendly activities to community events through the Museum's *Pop-Up Science* tent which brings health science activities to families at fairs and festivals. This new program allows the Montshire to reach audiences with important messages about healthy living outside the walls of the Museum.

Museum staff have delivered 37 *Heart Smart for Kids* and other health science family workshops in the past year, reaching approximately 450 visitors in extended learning activities. In addition, the new *Pop Up Science* program will have delivered health science activities to festivals and fairs during the summer of 2013 reaching approximately 1000 participants.

Teacher Professional Development:
July 1-3, 2013 saw the third and final teacher summer institute for this project. The project hosted 14 teachers from four states (Vermont, New Hampshire, Massachusetts, and Maine) for this three-day workshop titled *Designing Student Research Experiences in the Health Sciences.* Teachers were provided training in nutrition and energy balance, including introduced to current research in the childhood obesity epidemic by project advising researchers; learned how students could investigate what influences their healthy, and unhealthy, decision making process through behavior research; developed their capacity to help students design and carry out their own health research projects; and planned how they would implement this work into their own science curriculum for the 2013/2014 school year. The need for these kinds of professional development opportunities was made evident with 38 teachers applying for this workshop with only 14 available spaces.

To date, 48 teachers have participated in multi-day professional development workshop as part of the *Connecting Classrooms and the Community with the Health Sciences* project. These teachers, some who teach in self-contained classrooms of 16-18 students in small rural schools, and some who see over 150 different students in the course of the year as science or health education specialists, reach approximately 2,500 students in grades 5-8 in aggregate. Teachers who have participated in the Museum's health sciences professional development programs represent four states in New England, and 28 different schools.

Evaluation Activities:
Inverness Research Associates (IRA) evaluators continue to implement program assessment instruments providing formative evaluation data used to fine tune program curriculum materials, teacher professional development programs, and student workshops. IRA evaluators were on site at the annual student symposium in May, 2013. This provided evaluators an opportunity to interview teachers and students as part of their evaluation design. IRA also conducted a student focus group at this event, the results of the data collected is not yet available at the time of this report writing. In addition, student and teacher survey instruments continue to be implemented.

C. Significance
Based on data from Inverness Research Associates, we feel strongly that this project is having a major impact on student learning and excitement for the health sciences. We also recognize the importance of providing students opportunities to conduct their own research, even in the middle school years, and having an authentic experience sharing their work with their peers and others in the student symposium. It is also evident from IRA's data the need to provide teachers with the professional development and on-going support to build their confidence and abilities to provide these rich health science learning experiences for their students. Specific evaluation data are highlighted below:

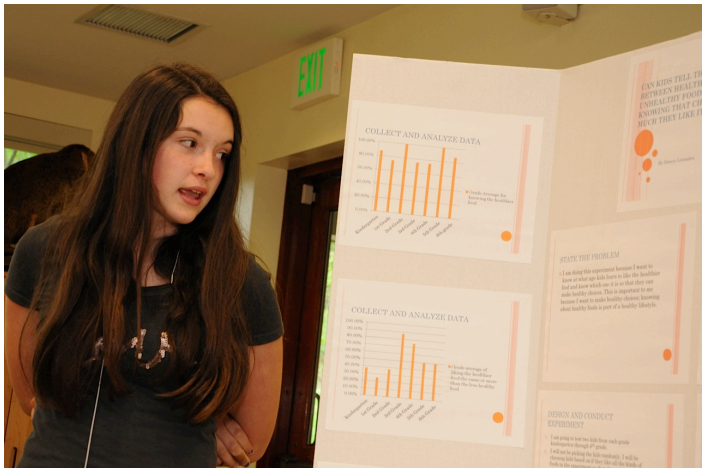
Student experience and confidence in conducting their own research:
To better understand the role of this project in building students confidence in conducting research, IRA administered a pre-research project survey and post-unit survey to students in two classrooms. On the pre-survey they asked: "How much experience have you had conducting your own research projects?" On the post-survey the question asked waws "How would you rate your confidence in your ability to conduct your own research project in the future?"

Before the unit, 62% of student have had at least a little experience conducting their own research, including 32% who self-reported "some" or "a lot." After completing the unit, 85% of students self-reported that they are at least "somewhat confident", including 46% who are "confident" or "very confident" in their ability to conduct their own student research.

Pre-unit student survey: "How much experience have you had conducting your own research projects?"						
	Not much		***A little***		***A lot***	***Not Answered***
Total PRE survey responses	16	21	34	23	14	5
Percentage	14%	19%	30%	20%	12%	4%
Post-unit student survey: "How would you rate your confidence in your ability to conduct your own research project in the future?"						
	Not confident		Somewhat confident		Very confident	Not Answered
Total PRE survey responses	8	7	39	29	21	4
Percentage	7%	6%	36%	27%	19%	4%
Percentage Differentials	-7%	-13%	6%	7%	7%	0%

Improving students' ability to design and carry out research:

Two teachers provided data on their students' success in carrying out different aspects of research design. Both teachers agreed, or agreed strongly that: 1) their students were mostly very engaged in conducting the research project, 2) their students were more engaged than they typically are for science-related projects, 3) the experience of designing and conducting a research project positively impacted their overall enthusiasm for and interest in science, and 4) their students generated additional questions from their research that they were interested in pursuing further.



In addition, these two teachers who participated in this phase of the project evaluation provided the following evidence of how the classroom work in this project increased their students abilities to do science:

Proportion of student in two classrooms who successfully carried out five aspects of research project before and after their teachers worked with the Montshire's SEPA project.				
	Teacher 1's Students		***Teacher 2's Students***	
	Before work with the Montshire	After work with the Montshire	Before work with the Montshire	After work with the Montshire
Form a testable research question	Few if any	All or almost all	About half	Many
Collect data	About half	All or almost all	About half	Many
Analyze/interpret data	Few if any	Many	About half	Many
Draw conclusions for data	Many	All or almost all	About half	Many
Represent data	Few if any	Many	About half	Many

Impressions of positive change in student health behaviors:
Teachers were asked if they felt their students health behaviors had changed during or following this curriculum work. Over half of the teachers provided examples of ways this unit positively influenced students' behaviors related to health:

- "Students became very aware of their nutrition and activities. I think kids became more aware of what they, and others, were eating."
- "I could tell they were thinking about making changes—from students who have very poor nutritional awareness and diet."
- "As a result of charting (their own) physical activity in 15 minute intervals, students frequently commented on the need to up their activity level. They asked for the opportunity to walk laps outside whey they were feeling sluggish."
- "Students asked good questions for their research projects and created ways to get answers. They learned a lot their own about eating habits, especially around the school lunch program."
- "Student behavior towards nutrition and healthy choices has shifted greatly in a positive manner towards making healthier choices."
- "After the short lessons that we did students started talking more about their snack choices. Because students were excited about it, some teachers started to keep tallies of healthy snacks in the classrooms. I also saw more water bottles coming to school and more willingness to try new fruits and veggies."

D. Plans for Year 5
Major activities planned for Year 5 include:

- Web publication of *The Choices We Make: Behavioral Research for Middle School Students* unit.
- Completion of activities and curriculum materials to supplement a unit on brain science, brain injury, and prevention.
- Final production of the video *Researchers Talking About Their Research* to be used as a classroom resource.
- Planning, recruitment, and implementation of final teacher summer institute in July 2013.
- Design, prototyping, and production of a new small exhibit, *Light beyond the rainbow*, a hands-on exhibit helping visitors understand UV light and connection to skin cancer.
- Continued community health science outreach programs using the Pop Up Science tent.
- Continued family workshops at the Museum.
- Continued professional support in schools for teachers implementing the curriculum.
- Annual student health science symposium.
- Final program documentation.
- Program summative evaluation report by Inverness Research Associates.