



NCRR  
Science Education  
Partnership Award  
Annual Conference ★

St. Paul, Minnesota  
May 18-20

Best Practices and Challenges  
in Science Education Partnership



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The SEPA 2009: NCRR Science Education Partnership Award Annual Conference was held May 18-20 at the Science Museum of Minnesota in St. Paul, MN. Principal Investigators, staff, evaluators, and teachers from 73 SEPA projects as well as NIH NCRR staff members and other interested individuals participated in the Conference; a total of 151 individuals attended.

The Conference theme, Best Practices and Challenges in Science Education Partnership, was addressed in both plenary and breakout sessions. The Conference also provided opportunities for updates by NIH staff, sharing educational materials that SEPA projects have developed, discussing evaluation methods and tools as well as networking and information exchange among SEPA projects.

### **Conference Organizing Committee**

**William Cameron, PhD**, Oregon Health and Science University

**Val Davillier**, Great Lakes Science Center

**Laurie Fink, PhD**, Science Museum of Minnesota

**Robin Fuchs-Young, PhD**, Univ. of Texas M.D. Anderson Cancer Research Center

**Ann Lambros, PhD**, Wake Forest University School of Medicine

**Louisa A. Stark, PhD**, University of Utah

**Judi Wilson**, San Joaquin County Office of Education

### **Conference Supported By**

NIH NCRR Grant R13 RR024901

Louisa A. Stark, Ph.D.

Principal Investigator

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# SEPA 2009: Annual NCRR Science Education Partnership Award Conference

Science Museum of Minnesota, St. Paul, MN

## Best Practices and Challenges in Science Education Partnership

### Schedule

All sessions will be held in Discovery Hall (level 4), unless otherwise noted

#### Sunday, May 17

- 6:30 - 9:00pm      **Early Conference Check-in** – Holiday Inn St. Paul – Downtown (Landmark Room)
- 7:00 - 9:00pm      **NAHSEP Satellite Session**  
**National Association of Health and Science Education Partnerships (NAHSEP)**  
**Business Meeting and Reception** – Holiday Inn St. Paul – Downtown (Cathedral Room)

#### Monday, May 18

- 7:30 - 9:00am      **Late Conference Check-in** – Discovery Hall Stairwell atrium (level 4)  
**Buffet Breakfast** – Discovery Hall (level 4)  
**Poster set-up** – Argon Room (level 6)
- 9:00 - 9:30      **Welcome from the SEPA 2009 Conference Organizing Committee**  
Louisa A. Stark, University of Utah
- Welcome from the Science Museum of Minnesota**  
Laurie Fink, Science Museum of Minnesota
- Conference Schedule and Logistics**
- 9:30 - 10:00      **SEPA Program Overview and Update**  
L. Tony Beck, NIH NCRR SEPA Program
- 10:00 - 10:30      **Break**
- 10:30 - 11:30      **Keynote Address – The Power of Partnerships**  
Eric J. Jolly, President, Science Museum of Minnesota
- 11:30 - 12:00      **Speed Networking**
- 12:00 - 1:15      **Lunch**  
New SEPA PIs and staff meet with potential mentors – see table signs  
Others, join discussion topics posted on each table.

1:15 - 2:45	<p><b>Breakout Sessions</b> See Breakout Session Descriptions for additional details</p> <p><b>Partnership: Science House: A Resource Center for Educators</b> Room: Meet in the Discovery Hall Stairwell atrium (level 4)</p> <p><b>Partnership: Developing and Sustaining Long Distance Partnerships</b> Room: Xenon (level 6)</p> <p><b>Evaluation: Evaluating Exhibits</b> Room: Classrooms 9 &amp; 10 (level 2)</p> <p><b>Evaluation: Evaluating School-Based, Summer Research and Other Student Programs</b> Room: Classroom 1 (level 2)</p> <p><b>Sharing Materials: Integrating Bioethics into Your SEPA Curricular Materials</b> Room: Classroom 2 (level 2)</p> <p><b>Sustainability: Strategies for Sustaining a Project</b> Room: Discovery Hall (level 4)</p>
2:45 - 3:15	<b>Break</b> – Discovery Hall (level 4)
3:15 - 5:30	<p><b>Poster Session</b> – Argon (level 6) 3:15 - 4:00 – Session A Posters 4:00 - 4:45 – Session B Posters 4:45 - 5:30 – Session C Posters</p>
5:30 - 6:00	<b>Cash Bar</b> (available through dinner) in the Riverway, adjacent to Elements Café (level 6)
6:00 - 7:30	<b>Dinner</b> – Elements Café (level 6)
7:30 - 9:00	<p><b>Explore the Human Biology Gallery and the Collections Gallery at the Science Museum of Minnesota</b> (level 4) Visit Disease Detectives – SMM's SEPA-funded exhibit</p>

## Tuesday, May 19

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7:30 - 8:45am	<p><b>Buffet Breakfast</b> – Discovery Hall (level 4)</p> <p>7:30am - <b>Required meeting for New SEPA PIs</b> with L. Tony Beck Meet at designated table</p>
8:45 - 9:00	<p><b>Update on the SEPA Evaluation Process and Preview of the SEPA 5-Year Strategic Plan</b> L. Tony Beck, NIH NCRR SEPA Program</p>

9:00 - 9:15	<b>Clinical and Translational Science Award (CTSA) Overview</b> L. Tony Beck, NIH NCRR SEPA Program
9:15 - 9:30	<b>Institutional Development Awards (IDeA) Overview</b> Krishan Arora, NIH NCRR SBIR and STTR Programs
9:30 - 10:00	<b>Best Practices and Challenges in Forming and Sustaining Partnerships</b> Nancy Moreno, Baylor College of Medicine
10:00 - 10:30	<b>Break</b>
10:30 - 12:00	<b>Panel: Partnership Successes and Challenges</b> Facilitator: Nancy Moreno, Baylor College of Medicine William Cameron, Oregon Health and Science University (SEPA-CTSA) Valence Davillier, Great Lakes Science Center (SEPA-CTSA) Nancy Murray, University of Texas Health Science Center - Houston (SEPA-CTSA) Ann Chester, West Virginia University (SEPA-CTSA and SEPA-IDeA) Debbie Colbern, Charles R. Drew University of Medicine and Science (SEPA-IDeA) Robin Fuchs-Young, University of Texas MD Anderson Cancer Center
12:00 - 1:15	<b>Lunch</b> – Discovery Hall (level 4)
1:15 - 2:45	<b>Breakout Sessions</b> See Breakout Session Descriptions for additional details
	<b>Partnership: Developing Effective SEPA-CTSA Partnerships</b> Room: Discovery Hall (level 4)
	<b>Partnership: Partnerships for Integrating Effective Student Learning and Professional Development Programs</b> Room: Classrooms 5 & 6 (level 2)
	<b>Evaluation: Evaluating Teacher Professional Development Programs</b> Room: Classroom 1 (level 2)
	<b>Project Design: Health Decision-Making for Student and Adult Audiences</b> Room: Classroom 2 (level 2)
	<b>Sharing Materials: FoodMASTER: Enhancing Math and Science Education through Food-based Activities</b> Room: Classrooms 9 & 10 (level 2)
	<b>Behind-the-Scenes Tour of the Science Museum of Minnesota</b> Room: Meet in the Discovery Hall Stairwell atrium (level 4)
2:45 - 3:15	<b>Break</b> – Discovery Hall (level 4)
3:15 - 4:45	<b>Breakout Sessions</b> See Breakout Session Descriptions for additional details

**Partnership: Collaborations to Develop a Broader Footprint**

Room: Discovery Hall (level 4)

**Partnership: Developing Effective Partnerships with School Systems**

Room: Xenon (level 6)

**Evaluation: Evaluating Curriculum Materials**

Room: Classroom 1 (level 2)

**Dissemination: Strategies for Exhibit Dissemination**

Room: Classrooms 9 &amp; 10 (level 2)

**Dissemination: Molecular Models for Engaged Learning**

Room: Classroom 2 (level 2)

**Sustainability: The SBIR and STTR Grant Programs**

Room: Classrooms 5 &amp; 6 (level 2)

4:45 - 5:00

**Take down posters**

Need to vacate building at 5pm

5:55 - 6:20

Catch one of several shuttles at the Holiday Inn for Padleford Boats  
or make the short walk yourself

6:30 - 9:30

**Riverboat Cruise and Dinner on the Mississippi River**

Riverboat will return to dock at approximately 9pm

Guests are welcome to stay on board and can depart at anytime up to 9:30

Return shuttles to the Holiday Inn will run continuously

from 9:10 until all guests have been returned

## Wednesday, May 20

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7:30 - 8:30am

**Buffet Breakfast** – Discovery Hall (level 4)

8:30 - 10:00

**Breakout Sessions**

See Breakout Session Descriptions for additional details

**Partnership: SEPA-IDeA Partnerships**

Room: Classrooms 5 &amp; 6 (level 2)

**Partnership: Partnerships Between “Informal” and “Formal”  
Science Education Programs**

Room: Xenon (level 6)

**Project Design: Designing Effective  
Teacher Professional Development Programs**

Room: Classrooms 9 &amp; 10 (level 2)



**Evaluation: Evaluating Informal Programs for Students, Families and Adults**

Room: Classroom 1 (level 2)

**Evaluation: Student Questions: Inquiry Skill and Evaluation Metric**

Room: Classroom 2 (level 2)

**Dissemination: Strategies for Disseminating Your Materials and Programs**

Room: Argon (level 6)

**Interest Groups:****Program Managers** – Meet at designated table in Discovery Hall**Teachers** – Meet at designated table in Discovery Hall

10:00 - 10:15

**Break** – Discovery Hall (level 4)

10:15 - 11:15

**Town Meeting** – Discovery Hall (level 4)

Long-range planning: Developing a SEPA 5-year plan

L. Tony Beck, NIH NCRR SEPA Program

11:15 - 12:15

**Lunch** – Discovery Hall (level 4)**Adjourn**

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Please remember to complete the online Conference Evaluation  
 at <http://learn.genetics.utah.edu/sepa2009/>

# SEPA 2009: Annual NCRR Science Education Partnership Award Conference

Science Museum of Minnesota, St. Paul, MN

## Best Practices and Challenges in Science Education Partnership

### Breakout Session Descriptions

**Monday, May 18 – 1:15 - 2:45**

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#### **Partnership: Science House: A Resource Center for Educators**

Science House at the Science Museum of Minnesota is a place where educators can check out classroom sets of hands-on materials for their students, engage in formal and informal consultation and professional development, and discuss education issues with friends and colleagues in a comfortable and creative environment. In this session you'll tour Science House and discuss models for teacher support.

**Outcome:** A written summary of the model, factors that have supported success, and challenges.

**Guide and Facilitator:** Liesl Chatman, Science Museum of Minnesota

**Room:** Meet in the Discovery Hall Stairwell atrium (level 4)

#### **Partnership: Developing and Sustaining Long Distance Partnerships**

Share successes and challenges in developing, implementing and sustaining long distance partnerships between SEPA projects.

**Outcome:** A written summary of best practices and challenges.

**Facilitators:** Ann Lambros, Wake Forest University School of Medicine

Larry Tague, University of Tennessee Health Science Center

**Room:** Xenon (level 6)

#### **Evaluation: Evaluating Exhibits**

This session will provide an opportunity for evaluators and others conducting evaluations to share best practices and evaluation instruments.

**Please bring evaluation plans and instruments to this session.**

**Outcome:** A written inventory of evaluation methods and instruments that are being used by SEPA projects to evaluate exhibits.

**Facilitators:** Vicki Coats, Oregon Museum of Science and Industry

Kirsten Ellenbogen, Science Museum of Minnesota

Cheryl McCallum, Children's Museum of Houston

**Room:** Classrooms 9 & 10 (level 2)

#### **Evaluation: Evaluating School-Based, Summer Research and Other Student Programs**

This session will provide an opportunity for evaluators and others conducting evaluations to share best practices and evaluation instruments.

**Please bring evaluation plans and instruments to this session.**

**Outcome:** A written inventory of evaluation methods and instruments that are being used by SEPA projects to evaluate school-based student programs.

**Facilitators:** Wendy Huebner, Montclair State University

Debra Yourick, Walter Reed Army Institute of Research

**Room:** Classroom 1 (level 2)

**Sharing Materials: Integrating Bioethics into Your SEPA Curricular Materials**

Learn how to utilize the resources developed by the Northwest Association for Biomedical Research, including the popular *Ethics Primer*, to introduce bioethics into your SEPA curricular materials and programs. A brief overview of ethical theories and principles, the role of decision-making frameworks, and several pedagogical strategies to facilitate discussion will be presented.

**Presenter:** Jeanne Chowning, Northwest Association for Biomedical Research

**Room:** Classroom 2 (level 2)

**Sustainability: Strategies for Sustaining a Project**

This session will provide opportunities to share and discuss ways in which a project can be sustained after SEPA funding ends.

**Outcome:** A written summary of best practices and challenges.

**Facilitators:** Charlotte Mulvihill, Oklahoma City Community College

Cora James, Haskell High School, Haskell, OK

Nancy Moreno, Baylor College of Medicine

Patrice Legro, Koshland Science Museum

Nancy G. Murray, University of Texas Health Science Center

**Room:** Discovery Hall (level 4)

**Tuesday, May 19 – 1:15 - 2:45**

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**Partnership: Developing Effective SEPA-CTSA Partnerships**

This session will provide opportunities to share and discuss ways in which project practices can evolve over time so project activities can be sustained after SEPA funding ends.

**Outcome:** A written summary of successful approaches and challenges.

**Facilitator:** William Cameron, Oregon Health and Science University

**Panelists:** Jeanne Chowning, Northwest Association for Biomedical Research

Leonard Munstermann, Yale University (Invited)

J. Michael Wyss, University of Alabama at Birmingham

**Room:** Discovery Hall (level 4)

**Partnership: Partnerships for Integrating Effective Student Learning and Professional Development Programs**

Share best practices for and challenges faced in achieving effective integration of curricular materials and enrichment activities with professional development programs, involving both “formal” and “informal” settings. Discussion of ideas and strategies to achieve integration of project components in order to optimize implementation of educational materials, engagement of classroom teachers and student comprehension.

**Outcome:** A written summary of best practices and challenges.

**Facilitator:** Robin Fuchs-Young, University of Texas MD Anderson Cancer Center

**Room:** Classrooms 5 & 6 (level 2)

**Evaluation: Evaluating Teacher Professional Development Programs**

This session will provide an opportunity for evaluators and others conducting evaluations to share best practices and evaluation instruments.

**Please bring evaluation plans and instruments to this session.**

**Outcome:** A written inventory of evaluation methods and instruments that are being used by SEPA projects to evaluate teacher professional development programs.

**Facilitators:** Molly Stuhlsatz, Biological Sciences Curriculum Study

Steve Rider, Pacific Research and Evaluation

Steven Guberman, Science Museum of Minnesota

**Room:** Classroom 1 (level 2)

**Project Design: Health Decision-Making for Student and Adult Audiences**

Explore how health decision making by students and adults can be supported by computer assisted learning techniques and assessments. Participants should feel comfortable brainstorming new ideas and discussing what works or does not work from their experience.

**Outcome:** A written summary of effective and ineffective practices, as well as brainstorm ideas.

**Facilitator:** Patrice Legro, Koshland Science Museum

**Room:** Classroom 2 (level 2)

**Sharing Materials: FoodMASTER: Enhancing Math and Science Education through Food-based Activities**

FoodMASTER (Food, Math, and Science Teaching Enhancement Resource) Intermediate is a multimedia curriculum using food as a tool to teach math and science concepts to third to fifth graders. The curriculum presents ten basic topics in foods with 23 hands-on and 22 virtual food activities. Workshop participants will be introduced to the FoodMASTER Intermediate (3rd-5th grade) curriculum including teacher's manual, student workbook, and assessment tools. Participants will experience the FoodMASTER hands-on approach while completing scientific inquiry learning labs such as "Fish in the Kitchen," "Immiscible," and "Selecting Cereals." In addition, participants will consider and explore ways to incorporate FoodMASTER materials into existing or future projects.

**Presenters:** Melani W. Duffrin, East Carolina University

Jana A. Hovland, East Carolina University

Virginia Carraway-Stage, East Carolina University

**Room:** Classrooms 9 & 10 (level 2)

**Behind-the-Scenes Tour of the Science Museum of Minnesota**

**Guide:** Science Museum of Minnesota staff

**Room:** Meet in the Discovery Hall Stairwell atrium (level 4)

**Tuesday, May 19 – 3:15 - 4:45**

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**Partnership: Collaborations to Develop a Broader Footprint**

Discuss opportunities for collaborating with other science education programs (e.g., other NIH and HHS, NSF and HHMI) that can assist your program in having a broader footprint and provide opportunities for dissemination. Share successes and challenges in developing collaborations.

**Outcome:** A written summary of opportunities, successes and challenges.

**Facilitator:** William Cameron, Oregon Health and Science University

**Room:** Discovery Hall (level 4)

**Partnership: Developing Effective Partnerships with School Systems**

Share best practices, successes and challenges in developing partnerships with districts, schools and teachers.

**Outcome:** A written summary of successful practices and challenges.

**Facilitators:** Judi Wilson, San Joaquin County Office of Education

Stanford Hill, Wake Forest University School of Medicine

**Room:** Xenon (level 6)

**Evaluation: Evaluating Curriculum Materials**

This session will provide an opportunity for evaluators and others conducting evaluations to share best practices and evaluation instruments.

**Please bring evaluation plans and instruments to this session.**

**Outcome:** A written inventory of evaluation methods and instruments that are being used by SEPA projects to evaluate curriculum materials.

**Facilitator:** Kristin Bass, Rockman Et Al

**Room:** Classroom 1 (level 2)

**Dissemination: Strategies for Exhibit Dissemination**

Share successes and challenges in implementing traveling exhibits.

**Outcome:** A written summary of effective and ineffective practices.

**Facilitators:** Vicki Coats, Oregon Museum of Science and Industry  
Martin Weiss, New York Hall of Science

**Room:** Classrooms 9 & 10 (level 2)

**Dissemination: Molecular Models for Engaged Learning**

This hands-on workshop will engage participants in using the molecular models developed by the Center for BioMolecular Modeling. A range of physical models and supporting computer visualization tools will be used to explore topics ranging from water, to proteins, to DNA – and ending with current vaccines and drugs to combat influenza virus. Learn how you can borrow these models from the MSOE Model Lending Library to use in your program.

**Presenter:** Tim Herman, Milwaukee School of Engineering

**Room:** Classroom 2 (level 2)

**Sustainability: The SBIR and STTR Grant Programs**

This session will provide an overview of the NCRR Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grant programs. These programs provide an avenue for SEPA grantees to commercialize the products they have developed.

**Outcome:** A list of resources with information about this program.

**Presenter:** Krishan Arora, Program Officer, NIH NCRR SBIR and STTR Programs

**Panel:** Dina Markowitz, University of Rochester Medical Center  
Isobel Contento, Teachers College Columbia University

**Room:** Classrooms 5 & 6 (level 2)

**Wednesday, May 20 – 8:30 - 10:00**

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**Partnership: SEPA-IDeA Partnerships**

The Institutional Development Award (IDeA) program broadens the geographic distribution of NIH funding for biomedical and behavioral research. The program fosters health-related research and enhances the competitiveness of investigators at institutions located in states in which the aggregate success rate for applications to NIH has historically been low. The program also serves unique populations—such as rural and medically underserved communities—in these states. The program has two main components – Centers of Biomedical Research Excellence (COBRE) and IDeA Networks of Biomedical Research Excellence (INBRE). The IDeA states are AK, AR, DE, HI, ID, KS, KY, LA, ME, MS, MT, ND, NE, NH, NM, NV, OK, RI, SD, SC, VT, WV, WY, and Puerto Rico.

This session provides an opportunity for SEPA projects located in IDeA states to share opportunities, successes and challenges in IDeA partnerships.

**Outcome:** A written summary of successes and challenges for SEPA-IDeA partnerships.

**Facilitator:** L. Tony Beck, NIH NCRR SEPA Program

**Panel:** Maurice Godfrey, University of Nebraska  
Kelley Withy, University of Hawaii

**Room:** Classrooms 5 & 6 (level 2)

**Partnership: Partnerships Between “Informal” and “Formal” Science Education Programs**

Share successes, challenges and opportunities for creating partnerships between “informal” and “formal” programs.

**Outcome:** A written summary of best practices, challenges and how they have been addressed.

**Panel:** John Pollock, Duquesne University  
 Roberta Cooks, Maryland Science Center (Invited)  
 Vicki Coats, PhD, Oregon Museum of Science & Industry

**Room:** Xenon (level 6)

**Project Design: Designing Effective Teacher Professional Development Programs**

Share best as well as ineffective practices, and challenges in designing and implementing effective teacher professional development programs.

**Outcome:** A summary of best practices and challenges.

**Facilitators:** Ann Lambros, Wake Forest University School of Medicine  
 Stanford Hill, Wake Forest University School of Medicine

**Room:** Classrooms 9 & 10 (level 2)

**Evaluation: Evaluating Informal Programs for Students, Families and Adults**

This session will provide an opportunity for evaluators and others conducting evaluations to share best practices and evaluation instruments.

**Please bring evaluation plans and instruments to this session.**

**Outcome:** A written inventory of evaluation methods and instruments that are being used by SEPA projects to evaluate informal programs.

**Facilitators:** Amy Grack Nelson, Science Museum of Minnesota  
 Cheryl McCallum, Children’s Museum of Houston

**Room:** Classroom 1 (level 2)

**Evaluation: Student Questions: Inquiry Skill and Evaluation Metric**

Learn how two SEPA projects have developed a method for analyzing student questions as one of their evaluation metrics.

**Outcome:** A summary of this evaluation method.

**Presenters:** Lewis Jacobson, University of Pittsburgh  
 Marlys Witte, University of Arizona College of Medicine  
 Peter Crown, University of Arizona College of Medicine

**Room:** Classroom 2 (level 2)

**Dissemination: Strategies for Disseminating Your Materials and Programs**

Share effective ways in which you’ve disseminated your materials and/or programs as well as challenges. Identify new opportunities for broadly disseminating your materials via a variety of mechanisms.

**Outcome:** A written summary of effective and ineffective dissemination strategies.

**Facilitator:** Robin Fuchs-Young, University of Texas MD Anderson Cancer Center

**Room:** Argon (level 6)

**Interest Groups:**

Join others with similar roles to discuss supports and challenges.

**Program Managers** – Meet at designated table in Discovery Hall

**Teachers** – Meet at designated table in Discovery Hall

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## Monday 9:30-10:00

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### SEPA Program Overview and Update

**Tony Beck** : National Center for Research Resources, National Institutes of Health

Reported by: Louisa Stark, University of Utah

Dr. Beck reviewed highlights about the SEPA program and its connections with other NCRR and NIH programs. A few of these highlights are listed below; additional information is available in Dr. Beck's PowerPoint presentation.

- ✦ The SEPA program began in 1991; this is its 18th year.
- ✦ The SEPA budget increased to \$18 million this year; this is a \$2 million increase from last year.
- ✦ There are 24 SEPA projects in 39 Clinical and Translational Science Award (CTSA) sites. NCRR is working to partner CTSA sites with science centers and museums in cities without SEPA projects.
  - He distributed SEPA informational materials at the recent CTSA Community Engagement national meeting.
- ✦ There are 19 SEPA projects in states with Institutional Development Awards (IdEA) programs.
- ✦ The SEPA website promotes the SEPA program.
- ✦ The SEPA program is valued by NCRR
  - The \$6-7 million of NCRR ARRA Stimulus Supplements that will be available for SEPA projects (out of a total NCRR budget of \$21 billion) shows the value that Dr. Barbara Alving, NCRR Director, places on the SEPA program.
  - The NCRR website includes its 5 divisions and SEPA

Dr. Beck reviewed key information about the next SEPA program announcement:

- ✦ All SEPA awards will be for five years; the options for a Phase I (3 years), and Phase II (2 years) have been discontinued.
- ✦ The next due date will be in October or November 2009.
- ✦ NIH has changed its review process; a 1-9 scoring system has been implemented.

Dr. Beck gave an overview of the SEPA program and its relationship to NIH overall and other NIH programs. Highlights include:

- ✦ The SEPA program is the largest R25 program at NIH; it is the designated lead on developing evaluation metrics and programs.
- ✦ The SEPA program is the lead at NIH on K-12 STEM education and informal science education.
- ✦ There is an opportunity for SEPA projects to work with the Director's Council of Public Representatives (COPR); they are very interested in diabetes.
- ✦ Trans-NIH K-12 Neuroscience Blueprint is a cross-NIH effort that envisions neuroscience as integrated in multiple curriculum areas.
- ✦ The National Cancer Institute's Community Center Oncology Program (CCOP) provides another opportunity for collaboration.
- ✦ The Clinical and Translational Science Award (CTSA) Community Engagement efforts as well as programs associated with pediatrics offer opportunities for collaboration.
- ✦ The NIH Visitors Information Center is looking for exhibits, hands-on experiences, posters, etc; some SEPA projects may have appropriate materials.

Dr. Beck reviewed how the SEPA program and SEPA projects are supporting NIH initiatives, including:

- ✦ Evolution Revolution
  - The NIH Office of Science Education is supporting development of a curriculum supplement module on evolution.
- ✦ DNA Day (Week)
  - There are 15 SEPA projects with a genetics/genomics focus
  - Six SEPA administrative supplements were awarded to support DNA Day activities
- ✦ Brain Awareness Week
  - There are 10 SEPA projects with a neuroscience focus
- ✦ NIH Nanoweek
- ✦ NIH Stem Cell website
  - 8 of the 12 education links on this site are from SEPA projects



Dr. Beck announced that the SEPA program recently received an NIH Evaluation Feasibility Award. This will provide \$250,000 for 9 months to plan and set up an evaluation for the SEPA program overall.

Dr. Beck reviewed the deliverables that he would like to see come out of this SEPA conference, including:

- ✦ Networking, partnering, and sharing among SEPA projects
- ✦ Collaborations among SEPA projects
- ✦ Summary (including best practices) and action items from each session
- ✦ SEPA-CTSA and SEPA-IDeA interactions
- ✦ Beginning of a 5-year strategic plan for the SEPA program
- ✦ Working groups on common topics




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**Monday 10:30-11:30**

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## **Keynote Address – The Power of Partnerships**

**Eric J. Jolly** : President, Science Museum of Minnesota

Reported by: Louisa Stark, University of Utah

Dr. Jolley welcomed SEPA conference attendees to the Science Museum of Minnesota (SMM). SMM has the largest exhibit production facility as well as the largest OMNI production company in the country. It has exhibits in 28 countries.

Dr. Jolley gave an inspiring address in which he talked about science as the literacy of the future. Science will be required for economic participation and civic engagement in the 21st century; three-fifths of jobs will require science knowledge. Therefore, we need a citizenry that understands science. Currently, 48% of high school graduates cannot accurately identify that it takes one year for the earth to go around the sun. However, science has to be presented in ways that are relevant to children and families. In addition, the science and science education communities need to learn how to speak to public policy makers so that they make informed decisions.



Companies that hire engineers say that they want someone who can take a complex problem, break it into solvable parts and solve it. Algebra is the only course that teaches these skills. The number one predictor of college graduation is the amount of math a student takes in high school. Just over 50% of high school graduates achieve college graduation in five years. With four years of high school math, 79.8% earn a college degree in four years or less. Minnesota has the highest SAT scores in the US, but also the largest achievement gap between Black and white students; this is unacceptable.

The National Science Foundation has tried various systemic initiatives – local, urban, rural and teacher professional development – all of which reported successes. After 20 years, how can so much success have led to so little progress? Most measures of success fall into three broad categories and theories of change:

- Capacity – Students must have the requisite required knowledge and skills to advance curricular knowledge. However, if a student does not believe that a particular subject is for them, they will not learn. If you do not have a sense of efficacy, if you have not heard about the field and do not have engagement, you will not learn.
- Engagement – We have put money into building excitement, but students do not move on if their school does not have calculus.
- Continuity – These are the systemic supports that help a student move on to advancement and achievement.



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## Monday, May 18 1:15-2:45

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### **Partnership:** Science House: A Resource Center for Educators

**Liesl Chatman** : Science Museum of Minnesota

Reported by: Mary Budd, Montclair State University

Theoretical framework and the Science House: Adults only

Produces its own energy

Online database

#### **District buys a membership to the House**

- ✦ reserve materials
- ✦ conducts summer Institutes (professional development)
- ✦ orientations to materials

Science Experiment with skulls/the jaw

Took two measurements

Grouped them by graphing

Interested in integrating science, technology, math and engineering (STEM)

Looking at intelligence, culture, systems (standards, schools) and equity to have scientifically literate population

#### **Challenges**

- ✦ gaps in science and math
- ✦ making it culturally relevant

*No Participant List*

**Ann Lambros** : Wake Forest University School of Medicine

**Larry Tague** : University of Tennessee Health Science Center

Reported by: Stan Hill, Wake Forest University School of Medicine

## Why seek partnerships?

Expand influence, multiple perspectives, disseminate your model, share expertise, open doors, utilize multiple influences, expand resources

## What do you look for?

Complementary programs, addressing a need, a commitment (trust), clarity in communication, compatible cultures, similar goals, credibility, getting specific agreements, assure timing is right

## Key elements

Mission alignment: shared resources, shared relationships, extended relationships, mutual benefits, leveraged benefits, leveraged visibility, power of collaborations, measurable outcomes

## Expectations

Each partner brings vision, action and commitment, working toward a common goal, effective communication, fun/enjoyment, honesty

## How does distance influence partnership decisions?

Costs, technology, support at the highest levels, travel impact on staff

Design considerations: takes time to build support, establish shared responsibility and balance

## Challenges

People not keeping their promises, out of sight - out of mind, distance creates a problem in developing rapport, hardships of travel

## Cautions

Confirm authority, avoid non-essentials, ensure working styles are compatible, vet experience to ensure capacity, like the partner or what they do

The anatomy of evolving partnerships (HUD neighborhood networks)

Description of the project (a specific partnership story)

Description of Google Apps for Education and its implications for establishing partnerships

## Outcomes/conclusions

- ✦ points to consider in establishing effective partnerships
- ✦ situations to avoid
- ✦ insights and experiences
- ✦ discussion of useful collaboration tools



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**Bill Klemm** : Texas A&M University

**Jana Hovland** : East Carolina University

**Stan Hill** : Wake Forest University

**Laura Gonzalez** : Duquesne University

**Susan Adler** : Northwest Association for Biomedical Research

**Karen Kalumuck** : Exploratorium

**Bruce Nash** : Cold Spring Harbor Laboratory

**Ah-Kau Ng** : University of Southern Maine

**Lisa Gough** : NIH Visitors Center and Nobel Laureate Exhibit Hall, National Center for Research Resources, National Institutes of Health

**Lucille L. Day** : Hall of Health

**Ann Chester** : West Virginia University

**Vicki Coats** : Oregon Museum of Science and Industry

**Kirsten Ellenbogen** : Science Museum of Minnesota

**Cheryl McCallum** : Children's Museum of Houston

## How we measure skills

- \* pre-post paper/pencil/survey
- \* concept testing protocol

## How we measure attitudes

- \* attitude focus groups
- \* volunteered comments
- \* interviews
- \* pre-post pencil survey
- \* focus groups
- \* concept testing protocol

## How we measure behaviors

- \* visitor observations
- \* timing and tracking pre-post pencil survey
- \* observations
- \* self report survey
- \* critical review

We also measure: psychographics, demographics

We are not measuring: long term behavior change, grades, identity development, test scores

## How we measure content knowledge

- \* front end, post visit surveys
- \* interview around a sorting task
- \* arbitrarily selected exit survey
- \* interview
- \* pre-post test
- \* front-end exhibit mock ups
- \* front end story line testing
- \* structured interview
- \* concept testing protocol
- \* pre-post test randomized assignment
- \* survey-paper pencil

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**Val Davillier** : Great Lakes Science Center

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**Mark DiRienzo** : ScienceWorks Hands-On Museum

**Leonard Munstermann** : Yale Peabody Museum

**Cheryl McCallum** : The Children's Museum of Houston

**Lisa Marriott** : Oregon Health & Science University

**Vic Serio** : University of Southern Maine

**Amy Nelson** : Science Museum of MN

**Kathleen Miller** : Science Museum of MN

**Martin Weiss** : New York Hall of Science

**Sean Duran** : Miami Science Museum

**Patrice Saab** : University of Miami

**Michael Bloom** : National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health

# Evaluation: Evaluating School-Based, Summer Research and Other Student Programs

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**Wendy Huebner** : Montclair State University

**Debra Yourick** : Walter Reed Army Institute of Research

Reported by: Debra Yourick, Walter Reed Army Institute of Research

Wendy Huebner, Montclair State University

After introductions and identification of issues, the group spent most of the time sharing advice about several areas of evaluation. We decided to include all of the tips and thoughts in the session report.

## Controls/comparisons in evaluation

- ✦ One example that worked: Matched classrooms across the same school, same class-type (biology, chemistry, physics) – then applied the Intervention vs. No Intervention to teachers, ultimately testing the students of teachers with and without the intervention.
- ✦ A dose-response analysis may be possible, comparing different levels of fidelity (e.g., such as none versus some versus many hours of an intervention—documented and naturally occurring levels of involvement or planned dose-response)
- ✦ Comparisons of students within a school system (who have received an intervention) to a full alumni assessment within the school system. Comparisons of current student body (in its entirety) to yearly alumni across years.
- ✦ Maintenance of science interest over time (benefit since participants have not lost interest – need not just show improved interest) should be assessed and is self-controlling.
- ✦ Important Point: If all students are ultimately included in a learning intervention, long-term assessments with “treated vs. control” are not possible since all eventually participated.
- ✦ Long-term assessment requires funding contemporary with that assessment, reducing the likelihood that long-term assessment is done.
- ✦ Long-term assessment where responders are self-selecting is often positive, since benefit biases the response.
- ✦ Taking a survey for assessment may actually benefit survey-takers/participants.
- ✦ Different assessments lead to different conclusions. A self-reported evaluation may strongly differ from an evaluator observation-based assessment. (It might be interesting to compare the two – to see if this occurs.)

## Fidelity in assessment and intervention

- ✦ Changing quality of a program or intervention is always a problem and may be of particular concern during dissemination.
- ✦ The assessment and intervention must be evenly and consistently assessed across the test period.
- ✦ Programs should be carefully evaluated for QA/QC in dissemination.

## Challenges – overall and in evaluation

- ✦ Many of us are attempting to be involved in educational research of our interventions to teach STEM. Many are being turned away necessitating a call to partner well and seek advisors from the school such that all are partners working together for solutions (Nancy Moreno and Ann Chester themes expressed the next day!).
- ✦ To partner – find friends near the top, volunteer and partner to garner school administration invitations and more positive responses from communities and schools.



## Tools and information on their validity and reliability should be available

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- ✦ Means to determine validity and reliability should be more readily available or centrally discussed, and explained clearly in lay language.
- ✦ Increased use will lead to likely increase in validity of claims.

SEPA Community would like a more obvious way to share curriculum materials, as well as surveys and other assessment tools.

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**Susan Kuner** : Vanderbilt University  
**Steve Oliver** : University of Georgia  
**Tamira Noble** : Diversity Films Inc.  
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**Kristin Bass** : Rockman Et Al  
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**Alison Slinskey Legg** : University of Pittsburgh  
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**Peter Crown** : University of Arizona College of Medicine  
**Debra Yourick** : Walter Reed Army Institute of Research  
**Rebecca Smith** : University of California San Francisco  
**Sabine Jeske** : University of California San Francisco  
**Molly Stuhsatz** : Biological Sciences Curriculum Study  
**Rebecca Kruse** : Biological Sciences Curriculum Study

## Sharing Materials: Integrating Bioethics into Your SEPA Curricular Materials

**Jeanne Chowning** : Northwest Association for Biomedical Research

Reported by: Jeanne Chowning, Northwest Association for Biomedical Research

I provided a basic overview of ethical theories, we discussed the relationship between science and ethics, and I outlined some lesson strategies (including the case study, structured academic controversy, and Socratic seminar approaches) from NWABR's Ethics Primer. We spent the last minutes practicing a Socratic seminar related to the use of Pre-implantation Genetic Diagnosis.



### PARTICIPANTS

**Kim Soper** : University of Nebraska Medical Center  
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**Mark Kaelin** : Montclair State University  
**Bill Cameron** : Oregon Health & Science University  
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**Mel Limson** : American Physiological Society  
**David Anderson** : Illinois State University  
**Joe Krajcik** : University of Michigan

# Sustainability: Strategies for Sustaining a Project

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**Charlotte Mulvihill** : Oklahoma City Community College

**Cora James** : Haskell High School, Haskell, OK

**Nancy Moreno** : Baylor College of Medicine

**Patrice Legro** : Koshland Science Museum

**Nancy G. Murray** : University of Texas Health Science Center

This session will provide opportunities to share and discuss ways in which a project can be sustained after SEPA funding ends. Introductions and program descriptions, including sustainability avenues that each project has explored, are provided.

## **Charlotte Mulvihill Oklahoma City Community College**

The program focus is to provide teacher professional development and equipment loan to facilitate lab experiences for high school science students. Original focus on pure biotechnology applications evolved to incorporate biotechnology into multiple areas of science education, including introductory biology courses, advanced biology courses, chemistry, earth science, physical science and dedicated biotechnology classes. The project also changed to emphasize how the project activities meet state and national standards. These changes helped promote the project biotechnology activities as a useful tool to teachers.

Due to involvement with this program several teachers have spearheaded movements to create biotechnology programs within their school districts. This has involved partnerships with the districts that include more professional development, equipment sharing, and consumables restocking. These programs are on their way to independent sustainability in some districts as the success of the activities with students becomes apparent.

To foster teacher involvement and ownership, the program has cultivated teacher leaders. These teachers have been included in curriculum and assessment development, fostering a community of invested, and motivated educators. These teachers then support other educators in their geographic regions by providing prepared labs and transporting the equipment to the schools. Some teacher leaders have done national presentations on the project.

## **Patrice Legro, Koshland Science Museum**

This is a field trip-focused program that seeks to develop student engagement and problem solving skills with a focus on developing student skills on data analysis. For sustainability the project has created an online teacher community. The web page features readily available student activities. Web quests are used as a student activity. Topics include current issues such as bird flu. The focus is on building teacher and student involvement and networking.

## **Nancy Moreno, Baylor College of Medicine**

The meaning of sustainability was discussed. It is unrealistic to expect that a successful program would keep going in the exact same format. Project staff must evaluate the most successful aspect of the program and look at modifying these aspects to sustain them in some way. Several avenues of sustainability were explored including developing products for sale, publishing products with for-profit and non-profit publishers. Web pages are useful for dissemination but require funds to maintain. Teacher professional development gets the materials directly into the classroom and teachers share resources with other educators.

Benchmarks for sustainability success include changes in class curriculum, changes in student learning, and changes in teaching practice. One area explored but not found to be viable was relying on funds generated from selling publications. The funds realized from this effort were minor. A more successful model involved linking professional development to selling supplies. Products from various funding sources were bundled and credit was given to individual funding sources. In this way elements of the project were able to persist in other formats.



The program focused on state and national standards. It also evolved to use fewer dollars than originally planned. Understood the necessity of human capital in development and implementation of program. Realized there is value to being able to show school administrators the statistically significant results of the program on test scores. This helped to develop school district partnerships. They have developed partnerships to maintain their web page. One of the significant successes involved making the project's curriculum mandated by the state. The state mandate will guarantee sustainability of the program.

### **Floor discussion**

There was significant discussion on using publishers to disseminate materials. Several publishers were mentioned including NSTA press, Destination Education, and Sylvan Learning Centers. Concerns were raised and caution advised when giving up rights to material. This may result in having to purchase back copyrights or in being denied the ability to disseminate curriculum in a free format. There was a reminder that all SEPA materials must be made available free of charge. Publishing materials may also involve giving up control of how the material is presented and may include continued involvement in professional development as part of selling the product.

Granting organizations are supportive of publishing materials and in publishing materials as a unit in despite development from multiple funding sources. Sustainable on-line resources were discussed such as podcasting on iTunes and other online databases. Libraries as depositories of curriculum that can be accessed free of charge by the public were discussed. The National Digital Library, Creative Commons, SEPA and NIH were mentioned.

### **Summary of sustainability ideas**

#### **Product**

- ✦ Reformatting curriculum to be used as a marketable product.
- ✦ Using publishers to disseminate materials. Use of for-profit and nonprofit publishing companies. Caution was advised in dealing with surrendering copyrights and entanglements with for profit publishers.
- ✦ Funding agencies have shown support for using publishers
- ✦ The importance of maintaining all SEPA products as free to the public was emphasized.

#### **Partners**

- ✦ Teachers and other acquired human capital are necessary to maintain for future efforts. These partners are valuable for maintaining use after funding is gone.
- ✦ Districts, schools, scientists, and teachers are valued human contacts that can be used to perpetuate program in an evolved form.

#### **Policy**

- ✦ If possible get your curriculum/program as part of district or state policy for sustainability.
- ✦ Become part of state curriculum meetings.

#### **Bundle**

- ✦ Using materials/curriculum from multiple funding sources to make it more marketable and appealing.
- ✦ Funding agencies are agreeable to the bundling idea with credit being given to the appropriate agency.

#### **Evidence**

- ✦ Having quantitative data of student score improvement on state mandated tests is valuable in promoting use of the program to school administrators.

**Pamela Koch** : Teachers College Columbia University

**Selcen Guzey** : University of Minnesota

**Nathalie Sessions** : University of Texas Health Science Center at Houston

**Virginia Carraway-Stage** : East Carolina University

**Tim Herman** : Milwaukee School of Engineering

**Nancy Marra** : University of Montana

**Marcus Girley** : Charles Drew University of Medicine and Science

**Sonsoles de Lacalle** : Charles Drew University of Medicine and Science

**Nancy Moreno** : Baylor College of Medicine

**Nancy Murray** : University of Texas Health Science Center at Houston



### **Update on the SEPA Evaluation Process and Preview of the SEPA 5-Year Strategic Plan**

L. Tony Beck, National Center for Research Resources, National Institutes of Health Reported by: Louisa Stark, University of Utah

The SEPA program recently received an NIH Evaluation Feasibility Award. This will provide \$250,000 for 9 months to plan and set up an evaluation for the SEPA program overall. All SEPA projects are asked to provide information and materials for this process, when asked.

The SEPA program will be developing a 5-year strategic plan. Conversations about this plan will be ongoing.

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## Tuesday, 9:00-9:15

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### **Clinical and Translational Science Award (CTSA) Overview**

Tony Beck, National Center for Research Resources, National Institutes of Health  
Reported by: Louisa Stark, University of Utah

A goal is for SEPA projects to partner more closely with other NIH programs. These include:

- Clinical and Translational Science Award (CTSA) program: Last week the second annual CTSA Community Engagement conference was held in Washington, DC. They discussed how SEPA projects have built trust in the communities they serve, and can assist clinical parts of CTSA in establishing trusting relationships.
- Institutional Development Award (IDeA) program: This program includes 23 states and Puerto Rico. There are SEPA projects in 19 of these IDeA states. A goal is to get students excited about science through participation in SEPA projects and have them enroll in institutions of higher education that are part of NIH's INBRE (IDeA Networks of Biomedical Research Excellence) program.

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## Tuesday, 9:15-9:30

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### **Institutional Development Awards (IDeA) Overview**

Krishan Arora, National Center for Research Resources, National Institutes of Health

Dr. Arora presented an overview of NCRR programs, which include four Divisions: Comparative Medicine, Biomedical Technology, Research Infrastructure, and Clinical Research.

He provided an overview of the Experimental Program to Stimulate Competitive Research program (EPSCoR) provides additional funding to expand and improve the research capability of scientists and institutions in states that receive less federal research funding. EPSCoR funding is provided by NSF, NIH, NASA, EPA, USDA, DOE, and DOD. The IDeA program is NIH's EPSCoR program. It provides funding to 23 states and Puerto Rico. Each of these has one or no medical school; many are largely rural.

The NIH EPSCoR program has two initiatives:

- Centers of Biomedical Research Excellence (COBRE), which supports short-term interventions.
- IDeA Networks of Biomedical Research Excellence (INBRE), which supports long-term interventions with the goal of building state-wide multidisciplinary research networks.

The IDeA states have become more competitive for NIH funding. A goal is to build networks among SEPA, INBRE, COBRE and CTSA projects that are in state or regional proximity. For example, the West Virginia University SEPA has developed partnerships with its INBRE program as well as the CTSA at the University of Pittsburgh.

## **Best Practices and Challenges in Forming and Sustaining Partnerships**

Nancy Moreno, Baylor College of Medicine

Reported by: Louisa Stark, University of Utah

In a perfect world, everyone benefits from a partnership. However, partners may be going in opposite directions, at cross purposes, by themselves with not a partner in sight, or working toward the same goal.

How do we find good partners?

- Keep showing up; it takes a number of contacts to build relationships.
- Identify needs.
- Find someone who can connect you with others; the Harris County Department of Education has helped them with this.
- Have someone on your team who can be a salesman.

Markets believe you have to come in contact with an idea six times before you act on it.

Once you find a potential partner, work together to define goals and understand each others' needs and priorities. A worst example is the time they handed out 1,000 plastic cups advertising a program at a networking meeting for school principals. They had not researched the meeting or the principals' interests or needs. They received zero responses. A best example involves the H-U-LINC Urban Systemic Initiative, which was led by the Houston Independent School District (ISD). The grant proposal involved six months of co-planning by the partners. The program included long-term professional development for elementary teachers. They found that even after teachers' involvement with the program ended their content knowledge continued to grow. It took 2-3 years after teachers began the program to see an increase in students' scores on standardized tests; students' scores continued to increase thereafter.

Engagement, continuity and capacity have to happen at every level in order for students to achieve. A recent study found that programs that focused on one of these three areas worked when the other two areas were in place.

Keys to successful partnerships:

- Value all partners and what they bring to the partnership.
- Share responsibilities.
- Be mindful of cultural differences; they give scientists a list of questions to ask before they go into schools. It is important for teachers and scientists to visit each others' places of work to observe and discuss these differences.
- Be clear about expectations for yourself, your partner, and your participants.
- Eliminate outreach from our vocabulary.

## **Panel:** Partnership Successes and Challenges

**Nancy Moreno** : Baylor College of Medicine

**William Cameron** : Oregon Health & Science University (SEPA-CTSA)

**Valence Davillier** : Great Lakes Science Center (SEPA-CTSA)

**Nancy Murray** : University of Texas Health Science Center - Houston (SEPA-CTSA)

**Ann Chester** : West Virginia University (SEPA-CTSA and SEPA-IDeA)

**Debbie Colbern** : Charles R. Drew University of Medicine and Science (SEPA-IDeA)

**Robin Fuchs-Young** : University of Texas MD Anderson Cancer Center

Reported by: Tracey T. Meilander, Great Lakes Science Center

In the panel presentation, SEPA Principal Investigators shared their successes and challenges in forming, developing, and sustaining long-term, fruitful SEPA-CTSA partnerships.

**Bill Cameron** from the Oregon Health and Science University (OHSU) shared a successful SEPA-CTSA partnership between OHSU and the Oregon Museum of Science and Industry. In this partnership, the CTSA funded the public exhibition, Body Worlds, and mounted the largest public research campaign at the university in association with the research exhibition. Researchers spoke with museum visitors about their research. SEPA-trained CTSA representatives to communicate their science effectively to the public. T-shirts with NIH logo and “Ask me how I spend your tax \$” were worn by researchers to stimulate discussion with the public. This successful endeavor was a result of a long-term CTSA-SEPA collaboration resulting in many museum exhibits including Amazing Facts of Aging, Dangerous Decibels, etc. CTSA researchers relied on the public trust in museums to collect data and information through a dietary assessment of museum visitors. This information is now part of a NIH database. The partnership hopes to extend their collaboration into teacher professional development programs.

Bill stated that in order to achieve a successful partnership, it is important to leverage the resources and knowledge of many partners to achieve common goals. CTSA researchers need assistance in communicating scientific information to the public - SEPAs are experts in this area; thus, collaborations will produce synergistic results.

**Valence Davillier** from the Great Lakes Science Center (GLSC) shared an emerging partnership between the science center and local CTSA (Case Western Reserve University [CWRU]), Cleveland Clinic, University Hospitals of Cleveland, and Metro Health Systems). Historically, GLSC has maintained a strong partnership with CWRU with researchers serving on an advisory committee to develop exhibition ideas and content for the “Mapping the Future of Bioengineering and Technology” SEPA project. The result is a 3000 ft<sup>2</sup> gallery with museum exhibits, interactive carts, and programming utilized by the public to explore advancements in biomedical technology. CWRU students designed a functional electrical stimulation investigation station as part of a course project (directed by an advisory committee member) for integration into the exhibits.

Val stated that while the collaboration with CWRU has been strong, connecting with the CTSA (a larger organization) has been challenging. Timing is important – the CTSA needs time to establish their structure and direction. Integrating the cultures of CTSA partners may be a challenge to the CTSA itself. It is important to keep trying and making your SEPA presence known. Serendipity and networking led to the recent establishment of a closer connection between the SEPA and CTSA. Attending a research event at CWRU connected the SEPA and CTSA which led to a discussions and interest in deeper collaborations. The SEPA was invited to attend two upcoming CTSA board meetings in order to share plans for the future. Inform the CTSA of common goals and services/expertise that SEPA is willing to provide.

**Nancy Murray** from the University of Texas Health Center – Houston shared the success and challenges of bringing diverse groups of professionals (CTSA, SEPA, school districts, and teachers) to the table for collaborative projects. It is important for all members to realize and acknowledge that all parties bring knowledge, skills, and expertise to the partnership. Community advisory meetings are opportunities for partners to listen, respect, and value the contributions of others. SEPAs can assist CTSA with conducting community-based research by providing resources and volunteers. In this way, the CTSA can regard SEPA as engaged partners. It is important to capitalize on existing networks that help CTSA utilize SEPAs.

Nancy stated that some of the challenges to keeping the CTSA-SEPA partnership strong include turnover in CTSA personnel, sustainability of long-term projects, and differences in cultures between CTSA, SEPA, and teachers. She alluded to the marriage analogy presented at the recent CTSA meeting – anyone can be involved; however, things change when you establish and acknowledge a strong partnership (engagement). Commitment is long-term and requires both CTSA and SEPA actively doing and sharing the work together.

**Ann Chester** from the West Virginia University shared her experiences with SEPA-CTSA and SEPA-IDeA partnerships. In West Virginia, she felt that community involvement and buy-in was an essential component of the successful partnership programs. The community is the best entity in the partnership to take the leadership in a college pipeline program. This was achieved by creating local governing boards, which were comprised of volunteers (parents, students, school boards, etc.). Community ownership was the key to success. The volunteer service translates into hundreds of thousands of dollars and immeasurable goodwill. This network was able to influence government and policy resulting in statewide fee waivers. Sometimes universities become too powerful of a player in the partnership and need to let go, allowing the community to hold the power. It is a delicate balance.

Ann shared the success of student-facilitated community science projects conducted in partnership with the University of Pittsburgh. Community students were more successful at obtaining data from local populations for university researchers (900+ data set). Students were trained in IRB, HIPAA, etc., procedures. It was important for the students to work as part of a team and encourage communities to change unhealthy lifestyles. This was an innovative idea to engage tough communities. “To be the big dog and to give away power is to gain influence and a true partnership.”

**Robin Fuchs-Young** from the University of Texas MD Anderson Cancer Center utilizes partnerships to engage rural communities and schools. She feels that partnerships are plentiful, but the best partnerships are organic and grow out of shared goals and needs. Successful partnerships require the following:

**1)** Identification of the needs of the partners involved, **2)** Finding the congruity between the partners’ goals and your goals and, **3)** Understanding and working within the partners’ limitations (time, enthusiasm, etc.).

In her successful partnership, Robin was able to facilitate a summer institute to provide professional development for teachers. The institute resulted in outstanding professional development opportunities for teachers, interactions between researchers and scientists, and dissemination of research information. It is important to meet the needs of the partners through frequent formative evaluation and to make suggested changes rapidly; recognize the limitations of the partners (working around standardized testing); and find needs that can be met by the project (providing resources to teachers). Following these suggestions will result in enthusiastic uptake of programs and products.

**Debbie Colburn** from Charles R. Drew University of Medicine and Science shared the success and challenges with her science-school-community collaboration in Los Angeles, CA. School students (4th grade) collaborated with scientists to improve scientific communication skills (via peer-peer student interviews). Students are engaged, interested, and enjoyed sharing about which topics they wanted to learn.

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Debbie stated that it was important to know the culture of the community. Her Medicine in the Movies programs were provided free to the community, however attendance was poor. Knowing the community is important to scheduling events (time, venue, etc.).

### **General Comments and Questions:**

Schools and other partners have specific needs and goals to be addressed through collaboration (WIFM – What's in it for me?)

### **How to get CTSA's to do more?**

Make your SEPA indispensable to them. Make their grant application more competitive. Focus on increasing research students. CTSA is the dominant partner who is not used to working with communities. Evaluation requirements will strengthen SEPA-CTSA partnerships out of necessity. Community engagement is a very important piece.

### **How can SEPA programs connect to more teachers and schools?**

Attend national and regional National Science Teachers Association (NSTA) conferences, use partners as distributors, websites, conferences for teachers, live web-casting, modularize curriculum (teachers don't use it completely) – “a la carte” approach, utilize students in the program, press releases, word of mouth from participants.

### **Is there a national CTSA meeting to present SEPA programs and products?**

SEPA posters are presented at NIH events, SEPA network will communicate these opportunities, look to COPR ([www.copr.nih.gov](http://www.copr.nih.gov)) – they are looking for new council members, much overlap between SEPA and COPR.

### **Is there a requirement that a CTSA utilize a SEPA?**

Not a requirement, but highly desirable. Helpful to sit on each other's board, no mandate – just encouraged, needs to be a real partnership, market yourself to the CTSA.

### **General Tips:**

- ✦ Keep trying – well-guided persistence pays off.
- ✦ Learn the goals and needs of your partners.
- ✦ Identify how you can help meet these needs (offer suggestions).
- ✦ Learn the culture(s) of your partners.
- ✦ Meet on a regular basis to share progress and discuss new ideas (advisory council meetings, boards).
- ✦ Plan for sustainability (new funding opportunities).
- ✦ Leverage resources and partnership networks to broaden scope of projects.



## Partnership: Developing Effective SEPA-CTSA Partnerships

**William Cameron** : Oregon Health and Science University

Panelists: **Jeanne Chowning** : Northwest Association for Biomedical Research

**Leonard Munstermann** : Yale University (Invited)

**J. Michael Wyss** : University of Alabama at Birmingham

Reported by: Lisa Marriott, Oregon Health and Science University

This session explored strategies for beginning and/or continuing partnerships with Clinical and Translational Service Award (CTSA) institutions. Panelists represented three different areas by which a SEPA program could partner with a CTSA:

- ✦ Academic health center (Michael Wyss, University of Alabama at Birmingham)
- ✦ Academic center with a museum (Leonard Mustermann, Yale University with Peabody Museum)
- ✦ Free-standing institution (Jeanne Chowning, Northwest Association for Biomedical Research, NWABR)

### Challenges

Some of the challenges to partnering with a CTSA include a difference in terminology and goals. For example, “community outreach” to CTSA often means recruiting subjects for clinical trials rather than a public education effort that is often thought of by SEPA programs. The need for CTSA to recruit for clinical trials represents one challenge and difference of goals between CTSA and SEPA programs, as the target audience and goals between these two groups may differ.

### Strategies

In an effort to overcome these challenges, the session identified several strategies a SEPA can use to leverage a partnership:

- ✦ Acquaint yourself with CTSA goals and be flexible in forging your relationship. You will often have to be creative in merging the goals between your two programs. Look for common themes and/or something that your CTSA needs, often evaluation of community outreach or educational programs. If you can help them serve this need, you will be better positioned to partner.
- ✦ Know the organizational cultures of all partners. Understanding their background and method of doing things will pay dividends as you navigate your potential partnership.
- ✦ If your CTSA is newly funded, you may have to be patient while they get their bearings. Attend their events and communicate with their boards so they get to know you over time. Be patient!
- ✦ If you are unfamiliar with who to contact at your CTSA, Tony Beck can be “matchmaker” between your SEPA and CTSA and/or other NIH program. He is able to communicate with their program officer to help build the initial bridge.
- ✦ Once you establish a relationship, a very effective partnership strategy is to have cross-fertilization of your program representatives on advisory boards or public events.
- ✦ Funding for science education efforts can often be tight at CTSA; however, a CTSA pilot grant can be used as entry-level leverage into further involvement.

**Terri Stern** : Yale Peabody Museum  
**Lew Jacobsen** : University of Pittsburgh  
**David Anderson** : Illinois State University  
**Monroe Duboise** : University of Southern Maine  
**Ah-Kau Ng** : University of Southern Maine  
**Walter Allan** : Foundation for Blood Research  
**Susan Adler** : Northwest Association for Biomedical Research  
**Tim Herman** : Milwaukee School of Engineering  
**Chris Cable** : The Imaginarium, Inc.  
**Hilleary Osheroff** : American Museum of Natural History  
**Laura Gonzalez** : Duquesne University  
**Carl Franzblau** : Boston University School of Medicine  
**Lisa Marriott** : Oregon Health & Science University  
**Bill Cameron** : Oregon Health & Science University  
**Jeanne Chowning** : Northwest Association for Biomedical Research  
**Michael Weiss** : New York Hall of Science  
**Leonard Munstermann** : Yale Peabody Museum  
**David Petering** : University of Wisconsin-Milwaukee  
**TaJuana Redmond** : University of Tennessee Health Science Center  
**Nancy Murray** : University of Texas Health Science Center at Houston  
**Louisa Stark** : University of Utah  
**Michael Bloom** : National Institute of Arthritis and Musculoskeletal and Skin Diseases, National Institutes of Health  
**Pete Ockuly** : University of Minnesota

## Partnership: Partnerships for Integrating Effective Student Learning and Professional Development Programs

**Robin Fuchs-Young** : University of Texas MD Anderson Cancer Center

Reported by: Heather Reddick and Robin Fuchs-Young, University of Texas MD Anderson Cancer Center

Dr. Fuchs-Young first described the MIDAS Project, and provided an overview of its structure, goals and objectives. She identified the many partners involved, including: teachers, administrators, students, parents, research scientists, field experience venues, summer institute trainers, etc.

Using the metaphor of planting, nurturing and supporting the growth of a tree, Dr. Fuchs-Young provided a brief overview of the challenges and successes of creating strong and productive partnerships during the MIDAS Project.

### 1. Planting the Tree

- \* Initiation – approaching the potential partners
- \* Knowing where to dig, i.e., understanding the politics - approaching administration and classroom teachers at about the same time so neither group feels neglected or disrespected

### 2. Sunshine strengthens the tree

- \* Project Development- openness and disclosure
- \* “Come bearing gifts” - sometimes helps to initiate a partnership
- \* Building Trust- Openness about expenditures and sharing decision making

### 3. Flexibility – Weathering the Storm

- \* Making adjustments
- \* Incorporating feedback
- \* Revising the “grand” design

### 4. Sharing Ownership – Strong trees have a lot of roots

- \* Incorporating new ideas

## 5. Strengthening – Prune, Water and Fertilize

- \* Meeting Needs
- \* Keeping promises
- \* Revise and cut or add

## 6. Great partnerships bear fruit

Dr. Fuchs-Young then asked the group to describe their project partnerships using their own metaphors. The group then made drawings of their metaphors and shared and discussed their concepts of the challenges and benefits of partnerships.

Examples

### 1. Rotary Telephone – Keep the lines open....OR DISCONNECTED

- \* Long distance charges
- \* No knowledge/control of the budget or shared vision
- \* Work to earn trust of partners, then dashed by others
- \* Different philosophies of the project
- \* Time limit

### 2. Hiking with a climb

- \* Hard work
- \* Views and elements new to everyone on the hike

### 3. Sunday Dinner- Amalgam of individual dishes – Everyone's expertise

- \* Individual dishes taste good, but together, they make a fantastic meal
- \* Integration of knowledge to make a common body of knowledge that is greater and better than any of ours individually.

### 4. Puzzle pieces – Projects take all pieces of certain angles to make a picture

### 5. Spider web – Many paths to partnerships are delicate, together they make a strong web

- \* Distance
- \* Conditions
- \* Often have to rebuild partnerships

## Conclusion

The best partnerships are organic and grow naturally out of shared needs and goals.

- \* Identifying the needs of the partners that the project can meet.
- \* Find the congruity between the partner's goals and your goals.
- \* Understanding and working within partners' limitations, i.e., time, enthusiasm, conflicting commitments, willingness to extend themselves.

**Gaylen Bradley** : Pennsylvania State University

**Amanda Meyer** : University of Alaska Fairbanks

**Victor Serio** : University of South Maine

**Barb Billington** : University of Minnesota

**David Potter** : Harvard Medical School

**Nathalie Sessions** : University of Texas Health Science Center at Houston

**Nancy Marra** : University of Montana

**Nonye Alozie** : University of Michigan

**Janet Dubinsky** : University of Minnesota

**Bill Klemm** : Texas A&M University

**Rebecca Smith** : University of California San Francisco



**Molly Stuhlsatz** : Biological Sciences Curriculum Study

**Steve Rider** : Pacific Research and Evaluation

**Steven Guberman** : Science Museum of Minnesota

Reported by: Molly Stuhlsatz, Biological Sciences Curriculum Study

Note: Evaluators and project staff would like to have an evaluation tools database

## **How do people deal with teacher turnover/attrition and how those changes impact evaluation design?**

- ✦ The longer the intervention, the more possibility of attrition.
- ✦ Turnover not as big a problem for programs that serve different groups of teachers each year.
- ✦ Stipends based on the amount of a project that you complete – provide carrots as a way to keep teachers engaged
  - give teachers parts of the stipend as they reach benchmarks in the project or fulfill evaluation requirements.
- ✦ Build in for expected attrition.
- ✦ Be sure to report the data that you do get – still report effect sizes even if power is not high enough to detect a statistically significant effect.
- ✦ Dose-response – is there a difference between the amount of intervention that a teacher gets (or effect on their students)? Do analysis that includes the amount of project-interaction as an independent variable in analysis.
- ✦ Dropout – don't assume that the dropout of teachers would be random. Is there bias on who is dropping out? Selection factors?
- ✦ Make sure that teachers know up front what they are in for. Be very clear about what the project expects and what the requirements for reporting/data collection will be prior to the start of the project.
- ✦ Use a treatment/comparison (cohort model) research design for first year, then include the first year comparison group in the intervention in year 2.

## **What are the outcomes for PD that folks are measuring? What instruments are being used?**

- ✦ DTAMS (Diagnostic Teacher Assessment in Math and Science)– Tom Tretter at Louisville (PS, LS, ES, Math Middle School) [http://louisville.edu/education/research/centers/crmstd/diag\\_sci\\_assess\\_middle\\_teachers.html](http://louisville.edu/education/research/centers/crmstd/diag_sci_assess_middle_teachers.html)
- ✦ Some are using released items from TIMMS, NEAP, or State tests.
- ✦ RTOP – (Reform Teaching Observation Protocol, Piburn, M., Sawada, D., Falconer, K., Turley, J. Benford, R., Bloom, I. [2000]). [http://physicsed.buffalostate.edu/AZTEC/RTOP/RTOP\\_full/](http://physicsed.buffalostate.edu/AZTEC/RTOP/RTOP_full/)  
Some thought that the RTOP could be informative to use as an observational protocol to assess the teacher professional development itself.
- ✦ STEBI – Science Teacher Efficacy Beliefs Inventory [http://findarticles.com/p/articles/mi\\_qa3667/is\\_200412/ai\\_n9473085/](http://findarticles.com/p/articles/mi_qa3667/is_200412/ai_n9473085/)
- ✦ Fol (Fidelity of Implementation) measurements are important too! Standardizing Fol is difficult and generally requires either direct or video taped observations.  
One participant suggested asking students a general question regarding the content that should be covered as a way of checking if teachers are implementing the topic in class.
- ✦ NOS – VOSTS – Glen Aikenhead, Alan Ryan
  - VNOS – Lederman, N. G., Abd-El-Khalick, F., Bell, R. L., & Schwartz, R. (2002). Views of nature of science questionnaire: Toward valid and meaningful assessment of learner's conceptions of nature of science. Journal of Research in Science Teaching, 39(6), 497-521.  
[http://www.flaguide.org/tools/diagnostic/views\\_of\\_nature\\_questionnaire.php](http://www.flaguide.org/tools/diagnostic/views_of_nature_questionnaire.php)
  - VOSTS -  
<http://www.usask.ca/education/people/aikenhead/vosts.pdf>
- ✦ Attitudes – Research experience for teachers – Sherri Southerland – Florida State [www.flaguide.org/tools/tools\\_technique.php](http://www.flaguide.org/tools/tools_technique.php)
- ✦ Horizon Research has really nice tools are online - <http://www.horizon-research.com/instruments/>

## What should projects and evaluators think about when getting started?

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- \* Get in on the ground level – use theories of change, expected outcomes, what are the activities that impact outcomes – is everything aligned? Make sure that project staff and evaluators work closely from the beginning of the project.
- \* Use logic model as a planning tool and to help refine outcomes.
- \* Use appropriate program theory.
- \* Are people aware of the language of professional development? Get everyone on the same page!
- \* Help project staff understand the importance of designing effective professional development for teachers. Consider Susan Loucks-Horsley and Nancy Love's book "Designing Professional Development for Teachers of Science and Mathematics" at the beginning. There is concern that without a science educator within the project staff there could be problems with ensuring effective professional development for teachers. Link to book: <http://www.corwinpress.com/booksProdDesc.nav?contribId=527448&prodId=Book225875>

## How is quality of PD being measured?

- \* Thomas Guskey's 5 levels
- \* Bouffard & Little, 2004 – Based on Kirkpatrick
- \* Many people have trouble including student level outcomes
- \* Organizational support is important factor included in Guskey and important for professional development
- \* Can Dose/Response models be used when attrition is a problem?
- \* Importance of measuring pedagogical content knowledge, not just content knowledge

## Where do people go for specialized instruments?

- \* MSPnet - Knowledge Management Dissemination Network
- \* MOSART Materials – misconception oriented – same test given to students and teachers
- \* Bioliteracy.net – bio based concept inventories
- \* Assessing content knowledge of teachers – "Societies" like the American Physiological society often offer instruments in specialized topic areas
- \* American Evaluation Association [www.eval.org](http://www.eval.org)
- \* Finding really specialized content tests is an issue.

## How to validate?

- \* We need to be cautious about using instruments that we design without testing reliability and validity.

**Rebecca Kruse** : Biological Sciences Curriculum Study

**Selcen Guzey** : University of Minnesota

**Sue Hills** : University of Alaska

**Kristin Bass** : Rockman Et Al

**Dina Drita** : University of Utah

**Mel Limson** : American Physiological Society

**Margaret Shain** : American Physiological Society

**Tonya Smith** : American Physiological Society

**Ken Jeddloh** : University of Minnesota

**Bert Ely** : University of South Carolina

**David Radford** : University of Alabama at Birmingham

**Mark Kaelin** : Montclair State University

**Louisa Stark** : University of Utah

**Wendy Huebner** : Montclair State University

**Gail Fletcher** : University of Southern Maine

**Kelley Withy** : University of Hawaii

**Theresa Britschgi** : Seattle Biomedical Research Institute

**Laurie Collins** : Center for Research and Learning

**Bruce Nash** : Cold Springs Harbor Laboratory

**Charlotte Mulvihill** : Oklahoma City Community College

**Simpfronia Taylor** : University of Tennessee Health Science Center

**Patrice Legro** : Koshland Science Museum

Reported by: **Patrice Saab**, University of Miami

- ✦ There are many sources of health information outside school or doctor's offices (e.g., peers, web, libraries, informal networks, etc.).
- ✦ Define "decision-making" as critical thinking or problem solving
- ✦ It is important to establish naïve knowledge, cultural context, community context, and a long-term strategy.
- ✦ Formative evaluation is not enough.
- ✦ More and deeper understanding of the target audience is needed.
- ✦ Better understanding of the barriers to decision making is needed.
- ✦ Multiple approaches should be used.
- ✦ Decision-making (a.k.a. problem solving or critical thinking skills) is much more dynamic than one medium or one approach.

## PARTICIPANTS

**Steve Oliver** : University of Georgia

**Judy Diamond** : University of Nebraska State Museum

**Margaret Evans** : University of Michigan

**Patrice Saab** : University of Miami

**Judith Bond** : Pennsylvania State University

**Consuelo Morales** : University of Michigan

**Shaw-Ree Chen** : University of Rochester

**Karen Cole** : Kansas University Medical Center

# Sharing Materials: FoodMASTER: Enhancing Math and Science Education Through Food-based Activities

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**Melani W. Duffrin** : East Carolina University  
**Jana A. Hovland** : East Carolina University  
**Virginia Carraway-Stage** : East Carolina University

Reported by: Melani Duffrin, East Carolina University

The Goals and objectives of the FoodMASTER (Food, Math, and Science Teaching Enhancement Resource) project were shared along with lessons learned during Phase I. Evaluation tools were discussed, as were results of Phase I implementation and data collection. Teacher feedback and comments were very positive, including that students were more focused and tuned in during FoodMASTER time than any other time of the day.

Participants broke out into smaller groups to experience FoodMASTER Scientific Inquiry Labs such as “Fish in the Kitchen” (using math to make salmon dip), “Selecting Cereal” (reading nutrition fact labels), and “Immiscible” (emulsifying salad dressing). Participants played computer-aided FoodMASTER educational games and were given a chance to look through the teacher manual and student workbook. Informal small group discussion about project development and implementation occurred at this time. The presentation concluded with a discussion of future partnerships and projects using the FoodMASTER approach to teaching math and science.

**David Petering** : University of Wisconsin-Milwaukee  
**Pamela Koch** : Teachers College Columbia University  
**Isobel Contento** : Teachers College Columbia University  
**Deborah Colbern** : Charter Drew University  
**Tara Lang** : Children's Museum of Houston  
**Marti Jett** : Walter Reed Army Institute of Research  
**Maurice Godfrey** : University of Nebraska Medical Center  
**Sabine leske** : University of California, Science and Health Education Partnership  
**Barbara Baumstark** : Georgia State University  
**Michael Bloom** : National Institute of Arthritis and Musculoskeletal and Skin Diseases,  
National Institutes of Health

PARTICIPANTS



## Partnership: Collaborations to Develop a Broader Footprint

**William Cameron** : Oregon Health and Science University

Reported by: Lisa Marriott, Oregon Health and Science University

This session explored other funding opportunities that could be utilized in addition to SEPA funding. Participants discussed some of the granting agencies that have funded them in the past as well as listed some agencies that maybe useful in the future. A comprehensive, but not exhaustive, document describing these funding opportunities can be obtained by emailing William Cameron ([cameronw@ohsu.edu](mailto:cameronw@ohsu.edu)).

### Sources discussed in this session

- ✦ **Other NIH funding** – Programs discussed included Step Up (R25 program through NIDDK), RIMI (Research Infrastructure Minority Institution, a P20), EXPORT grant (P40), educational cores through P50s and P60s (most fund grad/post-docs, but not always as some have K-12 or teacher opportunities).
- ✦ **HHMI funding** – often targets K-12 in rural underserved areas. These grants are \$475K for 4 years and come by HHMI invitation to campus. Have been used as a starter before SEPA grants. Contact person for HHMI is Deb Felix. Another HHMI opportunity is Biology Scholars (undergraduate initiative) that gives \$150K. Worthwhile to see if there's one in your city.
- ✦ **Other Government Agencies** – More information available in comprehensive document, but those discussed were: Department of Defense, Department of Energy, Homeland Security (STEM-based), Institute of Museum and Library Services (IMLS), Department of Agriculture (challenge grants), NASA (2 programs) and Department of Education (MSEIP grants)
- ✦ **NSF** – Especially the Math Science Partnership (MSP) program. Pot of money now mostly exists as block grants within individual states. Look with state to see if block grants exist. The application is not very formidable. States decide how money is distributed.
- ✦ **Professional Societies** – such as American Physiological Society (APS), which houses a teacher development program.
- ✦ **Associations/Private Foundations** – There are many foundations and private associations, each with their own set of guidelines and restrictions. Many prefer to administer grants locally. Some of the organizations discussed are: MacArthur Foundation, Robert Wood

Johnson, Scientific Atlanta, Motorola Foundation, Bill Gates Foundation, British Petroleum/Conoco Phillips, Exxon Mobil and Power Administrations (such as Bonneville Power Administration and Tennessee Valley Administration). Many of these programs are looking into STEM development.

### PARTICIPANTS

**Lucille Dayt** : Hall of Health  
**Steve Oliver** : University of Georgia  
**Sosoles de Lacalle** : Charles Drew University  
**Gaylen Bradley** : Pennsylvania State University  
**Patrice Legro** : Koshland Science Museum  
**Monroe Duboise** : University of Southern Maine  
**Chris Cable** : The Imaginarium, Inc.  
**Barb Billington** : University of Minnesota  
**Val Davillier** : Great Lakes Science Center  
**Bart Hays** : Helix Charter High School  
**Eve Wurtele** : Iowa State University  
**Larry Tague** : University of Tennessee Health Science Center  
**Carla Truax** : University of Southern California

**Judi Wilson** : San Joaquin County Office of Education

**Stanford Hill** : Wake Forest University School of Medicine

Reported by: Mary Budd

This workshop discussed barriers and roadblocks to the development of school partnerships. Questions were raised about how to keep our programs in the schools and how to keep relationships when significant key administrators leave.

## Discussions included:

- ✦ Resistance of our programs due to turnover in school systems (new administration).
- ✦ Sustaining or building a positive rapport with our partners.
- ✦ A need to have help from all different levels in the project.
- ✦ A need to utilize community members as stakeholders (not just school administration).
- ✦ Meeting the needs of different levels of teachers.

## Key Point

What do curriculum coordinators need that we have? What is it about our program that is different and can benefit the population we are working with?

## Challenges

Groups came up with some suggestions to solve the challenges:

### 1) How do you minimize negative impacts of high turnover?

- ✦ Get buy-in from community and supers , school board, parents, teachers, etc.
- ✦ Increase scope/depth of support groups.
- ✦ Speak to a variety of audiences.

### 2) How do you establish and sustain the project partnerships so they become an integral part form all levels.

- ✦ Know/respect your audience.
- ✦ Motivation on all levels of participants so they buy in.
- ✦ Make real world connections/relevance.

### 3) Why do teachers do this stuff?

- ✦ Barriers: Fear, comfort zone, time pressures, testing, money, administration
- ✦ Motivations: Support from above/systematic motivation, professional credit, self worth, student performance, evidence this helped others, building confidence.
- ✦ Support: Give them tools and give them help.

*No Participant List*

**Kristin Bass** : Rockman Et Al

Reported by: Dina Drits, Genetic Science Learning Center

Importance of identifying what is being measured. What is our goal for the evaluation? What are the outcomes you want to see in our curriculum?

## Outcomes

- ✦ Critical thinking, science process skills – students
- ✦ Student engagement/interest
- ✦ Enduring understandings of the specific subject (Wiggins & McTighe)
- ✦ Places in the curriculum where opportunities for assessment exist for reflection and modifying instruction to meet the needs of students
- ✦ State standards
- ✦ Usability and feasibility of materials
- ✦ Scientific literacy
- ✦ Understandings about the nature of science

The group discussed the purpose of this particular breakout session: is it about evaluating the curriculum design or the effectiveness of the curriculum for students?

## Additional outcomes

- ✦ Cycles of revision
- ✦ Integrity of design
- ✦ Effectiveness for students is more important than integrity of development?

## What is key to evaluating curriculum materials?

- ✦ Effectiveness for students
- ✦ Will teachers continue to use it?
- ✦ Did it make a positive difference?

## Design

- ✦ Randomized-Control Trials – nobody is doing this
- ✦ Quasi-experimental – people talk about pre/post measures with carefully matched controls
  - Matched samples (matched by demographics) - one way to check for validity is to ask a general question of both groups and see if the answers are similar
- ✦ Another design is an expert review of curriculum, for instance, a national panel. It's advisable to do this early in the process, and can serve as a formative evaluation of the pedagogy and content.

Discussion of an article by Douglas Clements: Clements, D. H. (2007). Curriculum research: Toward a framework for “research-based curricula.” *Journal for Research in Mathematics Education*, 38, 35-70. This is an exhaustive article about developing curricula. Even though the subject area is math, the information can be applicable to science as well.

Note: Clements' article is available: [http://www.gse.buffalo.edu/RP/PDFs/Clements\\_CRF.pdf](http://www.gse.buffalo.edu/RP/PDFs/Clements_CRF.pdf)



## How to make curriculum “value-added,” with so many curriculum choices available

- ✦ Immediacy needs of teachers.
- ✦ We must teach the teachers how to effectively implement our curricula.
- ✦ Teachers almost always take curricula and modify it.
- ✦ Research studies indicate that the most effective student results are from teachers who implement high-quality curricula with full or nearly full fidelity.
- ✦ Still, using high-quality curricula shows better results than not using high-quality curriculum materials.
- ✦ Health-related standards are sometimes very hard to create curriculum for and so these standards don’t get taught very much – big problem.

### Instruments

PISA, TIMMS and what each do. PISA measures the ability to achieve in a technological society, while TIMMS measures in-class performance on curriculum.

### Instrument matching

#### Need

- ✦ Generic test of scientific literacy/skills in inquiry
- ✦ Engagement of materials
- ✦ Fidelity of inquiry-based implementation

#### Have

- ✦ Lesson plan evaluation, Laurie (Bioquest)
- ✦ Mel Limson, American Physiological Association instrument, “Lab/Lesson Debrief form for Six Star Science”
- ✦ Wendy Huebner, Montclair State University
  - Attitude toward science inventory
  - Careers in science (developing)
- ✦ Scientific understanding instrument
  - Systems thinking
  - Notes of relationships, etc;
  - Exploratory abilities

**Margaret Shain** : American Physiological Society

**Tonya Smith** : American Physiological Society

**Mel Limson** : American Physiological Society

**David Anderson** : Illinois State University

**Laurie Collins** : Center for Research and Learning

**Tracey Meilander** : Great Lakes Science Center

**Bill Klemm** : Texas A&M University

**Don DeRosa** : Boston University School of Medicine

**Wendy Huebner** : Montclair State University

**Rebecca Kruse** : Biological Sciences Curriculum Study

**Selcen Guzey** : University of Minnesota

**David Potter** : Harvard Medical School



# Dissemination: Strategies for Exhibit Dissemination

**Vicki Coats** : Oregon Museum of Science and Industry

**Martin Weiss** : New York Hall of Science

Reported by: Terri Stern, Yale Peabody Museum

Pre-planned venues are easiest, create consortia

## “Non-Traditional” sites

- ✦ Health center, library, shopping mall, fairs, community events, community center.
- ✦ Presents challenges
- ✦ Not used to exhibits
- ✦ May not insure contents against damage
- ✦ Security

## Beware of shipping considerations in planning

- ✦ too large sections
- ✦ too heavy sections
- ✦ maintenance in design--who will staff?

## Provide marketing materials

- ✦ logo
- ✦ sample layouts for print  
collaboration works best!
- ✦ challenges--most design for “least workable venue”

## Other Issues to Consider

- ✦ packing crates: should be collapsible if possible
- ✦ use custom blanket wraps if possible
- ✦ manuals, extra software, cut lists of all contents, programming and curricula
- ✦ swap exhibits to reduce costs
- ✦ ask for buying up front as development costs

## Programming Issues

- ✦ Must think of “extra” issues. E.g., outside storytellers, extra staff, how to account for time of staff.  
One idea: include funding for training host venues (exhibit creators provide this).
- ✦ Hands-on “Discovery Boxes”--too fragile to be unsupervised  
One idea: Only have them out when large unsupervised groups (e.g., camps) are not there, or have docent/staff demonstrate one.

## Take-Home Message

- ✦ You have no idea how venue will use, display or interpret what you build. Keep this in mind during design.

**Mark DiRienzo** : ScienceWorks Hands-On Museum

**Terri Stern** : Yale Peabody Museum

**Steven Guberman** : Science Museum of Minnesota

**Vicki Coats** : Oregon Museum of Science & Industry

**Martin Weiss** : New York Hall of Science

**Patrice Saab** : University of Miami

**Sean Duran** : Miami Science Museum

**Laurie Fink** : Science Museum of Minnesota

**Tim Herman** : Milwaukee School of Engineering

In this hands-on workshop, participants engaged in using the molecular models developed by the Center for BioMolecular Modeling. A range of physical models and supporting computer visualization tools were used to explore topics ranging from water, to proteins, to DNA – and ending with current vaccines and drugs to combat the influenza virus. These models may be borrowed from the MSOE Model Lending Library to use in SEPA programs.

**PARTICIPANTS**

**Charlotte Mulvihill** : Oklahoma City Community College  
**Cora James** : Haskell High School  
**Debbie Colbern** : Charles Drew University of Medicine and Science  
**Maurice Godfrey** : University of Nebraska Medical Center  
**Debra Yourick** : Walter Reed Army Institute of Research  
**Ah-Kau Ng** : University of Southern Maine  
**Walter Allan** : Foundation for Blood Research  
**Vic Serio** : University of Southern Maine  
**David Petering** : University of Wisconsin-Milwaukee

## Sustainability: The SBIR and STTR Grant Programs

**Krishan Arora** : Program Officer, NIH NCRR SBIR and STTR Programs

Panel: **Dina Markowitz** : University of Rochester Medical Center  
**Isobel Contento** : Teachers College Columbia University

Reported by: Pamela Koch, Teachers College Columbia University

SBIR and STTP Grant program support scientific excellent and technical innovation through investment of federal research funds “one small business at a time.”

Small Business Innovative Research (SBIR) 2.5% set aside for all federal granting program for small business research and development that has the potential for commercialization. Grant has to be awarded to a small (fewer than 500 employees) business. PI must be primarily (over 50%) employed by the small business at the time of the award. Sub awards are permitted.

Small Business Technical Transfer (STTR) 0.3% set aside.

For the NIH this is \$580 million (SBIR) and \$70 million (STTR) and \$27 (SBIR) and \$3.2 million (STTR). Last year NCRR was not able to use all their funds.

**Phase 1:** Discovery around \$100 thousand for around 6 months. (Up to 33% can be sub award.)

**Phase 2:** Full research and development with commercialization plan ready \$750 thousand over two years (up to 50% can be sub award).

There is a fast track to get Phase 1 and Phase 2 money together since there can be a gap with funding. Very few fast track awards are made.

SBIR: [www.grants.nih.gov/grants/guide/pa-files/PA-09-080.html](http://www.grants.nih.gov/grants/guide/pa-files/PA-09-080.html)

STTR: [www.grants.nih.gov/grants/guide/pa-files/PA-09-081.html](http://www.grants.nih.gov/grants/guide/pa-files/PA-09-081.html)

SBIR: [www.grants.nih.gov/grants/guide/pa-files/PA-09-080.html](http://www.grants.nih.gov/grants/guide/pa-files/PA-09-080.html)

Dina has just received a Phase 1 SBIR grant. She created a small business to compliment her SEPA work, Science Take-Out, that sells individual lab kits. Dina created her company on her own and it is fully separate from her work at the University of Rochester. Her presentation had lots of details on starting a company, if you have any questions you can contact her at [dina\\_markowitz@urmc.rochester.edu](mailto:dina_markowitz@urmc.rochester.edu). Dina highly recommended attending the NIH SBIR/STTR conference where you can attend workshop and participate in one-on-one sessions with NIH staff. See <http://grants.nih.gov/grants/funding/SBIRConf2008/index.htm> for details. The conference is July 22-23 in Atlanta, Georgia.

**Isobel Contento and Pamela Koch** : Teachers College Columbia University

Isobel Contento has just received a Phase 2 grant with a computer company, Stottler Henke, <http://www.stottlerhenke.com> to convert their SEPA funded curriculum, Choice, Control, & Change <http://www.tc.edu/cfe/choice.html> into a computer game. Stottler Henke and Teachers College had not worked together previously before this project. They completed a Phase 1 grant, and just began their Phase 2 project.

PARTICIPANTS

**Debbie Colbern** : Charles Drew University of Medicine and Science

**Cathy Ennis** : University of North Carolina - Greensboro

**Tara Lang** : Children's Museum of Houston

**Karen Cole** : Kansas University Medical Center

**Louisa Stark** : University of Utah

**Laura Gonzalez** : Duquesne University

**Kelly Withy** : Hawaii/Pacific Area Health Education Center

**Bruce Howard** : Center for Educational Technologies

**Heather Reddick** : The University of Texas M.D. Anderson Cancer Center

**Carl Franzblau** : Boston University School of Medicine

**Gerry Boss** : University of California, San Diego

**Isobel Contento** : Teachers College Columbia University

**Pamela Koch** : Teachers College Columbia University

**Dina Markowitz** : University of Rochester

**Shaw-Ree Chen** : University of Rochester

**Carla Romney** : Boston University School of Medicine

**Cheryl McCallum** : The Children's Museum of Houston

**Jana Hovland** : East Carolina University-FoodMASTER

**Melani Duffrin** : East Carolina University

**Virginia Carraway-Stage** : East Carolina University

## Partnership: SEPA-IDeA Partnerships

**L. Tony Beck** : National Center for Research Resources, National Institutes of Health

Panel: **Maurice Godfrey** : University of Nebraska

**Kelley Withy** : University of Hawaii

✦ Collaboration proves an opportunity for learning through scaffolds.

INBRE

COBRE

GEAR UP

AHEC

Health professions programs

Community Colleges

TSA

✦ Some programs provide depth of student contact and some provide breadth so we can maximize impact through collaboration

✦ SEPA is high in recognition by INBRE, there is a full range of collaborations from no support to financial support

✦ Encourage IDeA states to apply for SEPA – INBRE Outreach Core Leaders of AHEC Director

✦ We are going to develop a list of K – 12 grant opportunities.

### PARTICIPANTS

**Kelley Withy** : University of Hawaii

**Charlotte Mulvihill** : Oklahoma City Community College

**Tony Beck** : National Center for Research Resources, National Institutes of Health

**Theresa Britschgi** : Seattle Biomedical Research Institute

**Krishan Arora** : National Center for Research Resources, National Institutes of Health

**Ann Chester** : West Virginia University

**Ah-Kau Ng** : University of Southern Maine

**Maurice Godfrey** : University of Nebraska Medical Center

## Partnership: Partnerships Between “Informal” and “Formal” Science Education Programs

**John Pollock** : Duquesne University

**Roberta Cooks** : Maryland Science Center (Invited)

**Vicki Coats, PhD** : Oregon Museum of Science & Industry

Reported by: Val Davillier, Great Lakes Science Center

Vicki began by describing the partnership between OMSI and OHSU to develop two traveling exhibitions for small museums. The exhibitions traveled to KidZone Museum in Truckee, California, and Bootheel Youth Museum in Malden, Missouri. Education materials, such as teacher and family guides, were developed in English and Spanish and are posted on the OMSI website. Teachers in those areas can also check out some materials from their rural library.

### Topics Discussed

- ✦ Involving teachers and other advisors in exhibit development process.
- ✦ Developing kits and other supplemental materials that work in the classroom.
- ✦ How are roles defined for advisors?
- ✦ Sustainability and dissemination of supplemental materials

### Key Points

- ✦ How can we bridge the gap between formal and informal environments?
- ✦ Is including teachers on advisory team helpful?
- ✦ Working with libraries may be a valuable asset for dissemination.
- ✦ With a facilitator in the classroom a virtual connection from exhibit floor can work.



### Challenges

- ✦ Scheduling around teacher schedules is almost impossible. Some have paid stipends to teachers as incentive to participate and ask if NIH funding could pay for substitute teachers as a means of encouraging teacher participation.
- ✦ Outside advisors sometimes think an exhibit is a three dimensional book.
- ✦ Working with teachers is sometimes frustrating.
- ✦ Kits—teachers not helpful with content, but are aware of how these will function for them.
- ✦ Sustainability—replacement parts and maintenance of items a huge problem.
- ✦ Dissemination of supplemental materials.
- ✦ Virtual dissemination could become another disconnect from reality. Can you have real virtual experiences?

**Barbara Baumstark** : Georgia State University

**Val Davillier** : Great Lakes Science Center

**Laura Gonzalez** : Duquesne University

**Margaret Evans** : University of Michigan

**Vicki Coats** : Oregon Museum of Science & Industry

**Martin Weiss** : New York Hall of Science

**Monroe Duboise** : University of Southern Maine

**Ann Lambros** : Wake Forest University School of Medicine

**Stanford Hill** : Wake Forest University School of Medicine

Reported by: Nathalie Sessions, University of Texas Health Science Center at Houston

- ✦ Evaluation and importance of follow up throughout academic year--identify key person that makes professional development calendar well in advance.
- ✦ Identify access points.
- ✦ Plan well ahead for design
- ✦ Research constituents (districts, schools, teachers, etc) and know your audience--be prepared to provide lit review.
- ✦ Keep in mind "prisoners," "learners," "CE seekers"
- ✦ Factor into design how to capture evidence of effectiveness
- ✦ Consider culture/geography/situation specifics
- ✦ Offer to be/be present at school events like science fairs, parent night etc. that are effective ways to DEVELOP RELATIONSHIPS

## Key Points

- ✦ Be intentional and thoughtful in design
- ✦ Develop relationships
- ✦ Add value to teachers and students
- ✦ Research Constituents
- ✦ Ensure alignment
- ✦ Recruit through local and regional avenues and National Staff Development Council
- ✦ Use free applications such as Google Apps for Education or Manhattan from sourceforge.net
- ✦ Add matrix to SEPA website with inventory of resources per topic/category and grade level

**Bill Cameron** : Oregon Health & Science University

**Melani Duffrin** : East Carolina University

**Nancy Marra** : University of Montana

**Louisa Stark** : University of Utah

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**Margaret Shain** : American Physiological Society

**Selcen Guzey** : University of Minnesota

**Tim Herman** : Milwaukee School of Engineering

**Bert Ely** : University of South Carolina

**Mark Kaelin** : Montclair State University

**Ah-Kau Ng** : University of Southern Maine

# Evaluation: Evaluating Informal Programs for Students, Families and Adults

44

Facilitators: **Amy Grack Nelson** : Science Museum of Minnesota  
**Cheryl McCallum** : Children's Museum of Houston

Y = **youth**  
A = **adult**  
F = **family**

## Skills

Coded observation (f)  
Exit interviews (f)

## Content Knowledge

Personal meaning maps (y)  
Exit interviews (f)

## Attitudes

Self-administered paper survey (y)  
Focus groups (a)  
Pre-post pencil surveys (y, a)  
Exit interviews (f)  
Online surveys (a)  
Paper survey (f)

## Behaviors (during program)

Pre-post pencil survey (y, a)  
Coded observations (f)  
Focus groups (a)  
Pre-post survey (y)  
Face-to-face individual interview (a)

*No Participant List*

# Evaluation: Student Questions: Inquiry Skill and Evaluation Metric

**Lewis Jacobson** : University of Pittsburgh

**Marlys Witte** : University of Arizona College of Medicine

**Peter Crown** : University of Arizona College of Medicine

Reported by: Alison Slinsky Legg, University of Pittsburgh

Marlys Witte and Peter Crown from the University of Arizona presented their Program on Medical Ignorance.

Marlys discussed the value of questions and importance of encouraging questions in the classroom. The honesty and integrity of questions matter.

Peter presented the tools employed by their programs to illicit questions like medical ignorance virtual campus, questionator-questioning log.

Lew Jacobson presented results from a University of Pittsburgh SEPA questioning project that stemmed from observations of how questions changed during the summer programs and collaboration with Marlys Witte and Peter Crown.

Presented question scoring scale

Discussed scoring issues and grader reliability.

**David Anderson** : Illinois State University

**Victor Serio** : University of Southern Maine

**Susan Adler** : Northwest Association for Biomedical Research

**Susan Kuner** : Vanderbilt University

**Kristin Bass** : Rockman Et Al

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**Sabine Jeske** : University of California San Francisco

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**Consuelo J. Morales** : University of Michigan

**Catherine Ennis** : University of North Carolina - Greensboro

**Nancy Moreno** : Baylor College of Medicine

**Karen Lind** : Illinois State University

**Cora James** : Haskell High School

**Simpfronia Taylor** : University of Tennessee Health Science Center

**Laura Collins** : Center for Research and Learning

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# Dissemination: Strategies for Disseminating Your Materials and Programs

45

**Robin Fuchs-Young** : University of Texas MD Anderson Cancer Center

**Mel Limson** : American Physiological Society

Reported by: Tracey T. Meilander, Great Lakes Science Center

Robin Fuchs-Young from the MIDAS Project and Mel Limson from the American Physiological Society shared how they utilized the web to disseminate resources, programs, and products created via SEPA funding.

Robin's program utilizes integrated curricula and programming to increase impact and improve statewide dissemination of resources. She utilized the following mechanisms: websites, professional development/conferences/workshops, publishing, and alternative electronic outlets (clearinghouses, libraries, etc.).

## Pros of websites include

- ✦ People can find you (you exist)
- ✦ Definitive product
- ✦ Update with new material
- ✦ Link to others

## Cons of websites include

- ✦ Never finished (design stale, typos, new info)
- ✦ Difficulties with contractors
- ✦ Always takes longer than expected (1 year)
- ✦ Many decisions to make – platform, programming, animations, etc.
- ✦ Hosting fees (\$50-\$500 per year), important to sustainability

## Tips for using websites

- ✦ Purchase key words to increase hits and/or orders
- ✦ Cluster based on metatags
- ✦ Invest in Google Analytics or other analytic to provide tracking information
- ✦ Encourage users to provide contact information
- ✦ Give most-accessed resources special attention
- ✦ Usage spikes post-conference/workshop/meeting
- ✦ Games hook students in
- ✦ Hire a staff person, if funding is available
- ✦ Produce backend database with resources, portalize entry through the front end
- ✦ Utilize a content management system
- ✦ Consider where to host the server (on or off site)
- ✦ Younger users prefer a more sophisticated site
- ✦ Grants available for Google Ad Words

## Tips for facilitating professional development programs

- ✦ Pay for attendees but provide no stipends (this ensures that all want to be there)
- ✦ Provide teachers with a full set of materials
- ✦ Evaluate the program at regular intervals, make timely changes and adjustments

Mel Limson, Coordinator for K12 Education Programs with the American Physiological Society, shared the APS Archive of Teaching Resources as an option for product dissemination. The APS ATR is a digital library for media, content, and resource storage and an information retrieval system. It was started in the mid-1990s as a learning object database with other partners (AAAS and others). Designed for students and educators (K-16+), the ATR provides lesson plans, labs, podcasts, video, lectures, assessments, press releases, journal articles, etc. It is peer-reviewed for scientific accuracy and animal use, but not pedagogy at this time. They are looking to catalog more SEPA articles and resources. Access is free to download PDF files and weblinks. New materials will require metadata and coding. Review cycles occur in summer and winter.

The group discussed how to select a webmaster. The following suggestions were provided:

- ✦ GoDaddy.com
- ✦ Craig's list
- ✦ Word of mouth and recommendation
- ✦ Database
- ✦ Code for Life conference
- ✦ Librarians
- ✦ Utilize high school students

### Overall Summary

Have a web presence and utilize APS ATR to disseminate your resources created through SEPA funding. Link to others' SEPA projects.

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**Tracey Meilander** : Great Lakes Science Center

**Sonsoles de Lacalle** : Charles Drew University of Medicine and Science

**Patrice Legro** : Koshland Science Museum

**Judith Bond** : Pennsylvania State University

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**Patrice Saab** : University of Miami

**Jennifer K. Campbell** : University of Medicine and Dentistry of New Jersey

**Karen Kalumuck** : Exploratorium

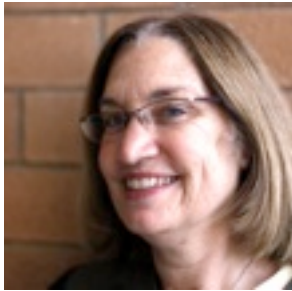
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**Brian King** : Harvard Medical School

**Carla Truax** : University of Southern California

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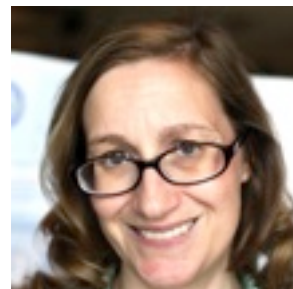
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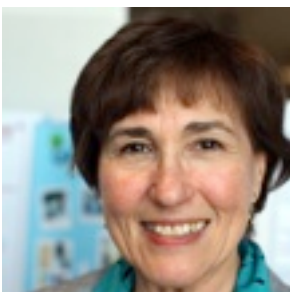
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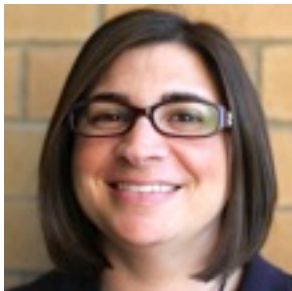
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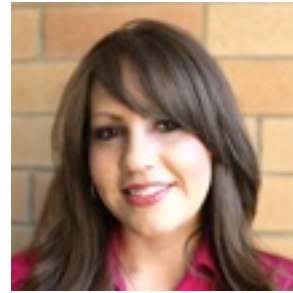
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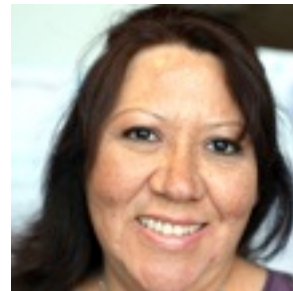
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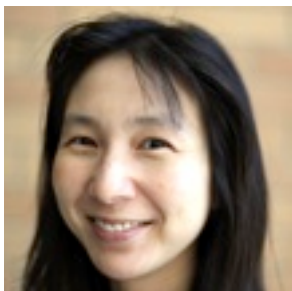
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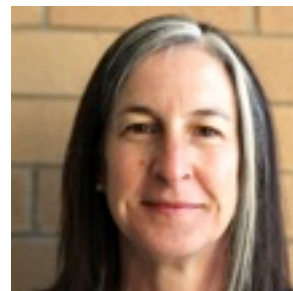
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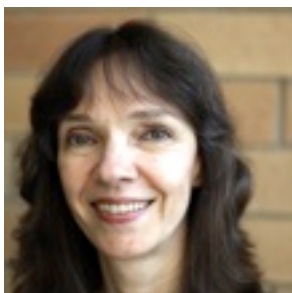
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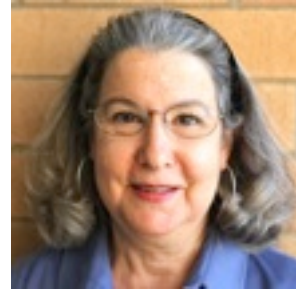
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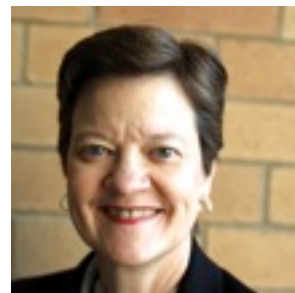
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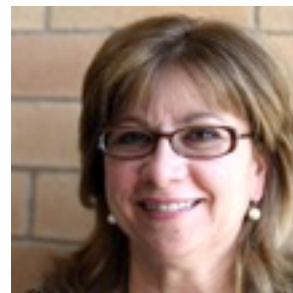
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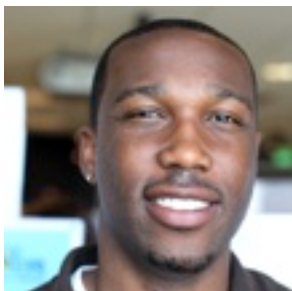
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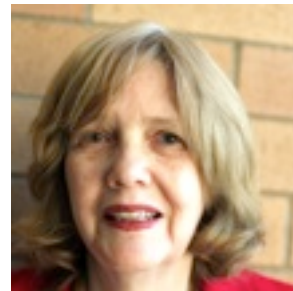
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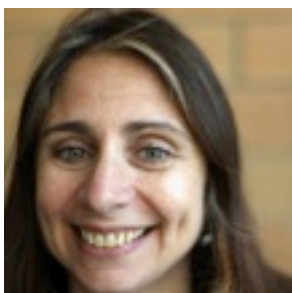
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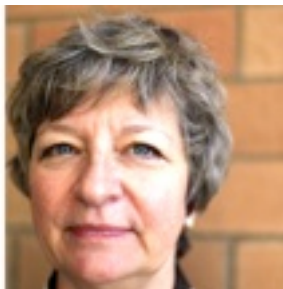
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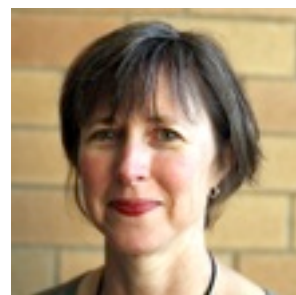
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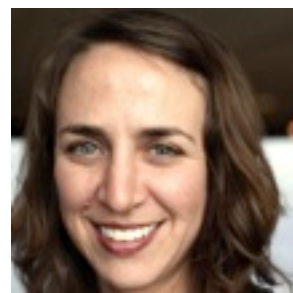
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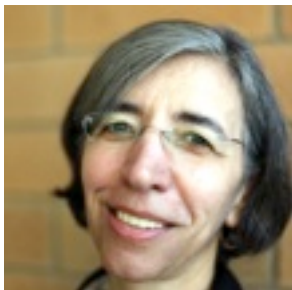
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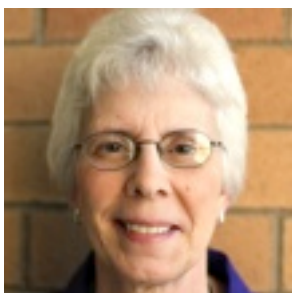
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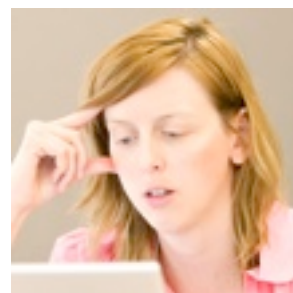
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**MOLLY STUHLSATZ**

*BIOLOGICAL SCIENCES CURRICULUM STUDY*



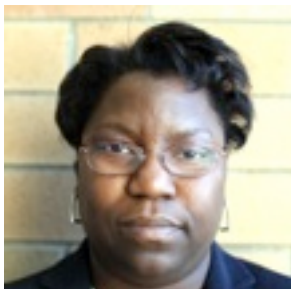
**LARRY TAGUE**

*UNIVERSITY OF TENNESSEE  
HEALTH SCIENCE CENTER*



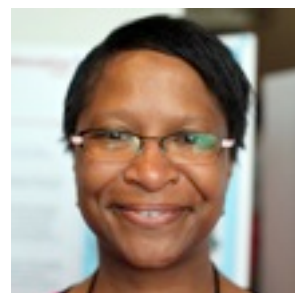
**KIMBERLY TANNER**

*SAN FRANCISCO  
STATE UNIVERSITY*



**SIMPFRONIA TAYLOR**

*UNIVERSITY OF TENNESSEE  
HEALTH SCIENCE CENTER*



**PATRICIA A. THOMAS**

*KANSAS UNIVERSITY MEDICAL CENTER*



**RANDY TOOTHAKER**

*UNIVERSITY OF NEBRASKA MEDICAL CENTER,  
COLLEGE OF DENTISTRY*



**CARLA TRUAX**

*UNIVERSITY OF SOUTHERN CALIFORNIA*



**POLINA VYAZOVKINA**

*UNIVERSITY OF UTAH*



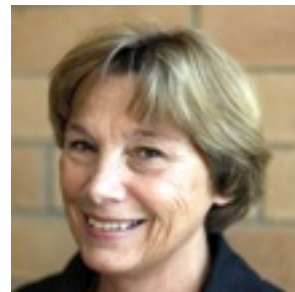
**MATHEW WEAVER**

*UNIVERSITY OF UTAH*



**MARTIN WEISS**

*NEW YORK HALL OF SCIENCE*



**JUDI WILSON**

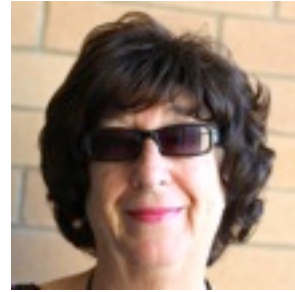
*SAN JOAQUIN COUNTY OFFICE OF EDUCATION*





**KELLEY WITHY**

*UNIVERSITY OF HAWAII*



**MARLYS H. WITTE**

*UNIVERSITY OF ARIZONA COLLEGE OF MEDICINE*



**EVE WURTELE**

*IOWA STATE UNIVERSITY*



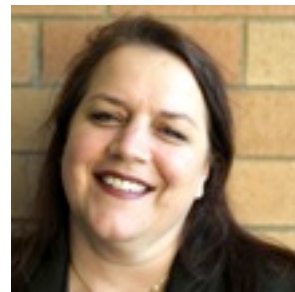
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**HENG XIE**

*NATIONAL CENTER FOR RESEARCH RESOURCES,  
NATIONAL INSTITUTES OF HEALTH*



**DEBRA YOURICK**

*WALTER REED ARMY INSTITUTE OF RESEARCH*



# BiomedicineWorks: How doctors use evidence-based medicine

## Foundation for Blood Research

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**Audience(s):**

Advanced High School Biology classes

**Topics Addressed:**

Critical thinking; Scientific process; Use of evidence in science and medicine; How to ask a medical question; How to analyze a medical paper for validity and importance

**Project Goals:**

1. To create a curriculum that will stimulate interest in health related careers by exposing students to the design and analysis of clinical trials in biomedical research
2. To create a curriculum that will increase students' understanding of the clinical trials process through exposure to evidence-based medicine
3. To partner with Maine master teachers to develop this curriculum thereby providing professional development for teachers in medical science
4. To promote inquiry teaching and learning through the BiomedicineWorks curriculum

**Project Description:**

The focus of the BiomedicineWorks project is to interest high school teachers and students in clinical trials research as a method of influencing career choices and improving understanding of the importance of this research and its application to clinical diagnosis and treatment. We have chosen to investigate whether this can be done using a model commonly employed in medical education – the teaching of evidence-based medicine (EBM). Our conjecture is that the scientific underpinnings of clinical trials research are not too difficult for high school students to understand, and the EBM steps are very similar to the elements of the scientific processes that students are routinely exposed to in their science classes. The parallels between inquiry in the science classroom and real-world science are clearly stated in the National Research Council's Inquiry and the National Science Education Standards. In addition, the mathematics needed to analyze the results of EBM studies represents a core expectation for high school students as stated in the National Council of Teachers of Mathematics standards. The significant advantage offered by the EBM approach to the study of clinical trials is its systematic nature. Although focused on the evaluation of clinical biomedical research, the knowledge, skills and tools acquired by students can be applied more generally to other science and mathematics contexts and problems. The EBM curriculum modules developed in the project are supplemental to the existing curriculum and most easily integrated into advanced high school courses such as Human Anatomy and Physiology, Honors Biology, Advanced Placement Biology, and Advanced Placement Statistics. However, the modules will be made available and can be used by any high school teacher.

**Project Evaluation:**

The first phase of the project is a curriculum development phase. During this phase (2006-2009), the evaluation will focus on providing formative evaluation feedback to project staff about the effectiveness and efficacy of the materials being developed. After each curriculum unit is completed, the evaluator will use survey and interview methodologies to determine what aspects of the curriculum need to be revised. Master teachers will be asked, based on their own experience and training, to evaluate the curriculum for effectiveness, understandability, user-friendliness, age-appropriateness, and desirability of this curricular approach for high school students. Content analysis of data will be conducted to ascertain themes related to positive aspects and/or those not deemed learner-appropriate and to evaluate curriculum content alignment with national standards. Results to date have been positive overall demonstrating that the project staff are fulfilling goals and expectations. Formative feedback regarding the curriculum has led to revisions of portions of the modules and re-design of the first 2 lessons in the curriculum module: Answering a Question About a Therapy. Student content gains have been quantified and suggest students can frame an appropriate clinical question (PICO question), assess a medical paper for signs of validity (randomization, blinding, appropriateness of experimental and control groups), importance (calculate event rates, relative risks, number-needed-to-treat) and appropriately apply the findings to the film vignette's patient.

**Materials/Products/Exhibits Produced:**

Development and piloting of two curriculum units with clinical case films: 1. Answering a Question About a Therapy - utilizing a filmed case about a teenager admitted with an exacerbation asthma of whom the medical team asks, "In a teenager with moderately severe asthma can a peak-flow action plan compared to a symptom-based action plan decrease ER visits and hospital admissions?" 2. Answering a Question About a Diagnosis - utilizing a filmed case about a teenager with possible bacterial meningitis in which the medical team asks, "In a teenager with possible bacterial meningitis but a low CSF white cell count, can an elevated CSF protein confirm the diagnosis of bacterial meningitis?"

**Dissemination Strategies:**

Dissemination plan: 1. Summer Workshops in Maine (with a target audience of teachers from around US of advanced high school biology - first workshop July 2009) 2. Community Outreach Strand of Dartmouth-Hitchcock Medical Center CTSA (with a target audience of local New Hampshire teachers of advanced high school biology partnering with clinical researchers) 3. Medical Pipeline Curriculum for University of Washington's U-DOCs summer program for under-served high school students with an interest in medical careers

# The Mind Project's Cutting Edge Health Science Initiative Illinois State University

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## Contact:

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## Audience(s):

Middle school and high school students and teachers (pre-service and in-service). (A secondary audience that just came to us?: Patients & their families, physicians, surgeons)

## Topics Addressed:

Neurosurgery, Parkinson's Disease, addiction, neurobiology, stroke, deep brain stimulation, dopamine, neuroradiology, computer models, brain-lesioning, AI, robotics, nanotechnology

## Project Goals:

1. Create seven immersive, online virtual science labs for introducing students and teachers to cutting edge developments in medical science
2. Develop effective online professional development materials to support the use of the virtual labs.
3. Create server software to support the online creation of courses, quizzes, etc.
4. Expand The Mind Project Learning Community to welcome middle school and high school teachers and students with online services, workshops, and conferences.
5. Sponsor student research projects via Internet collaboration

## Project Description:

The Mind Project is developing seven interactive, browser-based, immersive learning experiences where students will enter virtual worlds and learn about cutting-edge developments in medical science as well what it is like to have an exciting career in various fields of medical science. The labs include: Virtual Neuroscience Lab #1: Cocaine Study: Students become a neurobiologist researching the role of dopamine in cocaine addiction among self-administering rats. Virtual Stroke Clinic: Students become an endovascular surgical neuroradiologist and perform a coiling procedure to save the life of a patient suffering from a brain aneurysm. Virtual "Top-Down" Robotics Lab: Students become a roboticist, building a top-down mobile robot, writing scripts for the motors, and training the AI engine to operate in a hospital. Virtual "Bottom-Up" Robotics Lab: Students become a roboticist, designing a hierarchy of behavior-based functions that allows a medical robot to take medicine to a patient in the hospital. Virtual Neuroscience Lab #2: Parkinson's Study: Students become a neurobiologist testing an exciting new theory to help better understand Parkinson's disease, by monitoring dopamine in rats that they have lesioned. Virtual Deep Brain Stimulation Clinic: Students become a neurosurgeon implanting stimulating electrodes into a human patient to eliminate tremors from Parkinson's disease. Virtual Medical Nanotechnology Lab: Students become a chemist implementing nanotech procedures to replace or augment several traditional therapies. Students and teachers are welcomed into The Mind Project Learning Community where they can share their interests in the ongoing research projects captured in the virtual labs, engage in online cooperative activities, and become leaders in the online, Mind Project community. Online professional development materials train and support teacher's use of the labs in their classrooms. Workshops and conferences bring together teachers, educators, and sometimes researchers and students for hands-on experiences and collaborative ventures.

## Project Evaluation:

Evaluation Description: The formative evaluation of the Mind Project Curriculum will be conducted by a team of evaluators led by Dr. Karen K. Lind, Illinois State University. Evaluation will address both formative issues pertaining to ongoing programmatic development and needs, and more summative issues related to the impact of this project on the quality of health related teaching and learning in grades 5 - 12. The evaluation will provide information of direct interest and relevance to the project staff, the NIH more broadly, and the health education community. Quantitative and qualitative data will be collected with respect to the achievement of project goals and activities and quasi experimental methods, primarily well-matched comparison-groups will be used. The effectiveness of specific activities to meet project goals will be evaluated through the use of surveys, interviews, artifacts and existing databases, and on-site observations. Data collection instruments and interview protocols will be developed to address the specific activities and implementation of the project. The evaluation team will regularly visit project classrooms and interview project teachers, district administrators, university scientists and mathematicians, and health professionals involved in the project. Evaluation summaries and reports of project activities will be shared with the project staff on a regular basis. Instrumentation: Classroom observation instruments and rubrics will be adapted from the Classroom Observation handbook developed Excellence in Teacher Preparation (CETPC) Program Core Evaluation Project. These instruments will be used to collect data from individual classrooms and schools. Additionally, interview protocols will be developed to provide data related to the research. The Mind Project materials will be readily assessable to a wide variety of classrooms. Curriculum Alignment with Standards The Mind Project curriculum will emphasize the connections among the traditional disciplines of mathematics and science, and when appropriate, those of technology education. The module content and methodology will be reviewed to assure alignment with appropriate national standards, which traditionally guide and/or influence the development of state and school district level standards.

## Materials/Products/Exhibits Produced:

1. Three Virtual Labs are completed and currently available online. Four more are in development. (See details in "Project Description" above)
2. The Mind Project website has over 20 modules on related topics that can be used to support and expand the teaching of the virtual labs.
3. Online services supporting teachers and students include: Design your own course (or borrow someone else's), create a custom Table of Contents (or use someone else's), create your own online quizzes (or pick one from the quiz bank), make a Profile page so others in the Mind Project can get to know you.

## Dissemination Strategies:

1. Electronic dissemination through SciLinks, Youtube, Consortium on Cognitive Science Instruction, and The Mind Project Website (seeking other outlets)
2. Presentations to Principals and Science Coordinators at school districts in Illinois, Michigan, Virginia, and Washington DC.
3. National and Regional Conferences: NSTA, NABT, Annual Rend Lake Science Conference
4. The Mind Project Workshops and Conferences – 1-2 day workshops for teachers in the Midwest region and in Virginia, with a large national 3-day conference in the last year of the grant

# Helping K-12 Students Become Fluent in the Language of DNA

## Georgia State University

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### Audience(s):

K-5 students, teachers and families

### Topics Addressed:

DNA and genetics

### Project Goals:

1. To design age-appropriate learning modules in genetics and DNA for elementary school students
2. To pilot these modules in the City Schools of Decatur
3. To conduct follow-up studies on children participating in the module presentations to ascertain their understanding of fundamental genetic concepts
4. To incorporate the successful components of the modules into a program that can be delivered to schools throughout Georgia

### Project Description:

The Bio-Bus is a mobile instructional laboratory that travels to Georgia schools and presents hands-on, inquiry-based activities designed to kindle K-12 students' interest in science. Since its inception in 1999, the Bio-Bus has made over 1000 visits to schools in 30 Georgia counties, and in the process has brought exciting science experiences to more than 100,000 visitors. Under the auspices of the Bio-Bus program, we are developing a new set of activities designed to introduce young learners to DNA and the fundamental concepts of genetics. We are basing our new program on the metaphor of DNA as a molecular language that, like other languages, is effectively mastered by children at an early age. We are partnering with the City Schools of Decatur, a small suburban school district near Atlanta with a diverse student population. School visits are staffed by "Bio-Bus Fellows," graduate students and advanced undergraduates who are well versed in DNA and genetics and enjoy sharing their love of science with young learners. To date, Bio-Bus Fellows have piloted two DNA/genetics modules to students in Grades 1-3 at the participating schools. We are currently finalizing additional modules for testing in the Fall 09 semester. Modules use manipulatives, puzzles and laboratory experiences to generate interest in and comfort with DNA and the principles that govern gene expression. Additional activities that build on these principles will be implemented in later elementary and middle school classes. After evaluation and revision, successful activities will be offered to other school districts located in urban, suburban and rural regions of Georgia. The ultimate goal is to create a DNA language program that endows young learners with the knowledge and skills they will need to master and build on fundamental molecular genetics concepts as they progress through their academic careers.

### Project Evaluation:

The Bio-Bus program employs an external evaluator who assists with formative and summative assessment of various aspects of the program. For the DNA-based activities, survey instruments have been designed to measure K-12 students' acquisition of content information, their application of this information to new situations, and their attitude toward science. The survey process itself consists primarily of pre- and post-tests administered by teachers before and following Bio-Bus visits, along with a follow-up evaluation from the teacher regarding his/her assessment of the effectiveness of the visit. As the program progresses, we will conduct additional surveys to assess longer term effects on learning and attitudes toward science. Teachers will be asked to evaluate the activities we develop in terms of their intrinsic interest, their clarity and, in particular, their appropriateness for each age group. In addition, teachers will be asked to assess the effectiveness of the instruction provided by the Fellows, and to make suggestions for improvements. Suggestions for changes in the activities, or in the manner in which the Fellows present the activities, will be addressed as they are brought to our attention.

### Dissemination Strategies:

We will disseminate our results by posting our most successful DNA language activities (as determined during the assessment process) on our web site ([www.biobus.gsu.edu](http://www.biobus.gsu.edu)), presenting our results at meetings, and submitting our findings for publication. We will also share our observations with our colleagues in the Mobile Laboratory Coalition, a national and international consortium of programs dedicated to promoting science literacy by making science accessible to traditionally disadvantaged and underserved populations. Finally, as we develop and refine our DNA Language offerings, we will make it a priority to target rural and other underserved regions of the state, with the ultimate goal of developing regional "hubs" in collaboration with local colleges and universities so that collectively we can serve all of Georgia.

### Materials/Products/Exhibits Produced:

N/A.

# Educating High School Students and Their Families about Clinical Research

## Univ. Calif., San Diego

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### Topics Addressed:

Clinical Research

### Audience(s):

High School Students, Families, Community-at-Large

### Project Goals:

1. Develop Educational Materials about Clinical Research
2. Educate Students about Clinical Research
3. Expose Students to Clinical Research Through Tours of the General Clinical Research Center and Clinical Trials Center
4. Have Students Participate in Clinical Research
5. Disseminate Educational Materials about Clinical Research
6. Educate Families about Clinical Research

### Project Description:

Develop Educational Materials about Clinical Research. We have developed educational modules in the following six topics: What Is Clinical Research, The Ethics of Clinical Research, Design of Clinical Research Studies, Participation in Clinical Research, The Value of Clinical Research, and Current Clinical Research Projects at UCSD. Educate Students about Clinical Research. We teach 11th grade students about clinical research as part of the AVID (Advancement Via Individual Determination) program. Because AVID is an elective course and teaches skills rather than content, it is an ideal program for teaching about clinical research. Expose Students to Clinical Research Through Tours of the General Clinical Research (GCRC) and Clinical Trials Center (CTC). Students come to the UCSD GCRC and CTC for full-day participatory tours. They learn about the various on-going studies, and assume the role of research subject. Have Students Participate in Clinical Research. Each summer 10 students who have completed the 11th grade clinical topics program are paired up with UCSD faculty who are actively engaged in clinical research. The students help with research protocols by, for example, entering or collating data. Disseminate Educational Materials about Clinical Research. Please see below under Dissemination Strategies. Educate Families and the Community about Clinical Research. The 10 students who complete the summer internship give talks during the following academic year to their families and to the school community. The students from last summer are currently making a video to show during their presentation.

### Project Evaluation:

Evaluation Goals. We evaluate every aspect of the program to determine which parts are the most effective in teaching students about clinical research. Our goal is to educate students and the community about clinical research so that they will be able to make knowledgeable decisions about participating in clinical studies. Evaluation Design. We evaluate content that the students have learned in the AVID classes by administering pre- and post-lesson tests, and comparing the results for students in the intervention group to results from students in a well-matched control group. We also perform attitudinal evaluations by asking the students how they would feel about participating in a clinical study or having a family member participate. In addition, we evaluate the value of the GCRC and CTC tours, and the summer internship by asking both content and attitudinal questions, and by performing exit interviews of the students. We also evaluate the attitudes toward clinical research of parents and family members who have attended student presentations about clinical research. Instruments Used. For the content evaluations we use multiple choice, true/false, and short answer tests. For the attitudinal evaluations we use short answer and short essay instruments. Type of Data Collected. We enter all data into Excel worksheets without student identifiers. We have approval from the UCSD IRB to conduct these studies. Results of Data Analysis. Both the students and their families have learned factual information about clinical research. In addition, the program makes students and their families more favorably inclined towards clinical research.

### Materials/Products/Exhibits Produced:

Clinical Research Topics Materials. UCSD faculty generated 5-6 page summaries about each of the clinical topics listed in the project description. From these summaries, the high school teachers generated specific class lesson plans and tests. Student-generated Materials. As mentioned above, the students generate materials to be used as part of their presentations.

### Dissemination Strategies:

On-line Dissemination. On-line dissemination of the program is being done through the Professional Development On-Line Production (PDOP) group in the San Diego County Office of Education. Monthly AVID Workshops. The clinical research materials are presented to AVID teachers as part of their monthly workshops in Orange, Imperial, and San Diego counties. AVID Summer Training Conferences. Summer AVID conferences are held each year in several cities throughout the country with about 4000 teachers attending the conferences. The clinical research materials that have been developed are presented at the conferences.

# Investing in the Future: Collaborative Research Experiences for Students and Teachers, The Pennsylvania State University College of Medicine

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## Audience(s):

9th - 12th grade students, science teachers, families, the public, undergrad and grad students

## Topics Addressed:

Inquiry-based biomedical (anatomy, biochemistry, genetics, immunology, microbiology and physiology) and clinical (diabetes, obesity, health) science; science pedagogy; research ethics; protection of human subjects

## Project Goals:

1. To encourage and develop interest and capability in careers in science through hypothesis-driven research training experiences for high school students
2. To build the confidence, capacity and enthusiasm of science teachers that will lead to systemic changes in high school sciences curricula
3. To develop hands-on activities related to state proficiency standards that will be introduced into the school science classroom
4. To create a seamless process by which high school students enter college by promoting faculty exchange among the Penn State University, Lincoln University and other partners
5. To introduce the wide range of pathways to careers in science early in the secondary school, and to work with school counselors to provide opportunities for career exploration
6. To promote awareness of the pivotal role of the NIH by disseminating research findings to educational and lay public communities, and its role in promoting responsible conduct of research

## Project Description:

The Collaborative Research Experience for Students and Teachers (CREST) program addresses systemic changes needed to overcome the problem of attracting young students to science, followed by their entry into research and healthcare careers. The CREST program focuses on the Harrisburg PA Capital Area high schools with large populations of minority students who are underrepresented in research and healthcare arenas. The program provides carefully selected 9th grade students and their teachers with summer research experiences during three consecutive years. The first two summer sessions serve as an introduction to inquiry-based biomedical science and will lead to the performance of a supervised research project within research laboratories at Penn State College of Medicine during the third summer. The high school students will be guided by College of Medicine faculty, working in close collaboration with undergraduate student teaching assistants from Lincoln University and with summer undergraduate research interns at the College of Medicine. Each summer, the CREST program will accept 20 9th grade students (actually 21 in Summer 2009) and 4 science teachers. The CREST program focuses equally on the science teachers by providing professional development programs through Summer Science Academies at Penn State Harrisburg, in which the teachers will incorporate laboratory experiences into their everyday teaching programs and earn graduate credit. The collegial relationships among the students, their high school teachers, and the research mentors will be sustained throughout the school year, and by programs at the Whitaker Center for Science and the Arts in downtown Harrisburg. The Whitaker Center programs are designed to celebrate the achievements of the students and their teachers. and to inform the public of advances in science and the critical role of biomedical research and clinical trials.

## Project Evaluation:

A pilot project was conducted and evaluated during the summer of 2008. Two Middletown Area High School seniors tested a number of hands-on activities proposed for the SEPA/CREST in the summer of 2009, and were interviewed by an evaluator from Penn State Harrisburg. The students were also engaged in a research project similar to those proposed for the third summer. The students reported that the activities were interesting, informative, and age appropriate, that the research project was challenging and that the experience gave them a better understanding of the scientific process. Research for Better Schools (RBS), the external evaluators engaged by SEPA/CREST, have developed an evaluation matrix that lists specific aims for the project, translates aims into different measurable objectives, notes data sources to assess whether or not specific aims are being met, and then lists how such data will be obtained and the outcome targets associated with the measurable objectives. Related to this matrix, RBS has developed instruments to be completed by participating students, teachers and mentors in order to evaluate whether or not specific outcome targets are being met. These instruments have been developed with frequent dialog with the SEPA/CREST Steering Committee. RBS and the Steering Committee are working out the most efficient and effective means to distribute and collect these instruments, and a timeline that lists tasks, person(s) responsible, and due dates. These formative interactions have assured that the evaluation work is moving forward as more details about participants, future schools, and curricula for the teachers are generated. More than 250 visitors attended the Pathways to Health program at the Whitaker Center for Science and the Arts. A written evaluation found the program informative, interesting, and 'fun.'

## Materials/Products/Exhibits Produced:

1. A colorful recruitment brochure distributed to parents and 9th grade students at Middletown Area High School, Pennsylvania
2. Presentation to families of 9th grade students at Middletown Area High School that included posters highlighting two students who had carried out pilot projects during the summer of 2008.
3. Pilot project on anatomy of the laboratory mouse for Middletown students.
4. All day program at the Whitaker Center for Science and the Arts in Harrisburg PA for families featuring eight hands-on activities focusing on diabetes, obesity and nutrition.
5. Draft manuals for students and for teachers of hands-on activities that teachers can use in their classroom this coming academic year.

## Dissemination Strategies:

1. Programming with the Whitaker Center for Science and the Arts for the Capital Area.
2. Meetings with administration of additional school districts, including East Pennsboro school district, Pennsylvania
3. Participation in meetings of outreach programs such as the Partnership for Career Development and Capital Area Institute for Mathematics and Science.
4. Dialog and engagement with staff of the Pennsylvania State Department of Education.
5. Collaboration with Education Faculty of Penn State Harrisburg, one of the major training sites for secondary school teachers in Pennsylvania
6. Collaboration with Lincoln University of Pennsylvania, one of the nation's first Historically Black College/Universities.
7. Working closely with Penn State Strategic Services to promote awareness and understanding of the SEPA/CREST program and its activities

# BioQuest: Creating an Innovative Science Immersion Program for Teens Seattle Biomedical Research Institute (SBRI)

77

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## Topics Addressed:

Infectious diseases, biomedical research, global health policy, science careers and college pathways.

## Audience(s):

Directly, high school juniors, their families, teachers and student peers. Through the newly developed online tools, the project delivers curriculum and communication tools related to project content areas to a larger local and national audience.

## Project Goals:

1. To refine a successful pilot science immersion program into a model program, with the help of project advisors, whereby students are ably supported in their progression towards science, technology,
2. To successfully engage students and promote greater cohort interest and competence in science and biomedical research topics and careers, via new instructional tools and tactics.
3. To develop a supportive learning community for program participants, critical to the attraction of a more diversified cohort; and subsequently the development of a more diversified research workfor
4. To disseminate investigation outcomes and innovative instructional resources to a global online audience via the BioQuest Virtual Researcher website (BVR).

## Project Description:

The BioQuest Academy queries the impact of a science immersion program at Seattle Biomedical Research Institute (SBRI) upon a cohort of 180 high school juniors, meeting these seven recognized, published challenges in academically focused summer programs (Wilmer, 2006): • Develop program with intentionality. • Build positive and individualized connections with youth. • Recruit and develop highly skilled staff. • Develop ongoing, mutually supportive relationships with schools. • Build strong, positive connections with participant families. • Engage community members, groups and institutions in programming. • Incorporate a variety of fun and engaging program activities. Designed with a goal to provide young adults who demonstrate science predilection with access to authentic biomedical research, thereby promoting confidence and skills early in their scientific career pathways, the BioQuest Academy science immersion program responds to the increasing demand from teachers and mounting anxiety regarding the lack of real world, career-preparative experiences for youth. Additionally, the program was designed to address society's growing concerns about diminishing teen interest in careers critically needed to respond to the alarming trends in global health (e.g., AIDS, tuberculosis and malaria). With funding from the National Center for Research Resources, SBRI has designed and is implementing a model program, resulting in nationally available novel educational resources, as well as specific and direct benefits for the 180 teen participants.

## Project Evaluation:

Student Interviews—Students will be interviewed mid-year of their first year of college. Students will be able to describe specific abilities acquired by participating in the BQA. Curriculum Comparisons—Dr. Grubin, our external curriculum consultant, is currently reviewing the curriculum materials to determine strengths and weaknesses and to ensure alignment with national and state standards. Student Pre/Post Tests—Quality of materials and experiences is assessed through investigation of student learning outcomes, through pre and post tests at the BQA. Questions pertain to the direct benefits of the program. Analysis of variance is used to check for comparable outcomes for diverse teens. Standardized Achievement Test —Because BQA students were not randomly selected, we have chosen to compare their scores on a standardized assessment given to students nationally. College Board SAT biology Subject Tests are designed to measure students' knowledge and skills in particular subject areas, as well as their ability to apply that knowledge. Student Demographics—To track participation of targeted teens, demographic questions pertaining to race, ethnicity, and gender will be included on the student Pre Test. Results will be compared to program targets and recruitment will be adjusted accordingly to maintain representation of underserved teens. Science Education Fellow Interviews—To document program processes and outcomes, formal interviews will be conducted with each SEF each fall. Interview questions will clarify outcomes of the program and probe for descriptive information specific to the direct benefits of the program. Website tracking—Embedded tools will help us determine the size and location of the community of users and the extent of dissemination. When users access the site, they will be asked to include their zipcode. Embedded Online Pre/Post Tests—Embedded Assessment of gains in content comprehension will be determined through the inclusion of embedded queries in the resources designed by the multimedia contractor. Semi-annual reports will allow for modification of content to improve understanding.

## Materials/Products/Exhibits Produced:

- HIV curriculum: Evaluating an HIV Vaccination Strategy. Week-long immunology wet laboratory curriculum. • HIV curriculum: HIV testing and Epidemiology of Transmission. 1-day long immunology, proteomics and epidemiology wet laboratory curriculum. • Tuberculosis curriculum: In the Quest for New Drug Targets against Latent Tuberculosis. Week-long microbiology, drug discovery and microarray wet laboratory curriculum. • Malaria curriculum: Attacking the Global Challenge of Malaria, from the DNA UP. Week-long DNA purification, sequencing and Bioinformatics curriculum. • Yeast curriculum: Comparing the yeast in your bread and your gums by PCR and direct culture. 1-day long microbiology and molecular biology wet laboratory curriculum. • BioQuest Website: a teen-centric website inspiring teens to pursue a career in global health. [www.bioquestacademy.org](http://www.bioquestacademy.org) • Ethnically, culturally and racially savvy and appropriate recruitment tools used in 2008 and 2009 to enroll a more diverse student cohort (example: [http://www.youtube.com/watch?v=jAAMaX7q8\\_0](http://www.youtube.com/watch?v=jAAMaX7q8_0)) • Experience using teens as curriculum consultants/interns for new curriculum (see above). • Draft BVR concepts and themes – including team research on current popular tools (e.g., Twitter™ and Facebook™) and contemporary research findings on teen media use.

## Dissemination Strategies:

- New teen-centric website [www.bioquestacademy.org](http://www.bioquestacademy.org) • Social media Facebook™, Twitter™ • Academy students have hosted global health parties at the BioQuest laboratories and invited their teen peers. • In-school activities (Academy students serve as hosts).



# North Star (Phases I and II) The Imaginarium, Inc.

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## Audience(s):

Middle and high School students and teachers; families;  
general public

## Topics Addressed:

Biomedical research mentoring; general biomedical research programming;  
teacher professional development; biomedical research partnerships

## Project Goals:

1. Enhance an established six-week HCOP-supported pre-med Summer Enrichment program (U-DOC) at the University of Alaska Anchorage (UAA) that supports students with interests in health careers
2. Create a statewide Alaska Student Scientist Corps for U-DOC students (juniors and seniors) to extend the impact of the U-DOC program into a year-round program
3. Establish an Innovative Student Science Guide (ISSG) program for Anchorage-area students ages 13-17 that exposes them to rigorous science experiences designed to increase interest in science
4. Establish a year-long Mentorship Program for U-DOC and SSC students to provide them with job shadowing experiences with biomedical researchers and health professionals
5. Provide Professional Development training for university credit for forty teachers annually from across Alaska through in-service programs focusing on high school level science and health curricula
6. Formalize partnerships with the scientific, public health, educational and cultural communities in Alaska to improve student and public understanding of health sciences

## Project Description:

Alaska is a vast state equal to the combined areas of Texas, California, New York, Pennsylvania, Florida, Massachusetts, Virginia and Vermont, yet it has half the road miles of Maryland, a state 56 times smaller and with a population of just 626,932. Alaska's physical size, lack of road access to most communities, natural barriers and some of the earth's harshest weather have limited the state's ability to educate its citizens or provide adequate health care. Alaska also relies heavily on outsiders to fill its need for most professionals, such as educators, scientists and health professionals. Unfortunately, these outsiders often don't appreciate Alaska's extreme conditions or remoteness. They usually leave the state after serving only a few months or one or two semesters. If this trend is to change, Alaska must begin to identify, recruit and educate its own youth to become tomorrow's teachers, scientists and health professionals. The North Star program proposes to design and implement a 5-year, outcome-based Phase I/II plan that brings together The Imaginarium Science Discovery Center, the University of Alaska Anchorage (UAA) Department of Biological Sciences and WWAMI program, Providence Alaska Hospital, and a statewide advisory committee to provide: 1) Twenty five educationally and/or economically disadvantaged Alaskan high school students (predominantly Alaska Natives from rural villages) with direct access to biomedical research mentors to guide and support student research projects; 2) a six-week summer institute focusing on a pre-med curriculum and job shadowing opportunities; 3) school-year internships for 60 educationally and/or economically disadvantaged Anchorage students in grades 8-12 at The Imaginarium for direct access to science and health content, training on delivering research-based demonstrations and exhibit building for public purview; 4) teacher professional development for 200 teachers across Alaska focusing on inquiry-based, hands on learning techniques, supplemental health and science curricula; 5) University and Hospital researchers with direct access to the general public to disseminate their research methods and results in public venues; and; 6) a website for showcasing student and biomedical research methods and results, a participant forum for blogging, participant pages for sharing their research projects, and links to other relevant resources.

## Project Evaluation:

The Imaginarium and the Alaska AHEC partnered to develop an evidence-based framework for planning the North Star program and in designing the North Star evaluation strategies. Specifically, the Alaska AHEC staff interviewed key staff in remote Alaska native communities, faculty, students, health care professionals in tribal health organizations, and health leaders. Approximately 30 interviewees participated in responding to a problem statement: Youth from disadvantaged backgrounds are not entering health professions. Following each interview, a visual map depicting the relationship of the identified antecedent conditions was created. The map, along with a short written summary, was presented to each interviewee for validation. Upon receiving the validated interviews, a single interview map for each goal area was developed. Using these three levels of evaluation, there will be defensible data upon which to make programmatic decisions, such as whether to continue investments or reallocate dollars to other initiatives. The logic model addresses each of the North Star project goals using face-to-face interviews with students, teachers and staff, surveys and other instruments. David Heil & Associates, Inc. (DHA) has been selected to execute the attached logic model and provide external, independent evaluation services for the North Star project (see company profile in Consultants Section).

## Materials/Products/Exhibits Produced:

Most written materials, scripts, curriculum, and video production developed through each student's HRP will be unloaded onto the North Star website research for public review unless such data is considered confidential or proprietary (unlikely). Exhibits developed through each student's HRP will be shared with local communities. IMG, UAA, and Providence Hospital will provide access to their facilities to students as appropriate (usually under the supervisor of a biomedical researcher or mentor) Teachers receiving professional development training will, of course, share their experiences, materials, curriculum, etc., each other and with their students as appropriate.

## Dissemination Strategies:

The North Star project has a high probability for widespread dissemination in that its target enrollment exceeds 5,200 students and teachers. U-DOC and SSC student will deliver their research-based exhibits, demonstrations and curriculum and deliver the HRP's directly to their rural villages/schools, while teachers receiving professional development training will, in turn, weave health and science education into their curriculum. This alone could potentially reach thousands more students across Alaska. Further, the website has great potential for serving a world-wide audience.

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**Audience(s):**

Middle School Teachers

**Topics Addressed:**

Basic and clinical research, ethics of human and animal research, nutrition, exercise and obesity

**Project Goals:**

1. Improving communication and translational skills of researchers
2. Teachers learning the social and value context of biomedical research
3. Teacher develop classroom activities reflecting their research exposure
4. Teacher learn to navigate controversial topics in classroom (e.g., animal research)
5. Students appreciate need for use of humans and animals in research

**Project Description:**

The Teacher Institute for the Experience of Science brings pairs of middle school teachers (one science, one non-science) to become anthropological observers of the culture of biomedical research. Teachers spend two weeks in the lab and interviewing researchers Institute a clinical and basic science lab working on a related disease topic (e.g., nutrition) followed by a week with teacher educators translating their experience into classroom activities. During their research exposure, they become aware of the number of regulations that govern research and especially with respect to the ethical treatment of human and animal subjects. In the last two years of the program, teachers from rural areas are recruited for an intense 9-day program in which they benefit from the experiences of the earlier teachers in the program.

**Project Evaluation:**

Complete formative and summative evaluations were completed for each of the first three years of the program. Appropriate changes were made during the first two years based on feedback and some necessitated altering the logic model. In each of the first three years of the program, the evaluation of student attitudes have improved in quality and quantity to the point that we have control data from our teachers prior to starting the program and then pre- and post-surveys after implementing activities developed in the program. In some instances, we also have control data from comparable classes of teacher not participating in our program from the same school. We have demonstrated significant changes in the attitude of students toward biomedical research as a result of their teacher's participation in our program.

**Materials/Products/Exhibits Produced:**

The products of our teachers' experiences are available on our website and include teacher perspective of research expressed in profiles and posters as well as original classroom activities that reinforce themes of their research experience.

**Dissemination Strategies:**

In year 04 and 05, classroom activities and research experiences of Portland metropolitan teachers (year 01-03) will be translated by rural teachers to suit their local cultures. A nutrition research project will educate and recruit subjects from the communities that the teachers represent.

# Obesity & Diabetes Prevention Through Science Enrichment (Phase I/II)

## Colorado State University

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### Audience(s):

Elementary school students in grades 2 through 6 and their families, teachers, university students, and community members.

### Topics Addressed:

Program ENERGY is a science-inquiry learning enrichment program combining classroom (body science, health, nutrition) and physical activities designed to prevent obesity and type 2 diabetes.

### Project Goals:

1. Effectively reduce the rate of, and to prevent, obesity, type 2 diabetes.
2. Increase health knowledge, attitudes and health behaviors including a scientific understanding of the human body.
3. Increase awareness and knowledge of evidence based health and science information and how to integrate newfound knowledge into daily life.
4. Increase interest in health and science and careers.

### Project Description:

Lessons and activities use scientific experiments and inquiry-based learning for students to understand how the body works and why energy balance will prevent metabolic diseases. Lessons and activities are targeted to 2nd- 6th grade students with increasing complexity. Nutrition is continuously explored through learning of health benefits while the use of pedometers enhances the understanding of the benefits of physical activity. Interactive computer games and laboratory experiments tackle the issue of understanding diabetes and heart disease (glucose regulation and heart health). Field trips to local science centers provide enhanced explorations related to content covered in the classroom. Scientists and college students in the elementary school classrooms are the keys to program delivery and serve as inspiring role models.

### Project Evaluation:

Evaluation goals are to: • Demonstrate whether Program ENERGY is an effective model for increasing health knowledge, attitudes and behavior related to obesity and type 2 diabetes prevention in grades 2-6 • Determine which aspects of Program ENERGY are most effective. Also, continue to determine the effectiveness of biweekly version of the program. • Determine whether participants in the program develop increased interest in science and health careers. Design and instruments: The Program's effectiveness is evaluated by pre and post questionnaires and measurements (fall and spring of each school year). The following information is collected: 1) health knowledge, attitudes and behavior (CATCH), 2) physical activity behavior (SPARK), 3) physical activity (three day by sealed pedometers), 4) diabetes knowledge, 5) body image perception, 6) height, weight, waist circumference, BMI (body mass index), 7) career preferences. This information is only collected from subjects who gave their consent and assent. In addition, we have field-tested a set of Heart health lessons and survey instruments.

### Materials/Products/Exhibits Produced:

• Program ENERGY provides resources for educators including lesson plans for classroom and physical activities, newsletters, and take-home activities. A selection of these resources are available at no charge on the EDUCATOR RESOURCES page of the Program ENERGY website ([www.ProgramENERGY.org](http://www.ProgramENERGY.org)) • A hard copy of dissemination materials has been produced and is available upon request. • "ENERGY In and Out" and "What do you know about diabetes?" games. (PDF templates available for reproduction) • Training videos "Just Right" 2nd Grade • Also found on the website is information regarding the program's effectiveness. This information can be found on the PROGRAM EFFECTIVENESS page.

### Dissemination Strategies:

• Program ENERGY was disseminated to more than 800 children in 40 classrooms in 3 states (Colorado, Texas, and West Virginia) in 2005-2006. In 2006-2007, the program was disseminated to 450 children in 17 classrooms. In the last 2 school years, the program was disseminated to over 800 children in 40 classrooms in Colorado and Texas. • CSU students take charge of bringing the Program to other school districts. • Piloting of educator-led lessons. • Dissemination of the Program to the children's peers and families are being accomplished by encouraging them to share knowledge in the classroom and through a series of take home newsletters and challenges in addition to pilot after-school programs designed to increase child-to-parent communication and learning.

# Collaborations to Understand Research and Ethics (CURE) NW Association for Biomedical Research

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## Audience(s):

Primarily science teachers (9-12) and students (9-12).  
Scientists and families are also involved.

## Topics Addressed:

The scientific and ethical dimensions of the biomedical translational research process. Topics include introductory bioethics, animal models, clinical research, and the overall translational research process.

## Project Goals:

1. Our long-term goals are to increase understanding of:
2. the nature of biomedical research, particularly with respect to clinical trials and the translational research process.
3. the relationship between science and ethics in the responsible conduct of research.
4. the safeguards in place to protect animals and human participants in clinical research.

## Project Description:

While members of the general public enjoy the health benefits of biomedical research, they are usually unaware of the process that generates new treatments and cures, or the ethical standards that help ensure that research is responsibly conducted. The CURE program focuses on increasing understanding of these important aspects of research. Students and teachers learn about "translational research" - the process of applying basic research to the development of clinical therapies - as they connect with scientists in their laboratories and experience how ethical guidelines shape scientific progress. The CURE program will provide teacher professional development and curricular resources for middle and high school life science educators that target the science and ethics of translational research; create learning experiences for students that increase their understanding of translational research and ethics; and disseminate CURE resources and materials through an online teacher course, hands-on workshops and via the Web. The following activities are included: 1) 'Biomedical Research-Science and Ethics' teacher professional development workshop that includes time with scientists in research facilities and discussions with individuals who review research protocols, 2) 'Research Integrity' curriculum for secondary schools focused on the research process and ethical standards that apply to scientific conduct, the use of animals in research, and human clinical trials, 3) 'Biomedical Research Fellows' program for high school juniors from underrepresented minority backgrounds that provides laboratory visits, interactions with scientists, and a broad overview of the research process, 4) 'Youth Ethics Summit' that brings together students of teachers who have participated in our professional development to participate in interactive discussions with ethicists and other students and to showcase projects related to bioethics. CURE is partnering with the University of Washington Institute of Translational Health Sciences, also funded by NCRR's Clinical and Translational Science Award program.

## Project Evaluation:

The purpose of the external evaluation is to provide an independent look at the project's alignment to its goals and its impact on science education, in particular its effects on incorporating ethics instruction into science curricula. The evaluation is designed to support the program by: providing formative findings that guide planning efforts; building the program's own capacity to assess its outcomes; and conducting an independent assessment of program outcomes. Program Evaluation The evaluation will use formative strategies to guide program development and decision-making. Our logic model clarifies the links between activities, outcomes, and project goals. A set of measurement indicators derived from the logic model has been developed to ensure appropriate outcome measures are used. Data collection strategies will include surveys, interviews and focus groups, site observations, and ongoing review of program documentation. Research Design The purpose of the research is to investigate the effect of teacher professional development on student achievement. Research results will provide evidence of the extent to which teacher participation in CURE professional development results in measurable differences in student learning. The Randomized Solomon Four-Group Design includes four groups, with two of the groups' students completing the same pre-test and two groups who will not. Teachers will be randomly assigned to cohort groups, and teachers who have not yet been included in the CURE program will provide control groups for comparison. The experimental groups will be exposed to the "treatment" of CURE instruction. The control groups will receive traditional classroom instruction. All four groups will then complete the same post-test. For the pre and post tests, students will be given a bioethical case study to review and analyze. A rubric will be used to assess their responses. The Randomized Solomon Group Trial will serve as the key independent assessment of CURE project outcomes.

## Materials/Products/Exhibits Produced:

Introductory Bioethics Curriculum and Assessment (in progress). This curriculum introduces students to basic ethical principles, decision-making strategies, and reasoned justification. Resources from previous SEPA funding that are being leveraged in current SEPA (Ethics Primer and curricula on Stem Cells and HIV Vaccines) are also available.

## Dissemination Strategies:

CURE is in its first year of funding, so our focus is on program development. We have begun to share our materials through our website and at local and national science teacher professional development conferences. Our dissemination plan includes the following: An online 'Biomedical Research: Science and Ethics' distance learning course for teachers, to be provided through UW Educational Outreach; dissemination of CURE resource materials on the NWABR, States United for Biomedical Research (SUBR), SEPA, and Coalition on the Public Understanding of Science (COPUS) and ActionBioscience websites; and dissemination of CURE resources at teacher professional development conferences, and through peer-reviewed professional science teaching journals.

# Education for Community Genomic Awareness

## University of Michigan School of Public Health

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### Audience(s):

K-12 students, teachers, parents, community members

### Topics Addressed:

genomics and its applications to improve population health and reduce health disparities

### Project Goals:

1. stimulate the engagement of underrepresented K-12 students in the scientific process through new high school curriculum addressing molecular genetics and genomics
2. improve student learning of genomics aimed at becoming scientifically literate citizens
3. develop university-school-community partnerships supporting and sharing curriculum
4. engage community partners in relating curriculum to community interests and joining in activities advancing student and community knowledge
5. disseminate the curriculum, professional development and community engagement materials and provide workshops and web-based resources to promote adaptation and enactment throughout the U.S.
6. conduct formative and summative evaluation measuring achievement of project aims and maintaining continuous quality improvement

### Project Description:

Our project combines a new high school genomics curriculum module with student-community activities to enhance curriculum relevance, further student and community understanding of genomics and awareness of the potential applications of genomic research to improve population health and reduce health disparities, and promote genomic literacy among students and adults. A new curriculum addressing molecular genetics (single gene focus) and genomics (focus on human genome and its interaction with environment) has been developed and enacted in six high schools in Detroit, six high schools in Flint, and one high school in Howell. The curriculum has been revised based on teacher and student feedback and teacher professional education materials have been developed. Paralleling the curriculum activities in the schools are a series of activities engaging parents and other community members in the catchment areas served by the schools. The objectives of the community activities are to: engage the community in helping to shape the curriculum enacted in the schools to assure curriculum relevance to the lives of the students and their parents; improve the awareness and appreciation of the community of genomic science and research and its applications; strengthen student learning and interest in science through joint activities involving students working together with their parents and other community members; and tap into the expertise of community members related to the curriculum.

### Project Evaluation:

Changes in evaluation methods have been made and are currently being planned to incorporate Careful Comparison methods by considering three groups of students within the same schools: (1) those participating in the curriculum and in the community activities; (2) those participating in the curriculum and not in the community activities; and (3) those participating in neither curriculum nor community activities. Surveys of all three groups will assess the extent to which the curriculum alone and the curriculum coupled with various types of community activities improved science learning and literacy, as well as assessing the types of student-parent-other adult activities that influence student participation.

### Materials/Products/Exhibits Produced:

Curriculum-How Similar or Different Are We? Student/Teacher Evaluation  
Results Teacher Professional Development Materials Community Engagement  
Materials Community Focus Group/Dialogue Group Results

### Dissemination Strategies:

Implement regionally to a range of urban and suburban areas within the Detroit area starting in Year 4 (Ypsilanti, Jackson, Willow Run) Implement in other states starting in Year 5 (Toledo, Ohio; Chicago/Greater Chicago, Illinois) Will package for national dissemination

# Small Museum Research Collaborative (SMRC) Nutrition & Fitness Exhibitions 83

## Oregon Museum of Science and Industry

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**Audience(s):**

English & Spanish-speaking families & students (K-5)

**Topics Addressed:**

Nutrition, physical activity, obesity prevention

**Project Goals:**

1. Promote intergenerational learning about healthy nutrition and physical activity by creating exhibits and educational materials that are family-friendly and engage adults, children, and Latino families
2. Present clinical research methods and outcomes that advance our understanding of nutrition and physical activity to increase visitors' scientific literacy and encourage them to make informed healthy
3. Build on visitor understanding of healthy nutrition and physical activity with practical applications and better understanding of barriers and solutions.

**Project Description:**

To encourage families to pursue healthy nutrition and physical activity together, the Oregon Museum of Science and Industry (OMSI), in collaboration with the Small Museum Research Collaborative (SMRC), is developing and testing bilingual exhibitions for national tour to small museums. The exhibitions—Every Body Eats and Let's Get Active!—present current research and its impact on personal and family wellness in English and Spanish. OMSI's SMRC partners bring the experiences and resources of five geographically and thematically diverse small museums to this project. The project evaluation includes front-end, formative, remedial, and summative evaluation with family audiences at OMSI and SMRC sites. To enrich the visitor experience at the exhibitions, OMSI and SMRC are also producing educational materials and programs, including a Web site, teachers' guides, family take-home guides, distance-learning programs and interactive presentations. Exhibits and programs were developed in collaboration with local experts and scientists at the Oregon Health & Science University and the CTSA-funded Oregon Clinical and Translational Research Institute. The exhibitions target families and K–5 school group visitors to small science and children's museums in rural and small urban communities. Latino families are also a priority audience for the project. The museum estimates that more than 2 million people will visit the exhibitions during their national tours, which will continue for at least eight years.

**Project Evaluation:**

The project evaluation encompasses both the exhibitions and the collaborative process itself. The exhibition evaluation has been carried out in four stages: front-end, formative, remedial, and summative. Front-end evaluation was conducted both at OMSI and at the SMRC partner museums. Interviews with parents and children (in either English or Spanish) gauged the audience's knowledge, attitudes, and interest with exhibit topics. This information helped staff refine the exhibitions' main messages and develop individual components. Formative evaluation at OMSI included naturalistic observations and interviews of families using exhibit prototypes. This evaluation component was especially designed to determine the exhibitions' usability and safety, as well as the extent to which they conveyed key messages. Remedial evaluation studies have been conducted during the exhibitions' tour of the partner museums. At each site, partner museum staff members observe families interacting with individual components and then briefly interview them to find out what they learned from their interactions and identify any problems they might have had. This feedback will help project staff identify specific modifications that should be made before the exhibitions begin their national tour. Finally, the project's external evaluator will collect summative evaluation data at two national tour venues to establish whether the exhibitions achieve their goals with that broader audience. A second component of the project evaluation tracks partner museum staff's satisfaction with the project, documents how their participation has affected both them and their museums, and explores how the collaborative process might be improved. The project evaluator has periodically surveyed and interviewed key staff from the partner museums and those findings help OMSI staff monitor the success of the ongoing collaboration and identify features that could be improved.

**Materials/Products/Exhibits Produced:**

Every Body Eats, a bilingual (English & Spanish), 800-square-foot nationally traveling exhibition for small venues. Let's Get Active!, a bilingual (English & Spanish), 800-square-foot nationally traveling exhibition for small venues. Every Body Eats and Let's get Active! bilingual website: <http://www.omsi.edu/everybodyeats/>

**Dissemination Strategies:**

Our primary dissemination strategy is the national tours of the exhibitions to small museums. Each exhibition tours to three different venues each year. Rental fees support the cost of touring the exhibitions. Educational activities and resources are also disseminated by the project website. Project findings are being disseminated at national conferences (ASTC, VSA, etc.) and will be published on websites for ISE professionals (Exhibit Files, Informal Science, etc.).



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**Audience(s):**

Middle school students, their teachers, and their families

**Topics Addressed:**

Human biology, chronic disease etiology and prevention, nutrition, energy balance, and health science careers

**Project Goals:**

1. Develop and implement a new inquiry-based science education model, Choice, Control and Change (C3), for 6th or 7th grade students.
2. Develop, validate and administer a set of evaluation strategies to determine the effectiveness of C3, in increasing: conceptual understandings, competence, attitudes, and food and activity behaviors.
3. Foster and facilitate collaborations between working scientists in the areas of obesity/chronic disease, researchers in the areas of behavioral nutrition and science education, and classroom teachers.
4. Disseminate nation-wide the inquiry-based science education model C3 program by implementing a dissemination model with five implementation sites nationwide to reach 120 teachers and 2500 students.

**Project Description:**

C3 is an inquiry-based, middle school science curriculum that revolves around the driving question, "How can we use scientific evidence to help us make healthful food and activity choices?" The curriculum begins with the students exploring our current food and activity environments. Students conduct investigations and examine data to understand the complex causes behind increasing rates of overweight, obesity, and related chronic illnesses in our population. With an emphasis on system blame-- instead of victim blame--students learn scientific evidence for the importance of navigating through our current environment to make choices that will maintain personal energy balance. They collect data on their own "energy in" (food intake measured through personal food records) and "energy out" (physical activity measured through pedometers). As the students analyze these data they learn practical skills in how-to maintain energy balance in their own lives for both the short- and long-term. They choose from one of four curriculum specified food change goals (increase fruits and vegetables, decrease sweetened beverages-replace with water, decrease packaged snacks, or decrease fast food). All students work on achieving 10,000 steps a day. They collect data on progress toward their goals, learn more science about why the C3 goals are important for health, complete projects to teach others what they learned, and make a commitment toward maintaining healthful habits into the future. In New York City, the classes who receive C3 go on fieldtrips to the Exercise Physiology Lab at Teachers College and the Body Composition Lab at St. Luke's/Roosevelt Hospital Center. They also have a panel of health professionals from the General Clinical Research Center (GCRC) at Rockefeller University come to their school to allow the students to understand these professions and to begin to think about possible careers in health professions.

**Project Evaluation:**

We have two evaluation goals: determine the impact that C3 has on students, and determine the effectiveness of curriculum when implemented at our dissemination sites. For our student outcome evaluation we developed and validated paper and pencil assessments. These include, Is Science Me (attitudes toward science), Understanding Science (conceptual understandings) Tell Me About You (beliefs, values, competence/science agency) and EatWalk Survey (food and activity behaviors). In 2005-06, we conducted a formative evaluation with 500 students that we used to refine the curriculum and outcome instruments. In 2006-07 we conducted a summative student outcome evaluation. We used a pre-post, intervention-control, random assignment design. Ten New York City middle schools were put into pairs based on key criteria: leadership, enthusiasm, science philosophy, general academics, and percentage of students in poverty. One school from each pair was randomly assigned to intervention (20 classes, 561 students), and the other to control (21 classes, 572 students). The classes who received C3 were closely monitored to assure high curriculum fidelity, with Implementation Coordinators observing at least one-third of all class sessions. We conducted an ANCOVA comparing post-test results of intervention and control groups, holding pre-test scores constant. Students who received C3 improved on curriculum specific conceptual understandings, attitudes toward science and science class, beliefs, values, and competence/science agency. They also reported consuming significantly fewer sweetened beverages and packaged snacks (candy, chips and packaged pastries), choosing smaller sizes at fast food restaurants, increasing intentional walking and decreasing leisure screen-time. We also found that teacher satisfaction was related to student satisfaction, which was predictive of student behavior change. We conducted a student outcome evaluation in Jackson, MI in 2007-08 using a simplified student outcome assessment and less tightly monitored conditions that yielded similar, but less significant, results. This year we are conducting an evaluation in Philadelphia, PA.

**Materials/Products/Exhibits Produced:**

We can share our C3 teachers' manual, student materials, student outcome assessment instruments, and process evaluation tools. The teacher manual includes complete lesson plans with background information. The student materials include reading and activity sheets that go with the lessons. The student outcome assessments are outlined in the evaluation section. The process evaluation tools include classroom observation forms and materials to rate the dose delivered and dose received of the curriculum.

**Dissemination Strategies:**

Our dissemination strategies include supporting five implementation centers to reach 120 teachers and 2500 students. 2007-08 was our first dissemination year. We continued with schools that were part of our evaluation in New York City, worked in Lansing and Jackson, Michigan and in Hayward, California. In the 2008-09 school year are continuing our work in Jackson, MI and also working in Philadelphia, PA. We are working with all our sites to institutionalize the curriculum, using a leader teacher model, and tracking their progress. Finally, National Gardening Association, which published our previous SEPA curricula will publish C3 in 2009.

# Genetics of Taste: A Flavor for Health

## Denver Museum of Nature & Science

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### Topics Addressed:

Genetics, Human Genome Project, Single Nucleotide Polymorphisms (SNPs) Taste and smell, health outcomes Research and Clinical trial process Citizen Scientists

### Audience(s):

Adult Public, Teachers K-12, Community College Students, Museum Visitors

### Project Goals:

1. To increase public understanding of how genetic research will translate into meaningful personal information that can be used to better understand personal health risks and opportunities.
2. Increase public understanding of and participation in scientific research through developing a new model of audience-centered, community-based participatory research that can be replicated in other sc
3. Through participation in authentic research, families with school-aged children will know more about each family member's genetically-determined taster status and how it uniquely impacts their sense o
4. Families will be inspired to apply their new understanding of the genetic determinants of taste to practice healthy decision-making and to find ways to overcome barriers to healthy diet choices.

### Project Description:

The Denver Museum of Nature & Science (DMNS), with its SEPA partners are doing a Genetics of Taste: A Flavor for Health. This innovative project has two major components: (1) a community-based participatory research laboratory with interactive exhibits and (2) accompanying on-site and off-site education programs. The primary goal of Genetics of Taste is to increase public understanding of how genetic research translates into meaningful personal information that can be used to better understand their personal health risks and opportunities.

In the audience-centered, community-based participatory research laboratory, school-aged children and their families will participate in an authentic research project on the genetics of taste. In a series of simple but highly specific taste tests, participants will learn which of the three gene variations they possess and how it influences how they taste foods. Taste function has been increasingly linked to human health, in that variability in taste sensation correlates with, and may in part be causal for, major health problems, including cardiovascular disease and obesity. Interactive exhibit components, and participation in the research study, will inform participants about the scientific process, the principles of genetics, the human genome project, and genetic variation.

The data collected from Museum visitors who choose to enroll in the study will be analyzed and used in peer-reviewed scientific publications.

### Project Evaluation:

The Museum's exhibitions and educational programs offer life-long learning experiences that other educational venues cannot duplicate. First and foremost, people come to museums to learn. Importantly, this is "Free Choice Learning"—nonlinear, personally motivated, and learner-driven (Falk & Dierking, 2000).

This powerful form of learning leads to results. A recent study of 6,000 people shows that museums:

- helped people learn something new (87%),
- encouraged further learning (76%),
- broadened visitors' perspective (63%),
- inspired visitors (60%),
- lead to other interests (42%), and
- resulted in a new way of thinking (37%).

In addition, 39% of visitors surveyed looked for more information from another source after a museum visit. (Griffiths, King, & Aerni, 2007).

The Genetics of Taste: A Flavor for Health will be held to these well established museum learning benchmarks. The front-end, formative, and summative evaluation of the project components are guided by an evaluation team to include Kathleen Tinworth - DMNS Manager of Visitor Research and Program Evaluation; Marcella Wells, of Wells Resources, Inc., an external evaluator. The evaluation team focuses on exploring participant experiences and outcomes of engagement with the following program components:

- On-site Exhibits and Day Programming in the Community Lab
- Teacher Institutes
- Distance Learning
- Web-based Educational Programs
- Town Hall Meetings

### Materials/Products/Exhibits Produced:

The Museum produces award winning interactive kiosks on a variety of topics. Currently to support and help explain the Genetics of Taste: A Flavor for Health research lab and research experience, we are deploying an engaging interactive exhibit kiosk. This exhibit uses a very personal and intimate experience such as a person's sense of taste to explain the very abstract and unknown concepts behind the principles of genetics, the human genome project, and genetic variation.

### Dissemination Strategies:

DMNS is offering a suite of learning opportunities designed to reach underserved audiences and to extend the educational opportunities beyond the Museum's walls. These programs include Town Hall Meetings, special programming on Free Admission Days, Teacher Institutes, Web resources, and Distance Learning programs. All will focus on how genetic research is enhancing our understanding of human health.

DMNS curatorial research staff and education staff disseminate their findings at professional conferences.

# Mapping the Future of Bioengineering & Technology

## Great Lakes Science Center

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[www.greatscience.com](http://www.greatscience.com)

### Audience(s):

Students in 4th through 12th grades, and families

### Topics Addressed:

Medical Imaging, Genomics, Functional Electrical Stimulation, Infectious Disease

### Project Goals:

1. Engage the interest of students and the general public in Biomedical Technology by showing how it links with medicine and their health.
2. Develop an understanding among visitors of the interdisciplinary nature of Biomedical Technology
3. Develop an understanding among visitors of the cutting-edge applications of Biomedical Technology that represents Case Western Reserve University's research strenghts.
4. Introduce visitors to careers in Biomedical Technology and academic pre-requisites for such careers.

### Project Description:

1) Create a 3,000 square foot exhibition showing how rapidly advancing biomedical technologies give doctors new tools to improve personal and public health. 2) Inform the community about career opportunities in biomedical technology (BMT) via traveling kiosks. 3) Develop educational programs including Scientist Mentor Presentations; Mini-Med School; BMT Research Showcase during National Engineers Week; and a BMT Careers program 4) Design an educator's guide to BMT.

### Project Evaluation:

All evaluation reports and resources will be posted at [www.SelindaResearch.com](http://www.SelindaResearch.com) as part of the library of evaluation reports maintained by Selinda Research Associates (SRA). In addition to the data and analysis specific to BMT, the reports include general recommendations for developing engaging science exhibitions.

### Materials/Products/Exhibits Produced:

Produced a permanent 3,000 square foot exhibition on the main floor of the Science Center. Developed public program speaker series involving biomedical engineering graduate students, researchers, scientist, and entrepreneurs. Developed facilitated cart demonstrations in themes of medical imaging, dna/rna, minimally invasive surgery, and Functional Electrical Stimulation. Annual host to selected projects from the Cleveland Clinic's eXpressions exhibition: In order to stimulate learning of biomedical technology concepts, selected works of art and literature created by high school students are displayed alongside accompanying research posters created by high school students. Annual Health Careers Exploration Day: High school students from the Cleveland School of Science and Medicine, attend and hear informative and inspirational presentations from area health professionals about their careers, and interact with representatives from local colleges, universities, and organizations.

### Dissemination Strategies:

Dissemination of project resources to the science center and health education communities will be accomplished by working through informal and formal science education networks such as the Association of Science-Technology Centers, the National Association of Health Education Centers, and the annual NIHSEPA Project Director's meeting.

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**Audience(s):**

Adults and teens, middle & high school teachers and students

**Topics Addressed:**

Current research in virology

1. Conveying the importance of virology research and clinical trials for people's health, communities, and environments.
2. Creating partnerships between media producers, virology researchers, public libraries, and educators to give the public access to community resources to learn more about virology.
3. Generating interest by the public – especially middle and high school-aged youth – in virology careers.

The University of Nebraska State Museum, Soundprint Media Center, Inc., and the NIH/NCRR-funded Nebraska Center for Virology are developing an integrated educational media initiative to teach the public about cutting-edge virology research. World of Viruses is creating documentaries for public and satellite radio that are complemented with teacher professional development and an innovative outreach package for public libraries, educators, and students.

**Project Evaluation:**

World of Viruses evaluation utilizes surveys, program analysis, cognitive clinical interviews, and a quasi-experimental study to provide front-end and formative feedback and impact assessment of the programs and outreach modules delivered through radio, libraries and schools. All evaluation design, instruments, and consent forms will be approved by the University of Nebraska and/or Northwestern University Institutional Review Boards. The evaluation goals are as follows:

- Assess audience interest in and knowledge of basic virology concepts
- Provide formative feedback of prototype deliverables (radio programs, school, and informal learning package) and ongoing user-reactions to programs.
- Assess how the project materials influence adult and teen mental models of viruses and virology research. We will address individual impacts of project components as well as synergistic impacts of radio, school and library outreach.

**Materials/Products/Exhibits Produced:**

Radio Programs: 30-min radio documentaries and short radio features on current research in virology.

Library Materials: Virology essays by N.Y. Times writer Carl Zimmer, graphic stories by Martin Powell and Tom Floyd, illustrations of viruses by Angie Fox.

School Programs (Omaha Science Media Project): Teacher professional development in media and virology; partnerships between Omaha Public School District and virology research and media institutions (including University of Nebraska Medical Center).

Learning Research and Evaluation: Assessment of youth knowledge about viruses, cognitive clinical interviews of teachers and students to assess mental models about virology.

**Dissemination Strategies:**

Radio programs will be distributed through public radio stations and national satellite radio. Over half the states are committed to broadcasting the programs.

The Public Library Association with over 11,000 members is a partner in this program and is assisting dissemination of project materials along with a national publisher.

As a result of this project, the Omaha Public School district has created a learning unit on virology to be incorporated into all of the district's secondary schools.

Project dissemination will include links to popular websites already used by educators, including the University of California's Understanding Evolution website and All of the Virology on the WWW

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**Audience(s):**

Middle School Science Teachers

**Topics Addressed:**

neurobiology

**Project Goals:**

1. Train an expert cadre of middle school science teachers to integrate neuroscience into their classrooms.
2. Increase teachers' use of inquiry-based strategies.
3. Develop educational interest and stimulate student-directed investigation, experiences and materials that connect neuroscience to students' lives and increase student interest in science.
4. Partner with students and teachers to inform others about neuroscience research.

**Project Description:**

1. Train an expert cadre of middle school science teachers to integrate neuroscience into their classrooms. Teacher workshops and school year support provide teachers with the tools and confidence to discuss neuroscience concepts in their classrooms and in other professional and personal settings.
  2. Increase teachers' use of inquiry-based strategies. Participating teachers utilize the activities, investigations, and experiments created for this project to capture student
  3. Develop educational interest and stimulate student-directed investigation, experiences and materials that connect neuroscience to students' lives and increase student enthusiasm for and interest in science. Participating teachers use their knowledge and new experiences to provide linkages between the content and students' experiences with neural related disorders and experiences.
  4. Partner with students and teachers to inform others about neuroscience research.
- Participating teachers have presented at local, regional and national meetings sharing neuroscience activities. Student activities have included brain fairs for older students to share their research with younger students.

**Project Evaluation:**

Evaluation goal:

To determine the extent to which project implementation meets project goals.

Evaluation design:

In year 1, data collection instruments were developed, piloted and revised. Pre/post testing of all BrainU 101-303 participants have been performed to assess changes in content knowledge, use of inquiry-based instruction and of neuroscience content. On average, 12 teachers are observed each year. Visits include a brief interview with the teacher and observation of instruction. In years 5 and 6 all participants will receive a survey to assess teacher use of materials during the past school year. Repeat evaluations will provide assessment of the planned continued implementation of neuroscience and inquiry curriculum after project support ends. A meta-analysis of the entire scope of the grant will be prepared in year 5 to determine the effectiveness of multiple years of teacher training and support.

Instruments used:

1. Formative Assessments
  - a. pre-testing of Brain U content knowledge
  - b. surveys of teaching of neuroscience content and use of inquiry-based instruction
  - c. surveys of use of project materials and resources (trunks, assemblies, etc)
  - d. criteria for content evaluation of action plans and curricula
2. Summative Assessments
  - a. pre- and post- testing of Brain U content knowledge
  - b. surveys of teaching of neuroscience content and use of inquiry-based instruction
  - c. surveys of use of project materials and resources (trunks, assemblies, etc)
  - d. site visit teacher interviews
  - e. site visit classroom observation guides

Type of data collected: teachers content pre- and post tests, surveys, teacher interviews, class observations

Results of data analysis:

Evaluation data collected to date support excellent progress in achieving outcomes described in program description.

Survey instrument is posted on [www.ncrrsepa.org](http://www.ncrrsepa.org)

**Materials/Products/Exhibits Produced:**

All 21 lesson plans, 4 cartoons, 1 simulation, 5 exhibit stations, sheep brain dissection video, program description, etc are available online at [www.brainu.org](http://www.brainu.org).

**Dissemination Strategies:**

1. Local strategies
  - a. Teacher-staff presentations at state science teacher workshops
  - b. Informal presentations by teachers within their own school districts
  - c. Presentations to pre-service teachers by BrainU participants
  - d. Peer mentoring experiences among participating teachers
  - e. Brain Explorations! guide for teachers and others to explore neuroscience while visiting the Science Museum of Minnesota
  - f. Brain fairs presented by participating students to their peers and younger students on neuroscience topics
2. National strategies
  - a. Teacher-staff activity and poster presentations at annual meetings of the National Science Teachers Association, the National Association of Biology Teachers convention and the Society for Neuroscience.
  - b. Website with developed materials posted.

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website construction in progress

**Audience(s):**

K-12 teachers (especially of grades 3-12) and general public

**Topics Addressed:**

Microscopy, microbiology, virology, infectious disease, immunology, molecular biology, nanotechnology

**Project Goals:**

1. To reveal to K-12 teachers, students and the public the biological entities and molecular processes at micro- and nano-scales that dramatically impact human health.
2. Partnership of teachers and scientists to develop grade level appropriate standards-based curriculum units for grades 3-8 to reveal the health impact of the world at the micro- and nano-scales.
3. Development of micro- and nano-space multi-media resources in collaboration with USM Southworth Planetarium
4. Disseminate widely the project products including curriculum and multi-media resources and other creative efforts and to regionally sustain partnerships through outreach activities..
5. Integrate teacher professional development opportunities into graduate biosciences education at USM.

**Project Description:**

The usually invisible worlds at the micro- and nano-scale have immense importance for health and disease and for the environment in which humans live, but the tools for exploring these scales are not highly available or widely used in many grade 3-8 classrooms. This SEPA project seeks to address these needs. The focus of this teacher professional development project is on revealing and putting in perspective key aspects of the usually invisible world at micro- and nano-scales that relate to health and disease. Attention is being given to how these perspectives can be integrated into classroom learning that addresses basic language arts and mathematics standards which are currently emphasized to a greater degree than scientific learning at some grade levels. Throughout the project the staff seek to link teacher professional development and curriculum development with the state of Maine's science and technology learning standards and performance indicators which have as a framework in Standard A the unifying themes of: systems, models, constancy and change, and scale. Standards B-E respectively address: (B) The skills and traits of scientific inquiry and technological design; (C) The scientific and technological enterprise; (D) The physical setting; and (E) The living environment. Concepts of scale are recognized as critical in national and state science education standards and are a particular emphasis in this project seeking to enhance the classroom resources and capabilities of grade 3-8 teachers for using microscopy and microscopic resources in their classrooms. Grades 3-8 teachers participate in two week summer institutes to collaborate in development of curriculum resources and to gain skills using light microscopes that are being provided to the teachers and supported through continuing outreach. During the academic year the project sponsors public scientific lecture series aimed at K-12 teachers and a lab-based weekend program called "Microscopy, Microbes, Molecules, and More".

**Project Evaluation:**

During Phase I of the project key evaluation questions are:

1. How does participation in summer and/or academic year professional development influence teachers' acquisition of microscopy skills and knowledge of key aspects of micro- and nano-space that relate to human health and disease?
2. How does participation in summer and/or academic year professional development influence teachers' attitudes toward the microbial world?
3. To what extent does participation in summer and/or academic year professional development enable teachers to implement curricula in their classrooms such that students' interest in and knowledge of the microbial world is increased?
4. What features of the summer and academic year professional development programs are most closely associated with teachers' subsequent positive classroom experiences?

Surveys from the evaluation team at Education Development Center (EDC) are being used to gather data needed for addressing these questions. Results are currently being compiled for reporting. Content learning is being measured through systematic pre- and post-testing by the project faculty during the summer and academic year programs. In the summer workshop the pre-quiz was administered on day 1 of the ten day workshop and the post quiz on day 10. The average results on day 1 was 50.2% and the average results on day 10 was 68%, an increase of 17.8%. For the fall and spring sessions the quizzes were given at the beginning of each Saturday laboratory session and at the end of the final laboratory session. The average results in the fall increased by 15.3% and in the spring by 15.1%. This indicated a slightly higher retention of the factual information in the summer session that may be attributable to daily use of the information and reinforcement. The teachers in the Saturday sessions also demonstrated acquisition and retention of the information presented over a period of 6-8 weeks.

**Materials/Products/Exhibits Produced:**

A number of laboratory activities were developed and used in the summer laboratory workshops in 2008 and they are being revised and refined for use in the 2009 summer sessions. The grades 3-8 teachers from the summer workshop developed lesson plans to implement in their classrooms and will be reporting on the outcomes of those plans in an afternoon session on May 14. The fall laboratory sessions emphasized the cellular and molecular biology manipulations that permit scientists to probe the microscopic and molecular world. The spring sessions focused on readings, lectures and activities that contributed to understanding the cellular, genetic, and molecular evidence supporting evolutionary theory.

**Dissemination Strategies:**

Systematic dissemination efforts are not yet underway at the beginning of project year two.



# The FoodMASTER Initiative

## East Carolina University

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### Audience(s):

3rd-5th grade students and teachers.

### Topics Addressed:

Math, science, nutrition & food Science,

### Project Goals:

1. Prepare the final multi-media materials for distribution to a wider audience.
2. Disseminate teacher education packets to 20 3rd grade teachers in Ohio (N=10) and North Carolina (N=10) for comparative data analysis.
3. Disseminate materials to 100 teachers via professional conferences.
4. Disseminate Phase I outcome data via conferences and professional journals.

### Project Description:

The FoodMASTER (Food, Math, and Science Teaching Enhancement Resource) initiative uses food as a tool to engage students in math and science learning. Students encounter food on a daily basis and therefore have preexisting contextual experiences preparing them for learning new, relevant science and math materials. During phase I, the multimedia FoodMASTER Intermediate (3rd-5th grade) curriculum was created and implemented in 13 classrooms in Appalachia Ohio. Teachers reported that students connected with the hands-on food activities better than traditional textbook lessons. They also reported that students were more tuned in and excited about learning during FoodMASTER time than any other time in the day. Feedback from teachers and students resulted in improving the curriculum, pairing down the 45 hands-on and computer-based food activities to 23 hands-on activities and 22 computer-based food activities, and creating a teacher's manual. Ten teachers in Ohio and ten teachers in North Carolina will attend a 1-day training session during the Summer of 2009 to review content, work through hands-on activities, receive instruction for protocol for the academic year, and complete attitudinal pre-test surveys. The 20 teachers will implement the hands-on curriculum in their fourth-grade classrooms during the 2009-2010 school year, potentially reaching 240 students. Pre and post knowledge and attitudinal surveys will be completed by participating students. Data will be analyzed to investigate FoodMASTER's impact on third grade students in different state education systems, areas within a state and the impact on various minority groups. On the national level, 100 plus 3rd-5th grade teachers will receive the curriculum to implement in their classrooms. Product usage and feedback will be collected from the 100 teachers. Outcomes data will be shared via professional presentations and manuscripts.

### Project Evaluation:

The FoodMASTER Initiative evaluation plan includes formative and formal evaluation. Formative evaluation from Phase I, provided by students and teachers, was utilized to revise the hands-on curriculum and prepare the final DVD computer-based activities. Participating Ohio and North Carolina teachers will continue to provide formative evaluations throughout the implementation phase to direct future curriculum development and FoodMASTER activities. Nationally, teacher usage will be tracked and feedback pertaining to the curriculum will be assessed to guide future projects and dissemination plans. Teacher feedback will be collected through an online survey. Teachers' attitudes toward math and science will be formally assessed to determine if differences exist between Ohio and North Carolina teachers' attitudes, pre-implementation and post-implementation. FoodMASTER's impact on Ohio and North Carolina students' math and science learning and attitudes will be assessed via pre and post-implementation knowledge and attitudes questionnaires. Data from Ohio and North Carolina students will be compared to assess pre and post differences in attitudes toward math and science. Attitude differences between males and females, ethnic groups, and rural and urban students will also be assessed. Additionally, State Directors will gain valuable insight into FoodMASTER usage and implementation strategies by conducting site visits to participating schools.

### Materials/Products/Exhibits Produced:

Third to fifth grade student materials include the FoodMASTER Intermediate: Using Food to Teach Math and Science Skills Student Workbook and DVD.

-The student workbook contains 23 lessons. Each lesson includes a short reading, hands-on scientific inquiry lab, and a take home recipe page.

-The student DVD allows students to explore 22 food lessons without a mess.

- FoodMASTER Intermediate: Using Food to Teach Math and Science Skills Student Teacher's Manual provides teachers with tips and resources for completing FoodMASTER lessons.

-The FoodMASTER website (www.foodmaster.org) provides participating teachers with access to curricular materials.

### Dissemination Strategies:

Ohio and North Carolina - The FoodMASTER curriculum package will be disseminated to 10 teachers in Ohio and 10 teachers in North Carolina for implementation in the 2009-2010 school year. The impact of the curricular materials on knowledge and attitudes will continue to be assessed during the dissemination process for comparative purposes.

National - One hundred plus teachers, recruited via regional and national conferences, will receive curricular materials and access to pdf materials via the FoodMASTER website.

Conferences and Professional Journals – FoodMASTER outcomes data will be shared via professional oral and/or poster presentations. Manuscripts will be submitted to professional journals.

# Perfect Partnership: Science Enriched Physical Education University of Maryland, College Park

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## Audience(s):

Elementary teachers and their 3rd-5th grade students

## Topics Addressed:

Effects of physical activity on cardiovascular health, muscular strength and endurance, flexibility and nutrition

## Project Goals:

1. Design an science enriched physical education curriculum
2. Provide a rigorous, engaging physical education curriculum for urban children
3. Include constructivist problem solving/decision making in physical education
4. Include cognitive elements without diminishing physical activity time

## Project Description:

Be Active Kids! Science-based Physical Education curriculum has been designed, implemented and evaluated with urban, African-American 3rd-5th grade students. The constructivist-oriented curriculum uses problem solving formats to teach health-related science concepts and to guide students through the scientific inquiry process examining the effects of exercise on their bodies. Research to test the project's effectiveness was conducted with 6000 students in 30 urban Title I elementary schools. Results suggested that students in the experimental schools increased their health-related science knowledge by 18% when compared to students in the 15 control schools. Physical education teachers were trained to teach the curriculum to 3rd - 5th grade students in 3 units (90 lessons). Students assume the role of "junior scientist" to conduct experiments in each lesson using the "5E's" scientific inquiry process. The units consist of "Dr. Love's Healthy Heart" (cardiovascular health), "Mickey's Mighty Muscles" (muscular strength and endurance), and "Flex Coolbody's Fitness Club" (applications of health, nutrition, and fitness knowledge). Junior scientists are physically active throughout each lesson. They record data in their Student Science Journal, answering questions, graphing outcomes, drawing conclusions, and communicating their findings. Be Active Kids! schools host a Family Science Activity Night in which children lead their families through nine science experiments they have conducted in physical education. The curriculum is implemented in 185 schools in a large urban school district serving 38,000 children. Curriculum materials will be disseminated through a CD and Guidebook through Human Kinetics publishers.

## Project Evaluation:

BAK! Evaluation goals:

- To evaluate 3rd- 5th grade students knowledge growth of health related science as a result of the Be Active Kids! Science-based Physical Education Curriculum.
- To design, validate and standardize 10 knowledge tests for 3rd grade students
- To create an online testing process for 3rd-5th grades students; students complete the tests in school's computer lab; data sent to University of Maryland for analysis and addition to the master data base. Student scores returned to the teacher within 2 weeks.

Evaluation design Phase I:

- Clinical trial with random assignment of 30 schools to experimental and control groups.
- Sampling: Stratified random sample, stratified based on Maryland State Science Test Scores and FARM% by school; high representativeness of the sample with the population; from high to low SES and science test scores.
- Variables, health science related knowledge, interest in health-related science careers, and interest in science
- Data collected from ~6000 students in all schools due to the very high student mobility rate (~60%) in some urban schools
- Data collected/analyzed from Student Science Journals to identify student knowledge growth and naïve conceptions

Evaluation design Phase II:

- Design website to include sample lessons and journal entries
- Expand website capabilities to permit online student knowledge testing
- Large Urban School district adopted the BAK curriculum for 3rd-5th grade physical education
- Train 250 teachers (18 hours) to teach the BAK curriculum
- Identify 20 schools to be Project Team Schools to test curriculum dissemination and replicated Phase I research.

Other instruments (validated):

- Student Career Surveys
- Student Interest in Science Survey
- Teachers complete Curriculum Ease of Use Inventory
- Teachers and students interviews (teachers – ease of use; interest and motivation to teach curriculum; Students – enjoyment, knowledge of concepts; tracking origin of naïve conceptions)

## Materials/Products/Exhibits Produced:

The curriculum includes:

- 750 page Teacher's Manual
- 120 page Activity Directory
- Three, 70 page Student Science Journals (by grade)
- An Encyclopedia
- Family Science Activity Night program guidelines and Family Lab Notebook
- 10 validated, standardized tests (pretest, post tests - each unit/ grade)
- Testing Manual (test development and administration)
- Online testing program

## Dissemination Strategies:

Curriculum is implemented in 185 schools in a large urban school district serving 38,000 3rd-5th grade children and nationally in 11 schools across the United States.

- Staff development sessions:
  - o Nationally for elementary physical education teachers at national, regional and local physical education conventions
  - o Regionally for 250 teachers in the local urban school district where we are guided and supported the implementation
- Project Team Schools tested curriculum effectiveness to reach SEPA project goals
  - o 25 local schools new to the project returned tests to the project for scoring and analysis
  - o 11 national elementary schools returned tests for scoring and analysis
- Curriculum materials will be disseminated through a CD and Guidebook to physical education teachers through Human Kinetics publishers.

# Disease Detectives

## Science Museum of Minnesota

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### PI Name:

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<http://www.diseasedetectives.org/>

### Audience(s):

Family and school groups, high school science teachers and community center programs

### Topics Addressed:

Infectious disease, microbiology, epidemiology, public health, influenza, malaria and E. coli O157:H7.

### Project Goals:

1. • Create an engaging and interactive exhibition that presents infectious disease information to the general public.
2. • Create programming and a website that complements the exhibition
3. • Emphasize how individuals play a role in stopping the spread of infectious diseases.
4. • Demonstrate the wide variety of professionals that work together to solve infectious disease mysteries.
5. • Highlight current infectious diseases research and outbreaks.

### Project Description:

This project engages the general public, teachers and community centers around the science of infectious diseases through an exhibition and related programming.

#### Disease Detectives Exhibition

Three mannequin patients have an infectious disease and need your help. In this interactive and immersive 1500 square foot exhibition museum visitors investigate infectious diseases mysteries by role-playing various medical professionals. Participants meet interactive patients, analyze lab tests and learn about the transmission and prevention of infectious diseases. Each of the three case studies highlights different microbes, modes of disease transmission, and prevention techniques.

We developed a companion website to complement the exhibition. The site includes information about infectious diseases, a teacher guide, and related activities ([www.diseasedetectives.org](http://www.diseasedetectives.org)).

#### Teacher Professional Development

We have completed two week long summer teacher institutes for junior and senior high school teachers. Each institute focuses on the nature of science using infectious disease as the content. It includes inquiry based activities guest speakers and a behind the scenes tour of the museum. This fall we will host a series of workshops about infectious diseases for additional teacher participants.

#### Science Live Theater

Riddles of Disease is a puppet show written and produced for the Science Museum of Minnesota. It is a show for visitors of all ages.

#### Youth Outreach

Eight teens from the museum's Kitty Anderson Youth Science Center developed programs about infectious diseases and brought them to our community partners. Their presentations and activities were geared for students in 4th – 6th grades in after school and summer camp programs.

### Project Evaluation:

The goal of evaluation is to ensure that the project effectively engages the target audiences in an exploration of the science of infectious diseases and communicates the main messages.

#### Evaluation led by:

- Carol Freeman (University of Minnesota): Teacher Institutes
- Randi Korn & Associates: Exhibition remedial and summative
- Kirsten Ellenbogen (SMM Department of Evaluation and Research in Learning): Exhibition frontend and formative; Website; Community Outreach Program

#### Exhibition:

Front-end evaluation interviews focused on storyline testing at SMM and the Maryland Science Center. It gauged visitors' reactions to two potential storylines and measured visitor interest in, familiarity with, and prior knowledge of infectious diseases.

Formative evaluation identified several critical experiences to test usability and potential learning outcomes. The evaluation included cued and un-cued interviews and observations.

Remedial evaluation identified problems and recommend solutions. We used post visit in-depth interviews with visitors and timing and tracking to collect data.

Summative evaluation included pre and post exhibition visit data collection and follow-up phone interviews. Data analysis is in process.

#### Website:

Evaluation looked at ease of use for the different web components. Data collection included cued testing and users were asked to "talk aloud" during key points. The evaluator followed along to note which of the web features are used, which cause obvious problems, and which are used without difficulty.

#### Teacher Institutes:

Formative and summative evaluations looked at the institute's effectiveness. We collected data through teacher self-assessments before and after the institute, teacher feedback during the institute, evaluator observations during the institutes, follow-up self assessments, phone interviews, classroom observations and student interviews.

#### Community Outreach:

Pre- and post-program questionnaire with teens measured conceptual understanding and attitudes. We also used pre-and post concept mapping for analysis using an established scoring rubric that assesses the extent of knowledge and feeling, breadth of conceptual understanding, depth of conceptual understanding, and, overall mastery of content.

### Materials/Products/Exhibits Produced:

Exhibition: A 1500 sq-foot immersive and interactive exhibition called, Disease Detectives. It will begin traveling to other institutions in September 2009.

Puppet Show Script: A family oriented puppet show script called Riddles of Disease which explores the history of infectious diseases.

Website: An interactive website about the exhibition. It includes infectious disease information, a teacher guide and related activities ([www.diseasedetectives.org](http://www.diseasedetectives.org)).

Volunteer led activities: We have put together a series of volunteer led activities to complement the exhibition content.

### Dissemination Strategies:

Disease Detectives traveling exhibition: This 1500 sq ft exhibition is available for rental.

Puppet Show Script: A family oriented puppet show script called Riddles of Disease which explores the history of infectious diseases. We are happy to share the script with anyone interested.

Website: An interactive website about the exhibition. It includes infectious disease information, a teacher guide and related activities ([www.diseasedetectives.org](http://www.diseasedetectives.org)).

Volunteer led activities: We have put together a series of volunteer led activities to complement the exhibition content. These activities are related to the exhibition but could be adapted to different venues.

Evaluation Reports: We are happy to share all of our evaluation reports.

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**Audience(s):**

students and teachers grades 7 - 12

**Topics Addressed:**

molecular biology and biotechnology

**Project Goals:**

1. To develop new curriculum modules using a systems approach as a unifying thread to biological inquiry
2. To further disseminate CityLab programs by encouraging institutions throughout the world to develop programs similar to those offered through CityLab
3. To improve our ability to assess the impact of CityLab programs on students in grades 7 - 12

**Project Description:**

Both content and process are critical to scientific investigations. We recognize that students require a solid grounding in current scientific content as well as the cognitive tools to carry out sound scientific inquiry. Systems analysis incorporates process and content that provides students with strategies for seeking explanations based on evidence. In compliance with our initial aims, we have been working closely with teachers and students in a single high school to create a year long science experience that integrates a systems approach into the extant science curriculum.

With respect to our second goal, CityLab has disseminated its program state-wide as well as internationally. Through a partnership with MassBioEd, more than 125 public high school science departments in Massachusetts have been trained in teaching three of CityLab's curriculum supplements with plans for all schools to receive training by 2010. Additionally, CityLab supplements are requested by teachers and used by CityLab satellites and mobile laboratory programs. Edvotek has developed laboratory kits to support three CityLab curriculum supplements. As a result, we estimate that several thousands of students experience some form of CityLab curriculum supplements each year. Lastly, the Sik Sik Yuen Mobile Laboratory in Hong Kong is the most recent mobile laboratory in a line of several modeled on the CityLab MobileLab.

**Project Evaluation:**

Evaluation of the CityLab project has focused on the intervention at one school. Data collection is based on student performance on open response questions and standardized state tests. Matched groups of students are also tested and serve as a control group. Classroom observations provide qualitative insights with respect to the impact that the systems approach has on both the teacher and students. Data collection will be completed at the end of the 2009 school year and analyzed during the summer of 2009.

We have developed a Systems Thinking Analysis Test (STAT) to code student responses. The resultant coding enables us to describe the level of systems thinking exhibited by the students. Initially the STAT was given as a pre and post test. Subsequently, we have identified the STAT as an instrument that can be used to assess the depth of systems thinking by students on any open response question. To date, the data suggests that students whose academic performance is typically lower than average benefit most from the critical thinking strategy offered through the systems approach.

**Materials/Products/Exhibits Produced:**

Curriculum Supplement: 3-2-1 Blast Off: A medical mystery in space, uses the phenomenon of space anemia to investigate properties of blood and circulation.

**Dissemination Strategies:**

Dissemination strategies include the following:

- national workshop presentations at NSTA 08 and 09, NABT 07 and 08, Mobile Laboratory Conference 04 - 08;
- local workshop presentations at Bridgewater State College (a SEPA award recipient), Massachusetts Biotechnology Education Foundation, Massachusetts STEM Pipeline Conference;
- international presentation in Hong Kong.
- the CityLab web site [www.bumc.bu.edu/citylab](http://www.bumc.bu.edu/citylab)
- kits developed by Edvotek to support three CityLab curriculum supplements: Mystery of the Crooked Cell, Case of the Crown Jewels, and Entangled in the Web

# The MIDAS (Models of Implementation and Dissemination of environmental health science Across Subjects) Project

## UT MD Anderson Cancer Center, Science Park Research Division

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**Audience(s):**

4th-8th grade students, K-12 teachers

**Topics Addressed:**

environmental influences on health

**Project Goals:**

1. PHASE I: INTEGRATED K-12 IMPLEMENTATION MODEL
2. Goal I: Advance science education and improve scientific literacy by integrating environmental health and science materials across subjects in a model school system.
3. Goal II: Provide a self-sustaining, integrated curricular model that utilizes existing, local and accessible resources and infrastructure.
4. PHASE II: ENVIRONMENTAL HEALTH SCIENCES SUMMER INSTITUTE FOR K-12 EDUCATORS
5. Goal I: Train teachers and disseminate environmental health and science materials through professional development.
6. Goal II: Advance education through improved instruction and integration of environmental health and science materials across subjects, including science, mathematics, theater, reading, writing and soc

**Project Description:**

The goal of the MIDAS project is to improve instruction in a model school system by using environmental science as an integrating framework. The project also includes a comprehensive approach to evaluating the impact and measuring the outcomes. Evaluation of the project is facilitated by the structure and testing in the Texas school system. The project aims to test a two-part strategy for improving education. It will combine thematically correlated Phase I implementation programs, including:

- real world experiences and field trips,
- seminars and presentations from scientists and experts, and
- student projects

with enhanced, focused professional development for educators (Phase II), in a manner designed to increase instructional capacity and effectiveness. This dual approach links the two phases through an extensive, integrated and innovative environmental health and science curriculum that has been developed by some of the nation's leading biomedical research and training institutions.

**Project Evaluation:**

A variety of formative and summative approaches and instruments have been employed to assess the effectiveness of each project component as well as the project as a whole.

Phase 1:

1. Online surveys to assess each Scientific Seminar speaker and each field experience venue (formative).
2. End of the school year: focus groups with participating teachers or students (formative and summative)
3. Comprehensive online survey - end of each school year - assessing component and subject integrations, perceived benefit to students, impact on classroom lessons (summative)
4. Comparison of standardized test scores achieved by age-matched students in participating and non participating campuses in the same school district (summative).

Phase II. Summer Institute

1. New workshop evaluations - onsite and online evaluations of new workshops (formative)
2. SI evaluation - onsite, online evaluations of the SI as a whole, includes questions about venue, organization, food, registrations website, etc. (formative)
3. SI implementation survey - online - sent to SI participants at the end of the following school year to assess the level of material/pedagogical implementation, perceived professional development benefit, impact on classroom lessons, perceived benefit to students, etc. (summative).
4. SI implementation - for multiple year attendees - overall impact of SI training over time (summative).

**Materials/Products/Exhibits Produced:**

New curricular materials:

Holes: Can you dig it?  
It's Elemental  
Veggie-mon.org

**Dissemination Strategies:**

We use a variety of professional development conferences, including:

NSTA  
CAST  
EHS Summer Institute for K-12 educators ([k12summerinstitute.mdanderson.org](http://k12summerinstitute.mdanderson.org))

also, websites:  
[veggie-mon.mdanderson.org](http://veggie-mon.mdanderson.org)  
[SCREAM.mdanderson.org](http://SCREAM.mdanderson.org)

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**Audience(s):**

Students (K-8); Teachers (K-8); Families, Community

**Topics Addressed:**

K-8 Science

**Project Goals:**

1. Build Trust with American Indian Communities
2. Increase Science and Health Literacy
3. Stimulate Student Interest in Science
4. Teacher Professional Development
5. Increase College Science Majors (long term)
6. Engage Community in Understanding Health and Science Issues

**Project Description:**

Our SEPA program continues to work with teachers and students on six Indian reservations in Nebraska and South Dakota. The hallmark of our outreach efforts continues to be our ability to spend a significant amount of time in these reservations communities. Our Advisory Board, consisting of representatives from each of our partner communities, reports that our efforts to spend time in their schools and communities is noticed and appreciated.

Our 2008 teacher workshop was centered on grades K-2. We tied as much cultural relevance into the lessons as possible. To better serve the national, state, and Indian content standards we developed a "Bird Curriculum". This curriculum promoted and encouraged awareness and recognition of sixteen different birds that could be found in Nebraska and South Dakota. Science, math, language arts activities and connections to other academic areas were also included.

Our middle school 2008 summer camp was held on the campus of the University of Nebraska Medical Center. Camp program included a wide variety of hands on science activities. We were fortunate to have two American Indian scientists [molecular biologist (Navajo) and a MPH student (Santee)] work with our campers.

We have held teacher in-services at each of our partner schools. We have participated in science nights and science fair programs, which have included community participation.

We recently completed our second series of Role Model posters that feature American Indians in health and science profession. This series includes a molecular biologist, occupational therapist, dentist, and two teachers. A third series is underway. The success of our lab safety posters has been gratifying. We are in the process of developing ancillary materials that will introduce lab safety in the elementary and middle school classrooms.

**Project Evaluation:**

The evaluation has been designed to help project staff develop the various project activities through an understanding of the effectiveness of past and ongoing activities. The evaluation is designed to inform the project staff on the effectiveness of project activities through a mixed methods approach to data collection. The first task in reaching the overarching goal of obtaining data on project effectiveness was a needs assessment of teachers and administrators (collection in spring 2006). The needs assessment assisted project staff in identifying the greatest areas of need for teachers and students in the communities they are serving and in developing programs specific to the three grade "bands" (K-2, 3-5, 6-8).

Each summer teacher workshop and student camp is assessed using both quantitative and qualitative data. Teachers are asked to respond to evaluation surveys at the end of each day. On the final day, they are asked to assess their individual learning in the content areas using retrospective pretest and posttest. Student summer camp data is collected using both pre-post attitudinal data, and qualitative photo experience data. Each student is asked to document their experience at the camp through photographs and then asked to reflect on their favorite photos at the end of the camp experience. In the final year of the project, students will be asked about their experience at the camp and to reflect on their photos again.

The summative evaluation (data collection in progress) will compare needs assessment data collected in 2006 with current attitudes and needs, and changes in understanding that have occurred within schools over the past few years. We will also use summative data to investigate if greater involvement in the UNMC SEPA project has impacted teacher self-efficacy and attitudes toward teaching science.

**Materials/Products/Exhibits Produced:**

Lab Safety Posters: We developed a series of lab safety posters for elementary and middle school. We are in the process of developing ancillary activities to go with the posters.

Ethno-botany and bird curricula: We developed an ethno-botany curriculum to highlight some plants that were used by Plains Indians and early settlers. We have also developed a bird curriculum for early elementary grades using birds found in Nebraska and South Dakota. Activities related to science, math, and language arts were designed around the birds.

Role Model Posters: We have produced two series (a third is in development) to highlight American Indians in health and science professions. The posters come with teacher pages to help incorporate the individual's profession into the classroom curriculum.

**Dissemination Strategies:**

All of our evaluation documents and surveys are available on our web site. We are also in the process of writing several papers for publication. We have presented our programs at several conferences in Nebraska and nationally.

Nebraska: Nebraska Association of Teachers of Science; Nebraska Academy of Science; Nebraska Department of Education Diversity and Indian Education Conferences; Omaha Public Schools High Ability Learners Conference, Lincoln Public Schools Teacher In-service.

National: National Indian Education Conference; Department of Education Partnerships for Indian Education Conference; National Rural Health Minority Health Conference.

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**Audience(s):**

middle and high school students, teachers, and their communities

**Topics Addressed:**

Molecular biology

**Project Goals:**

1. Specific Aim 1. We propose to increase middle and high school teachers' comfort with inquiry-based molecular biology in the classroom and their knowledge of research processes.
2. Specific Aim 2. We propose to increase recruitment of Alaska middle and high school students (with emphasis on Alaska Native and rural students) into biomedical and health careers through their involvement
3. Specific Aim 3. We aim to spread appreciation of the importance and limitations of science to the general Alaska public.

**Project Description:**

Alaska BioPREP is a program designed to engage 7th -12th grade students and teachers, with emphasis on rural students of Alaska Native ethnicity, in biomedical research projects that lead toward health careers. This program expands our Alaska community of science educators and learners. It begins with the intellectual rigor of scientific inquiry and then addresses the attitudes and social values conducive to learning science. Pilot projects have proved that if we can engage students in rural Alaska high schools, they go on to science majors in college. We will leverage the expertise of research faculty supported at the University of Alaska through three NIH funded activities (COBRE, INBRE, and SNRP) to broaden the existing student/teacher base. Our fundamental tactic is Motivate students to ask good questions and give them the toolsets to ask at the lab bench. We will help students in 7th to 12th grades use molecular biology within the Grade Level Expectations (GLE's), to address scientific questions that are locally relevant. We believe that one result will be increased numbers of students who choose to attend college and to declare science majors in biomedical and health sciences.

**Project Evaluation:**

The innovative and multi-dimensional approach of Alaska BioPREP requires both formative and summative components in its evaluation plan. We will use a mixed-method (qualitative and quantitative) evaluation strategy with a variety of evaluation instruments to measure outputs and short-, medium-, and long-term outcomes, such as a logic model and various evaluation instruments. An emphasis on formative evaluations, especially during Phase I will identify problem areas within the program, and aid in finding solutions. Effective teacher training is crucial to the program's success. Thus, there is an early emphasis on evaluating teacher content knowledge and comfort with mentoring student research. Further, long-term participant (student and teacher) follow-up data will help determine program effectiveness. Fortunately, these evaluations can be conducted efficiently and with little burden on BioPREP staff or participants.

**Materials/Products/Exhibits Produced:**

This is our first year. No materials have been finalized.

**Dissemination Strategies:**

This is our first year. We are not yet in the dissemination phase.



# HOPE Partnership (Health Observances and Public Education) University of Medicine and Dentistry of New Jersey-School of Public Health (UMDNJ-SPH)

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## Audience(s):

Middle and high school students and teachers and the adult public

## Topics Addressed:

Research on asthma and allergies, lead poisoning, and cancer.

## Project Goals:

1. Improve public understanding of the biomedical and health-related sciences through the development of public health science education materials.
2. Determine the most effective methods for improving public understanding of the biomedical and health-related sciences utilizing six action mechanisms.

## Project Description:

The HOPE Partnership is designed to enhance public understanding of biomedical and health-related research and the impact of this research on human health through the development and dissemination of public health science materials. The project partners include Community Outreach and Education Programs at Oregon State University, University of Arizona, University of North Carolina at Chapel Hill, University of Southern California/University of California, Los Angeles, University of Texas M.D Anderson Cancer Center and University of Wisconsin-Madison. Through this initiative, students, teachers and the general public gain access to resources and information necessary to realize the impact of research on public health and improve their scientific literacy. The HOPE Partnership capitalizes on three established national health observances that focus on diseases to which many people can relate: Cancer Control Month (April), Asthma and Allergy Awareness Month (May) and Lead Poisoning Prevention Week (3rd week of October).

## Project Evaluation:

Evaluation of the HOPE Partnership assesses the effectiveness of the public health science education model. The evaluation will demonstrate whether the HOPE Partnership made a difference-whether the use of health observances, educational materials and action mechanisms have enhanced public understanding of biomedical and health-related research.

Several evaluation forms were developed to document both successes and areas for improvement. Participant questionnaires documented participant's demographic information, science background, interest in topic areas and research understanding. Evaluation forms addressed best practices of focus group and Action Mechanism implementation. Project partners completed report forms after conducting focus groups and Action Mechanisms. Focus groups were evaluated through participant questionnaires and evaluation forms. Implementation of the Health Observance Packages through the Action Mechanisms was documented through participant questionnaires, evaluation forms and an interview guide. Report forms were completed by project partners to document the strategies, successes and areas for improvement for each focus group or Action Mechanism.

Each project partner conducted focus groups to understand the target audience's perceptions and understanding of health-related research regarding topic areas, to explore what information is desired about research results to help the public evaluate the value of the research and its impact on public health, and explore best methods for dissemination of health-related research. Eighteen focus groups were transcribed and analyzed using Atlas.ti. Participants thought health-related research is important but do not understand the research process. Participants generally perceived health-related research as treatment-oriented and were skeptical about the media's role in understanding health research.

Action Mechanisms were conducted by each project partner to disseminate information to target audiences about health-related research related to cancer, asthma and allergies and lead poisoning. One hundred and thirty-one Action Mechanisms were completed (68 Asthma and Allergy, 42 Lead Poisoning and Prevention and 21 Cancer Control). Participants valued Action Mechanism events and hands-on activities.

## Materials/Products/Exhibits Produced:

The Asthma and Allergy Awareness Month Health Observance Package (HOP) contains educational materials to be used by partners during Asthma and Allergy Awareness Month in May.

The Childhood Lead Poisoning Prevention HOP contains educational materials to be used by partners during Childhood Lead Poisoning Prevention Week, the third week in October. The Cancer Control Month HOP contains educational materials to be used by partners during Cancer Control Month in April.

## Dissemination Strategies:

Project partners implement HOPs through six Action Mechanisms during each health observance. Action Mechanisms include community learning, formal education, informal education, science centers/museums, media and non-profit events.

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**Audience(s):**

High school teachers and students

**Topics Addressed:**

Molecular structure and function

**Project Goals:**

1. To engage high school teachers in a rigorous, in-depth exploration of basic concepts of molecular structure and function.
2. To develop student-centered curriculum modules (TLC – Tactile Learning Curriculum modules) focused on molecular structure and function.
3. To broadly disseminate two student enrichment programs that have evolved from our program --- SMART Teams and a Protein Modeling event for the Science Olympiad competition.

**Project Description:**

The core effort of this project is to engage high school teachers in a professional development program in the area of molecular structure and function. We do this in a series of summer professional development courses in which we model an active learning pedagogy for teachers that involves the combined use of physical models of molecular structures and computer visualization tools to make the molecular world come alive for students. Teachers report an appreciation for both the rigorous nature of the course and the holistic way in which a myriad of topics central to a high school biology curriculum are tied back to basic principles of chemistry and molecular structure/function.

In a parallel effort, we are working closely with a small group of teachers to develop a set of core lessons (Tactile Learning Curriculum modules) addressing molecular biology, appropriate for a general biology classroom at the high school level. Each lesson is designed to actively engage students in an exploration of a specific topic, using physical models. Computer visualization tools are then used to extend the students' learning and exploration of more sophisticated issues that result naturally from the use of the models. Six core lessons focused on molecular structure and function have been created and piloted. These core lessons are currently being extended with four additional lessons focused on DNA/RNA/Proteins.

The SMART Team program (Students Modeling A Research Topic) is a student-enrichment program that has evolved from our work with teachers. Following participation in our summer courses, teachers organize a Team of students in their school who first learn about protein structure and function, and then work with a local reach lab to design and build a physical model of the protein that is the focus of the lab's work. The major goal of this project is two-fold: (i) to continue the professional development of teachers and (ii) to expose students to an active research lab where they actively participate in the process of science.

**Project Evaluation:**

The evaluation of this project continues on three fronts:

1. The impact of our professional development program on teachers is evaluated with retrospective surveys. When surveyed two to six years following the summer course, 93% of the teachers reported that they were using activities learned in the summer course. The reported use of physical models in their classrooms increased from 25% before the course, to 92% after the course. The reported use of computer visualization tools increased from 2% to 49% following the course. And most importantly, 97% of the teachers reported that they have encouraged colleagues to participate in the course. The summer course has been oversubscribed (capped at 30 participants) for the past five years.
2. The evaluation of the TLC curriculum modules is ongoing and involves two efforts. We continue to work closely with a small group (5) of teachers in the development, initial pilot testing, and revision of the core lessons. On a second front, we are in the process of developing and validating a pre / post test to measure the impact of the lessons on student learning.
3. We continue to refine our own understanding of the unique features of our SMART Team program (Students Modeling A Research Topic), and its benefits to students, to teachers and to research mentors. This sharpening focus has resulted in a recent revision of the annual student and teacher survey instruments, with a view to tracking the long-term impact of the program on both the teachers' pedagogy and the career path of the student participants. The results of these revised survey instruments are also informing the development of a SMART Team Mentor Manual that will be used to disseminate the program to other institutions.

**Materials/Products/Exhibits Produced:**

Classroom sets of physical models are available for educators to borrow for two weeks, at no cost except return postage. Each model collection is supplied with background materials for teachers and suggested classroom activities. The physical models are supported by a variety of on-line resources, in the form of molecular animations and narrated jmol tutorials, that lead students into a further exploration of the topics introduced by the physical models. On-line resources related to the use of RasMol model design software and training for students participating in the Science Olympiad Protein Modeling event are also available.

**Dissemination Strategies:**

The results of this project are broadly disseminated through workshops presented by CBM staff at regional and national science education meetings. Selected models and activities resulting from this project are commercialized by the CBM's sister organization, 3D Molecular Designs. The further dissemination of the SMART Team program and the Science Olympiad Protein Modeling event is being supported by an HHMI precollege science education award, in collaboration with UW-Madison.

# Environmental Health Science Education for Rural Youth

## Center for Environmental Health Sciences (CEHS) University of Montana

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### Topics Addressed:

The project focuses on environmental health with emphasis on air quality and water quality concerns affecting rural households. Special effort is being made to incorporate Native American perspectives and to develop instructional materials that are cross-curricular in scope (math, science, language arts, social studies, health enhancement).

### Audience(s):

Students and teachers at grades 4-12, plus a public outreach component for primarily rural demographic.

### Project Goals:

1. Enhance K-12 environmental health science education by strengthening the partnership with the UM Center for Environmental Health Sciences (CEHS), Salish Kootenai College (SKC), and education groups
2. Develop culturally appropriate strategies and materials (hands-on and inquiry-based) to address environmental health related subjects, such as air toxics and water pollution.
3. Disseminate information on environmental health science by means of distance learning delivery, on-site visiting lecture program to rural schools, and multimedia programs.
4. Expand public support for integrating environment health education in schools consistent with rural and socioeconomic character of state, and now being expanded to our Northwest region.

### Project Description:

Environmental health is being used as an integrative context for science learning, with a focus on developing hands-on inquiry-based activities relating to water and air quality issues in the rural West. Special effort is being made to incorporate Native American perspectives and to develop instructional materials that are cross-curricular in scope (math, science, language arts, social studies, health enhancement). There are four subprojects:

1. Air Toxics Under the Big Sky/North Star curricula developed through a research partnership with five western Montana high schools, two Nez Perce Indian Reservation high schools in Idaho, and three high schools in Alaska. Faculty are trained so they can instruct their students in sampling indoor air for air pollutants (VOCs, PM2.5, CO2) and human health impacts from wildland fires, woodstove combustion, agricultural burning, and mountain valley inversions.
2. Small Scale Chemistry Training provides hands-on lab training modules developed by Salish Kootenai College on small-scale chemistry delivered during classroom visits, after-school programs and district-wide training institutes. This campus-to-community project introduces students and teachers to small-scale chemistry and the research process by guiding them through the simulation of environmental episodes that can affect human health.
3. Western Montana Watershed Education developed in partnership with Salish Kootenai College, local teachers, content consultants, and two nonprofit organizations to deliver lessons and disseminate developed material in formal and informal educational settings such as a summer program on the Flathead Indian Reservation on topics such as stream monitoring, waterborne contaminants and Superfund remediation.
4. Community Involvement/Environmental Health Awareness initiative to improve science literacy by making information and materials culturally appropriate and comprehensible to a broad audience, including Native Americans, rural residents, and groups most affected by environmental health problems and disparities in health outcomes.

### Project Evaluation:

Impact evaluation of the Air Toxics sub-project uses a careful comparison study. Performance of two groups of students are compared using a content assessment dealing with content (PM2.5, asthma, math computation, anatomy) and understanding of scientific research (hypotheses, research design). Students participating in either treatment or comparison groups were drawn from intact classes at five Montana school districts. A pre-survey was administered to both groups which was used as a covariate to adjust final scores on the content assessment.

Initial results showed that the treatment students outperformed comparison students on the content assessment. In particular treatment students were three times as likely to be able to generate a good hypothesis and good research design than comparison students. Impact of the May symposium is evaluated through student and teacher surveys.

The evaluation of the Western Montana Watershed Education sub-project uses the same careful comparison study design as in Air Toxics. Treatment and comparison students are identified and complete a pre-survey. Treatment students participate in the designated instructional units that relate to water and health issues. Upon completion of the units, a post survey is administered as well as a final content assessment. The goal is to determine the extent to which participating students, as compared to treatment students, learn, understand and retain information related to water quality and health.

### Materials/Products/Exhibits Produced:

- \*Air Toxics Under the Big Sky: Resources include a portable learning module (gr3-5), high school curriculum consisting of ten lesson plans, protocols for DustTrak equipment, and a training video on instrument usage and analysis
- \*Small-Scale Chemistry Training: Resources include curriculum highlighting laboratory activities involving topics such as acid deposition and climate change
- \*Western Montana Watershed Education: Resources include watershed education curriculum consisting of ten lesson plans and the Watershed Investigation (WSI) educational activity, and a portable model of the Clark Fork watershed with supporting lesson plan, recording, and activities
- \*Community Involvement/Environmental Health Awareness: Resources/activities include annual science symposia, environmental health fairs, school-community events, web-based resources including science trivia quizzes, and children's environmental health initiatives.

### Dissemination Strategies:

- \*Offer professional development workshops for rural teachers to integrate environmental water quality and air quality health topics into the school curriculum;
- \*Provide formal and informal educational offerings via collaborators: Watershed Education Network and Montana Natural History Center;
- \*Offer presentations at state/regional/national conferences
- \*Develop culturally appropriate materials and learning opportunities: Saturday academies, laboratory tours, portable learning modules, field trips, summer internships; festivals, lab experiences and independent study for high school students to design peer-led lessons based on their research
- \*Coordinate Researchers in the Schools program for delivering EH research to rural k-12 classrooms, tribal colleges and villages either in person or via videoconferencing
- \*Sponsor culminating events: symposia, environmental health fairs, assemblies, open houses, science fairs
- \*Develop multi-media resources
- \*Offer distance learning training using interactive communication technology
- \*Collaborate with tribal groups, community-based education specialists to enhance K-12 environmental health science education for formal and informal science learning;
- \*Expand public support for integrating EH training in K-12 schools consistent with Montana's Indian Education for All Act making resources available at community health fairs and school events.

# CyberSurgeons Live Simulation Development

## Center for Educational Technologies at Wheeling Jesuit University

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### Topics Addressed:

Human anatomy and physiology, understanding  
clinical trials, the diagnostic process

### Audience(s):

High school students taking biology, health, or anatomy

### Project Goals:

1. Improve science education using innovative and highly engaging approaches to teaching and learning.
2. Increase science literacy among high school students taking biology, anatomy/physiology, or related classes.
3. Promote career awareness for biomedical fields among the target population.
4. Create a program with the potential to be replicated for widespread use
5. Build on existing science education programs.

### Project Description:

The CyberSurgeons simulation provides an authentic way for high school students to apply science knowledge and skills. The mission curriculum is based on national and state science standards related to human body systems and the disease process. To complete the mission, students become part of the fictional CyberSurgeons remote trauma unit on a mercy ship. The simulated ship is equipped with high-tech hospital and medical research capabilities, state-of-the-art high-end communications systems, and dedicated satellites to relay information.

The mission is conducted through a videoconference hookup into schools. Before the live simulation, students learn how to analyze and apply simple datasets to medical situations. On mission day students connect live for 40-75 minutes with the "chief medical officer," played by a professional educator. As they travel up the Amazon River, teams of students receive alerts from research stations located in ports along the way, diagnose various maladies and recommend treatment. The students use an array of computer tools during the mission-- accessing a database that links symptoms, possible conditions, test results, and treatment options.

### Project Evaluation:

During the development process, the CET has conducted design-based evaluation. The live simulation and PBL components each have two cycles of development, classroom testing, formative evaluation, and revisions. Over the next two years, an external evaluator will conduct a summative research study utilizing a quasi-experimental design to demonstrate the effectiveness of the modules in classrooms. Dependent measures will be science literacy, science-related attitudes, and career development.

The following questions assess the impact of CyberSurgeons:

In what ways does CyberSurgeons increase the science literacy of high school students in targeted contexts?

In what ways does CyberSurgeons provide highly engaging science education in its design principles?

How does CyberSurgeons promote biomedical-related career awareness?

How effectively is CyberSurgeons disseminated?

How well does CyberSurgeons facilitate teachers' implementation by building on existing science education curricula?

How does CyberSurgeons take into account the needs of underrepresented and underserved populations?

### Materials/Products/Exhibits Produced:

We have produced a beta-tested version of the live simulation and all mission-related student and teacher materials such as worksheets and lesson plans.

We are in production of several problem-based learning modules delivered online.

### Dissemination Strategies:

Program dissemination utilizes a multimodal, multifaceted approach with the goal of program sustainability past the grant period. Over first three years, we have fostered partnerships with three geographic regions in the development and testing process. In the final two years, the program will be promoted regionally, then nationally—doubling program outreach each year. Additionally, the program will be promoted among informal science education entities such as science centers and Challenger Learning Centers. Other dissemination means include conferences, workshops, promotional mailings, and research papers.

# Partnership in Biomedical Discovery

## University of Pittsburgh

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### Topics Addressed:

Biomedical research using genetics and molecular biology of model organisms. Evolution and natural selection.

### Audience(s):

Students and teachers 9-12; students 1-8

### Project Goals:

1. Scientific research participation for HS students & teachers
2. Development of inquiry-based curriculum for HS biology
3. Delivery of experimental inquiry modules to grades 9-12
4. Student delivery of science instruction to grades 1-8
5. Development of novel metrics for inquiry-based learning

### Project Description:

- Team HS teachers and students in cutting-edge genetic research using model organisms  
Three projects (selected from 9 research labs) carried out in 7-week summer program.  
Teacher-student lab teams are assisted by graduate and undergraduate researchers.  
Products (mutants, cloned genes, etc.) returned to originating labs for follow-up.
- Develop inquiry-based learning modules for HS biology  
Curriculum Roundtable includes teacher-researchers, Advisory Board and Univ. faculty.  
Class and lab modules use model organisms for strictly inquiry-based learning.  
High-school students develop and deliver science inquiry activities for grades 1-8

Students of "Gene Team Science Corps" teach in grades 1-8

- Promote and support the adoption of inquiry-based learning methods  
Staff support promotes and assists implementation by school visits.  
"Kits" program provides all materials for lab modules.  
Support high-school student visits to classes grades 1-8

### Project Evaluation:

Evaluation goals:

1. Determine how participation in the 7-week summer research experience affects
  - (a) scientific reasoning skills of student and teacher summer participants
  - (b) cognitive content of questions posed by student and teacher summer participants
  - (c) frequency of adoption of inquiry-based curriculum
  - (d) amount of time teachers devote to inquiry-based learning
  - (e) educational/career paths of student participants
2. Determine whether and how much inquiry-based learning affects student scientific reasoning skills and cognitive content of student questions.
3. Measure program effectiveness in reaching quantitative annual and cumulative performance goals.

Evaluation design

The principal instruments and methods to be used will be:

1. For scientific reasoning skills, a written test is administered before and after the summer program. This test was designed by our program evaluator (K. Raghavan), based on the work of A.E. Lawson, TIMSS and NAEP, modified in consultation with program staff. The test is relatively free of specific content knowledge, and attempts to measure abstract reasoning skills important in science, including: conservation principles, proportional reasoning, probability, control of variables, correlation, and inference. This test is now being refined after our first experience with it.
2. The same test is given as "before and after" assessment in high school classes making extensive use of our inquiry-based learning modules.
3. Summer program participants write questions about their lab experience in biweekly online sessions. Questions are scored on a cognitive category scale by multiple graduate student scorers.
4. All participants receive an attitudinal survey instrument at the start and end of the summer program. This is supplemented by personal interviews conducted by our lead evaluator.
5. Our Assistant Coordinator tracks adoption of the inquiry-based learning modules in schools, and use of in-class kits.
6. Program Staff and our Advisory Board compile annual quantitative data pertinent to our annual performance goals for participant numbers, production of learning modules, adoption rates and kit usage.

Results of data analysis

There are four principal findings:

- (1) The scientific reasoning assessment of summer program participants and about 600 unselected high school students shows that our summer participants are an exceptionally talented group.
- (2) Summer program participants show dramatic improvement in cognitive content of scientific questions over 6 weeks of the program. This improvement remains almost completely intact at 1 month and 6 months after completion of the program.
- (3) Teachers participating in our one-week training workshop adopt inquiry-based curricular materials at only slightly lower frequency than teachers in the 7-week research program, but show much less confidence in conducting these activities independently.
- (4) The program meets or exceeds all quantitative annual performance goals.

### Materials/Products/Exhibits Produced:

Inquiry-based instructional module in Mendelian genetics, using *C. elegans*. Students carry out genetic crosses to explore concepts of dominance, partial dominance and independent assortment.  
Inquiry-based instructional module on Natural Selection, using predation of *Salmonella* by amoebae. Students carry out differential survival experiments using *Salmonella* of distinct genotypes.  
Inquiry-based instructional module on use of model organisms in biomedical research. Students learn characteristics of common laboratory model organisms and evaluate the suitability of each for specific biomedical research investigations.

### Dissemination Strategies:

- Training workshops for HS teachers in inquiry-based learning materials
- Encourage and assist trained teachers in promoting "lateral" dissemination to colleagues
- Learning modules and lab protocols on project website and other educational websites
- Gene Team Science Corps disseminates to elementary and middle grades

# Epidemiology and the Energy Balance Equation

## Montclair State University

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### Audience(s):

students (middle school), teachers

### Topics Addressed:

Obesity and nutrition

### Project Goals:

1. Create a curriculum, called Epidemiology and the Energy Balance Equation
2. Prepare teachers to teach the curriculum
3. Evaluate the curriculum
4. Disseminate the curriculum

### Project Description:

The broad, long-term objectives of this project are to: 1) create a curriculum, called Epidemiology and the Energy Balance Equation, that develops middle school students' understanding of the science of epidemiology by exploring patterns of physical activity and diet and their health consequences; 2) prepare teachers to teach the curriculum by conducting professional development workshops; 3) evaluate the curriculum by determining the degree to which it is associated with improved scientific literacy, abilities in scientific inquiry, understanding of epidemiology, knowledge of the physical activity and diet and their health consequences, and increased interest in science and careers in public health; and 4) disseminate the curriculum by having it taught by science, mathematics, and health teachers, in both middle and high school, and in a variety of venues.

### Project Evaluation:

The curriculum will be field-tested in after-school Epidemiology and Public Health Clubs that are led by the Field-Testing Team teachers. During the field-test, using a pre-test / post-test, experimental / control group study design, we will test the hypotheses that exposure to the curriculum will improve scientific literacy, abilities in scientific inquiry, understanding of epidemiology, and knowledge of the physical activity and diet and their health consequences, and increase interest in science and careers in public health.

### Materials/Products/Exhibits Produced:

NA

### Dissemination Strategies:

The curriculum will be revised, posted on an Epidemiology and the Energy Balance Equation web site, and disseminate it by leveraging government regulation, presenting at professional meetings, conducting professional development workshops, and adapting the curriculum for use by specific audiences.

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**Topics Addressed:**

student science enrichment teacher professional  
development inquiry based learning

**Audience(s):**

teachers and students

**Project Goals:**

1. • Create inquiry-based lesson plans for elementary, middle, and high school classrooms that engage students in a deeper understanding of the relationship between classroom science, research science, c
2. • Provide focused professional development activities for K-12 teachers to effectively deliver inquiry-based lessons that deepen the understanding of the processes of scientific inquiry and its relati
3. • Expose students and teachers to career options in biomedical research through the development of inquiry-based lesson plans.
4. • Create enrichment opportunities for K-12 students designed to attract them to careers in biomedical research.
5. • Develop traveling scientific exhibits, related to the promotion of healthy lifestyle choices, that are anchored in interactive, hands-on experiences and directly linked to the classroom curricula, N
6. • Promote community awareness of healthy lifestyle choices through use of the traveling exhibits and related science museum activities.

**Project Description:**

Research, Education, And Linking Science Careers: REAL Science Careers, is designed to achieve the objectives described above through these specific aims:

1. Professional development for teachers in an inquiry-based methodology, Problem-Based Learning (PBL), designed to increase student understanding of scientific inquiry and to integrate science topics now absent from the standard course of study.
2. Instructional material development to support inquiry-based lessons plans in the PBL methodology.
3. Assisted classroom implementation of the PBL materials created for this project.
4. Development of exhibits at SciWorks featuring current research on healthy lifestyle choices accompanied by traveling kiosks of each exhibit for schools and community display.
5. An evaluation design to support systematic collection of data regarding the impact of inquiry-based instruction on students' knowledge and attitudes about science concepts, scientific inquiry, and the translation of these topics to public health.

**Project Evaluation:**

This evaluation plan includes data collection from multiple sources (teachers, students, parents, faculty mentors, and museum visitors) using multiple methods (survey, interview, and focus groups) to assess the effectiveness of the components to achieve the project aims and goals. Project staff will be responsible for the evaluation plan described here. Dr. Stan Hill, Co-PI, who has extensive experience in evaluating curriculum design and implementation, teacher performance, and program effectiveness will lead the internal evaluation staff. Ms. Adrienne Loffredo, a research assistant in CERTL completing her masters' degree in research methodologies, will assist with data collection and analysis along with Mr. Curtis Dixon, a 30-year veteran teacher who will also assist with data collection during professional development activities and in classrooms.

External evaluators will be contracted to administer an independent evaluation process. Strategic Evaluations, Inc. currently provides this service for the SEPA project, CLEAR Science, in its fifth year, and for the Howard Hughes Medical Institute-funded project. It is anticipated that Strategic Evaluations, Inc. would be the contracted external evaluator.

Each of the internal evaluation components align directly with the four project components found on pages 29 and 30, as well as the project goals, outlined on page 29. Evaluating the project components both with regard to the project goals and their effectiveness will yield a fuller picture of the efficacy of this proposed project.

The four evaluation components are

1. Evaluation of professional development activities (both the PBL training and the additional customized materials development) described on pages 31-34 by teachers who participate in those activities.
2. Evaluation of the developed curriculum materials by students who receive the curriculum, teachers who implement the curriculum, and trained observers.
3. Evaluation of the student internships by students, teachers, and faculty mentors.
4. Evaluation of science museum exhibits and traveling exhibits.

**Materials/Products/Exhibits Produced:**

PBL units to support inquiry based lesson plan implementation

**Dissemination Strategies:**

The PI and CERTL professional staff have provided professional development in PBL to teachers beyond the funded area of Winston-Salem/Forsyth County Schools in 12 North Carolina counties and in 6 additional states. Further dissemination will occur through networked collaborations. The PI has established a formal collaboration with the University of Tennessee at Memphis School of Medicine to provide professional development in PBL to Memphis City Schools through a recently awarded SEPA project. PBL instructional materials will also be made available to the teachers trained in Memphis.



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**Topics Addressed:**

Topics addressed are; 1) The biomedical science of the heart; 2) The biomedical science of the mouth; and 3) How to use 3D technology to create interactive models to inform others about science and research related to the human heart, mouth and brain.

**Audience(s):**

minority and underrepresented middle school students and teachers

**Project Goals:**

1. Increase the interest and knowledge of minority and underrepresented middle school students ages 11 to 15 in biomedical sciences, clinical trials, and scientific uses of technology.
2. Expand the biomedical science, technology skills, and biomedical science career knowledge of middle school teachers and counselors serving minority and underrepresented students.
3. Evaluate changes in student interest, knowledge, skills and changes in career paths in biomedical science.
4. Design and distribute the TRY-IT curriculum which includes a technology-rich exhibit for K-12 students.

**Project Description:**

TRY-IT targets minority and underrepresented middle school students with: 1) Two weeklong Summer Sessions at the University of Kentucky campus in Lexington for two consecutive years; 2) Saturday/After-school sessions for two academic school years; and 3) Mentoring relationships with community professionals, University Scientists and State Government Information Technology (IT) staff. In addition, TRY-IT provides middle school science teachers with professional development courses that focus on biomedical science and the scientific uses of technology. School counselors also learn additional skills and education requirements for future careers in biomedical science.

**Project Evaluation:**

Project staff recruited the first cohort of 36 middle school students and 7 science teachers from Leestown Middle School, Lexington Traditional Magnet School, and Edythe J. Hayes Middle School. TRY-IT targets students who are low income which is evidenced by their family eligibility in the free or reduced lunch program and who also demonstrate achievement in math and science based on standardized test scores, or who have been recommended by a teacher or other educator. Priority is given to students who meet the above criteria who volunteer to be randomized into the program group or a comparison group. Future cohorts will be selected using the above criteria with additional students being recruited now. 2008 recruitment began with those schools already involved in the TRY-IT program and additional schools for a total of 4 local middle schools.

During the project's initial year, 36 students enrolled in TRY-IT (20 females and 16 males). The majority were African American (58.3%), followed by Caucasian (16.7%) and Hispanic (11.1%) participants. Comparisons of socio-demographic information revealed no major sex differences, with the exception of race (more Caucasian females than males). The average number of household members was 4.1. Many of the participants' parents had completed some college or trade school, but few had a college degree. In general, participants came from homes with low household incomes. Interestingly, the overwhelming majority (88.9%) plans to attend a 4-year college. Comparisons of female and males revealed few significant sex differences on individual psychosocial measures, with the exception that girls were more confident that they could successfully complete the required education and/or training to be a social worker (mean 7.89 versus 5.23;  $p > .05$ ) or a travel agent (mean 7.74 versus 4.5;  $p > .02$ ). Changes in psychosocial measures from Baseline to follow-up after the Summer Institute revealed a general improvement of both girls' and boys' knowledge about science and technology as well as attitudes toward science. Mean scores improved for male respondents on persistence, attitudes toward science and technology, and learning self-efficacy. However, a decrease in mean scores was found for females on persistence, attitudes toward technology, and learning self-efficacy. In addition, school self esteem remained stable across the two points of data collection. Career gender stereotypes were rated for eight professional categories according to beliefs of whether choosing the career would be mainly masculine or feminine. Results show, for example, that librarian was perceived as a mainly female profession, while engineer was seen as predominately male. These scores remained stable across the two data collection times.

**Materials/Products/Exhibits Produced:**

None to date.

**Dissemination Strategies:**

Not ready for distribution at the present time

# Positively Aging®: Maintaining Mobility Across the Lifespan

## The University of Texas Health Science Center at San Antonio

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### Topics Addressed:

Aging, mobility, obesity, diabetes, forces and motion. See website for additional topics.

<http://teachhealthk-12.uthscsa.edu/>

### Audience(s):

Teachers (6-8)

### Project Goals:

1. Provide innovative, effective science, math, and health teaching materials
2. Help students make critical, life-determining decisions for extending and enhancing their own lives
3. Improve teacher professional development to increase the quality of science and math instruction
4. To define and describe the evolving model of teacher professional development in which the Positively Aging® teachers are trained

### Project Description:

The Positively Aging® program involves partnerships between UTHSCSA researchers and health professionals and Bexar County area school teachers. Teachers participate in intensive summer professional development programming and, in collaboration with researchers, they acquire advanced science content and create innovative multidisciplinary health science curricular materials. The materials are disseminated through the project website: <http://teachhealthk-12.uthscsa.edu> and at local, national, and international venues.

### Project Evaluation:

A controlled trial evaluation was conducted (2000-2003) with four schools to test the best dissemination method. Data showed that in-school support by project staff working with teachers was necessary to increase utilization of the Positively Aging® materials. Website, summer training and workshops alone were insufficient dissemination strategies. Pre/post knowledge tests were collected in 2006-2008 to test the effectiveness of the curricular materials. Results indicate that the Positively Aging® lessons can have a significant impact on student knowledge gains. Sample data collected: Discrepant Design: Levers in the Body (N=95 (7th grade);  $p < .001$ ;  $r^2 = .53$ ) and Sedentary Stan: Vascular Complications of Diabetes (N=56 (8th grade);  $p < .001$ ;  $r^2 = .22$ ). During 2003-2009, a comprehensive review of 66 instruments confirmed that the majority of existing science attitude instruments needs psychometric validation. Results of this study are published in the International Journal of Science Education and available upon request. Additionally, the Women in Science Survey (WiSS) was evaluated using factor analyses, suggesting that the WiSS can be shortened to 14 items spanning two revised dimensions. The Simpson-Troost Attitude Questionnaire (STAQ) was evaluated as well using factor analyses and structural equation modeling. Results suggest that the STAQ can be reduced to 22 items spanning five revised subscales. Results from the structural equation model showed some grade and gender differences and strong associations among classroom environment, self-directed effort, and science affect. Findings raise the potential for teacher professional development to improve science classroom activities and influence student self-directed effort and science affect. The revised scales, WiSS-R and STAQ-R, are available upon request.

### Materials/Products/Exhibits Produced:

Interdisciplinary, innovative health-related lessons and activities have been developed by the Positively Aging® teachers, staff, and researchers. These activities are freely available on the project website at <http://teachhealthk-12.uthscsa.edu>.

### Dissemination Strategies:

Dissemination strategies used by the Positively Aging® team include teacher workshops; presentations at local, state, and national conferences; collaboration with area school district curriculum-development teams; and the project website located at <http://teachhealthk-12.uthscsa.edu>.

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**Audience(s):**

4th and 5th grade students, teachers, parents, families

**Topics Addressed:**

nutrition and obesity, traumatic brain injuries and neurobiology, infectious diseases and immunology, environmental toxics and poisoning prevention, nutrition and diabetes, lung disease and the respiratory system, genetics and sickle cell disease, heart disease and the circulatory system.

**Project Goals:**

1. Help 4th and 5th grade students meet state and national objectives for learning in health, science, and scientific inquiry.
2. Equip 4th and 5th grade students to live healthier lives by providing scientific information that they can translate into behaviors that lead to disease prevention.
3. Stimulate the interest of 4th and 5th grade students in health and biomedical science careers, particularly students from minority groups traditionally underrepresented in health and scientific professions
4. Enhance the professional skills of teachers and after-school staff by providing them with hands-on lessons in health and biomedical science.
5. Enable students and parents to learn together, at family festivals, about the connections between health and state-of-the-art research.
6. Help children and parents understand how both genetic and social factors contribute to health, and enable them to identify lifestyle changes that can improve their health.

**Project Description:**

To address goals 1-3 above, the project has developed a novel, interactive health and biomedical science curriculum specifically aimed at diverse 4th and 5th grade students in economically deprived areas. The curriculum was piloted in the classroom with students from two elementary schools in Oakland, California, and is now being disseminated through after-school science clubs in Oakland, Berkeley, and Contra Costa County, California. The curriculum—which addresses minority health issues such as asthma, obesity, diabetes, and heart disease—includes four five-lesson instructional units for 4th grade, and four five-lesson instructional units for 5th grade.

To address goal 4, the project has held 15 teacher workshops at the Hall of Health, Children's Hospital Oakland Research Institute (CHORI), and school sites. Workshops at the Hall of Health and school sites have focused on use of the curriculum and related hands-on activities for students. Those at CHORI have brought teachers and scientists together to enable teachers to learn about state-of-the-art biomedical research.

To address goal 5, the project has developed a family science festival and presented it 15 times. The festival consists of 17 hands-on activity stations on such topics as nutrition and portion sizes, energy balance, human anatomy, diabetes, brain anatomy and function, respiratory anatomy and function, heart anatomy and function, genetics, and hand washing.

To address goal 6, the project has developed and disseminated both permanent and traveling versions of "Your Genes & Your Choices," a hands-on exhibit on social and genetic factors in health. The exhibit has eight activity stations: 1. Our Genes Make Us the Same, 2. Our Genes Make Us Different, 3. A Reason for Skin Color, 4. We're All from Africa, 5. Genes Can Cause Disease, 6. Sometimes There's a Reason for Disease, 7. It's Not Just Your Genes, and 8. Take a Break from Stress.

**Project Evaluation:**

The evaluation has used surveys, reflection forms, pre/posttests, interviews, focus groups, and direct observation by the evaluator.

A 20-item, multiple-choice pre/posttest has been developed for each curriculum unit. These tests look at changes in students' self-reported, health-related behaviors (e.g., food choices and frequency of washing hands), their knowledge of science concepts and careers covered by the curriculum, and their understanding of the scientific process.

During the 2006-2007 school year, the pre/posttests were administered for each curriculum unit at two experimental ( $N = 332$ ) and two comparison ( $N = 221$ ) schools. T-test analyses showed that students in the experimental group had statistically significant improvements ( $p < .05$ ) on more items on each unit test than the students in the comparison group. The greatest differences were for the brain unit, where the experimental group improved on 19 items, and the comparison group on 6 items, and for the genetics unit, where the experimental group improved on 13 items, and the comparison group on 0 items.

A reflection form is used to evaluate the teacher workshops. This form asks teachers to rate their satisfaction with the workshop on a scale from 1 (low) to 10 (high). It also asks them to state what they learned, how they thought the workshop was successful, how they felt it could be improved, and which of the activities and ideas presented they plan to use in their classrooms. Since the inception of this project, 15 teacher workshops have been conducted with 167 participants. The average workshop satisfaction ratings given by the teachers have ranged from 9.0 to 9.5. Typical comments are "Informative, really energizes me to teach more science" and "I will do most of the experiments."

Similarly high ratings have been obtained on reflection forms for the family science festivals and on surveys for the exhibits.

**Materials/Products/Exhibits Produced:**

1. Four 4th grade curriculum units, each consisting of five one-hour lessons. Topics: nutrition/obesity, traumatic brain injuries, infectious diseases, and environmental toxics. Each unit includes experiments, games, demonstrations, and interaction with researchers and health care providers.
2. Four 5th grade curriculum units, each consisting of five one-hour lessons. Topics: nutrition/diabetes, asthma and lung disease, genetics, and heart disease. Each unit includes experiments, games, demonstrations, and interaction with researchers and health care providers.
3. Permanent and traveling versions of "Your Genes & Your Choices" an exhibit on social and genetic factors in health.
4. Museum field-trip programs on body image and genetics.
5. Family science festival with 17 stations.
6. Evaluation tools: reflection forms for parents, teachers, and presenters; exhibit surveys; pre/posttests for curriculum units.

**Dissemination Strategies:**

1. Posting the curriculum on the Internet at <http://hallofhealth.org/sepa/curriculum.htm>
2. Holding workshops to train teachers and after-school personnel to use the curriculum.
3. Presenting the curriculum in after-school science clubs.
4. Sending the traveling exhibit to other museums and health education centers nationwide.
5. Writing papers on research findings (in progress).
6. Book and CD (seeking funding).

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**Audience(s):**

high school teachers and students

**Topics Addressed:**

stem cells, molecular evolution of cholera, kidney disease, and the neurobiology of vision repair

**Project Goals:**

1. Create educational materials to promote a greater understanding of the relevance and importance of biomedical research.
2. Develop strategies for integrating curricula into courses designed to correlate with NY State and National science education standards.
3. Develop a model for disseminating the curricula on a local, statewide, and national level.
4. Develop a model for training scientists (graduate students and post-doctoral fellows) in the presentation of curriculum and scientific information to high school students.
5. Help graduate students and post-doctoral fellows to develop skills for communicating science knowledge clearly and concisely in a way that is interesting and engaging to non-scientists.

**Project Description:**

This project brings together University of Rochester scientists and science educators from the Life Sciences Learning Center (LSLC) in developing and disseminating four curriculum modules that focus on biomedical research that is being undertaken by University of Rochester Medical Center scientists. These modules provide learning and teaching strategies to engage student interest, support learning of biological concepts, and foster an awareness and understanding of biomedical research.

The topics of the four case-study based module are: (1) Stem cells, (2) Molecular evolution of *Vibrio cholerae*, (3) Neurobiology of vision repair after brain damage, and (4) Kidney disease and transplantation.

For each module we are creating two versions of the lessons - a "classroom version" and a "LSLC version." The classroom version of the lessons are disseminated to classroom teachers by trained "Mentor" teachers who are part of the New York State Biology-Chemistry Professional Development Mentor Network. The LSLC versions of the lessons are used in field trip programs at the LSLC taught by our graduate student and post-doctoral interns. Nation-wide dissemination of the curricula is facilitated through workshops and a website in which educators can download the lessons for free.

**Project Evaluation:**

Our comprehensive, mixed-methods evaluation consists of process and outcomes measures, employing both quantitative and qualitative methodologies. We are assessing the implementation of the curricula and the impact of the curricula on student content knowledge.

The objectives of the development phase evaluation are:

1. To provide evidence that the curriculum modules are "usable" in the high school classroom setting and at the LSLC
2. To provide preliminary evidence that use of the curriculum modules increase student content knowledge and awareness of topics in biomedical research.

The objectives of the dissemination phase evaluation are:

1. To provide evidence that the curricula are "transportable" – that curriculum modules can be disseminated widely (by Mentors, Teachers and Scientist Instructors)
2. To provide evidence of impact of curricula on students' content knowledge and awareness of topics in biomedical research.

During the development phase (Years 1-3) we are collecting formative data from "Pilot Teachers" and LSLC staff to assess the usability of the curriculum modules in classrooms and at the LSLC (i.e. how is the curricula implemented, are the students engaged, etc.). We are also collecting data to assess the impact of the curricula on student content knowledge. Formative evaluation data from the pilot testing includes: (1) pilot teacher written feedback collected during the pilot teacher training workshop; (2) pilot teacher written feedback following use of the curricula in their schools; (3) observation of classroom teaching; (4) notes from teacher interviews following pilot-testing; (4) samples of student work.

During the dissemination phase (Years 4-5) we will collect data to assess the use of the curricula by a much larger group of teachers (statewide teachers who are trained at the Mentor-led workshops) and their students. We will also collect data from graduate students and post-doc "Scientist Instructors" who lead the LSLC sessions.

**Materials/Products/Exhibits Produced:**

A Medical Mystery of Epidemic Proportions -

Extended Version: A series of 8 lessons and hands-on activities on the biology of cholera and the molecular evolution of a new strain, epidemic causing of *Vibrio cholerae*. Includes an animated slide show.

Short Version (2 class periods): Students explore a case study about a cholera epidemic. They conduct laboratory tests to identify the disease-causing organism and determine why people who have had cholera or been vaccinated do not have immunity. They develop a plan for preventing the spread of cholera.

Stem Cell Biology:

A series of 10 lessons on stem cell biology created for easy integration into 40 minute class periods.

Stem Cell Biology: The Adventures of Cryptic Ron

A 3.5 hour continuous case-study session (as presented at the LSLC). Includes a video presentation.

**Dissemination Strategies:**

- Teacher workshops held in New York State led by our partners from the NY State Biology-Chemistry Professional development Network.

- Teacher workshops led by our group at the National Association of Biology Teachers (NABT) and National Science Teachers Association (NSTA) conventions.

- Our curriculum materials are posted on our website (<http://lifesciences.envmed.rochester.edu/downloads.html>) for free downloading

# Six Star Science for Student-Centered Learning

## American Physiological Society

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### Audience(s):

Middle and high school science teachers, biomedical researchers, graduate and postdoctoral students in biomedicine

### Topics Addressed:

Physiology, life science, science, pedagogy

### Project Goals:

1. Develop, evaluate, refine, and disseminate a model and materials to help teachers create Six Star Science learning environments within the context of their state standards-based curricula.
2. Build ongoing working relationships between basic and clinical research scientists and MS/HS teachers through research, in-service experiences, classroom visits, and online communications.
3. Promote the effective implementation of state standards for K-12 content and pedagogy -- especially inquiry-based teaching, diversity strategies, and technology use.
4. Provide a model for biomedical research societies and organizations for promoting the public understanding of basic & clinical research and facilitating improvements in science education.

### Project Description:

The Six Star Science Research Teacher Fellowship program provides middle and high school teachers with a framework for creating effective student-centered learning environments within their state-mandated curricula. The program includes both proven components from the APS Frontiers in Physiology program (summer research experiences for teachers, curriculum review and adaptation activities, a Science Teaching Forum focused on effective pedagogy). New components include online and live short courses on basic versus clinical research and research ethics. These courses will be open to the public for use by teachers and students worldwide. In addition, teachers will develop 4-page primers describing their research and related clinical studies as well as the physiological system in health and disease. Finally, teachers will learn to develop podcasts on their research topic to share with students and the public. The program is built on Six Star Science, the APS research-based framework for supporting excellence in science education for diverse students: Student-centered instruction, promoting diversity, integrating technology, using authentic assessment, integrating current content, and reflecting on teaching and learning.

### Project Evaluation:

#### Evaluation of Impacts on Teachers

Data to evaluate impacts of the programs on the participants will be drawn primarily from actual work produced by the teacher, including a portfolio of his/her work throughout the program. Portfolios will include baseline assessments, online professional development work, transformed lessons, field test results, and all new products produced. For some objectives, teachers will complete online surveys or assessments to evaluate specific impacts of the program. In all cases, instruments will be either previously proven or will be field tested with past RTs and reviewed for content externally. Instrument length will be minimized so that teachers' spend necessary but not excessive time on the evaluation component of the program. Surveys are conducted at a secure online survey site. All responses are confidential, coded by an identifier, and stored in secure databases at the APS. An external evaluator will review each teacher portfolio for evidence of overall teacher professional development in addition to the specific objectives.

#### Evaluation of Impacts on Research Hosts

Hosts will complete an online survey that addresses the objectives at the start of the fellowship year and again at the end of the year. Their participation in APS K-12 outreach programs will be tracked over a 5-year period, and they will receive a biannual survey to assess ongoing activities with their teacher. In addition, the external evaluator will interview selected research hosts to gain formative feedback on whether the program information, structure, etc. is providing them with the resources they need.

#### Materials Development

The materials field-testing will take place in the classrooms of both current and past RTs via the WISE site, a secure student learning environment where student names are visible to the teacher but not to the research team member. Therefore, student responses, for research purposes, are confidential.

### Materials/Products/Exhibits Produced:

\*Six Star Science Lab Activities are state-mandated lessons that are enhanced to promote student-centered learning.

\*\*"Bench to Bedside" ("BTB") Primers are four-page handouts that highlight the RT's summer research project, related clinical research, normal physiology, and health issues.

\*\*"Bench to Bedside" ("BTB") Podcasts are audio/video Podcasts of the BTB Primers.

\*\*"Bench to Bedside" ("BTB") online WISE Units for Teachers and Students provide an interactive lesson on basic and clinical research, research ethics, and public health benefits.

### Dissemination Strategies:

\*Workshops and exhibits at national science education conferences, including NSTA, NABT, SACNAS, NSDL meetings.

\*Publications on varied aspects of the program in science education journals.

\*Seminar Series on K-12 Partnerships for other constituent societies of the Federation of American Societies for Experimental Biology (FASEB) and other societies in the metropolitan Washington, DC area, highlighting aspects of the program and resources that can be used by other societies.

\*Products posted on the project website, and reviewed for scientific accuracy and catalogued into the APS Archive of Teaching Resources, allowing access through the BioSciEd Net Portal, the NSDL Pathway Portal to the Biological Sciences ([www.bioscienednet.org](http://www.bioscienednet.org)).

\*Program promotion to program directors at colleges of education, state, and district science coordinators, the SEPA community, and national science education organizations.

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**Audience(s):**

children ages 5-12 and their families and teachers

**Topics Addressed:**

fitness, fitness measures, nutrition, obesity, inquiry, data analysis, research, health science careers

**Project Goals:**

1. Engage children and families in physical challenges and related activities that prompt them to increase their physical activity or continue physical activity if they already are pursuing it daily.
2. Enable children and families to plan and track their own physical activity and nutrition, in essence conducting action research on their own health and development.
3. Facilitate children's and families' understanding of research and the research process as it relates to exercise, nutrition, and their own health.

**Project Description:**

Supported by a partnership with Baylor College of Medicine, PowerPlay includes the following products and services:

1. An interactive, bilingual (English/Spanish) long-term exhibit at CMH that engages visitors in a set of interconnected, novel, and rigorous full body physical challenges integrated into a multi-story structure. Participation increases visitors' activity levels within the Museum and aims to encourage them to pursue new types of physical activities outside of the Museum. The exhibit launched March 14, 2009.
2. Planning and tracking devices and strategies – PowerTrackers – that are integrated into the exhibit activities. Children and families use these devices, along with the associated Kid Card, to investigate their bodies' responses to a host of physical activities, and record their progress on a password protected personal profile on the PowerPlay website hosted by Baylor.
3. Inquiry-oriented demonstrations and facilitated activities – Power Science Lab – developed and led by educators, research scientists, graduate students, and postdoctoral fellows from Baylor and other local organizations. These short programs delivered by educators, scientists and students of health science programs connect families with research related to the influences of exercise and nutrition on health.
4. A bilingual (English/Spanish) pre/post museum field experience web-resource – PowerPlay at BioEd Online – that will contain six guided bilingual inquiry lessons (downloadable) related to the content presented in the exhibit, professional development on the lessons in the form of streaming video presentations, and opportunities to interact with other teachers who are using the lessons via facilitated discussion forums on the same site. These resources are under development for field testing Fall 2009.

**Project Evaluation:**

Evaluation for PowerPlay is three-phased - front end, formative, and summative. The primary questions guiding evaluation are:

- What changes can be made to project activities to maximize their effectiveness?
- How effectively does PowerPlay accomplish the project's Specific Aims and intended outcomes?

Cecilia Garibay, M.Ed. and Baylor College of Medicine faculty will serve as project evaluators—Garibay with expertise in museum exhibit and program assessment and Baylor with expertise in the assessment of classroom curriculum and web-based learning tools. CMH and Baylor, working together with Garibay, are collaboratively planning and executing the methodologies for all three evaluation phases. Front end assessment is complete. Formative prototyping is complete and formative remedial assessment of the exhibit is just beginning. Summative evaluation will ensue in Fall 2009.

**Materials/Products/Exhibits Produced:**

PowerPlay exhibit for children 5-12 years old and their families and teachers. The exhibit holds 12 physical challenges that visitors can pursue in a variety of ways.

PowerPlay website hosted by CMH and Baylor College of Medicine. The CMH aspect of the site has general information about the exhibit. The connected Baylor site is the place where visitors can access the data that they accumulate with their Kid Cards while visiting the exhibit.

PowerPlay at BioEd Online is a site being developed by Baylor College of Medicine that will provide activities and training that teachers can use to prepare students for their exhibit visit.

**Dissemination Strategies:**

Project partners plan to present on the evaluation findings as soon as the final report is ready.

# Nationwide Dissemination of Inside Cancer, a SEPA-Funded Internet Site for Teachers Cold Spring Harbor Laboratory

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## Audience(s):

Secondary health and biology teachers and other biology professionals or educators

## Topics Addressed:

Cancer biology, cell cycle control, cell death, angiogenesis, senescence, metastasis, immune responses, causes, prevention, diagnosis, treatment.

## Project Goals:

1. Develop a Teacher Center with tools to build custom multimedia presentations and collaboratively-generated lesson plans.
2. Disseminate the Internet site and teaching tools through first- and second-round workshops to reach 1,440 faculty nationwide.
3. Evaluate general use of the Internet site, effects of workshop participation, and use of the Internet site in science classrooms.

## Project Description:

With Phase I funding we developed Inside Cancer, a multimedia Internet resource for understanding the molecular genetic basis of cancer. On a biological level, the site takes students inside the cell to explore the molecular and genetic roots of cancer. On a sociological level, it provides the insider's perspective of the world of cancer research. One objective is to help students understand how modern concepts from molecular and cellular genetics are being integrated into ideas about cancer diagnosis, prevention, and treatment. Another is to allow students to learn modern biology in the same way as basic cancer researchers – by meeting scientists, seeing how experiments are done, and by visualizing the unseen world of genes and molecules. This Phase II grant aims to improve the usefulness of Inside Cancer for educators, disseminate Inside Cancer to biology and health educators through workshops, and assess the impact of the workshops and the teaching using the Inside Cancer website on student learning.

### Teacher Center

We have developed several features that improve the usefulness of the Internet site in the science classroom.

- A search/viewer interface that allows teachers to find and organize any content "atoms" used to build Inside Cancer, as well as other DNALC Internet sites. A keyword search looks for matches among metadata fields that describe each item. Then, teachers can save items to their own profiles for classroom use.
- A Concept Matrix currently displays links between major Inside Cancer sections and several national science education standards. Individual content items are also cross-referenced to key concepts embodied in major national and state standards and syllabuses.
- A Lesson Wiki that allows teachers to build and communally edit lesson plans. The Wiki is being seeded with lessons developed during teacher workshops and by Inside Cancer Fellows.

## Project Evaluation:

We are conducting a multi-faceted evaluation program in collaboration with an external consultant, Robert Abrams Consulting. This evaluation includes monitoring Inside Cancer website traffic using Webtrends data to obtain information about site visitation ([http://www.dnalc.org/ddnalc/websites/site\\_statistics.html](http://www.dnalc.org/ddnalc/websites/site_statistics.html)). We are also using online surveys to monitor visitors to Inside Cancer. A longitudinal study of workshop participants with pre-, post-workshop, and 12-month follow-up surveys aims to gauge Inside Cancer use and ascertain how classroom use of Inside Cancer complements required instruction in biology and health. Some preliminary results from post-workshop surveys include: 95% of participants reported being very likely or likely to use Inside Cancer in their teaching, 78% of participants expect to use the site 4 or more times; 44% of participants expect to use Inside Cancer over a semester or a year; and 63% expect to use the site two to six times per year. This expected use is encouraging and suggests the site is seen as a valuable teaching tool. When asked to estimate changes in understanding, 59% reported Very Great or Great improvement in their understanding of cancer, 44% reported Very Great or Great improvement in their understanding of how to use technology, and 66% reported Very Great or Great improvement in their understanding of "how to teach cancer to my students". Although predominantly positive, feedback from surveys is continuously used to fine-tune the site and workshops. Finally, an experimental study will assess attitudinal and learning effects among high school biology and health education students whose teachers have participated in an Inside Cancer Workshop. The study will assess student changes, pre- and post-instruction, across three dimensions: 1) understanding of key concepts of biology and the scientific process, 2) understanding the genetic and cellular effects of smoke and other mutagens, and 3) attitudinal changes about health-risk behaviors, especially smoking.

## Materials/Products/Exhibits Produced:

### Materials and Products Produced:

#### Inside Cancer searcher/viewer:

The Inside Cancer website has been improved with the addition of a Teacher Center allowing teachers to create and store customized presentations by searching and selecting Inside Cancer and other DNA Learning Center multimedia content.

#### Teacher Wiki:

The Inside Cancer Wiki provides teachers with a place to develop and share lesson plans using Inside Cancer content.

#### Standards alignment:

Inside Cancer content has been aligned to national standards. The aligned material is easily accessible in a concept matrix and is displayed with each Inside Cancer item in the Teacher Center.

#### Inside Cancer content:

The Inside Cancer website has been improved by the addition of material from other DNA Learning sites in response to Inside Cancer fellow feedback.

#### Inside Cancer assessment tools:

The surveys and assessment tools include new tools to assess biology and cancer knowledge.

## Dissemination Strategies:

### Dissemination Program

Over the term of the grant, our aim is to provide 800 secondary biology and health teachers with intensive training at one-day workshops held at sites nationwide. The workshops are being conducted in conjunction with teacher professional meetings and science outreach programs at universities, and historically Black and Hispanic institutions. To date, 14 Inside Cancer workshops have been conducted. Another 12 have been scheduled for the summer and fall of 2009, for a total of 26. Second-round training by participants in Inside Cancer workshops is ongoing, and aims to reach an additional 640 teachers.



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**Audience(s):**

Elementary through high school teachers and students

**Topics Addressed:**

Infectious diseases; microbiology; cell and molecular biology; stem cells; genetics and genomics; HIV/AIDS; nature of science; human body

**Project Goals:**

1. Develop inquiry teaching materials on infectious diseases, biomedical research, healthy lifestyle choices, risk factors for disease, and the everyday relevance of science
2. Evaluate effectiveness of developed materials with diverse populations of learners
3. Provide support to teachers through face-to-face and web-based professional development
4. Disseminate developed materials through partnerships with Centers for AIDS Research and other organizations

**Project Description:**

The MicroMatters project aims to increase understanding by elementary and middle school students and their teachers of infectious diseases, biomedical research, healthy lifestyle choices, risk factors for disease, and the everyday relevance of science; and promote science/health teaching and learning through guided inquiry. The project has developed and published an in-depth inquiry guide for teachers entitled, *The Science of Microbes*, that introduces concepts related to microbiology, cell biology, populations, immune system, infection and disease (including HIV/AIDS) and history and nature of science. Field tests of the unit yielded statistically significant gains in student learning using a quasi-experimental comparison group design with pre/post assessments. In addition, related streaming video presentations, lesson demonstrations, science news and annotated PowerPoint slide sets on the same topics have been developed and made available on the project-related websites, BioEd Online ([www.bioedonline.org](http://www.bioedonline.org)), and K8 Science ([www.k8science.org](http://www.k8science.org)), which reach 1.5 million users each year. A new set of related inquiry activities specifically on the HIV/AIDS pandemic is under development. Dissemination of project-related resources is taking place through partnerships with biomedical research organizations, Centers for AIDS Research and individual schools and districts. A professional development short course for teachers on *The Science of Microbes* set of guided inquiry lessons is under development and will be made available online. Project dissemination partners receive free materials kits, support for teachers stipends and access to project-related teacher professional development. Approximately 675 teachers have participated nationally in *The Science of Microbes* live dissemination workshops at state and national meetings during the past two years.

**Project Evaluation:**

Project evaluations are being guided by the following questions: Do the instructional materials promote effective learning of science and health concepts by diverse populations of teachers and students? What are the scalable aspects of the project dissemination? What impact has the project made upon the extension of partnerships between scientists and educators? How effective are the technology components in creating and maintaining a community of users? To examine these questions, we are examining information from field tests, project partners, participants in teacher professional development, students and users of technology resources. The *Science of Microbes* unit was field tested in 18 Houston-area middle schools, with 12 additional classrooms serving as comparison groups. Students in both groups were given matched pre/post assessments of content. The assessment consisted of 20 multiple choice items investigating knowledge on topics related to the unit, such as "The global environment is dependent on microbes for ..." and "Which of the diseases below is not caused by a microbe?" Field test (n=344 students) and comparison (n=229 students) classrooms were statistically similar in student content knowledge before beginning the microbes unit ( $t = .325$ ,  $p = 0.745$ ,  $df = 563$ ). Afterward, field test groups saw an average gain of 18% on the posttest ( $t = 18.847$ ,  $p < .001$ ,  $df = 330$ ,  $d = 1.036$ ), while comparison group students' scores actually went down (8.96 and 8.61 pretest and posttest means, respectively).

**Materials/Products/Exhibits Produced:**

*The Science of Microbes*. Inquiry teaching guide aimed at teachers of grades 5-8, but also suitable for other grades. Available in hard copy or on the websites BioEd Online ([www.bioedonline.org](http://www.bioedonline.org)) and K8 Science ([www.k8science.org](http://www.k8science.org)).

Streaming video content presentations. Six presentations and annotated slides sets on topics such as Viruses, Infectious Diseases and Stem Cells.

Streaming video lesson and lab techniques demonstrations. 15 presentations to date on lessons in *The Science of Microbes* and microbiology.

**Dissemination Strategies:**

Dissemination strategies include: face-to-face teacher workshops; partnerships with biomedical research institutions and schools; web-based approaches (materials and professional development).

# Biotechnology/Bioinformatics Discovery!

## Oklahoma City Community College

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### Audience(s):

high school science teachers and their students

### Topics Addressed:

biotechnology; bioinformatics; with biomedical applications

### Project Goals:

1. increase awareness about biotechnology and its role in biomedical research
2. improve student success in science
3. enhance the quality of science learning
4. improve health science literacy

### Project Description:

Our project aims to enhance science education for students through professional development for teacher. Using the learning cycle as a pedagogical model, summer institutes work with participating teachers so they can use exemplary biotechnology and bioinformatics laboratory activities to teach science concepts which are aligned to state and national standards. Participating teachers are then provided with "ready-to-go" loaner kits containing all the equipment and materials needed to implement the activities in their classrooms. Pre-biotech middle school activities have been added. Capstone events in partnership with the University of Oklahoma Health Sciences Center and the GCRC in particular, make students aware of biomedical research and progress in OKC. A DVD on clinical trials has been produced in partnership with the OUHSC GCRC. Sustainability is being addressed with the setup of four rural loaner centers, stocked with equipment and materials and staffed by teacher-leaders who carry out some of the functions that our center at OCCC performs.

### Project Evaluation:

Early evaluation efforts used attitude surveys from students and indicated positive influence on students' interest in biotechnology and science careers. Teacher surveys consistently report favorable influence on students' interest and learning. Post teacher workshop evaluations showed positive experience and intention to implement. Our database of loaner kit deliveries confirms that 85% on average of teachers attending our workshops implement more than one of our biotech modules, and continue to use year after year. Student knowledge assessments using pre and post module matched testing showed statistically significant knowledge gains. Hence, we have evidence for positive changes in attitude and science knowledge as a result of our project activities.

### Materials/Products/Exhibits Produced:

Website [www.occc.edu/bbdiscovery](http://www.occc.edu/bbdiscovery) contains extensive resources for teaching biotechnology and bioinformatics at the middle school and secondary level: sample outline for high school biotech course, Hispanic teaching resources, internet resources, list of supported activities (modules) including protocols for laboratories, powerpoint presentations to go along with labs, photo gallery, online request form, listing of local and national professional development opportunities for science teachers, links to science and biotech workforce standards, and a list-serve for communication among project participants. NEW module on clinical trials as a model of a scientific experiment available, targeted to middle school students, includes DVD on clinical trials for students to view at home with parents (with Spanish subtitles option). Companion website contains the SOPs for making reagents and materials to perform wet labs: [www.occc.edu/mockbiotech](http://www.occc.edu/mockbiotech).

### Dissemination Strategies:

Two websites: [www.occc.edu/bbdiscovery](http://www.occc.edu/bbdiscovery) and [www.occc.edu/mockbiotech](http://www.occc.edu/mockbiotech).

Four publications to date.

Multiple presentations have been made at local and national conferences, including Oklahoma Science Teachers Association, National Association of Biology Teachers, national and regional National Science Teachers Association.

Presentations also made at school districts' in-service programs for teachers.

Loaner centers around the state provide equipment and materials in rural areas.

# Curriculum Modeled on Biodiversity and Vector-borne Disease

## Yale University

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### Topics Addressed:

vector-borne pathogens; infectious disease transmission; vaccine development; clinical trials; science process skills; disease ecology; tick and mosquito biology

### Audience(s):

Grade 5-11 teachers and students in underserved urban school districts; families; adult public

### Project Goals:

1. To build teacher capacity for bringing research in biodiversity and disease ecology into middle and high school classrooms in an engaging, inquiry-based style.
2. To develop innovative standards-based science curriculum resources that use Museum collections to investigate biodiversity and vector-borne disease ecology.
3. To increase middle school students' understanding and practical application of science process skills through the use of curriculum resources and museum specimens, and through visits to biomedical research laboratories
4. To release the teacher-designed curriculum resources through three national dissemination sites in California, Texas and Wisconsin.
5. To increase public understanding of the nature of biomedical sciences and scientific research in the context of two case examples: Lyme disease and West Nile virus.
6. To disseminate this model that describes collections-based science partnerships to school districts, and to biomedical research and informal science institutions

### Project Description:

The Yale University SEPA initiative is a professional development program for Connecticut middle and high school teachers. The project has designed a curriculum for grades 5 -11 to create a better understanding of the dynamics and biological basis of infectious disease transmission. The curriculum features Lyme disease and West Nile virus as models because of their public health significance, and because they point to broader biological relationships. Yale University is a major research center for these diseases and has provided scientific authority for the curriculum content. The project is centered at Yale's Peabody Museum of Natural History. The scientific component draws on the relevant expertise from researchers at the Yale School of Medicine departments of Internal Medicine and Pediatrics, the Yale School of Epidemiology and Public Health, and the nearby Connecticut Agricultural Experiment Station. Yale's SEPA Advisory Council includes three vector biologists, and four investigators engaged in research on Lyme disease, West Nile virus and other emerging infectious diseases under the auspices of Yale's CTSA (Yale Center for Clinical Investigation). In Phase I, investigators from the Yale University School of Medicine and the Connecticut Agricultural Experiment Station—together with the Peabody Museum educators—collaborated with a select group of 9 science teachers from three urban public school districts to design a curriculum based on their joint resources. The unit was refined after review by three independent evaluators and the SEPA Advisory Council. The final products included inquiry-based lesson plans, a teacher reference manual, and student science kits. Phase II will distribute these curricular resources regionally and nationally. The project activities reached 5,850 students during Phase I and are expected to reach 11,400 students in Phase II. The project will also design a traveling exhibit that focuses on Lyme disease and West Nile virus as models for depicting the crucial links between biodiversity studies and biomedical research.

### Project Evaluation:

Yale's SEPA project targets four main audiences: teachers, students, families, and informal science institutions. Each program component is being evaluated serially over the course of the program, beginning with formative evaluation to test early versions and provide feedback for program correction or improvement. Once each component has achieved its final form, it undergoes summative evaluation to assess the impact on its intended audience. Evaluation techniques are varied and have included quantitative and qualitative measures such as: written questionnaires, classroom observations, student performance tests, one-on-one interviews, and focused discussions. Formative assessment methods included lesson review by two curriculum consultants; teacher assessment of prototype lessons; classroom observations, and student focus groups. Student competence in science content and process has been assessed using a variety of measures including a pre-post test and portfolio review following the curriculum module's culminating project. In Phase I, a primary focus was the refinement of the curriculum module and an associated instrument for assessment of student learning. A pre-post test has been administered to three cohorts of middle and high school students to date ( $n = 1266$ ). The test contained 18 multiple choice and short-answer items covering module content. Middle school students ( $n = 720$ ) demonstrated improvements on all items with statistical significance at the  $p \leq 0.001$  level. High school student scores also showed improvements on all items, and statistical significance ( $p \leq 0.001$ ) for 16 items. A fourth student cohort will complete the post-test in June 2009. Comparison classrooms were identified and assessed in 2008-09. These were classrooms taught by teachers the semester before they began their participation in the SEPA program. An external evaluator is currently analyzing the data. Preliminary results demonstrate a significant increase from the baseline post (comparison group) to the post-test (experimental group). This indicates that the students' improved their performance on the test above the performance associated with the standard school curriculum as a consequence of the Yale SEPA curriculum.

### Materials/Products/Exhibits Produced:

An innovative curriculum module on biodiversity and vector-borne disease will use West Nile virus and Lyme disease as case studies. The module is modeled on Event-Based Science, a unique problem-based approach. EBS combines news footage of an actual event with additional primary sources to emphasize laboratory investigation, teamwork and student-driven learning. The curriculum module includes: • Field and laboratory exercises for students (such as investigating vector life cycles by collecting and examining mosquito larvae) • A teacher reference manual with extensive background information and assessment instruments • A DVD featuring news footage of surveillance and prevention activities for Lyme and West Nile • BioAction kits that contain pertinent Peabody Museum specimens (e.g., preserved ticks; study skins; and the skeletal materials of bird and mammal hosts)

### Dissemination Strategies:

The curriculum will be distributed regionally and nationally in Phase II. National dissemination sites include the University of California/Berkeley Botanical Gardens, University of Wisconsin/Madison Arboretum, and Baylor College of Medicine in Houston. These sites were selected due to a high incidence of Lyme disease and/or West Nile virus. Yale Peabody Museum will publish and place selected materials on its website for broad accessibility. The project will design a traveling exhibit that uses Lyme disease and West Nile virus as models for exploring the interplay between environmental change, biodiversity and vector-borne disease. The program development process, programming details, evaluation instruments and data will be available on the Museum's website. The site will provide technical assistance for other informal science institutions seeking to establish science education partnerships with local school districts.

# University of Texas Health Science Center at Houston (UTHSC-H)

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## Audience(s):

5th to 8th grade and high school students; middle and high school science and health teachers

## Topics Addressed:

basic genetics, advanced genetics, diabetes, cardiovascular disease, nutrition, physical activity, the nervous system, the immune system, infectious diseases

## Project Goals:

1. • Increase student self-efficacy for science, academic aspirations, interest in health science careers; and improve performance and competence in science
2. • Increase teacher confidence in teaching topics related to health science and biomedical research

## Project Evaluation:

### Goals

In cooperation with Project GRAD Houston, a third-party evaluation with the University of Houston-Downtown conducted a rigorous evaluation of the effectiveness of middle school, multimedia health sciences program materials on non-Asian-minority, inner-city student performance and attitudes toward science, as well as effectiveness on teachers' self efficacy and interest in making changes in the instructional environment.

### Design

Evaluated from 2004-2007, the program was designed to increase the number of non-Asian minority students entering the academic health sciences pipeline. A quasi-experimental, two-group pre-test/post-test design was used to assess program effects on students' performance, interest, and confidence in their ability to perform well in science; fear of science; and confidence in their ability to pursue science-related careers. An intervention school was matched to a comparison school by test scores, school, and student demographics. Then, pairs of sixth-grade students (428 students) were matched by fifth-grade scores in science and by gender, ethnicity, and poverty status (free or reduced lunch) and followed up for three years.

### Instruments

Survey instruments adapted from the Student Science Questionnaire (Britner and Pajares 2001) and the Student Occupational Questionnaire (Bandura, 2001)

### Type of data collected

Test scores and survey data

### Results (Note: Abstract excerpt from Academic Medicine article in press.)

At eighth grade, students from the intervention school scored significantly higher ( $F=12.38$ ,  $p<0.001$ ) on the Stanford 10 Achievement Test in science and reported higher interest in science ( $F=11.08$ ,  $p<0.001$ ) than their matched pairs from the comparison school. HEADS UP shows potential for improving inner-city minority middle school students' performance and interest in science and is an innovative example of translating health-sciences research to the community.

## Project Description:

HEADS UP is an initiative to excite students about science and health science careers!

Multimedia science materials provide middle and high school teachers with cutting-edge health science content to enhance classroom curricula. Presented in a video format with student role models, researchers, field experts, and eye-catching illustrations, content is reinforced with classroom activities and assessment tools. A variety of science-related careers are highlighted with short video biographies of scientists and other professionals. Materials are designed by teachers with field and science experts. Videos and classroom activities aligned with National Science Education Standards and Texas Essential Knowledge and Skills in Science (some also with Health, Career, and Math).

HEADS UP is disseminated throughout Texas, including the lower Rio Grande Valley. HEADS UP Diabetes/Cardiovascular Disease and Nutrition/Physical Activity project materials are also disseminated to middle schools through the Coordinated Approach to Child Health (CATCH) Middle School program. CATCH Middle School is one of three approved programs by the Texas Education Agency available to meet the state mandate for coordinated school health programs in middle schools.

The modules have been demonstrated successful in increasing achievement test scores in science and interest in science in a three-year prospective cohort study using carefully matched comparison design and have received awards from the video industry.

HEADS UP was featured in the NCR Reporter Fall 2007 issue, and in several other stories which may be viewed on the project web site's "In the News" section.

## Materials/Products/Exhibits Produced:

HEADS UP consists of six modules (listed below), as well as a Clinical Research Trials packet. Each module is comprised of a DVD containing content videos and career story videos and a CD with classroom activities and other resources. Anyone with access to the internet may visit the project site to view sneak previews of several videos, see sample activities, and access all 34 Career Story Videos by viewing them online or clicking on a link to view or download them to an iPod from UTHSC-H's iTunes U.

### Modules:

Genes, Health & You  
Advanced Genetics  
Diabetes/Cardiovascular Disease  
Nutrition/Physical Activity  
The Nervous System  
The Immune System & Infectious Diseases  
Diabetes for Elementary School module is in the works and should be available in Fall 2009.

## Dissemination Strategies:

HEADS UP is disseminated throughout Texas primarily via teacher professional development activities including an annual Teacher Summer Science Institute (TSSI) and in cooperation with Regional Education Service Centers, Texas Regional Collaboratives for Excellence in Science & Mathematics Teaching, Rio Grande Valley Science Association, and UTHSC-H's CCTS.

Trainings are requested by schools/districts and other organizations. A Training Request Form and information regarding the TSSI are available on the project site or by calling the project director. Requests may also be made for presentations at professional conferences.

HEADS UP Diabetes/Cardiovascular Disease and Nutrition/Physical Activity materials are also disseminated to through CATCH Middle School, one of three approved programs by the Texas Education Agency available to meet the state mandate for coordinated school health programs.

# Learning Biological Processes Through Animations

## The University of Georgia

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**Audience(s):**

High school students

**Topics Addressed:**

Physiology and Diabetes

**Project Goals:**

1. To work with high school science teachers and curriculum development specialists to create curricular materials on five biological processes that underlie cellular and organ function (filtration, pass
2. To construct inquiry-based curricular materials that demonstrates the effects of diabetes on the five selected biological processes.
3. To evaluate the impact of these inquiry-based curricular materials on student achievement in biology and student attitudes toward science and careers in biomedical sciences.
4. To introduce high school biology students to the clinical reality of diabetes in humans and pet animals by hosting them at the Colleges of Veterinary Medicine and Pharmacy at the University of Georgia.

**Project Description:**

The objectives of this project are to create and rigorously evaluate curricular materials that utilize high quality 3-D animations of physiological processes as a means for high school students to conduct inquiries into the life-threatening effects of diabetes. Diabetes is a disease of enormous human significance in the U.S., and veterinarians report that the prevalence of diabetes in our pets is increasing at an alarming rate. While diabetes has deleterious effects on a variety of body systems, it is the most common cause of kidney failure in people. The inquiry-based learning activities created in this project will cover 5 key biological processes: filtration, active transport, passive transport, blood pressure, and glucose homeostasis. These processes were selected for 5 reasons: (1) they are central to understanding cellular structure and function; (2) they are prominent in both state and national science learning standards; (3) they can be illustrated using a single nephron, the basic component of the kidney; (4) they are interrelated in ways that will allow students to develop robust understandings of these processes by exploring a series of inquiry questions; and, (5) diabetes substantially alters each of the processes. We will develop and evaluate the effectiveness of a set of inquiry-based curricular materials incorporating high quality 3-D animations of the 5 biological processes in a normal nephron and in a nephron from an individual with diabetes. The inquiries will direct the students to look for, describe, and quantify details and changes that characterize the effects of diabetes on the 5 selected biological processes. As the students progress through the inquiries, they will generate data that will be used to compare the effectiveness of these curricular materials with traditional methods of teaching the same subject matter.

**Project Evaluation:**

During the first three years of the project, the curriculum materials will be pilot tested with classes, and their impact on student learning will be evaluated qualitatively. This phase of the evaluation will focus on student engagement, interest, and motivation related to the use of these materials. Further, extensive efforts will be made to evaluate the clarity of the materials from the students and teachers perspectives. Based on this learning, training materials will be developed to aid the teachers' implementation and their professional development related to the implementation of the materials. In the final two years, the impact of the instructional treatment on students' learning of the 5 biological processes will be quantitatively assessed. A repeated measures analysis of variance will analyze the four repeated waves within a nonequivalent dependent variables design to assess the effects of the inquiry animations on the achievement of students. A unique feature of this kind of design is that all students will have access to the instructional treatments. Adding repeated measures and predicting achievement patterns (i.e., pattern matching), as will be done in this study, will minimize plausible threats to internal validity such as maturation, history, and testing. Researchers have used this same type of multi-wave design with classrooms to successfully demonstrate the effectiveness of an instructional treatments. Students in all 10 classes (i.e., two classes in each of 5 schools) will be administered four tests. Each of the four tests will measure all 5 of the biological processes. It is intended that some of the items on a test will serve as a pre-test for the subsequent instruction, and some of the items will serve as a post-test. The evaluation will also examine the probabilities of different transition paths in learning the 5 biological processes.

**Materials/Products/Exhibits Produced:**

None yet.

**Dissemination Strategies:**

Our project collaborator, the Biological Science Curriculum Study, will work with us in the final years of the project to disseminate the products to high school teachers.

# Science Education Partnership Award (SEPA) - BioMedical Faces of Science (BFS) Jackson State University

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## Audience(s):

Students (K-12 grade levels), Teachers (K-12 grade levels) and the general public

## Topics Addressed:

HIV Pathogenesis, AIDS, Microbicides, Asthma, Prostate Cancer, Type II Diabetes, Heart Disease, Kidney Disease and Cell-Cell Communication in Disease

## Project Goals:

1. Integration of (BFS) supplemental curriculum into the health-related courses to stimulate the interest of K-12 students in processes involved in biomedical and clinical research.
2. To increase the number of under-represented minority and underserved students who enter science education tracks that lead to careers in the biomedical sciences and in the health professions.
3. To promote health, improve quality of life, and address health inequalities in minorities via service learning, outreach and enhanced education in the biomedical sciences.

## Project Description:

The JSU SEPA Program focuses on students as the ultimate health messengers and future researchers who will educate the community and work toward improved health outcomes by working toward eliminating health disparities.

The objectives of the JSU-SEPA Program are:

- 1) To develop an innovative, inquiry based, interactive multimedia program (BFS) that features a diverse (gender and ethnically) group of active, basic and clinical researchers.
- 2) To enhance the JPS ECHS course of study by integrating the BFS supplemental curriculum into the ECHS curriculum.
- 3) To develop a teacher training program to prepare ECHS and other JPS teachers to utilize the BFS in their classrooms.
- 4) To implement a service-learning program for ECHS students to have intern experiences with community-based organizations with a mission to eliminate health disparities.
- 5) To develop a summer research experience for ECHS students at JSU to facilitate students' entry into health-related majors for the BS degree through graduate studies at JSU and other universities.
- 6) To create a marketing/dissemination plan to make the BFS available to all JPS and K-12 schools in the state, region and nation.

## Project Evaluation:

A total of (75) students attending one of the Jackson Public High Schools (JPS) have participated in both the SEPA summer research and service learning programs. The selected (45) students participating in the SEPA summer research experience spent eight weeks on campus conducting research in an area of biomedical sciences and learning about issues surrounding health disparity diseases in African Americans and other underrepresented minority groups. For the SEPA service-learning component, (30) students had intern experiences with community-based organizations preceptor sites such as the Jackson Heart Study where the Director Dr. Herman Taylor is a featured role-model scientist in Biomedical Faces of Science. Furthermore, both components of our SEPA, the summer research and service-learning experiences, have had a positive effect on JPS teachers. To date, (22) teachers within the JPS district have benefited from working with the SEPA Scholars. Students who have participated in the SEPA summer research component and academic year service-learning component have served as ambassadors for the program in Jackson Public Schools. They have shared their knowledge to teachers and students, especially about health disparities that disproportionately affect the underserved communities of Mississippi and the nation.

## Materials/Products/Exhibits Produced:

BioMedical Faces of Science exhibit display – a 3X3 “pop up” display featuring the six role-model scientists featured in the BFS program. The exhibit was recently displayed at the 2009 National Science Teachers Association (NSTA) Conference and the display will be featured at each of the 8 JPS high schools for the 2009-2010 school year.

## Dissemination Strategies:

1. SEPA Scholars conducted formal and informal communications, through means such as, PowerPoint presentations, journal club meetings, creative pamphlets and brochures explaining different infectious diseases, like HIV/AIDS, Type II Diabetes and Heart Disease, in settings within the schools and in the community at churches and other community gathering settings.
2. “Putting a Face on Science”- BioMedical Faces of Science posters provided to schools in rural communities in Mississippi and Puerto Rico.
3. The JSU-SEPA staff attended the National Science Teachers Association Conference where (25) poster sets (6 posters – Drs. Herman Taylor, Keith Norris, Carmen Zorrilla, Georgia Dunston, Sandra Murray, and James Hildreth) of the BioMedical Faces of Science role-model scientists were available for teachers to display and generate biomedical discussions in their classrooms.
4. BioMedical Faces of Science Road Show Exhibit will help “put a face on science” in communities across the nation, especially underserved communities where there is extremely low participation of underserved groups in biomedical and clinical sciences career tracts. The students, teachers and visitors will be exposed to the BFS scientist in a highly interactive setting that provides an interface with the video and audio presentation of the BFS scientists.

# Regenerative Medicine Partnership in Education Duquesne University

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**Audience(s):**

general public (families), elementary -  
middle school, teachers

**Topics Addressed:**

Stem Cells, Regenerative Medicine, Tissue  
Engineering, Bone, Heart, Nervous System, Type  
1 Diabetes, Osteoporosis, Heart Transplant,  
Evolution, Charles Darwin

**Project Goals:**

1. Produce Planetarium show on Stem Cells topics
2. Produce museum kiosks on stem cells and also evolution
3. Produce teaching resources to support informal science education assets
4. Produce health literacy multimedia
5. Produce supporting digital library and web based supporting materials

**Project Description:**

The Duquesne University Partnership in Education develops planetarium shows and educational resources on topics of stem cell biology and other current themes using innovative informal science education tools focused on wide dissemination.

- (1) EDUCATION: To communicate scientific information about stem cell research and regenerative medicine approaches to human healing. The films will use engaging interactive demonstrations and rich 3D graphics to illustrate tissue/cellular function and medical remedies for disease and disability.
- (2) INNOVATION: To enhance the educational experience. We create immersive visual experiences by projecting high-definition video over the entire planetarium dome ('all dome' video). An 'all dome' video development laboratory on our campus will be used to create and test show content with focus groups, consultants and test audiences.
- (3) DISSEMINATION: To insure national distribution to planetarium nationwide and other appropriate venues. The shows will be made available to planetariums that have 'all dome' projection systems. The digital, high-definition video will be re-edited for presentation in other formats, increasing our distribution potential.

The 2008-2009 year has an added focus on Evolution and Charles Darwin through a project that we have led called Darwin Celebration-2009; A Pittsburgh Partnership. The partnership includes the Carnegie Science Center, Carnegie Museum of Natural History, Phipps Conservatory & Botanical Gardens, Pittsburgh Zoo and PPG Aquarium, National Aviary, Children's Museum and Carnegie Library of Pittsburgh. We have produced informal science education assets for each institution along with teaching resources and curriculum combined with teacher professional development ([www.sepa.duq.edu/darwin](http://www.sepa.duq.edu/darwin)).

**Project Evaluation:**

The primary goals of the evaluation will be to demonstrate that the shows fulfill the educational proof of concept, namely that children and the general public learn about the complex systems of biology through visual experience. Through formative and summative surveys we test the impact of the film on participants' attitudes, perceptions, and knowledge. For previous shows, we have used a program evaluation study. We have demonstrated the effectiveness of the shows for children ranging in age from 7 to 16 years old. A two group pre- and post-test design was used to compare children's learning and attitudes in response to the two versions of a given show. The results indicate that children demonstrated increases in knowledge of the topic with either format, but preferred story telling by animated characters. For each new project a series of formative surveys instruct our development of the storyboard and script. In progress testing with target audience provides refinement of the final product, which is again evaluated with pre- post-surveys. This process is applied to animated movies, video games, web resources and other materials. Educational booklets are evaluated individually by teachers.

**Materials/Products/Exhibits Produced:**

REGENERATIVE MEDICINE PARTNERSHIP IN EDUCATION WEB SITE ([WWW.SEPA.DUQ.EDU](http://WWW.SEPA.DUQ.EDU))  
TISSUE ENGINEERING FOR LIFE, 2ND EDITION (Planetarium Show or DVD on Bone & Heart)  
DR ALLEVABLE'S UNBELIEVABLE LABORATORY (Planetarium Show or DVD on Bone & Heart)  
THE LABORATORY ROBOT SCIENCE (Planetarium Show or DVD on Bone, Heart and Nervous System)  
OUR CELLS, OUR SELVES (Planetarium Show or DVD on Type 1 Diabetes, Immune System & Evolution)  
DR. ALLEVABLE'S UNBELIEVABLE LAB – THE KIOSK (Interactive Video Game developed for Joan Schanck – PTEI Starfish Project)  
POOR BENNY – THE VIDEO GAME (Interactive Video Game on the Immune System)  
YOU MAKE ME SICK! – THE GAME (A Board Game)  
DARWIN 2009- "Ask Darwin – Synthetic Darwin Interview"  
DARWIN 2009- THE WONDERS OF HORSE EVOLUTION; THE LAST 55 MILLION YEARS  
DARWIN 2009-THE GENETIC GARDEN; THE STORY OF GENES AND EVOLUTION THROUGH PLANTS WE LOVE.  
DARWIN 2009-THE MURAL PROJECT ON THE SPIRAL OF LIFE

**Dissemination Strategies:**

- All dome high definition video shows will be distributed directly to planetarium nation wide.
- Re-edited DVD/videos will be made available for school/library and home use.
- Educational resources and accessory materials will be available on the web.



# Native American High School Summer Program at Harvard Medical School- Phase 2 Harvard Medical School

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## Topics Addressed:

neurobiology, medical science,  
clinical psychology and  
psychosocial aspects of drug  
use, abuse, addiction and  
treatment

## Audience(s):

Native American high school  
Students, high school teachers,  
Native American/ Hawaiian/  
Alaskan communities, post  
secondary Pipeline initiatives

## Project Goals:

1. To increase the probability that Native high school students in four Native communities will go on to undergraduate and graduate training in science at leading four-year colleges and universities
2. To collaborate and innovate with the community partners to improving pipeline program
3. To disseminate successful procedures of pipeline summer programs
4. To develop more rigorous methods of program evaluation appropriate for use in Native communities

## Project Description:

Program participants. Teams of seven Native high school students (rising juniors and seniors, boys and girls) from the Hopi Reservation (Arizona), the Fort Peck Tribes (Montana), the Aquinnah and Mashpee Wampanoag communities on Cape Cod and Native Hawaiian communities in Hawaii. One teacher/chaperone and one community mentor from each site. The participants are chosen by the communities. Totals: about 36.

Two major goals set by the Hopi School Board in 2001: to demystify college life and to increase the probability that the students will go on to undergraduate and graduate trainings at major universities. A goal for the teachers: to become familiar with case-based learning. Duration: Three weeks: June 27-July 18. Live at a Harvard Law School dorm in Cambridge, eat at cafeterias at Harvard College and HMS, and travel by shuttle bus to and from HMS. Academic subject. Chosen by the communities: the biology, clinical psychology and treatment of substance abuse. Program format: On ten weekdays, a lecture, a small group conference and a small-group tutorial devoted stepwise to a 10-part realistic medical case of multiple substance abuse by a fictional young mother on the Fort Peck Reservation. The narrative of this case was written by the Wellness Director and the Police Chief at Fort Peck, and the medical and scientific aspects were written by the HMS staff. In the final week, the students prepare a presentation for a designated group at home.

Living in a Harvard dorm, eating at college and HMS cafeterias, catching the shuttle bus in time to make morning lectures at HMS and becoming responsible for learning in this setting are introductions to college life. The case is a medical introduction to substance abuse at home. The Hopi, Wampanoag and Hawaiian communities propose to write their own cases.

## Project Evaluation:

Given the positive outcomes reported in past evaluations, the successful ongoing collaboration with five specific Native communities, and continuous implementation over seven years serving over 200 students, we should expect to discern long-term positive outcomes for Program alumni and secondary impact on the participating communities.

Three inquiry strands emerge:

1. Has the Program had a measurable individual impact on Program participants?
2. Has the Program had a measurable secondary impact on participating communities?
3. What characterizes the degree and variance of Program outcomes among participants?

To address these questions a participatory cluster evaluation is proposed to document standardized outcomes on participants and communities, while accounting for community variance. [I.e., we will analyze outcomes on individual participants, but appreciate the fact that they are grouped and that we expect differences in individual outcomes within the groups].

A retrospective study of Program alumni will document longitudinal individual outcomes. Data collected will document colleges applied to and attended; majors chosen, retention and current status of alumni. Data will be compared to national and local norms, and to a local retrospective control group, if possible. Community-based attitudes and outcomes will be documented. Retrospective pre and post surveys of current Program participants' families, peers and teachers will be used as a proxy measure of community impact.

The evaluation design will utilize a multiple static group comparison with nested variables. Content and trend analysis of prior evaluations will frame the individual impact components of the evaluation and will be used to determine the variables to nest. Community advisors will frame the community impact questions and data gathering approach. Native and university Program staff will administer the evaluation to avoid potential impact of outside data collectors (evaluators). Methods will include document analysis and quantitative and qualitative analysis of written questionnaires and interviews. Comparisons between groups, experiences, and psychographic and demographic variables will show how various Program elements contributed to outcomes and impacts.

## Materials/Products/Exhibits Produced:

Student-produced plays, talks and printed materials for designated groups in Native communities.

Program curriculum: PowerPoint presentations, case-base tutorials, neuroscience reader, and syllabus

Presentations, "Building the Public Health Work Force" to the 2007 National Indian Health Board's 24th Annual Consumer Conference, 2007 Portland, OR  
Panel presentation, "Overview of national-level programs designed to recruit or fund AI/AN academic and life pathways into public health positions" at National Indian Health Board's First Annual Public Health Summit, 2008, Green Bay, WI

Poster Presentation, "A successful medical case-based teaching module for Native high school students, on substance abuse, written collaboratively by a team of concerned adults at the Fort Peck Reservation and a Harvard Medical School team. at the 2008 Annual Meeting of the Society for Neuroscience, Washington, DC.

## Dissemination Strategies:

Developing a a NAHSSP program website including:

Program history, with a focus on Tribe-University collaboration as pipeline strategy.

Program curriculum: lectures, case-base tutorials, neuroscience conference readings, final projects, syllabus and schedule.

Resources for educators authoring and implementing case-base curriculum.

Resources for Native students interested in biomedical science

Program observation by other community and university representatives interested in replicating the Program.

Article publication and conference presentations.

Hosting a two-day Symposium at Harvard Medical School "Partnering Pipeline Programs in Support of Native Americans in Biomedical Professions", to be attended by program partners, active organizations, and other individuals with an interest in establishing new collaborative Native pipeline efforts.

Students creating projects that disseminate the Program and of its subject matter to their communities.

# Serial Passage: AIDS, Race, and Culture Diversity Films, Inc.

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## Project Goals:

1. To explain why African-Americans have disproportionately high rates of HIV, demonstrate what can be done to help solve the problem, and encourage safe sex practices
2. To disseminate the completed documentary film through theatrical release, broadcast television, educational distribution, and grass roots community organizations
3. To continue evaluation of the documentary film through screenings with teenage and adult audiences throughout the United States
4. To continue following the original cohort of African-American teenagers who conducted most of interviews in the documentary film
5. To distribute the film nationally as well as internationally
6. To develop and disseminate a curriculum enhancement for high schools and colleges with substantial African-American student populations

## Topics Addressed:

The disproportionate impact of HIV/AIDS upon African-Americans and Africans.

## Audience(s):

high school students, teenage and adult public

## Project Description:

This documentary film weaves some of the science of HIV with an examination of the socio-economic, political, and cultural factors which encourage the spread of HIV in black America.

In 2006, black Americans accounted for 45% of the new HIV infections in the United States even though we are approximately 13% of the population.

This film is called "Why US? Left Behind and Dying." It explores how secrecy, stigma, gender inequality, sexual patterns, prison incarceration, forced migration, distrust of science and the health care system, homophobia, and religious beliefs all help the AIDS virus flourish in black America. When relevant, the film also examines these factors in the context of the AIDS pandemic in sub-Saharan Africa.

A small group of African-American teenagers from an inner-city high school in Pittsburgh, Pennsylvania are the narrative voice of this film. They conducted interviews with people from Africa and America -- AIDS research scientists, public health experts and epidemiologists, as well as people living with HIV and AIDS.

The students also served as the project's anonymous research subjects. Our goal was to find out what --if any --impact participation in this project had upon their ideas and beliefs about HIV/AIDS as well as their sexual behavior.

The answer to that research question unfolds throughout the film.

Other than post-production, the film is complete. It is being entered in many film festivals throughout the country in order to find a distributor for theatrical/ broadcast television/and educational release.

We will soon begin developing an on-line curriculum based on the film. We intend to have teenagers help create the curriculum under professional supervision.

## Project Evaluation:

### INTERIM EVALUATION REPORT PHASE 1: 2006

Original cohort of 17 student participants from Westinghouse High School

Pre-Survey results: 18% of students felt they knew a lot about HIV/AIDS

Pre-Survey results: 65% of students claimed to be sexually active

Post-Survey results: 57% of students felt they knew a lot about HIV/AIDS

Post-Survey results: 43% of students claimed to be sexually active

### SUMMATIVE EVALUATION REPORT PHASE 1: 2007

8 remaining students/filmmakers after seniors in the project had graduated

1. Students' self-assessed knowledge about HIV/AIDS has increased as a result of their participation in the project.

2. Students' reported behaviors had changed as a result of their participating in the project. Specifically, they are more likely to be tested for HIV and to use condoms or abstain now than prior to their involvement in the project. They are more likely to be tested to encourage their partners and friends to do the same.

3. Students are less likely to believe in conspiracy theories about HIV/AIDS.

4. Students are more likely to watch a documentary film about HIV/AIDS that is produced by, and targeted towards, their own demographic group.

### FORMATIVE AND SUMMATIVE EVALUATION PHASE 2: 2009

Evaluation study conducted at Peabody High --a second inner-city high school in Pittsburgh, PA

Evaluation group/Sophomores ages 15-17/half male and half female n=31

Control group/Seniors ages 17-18/half male and half female n=58

Note: Because of increased concern about Pittsburgh's 'abstinence-only' curriculum, we were not allowed to ask direct questions about sexual behavior on our surveys. Instead, our surveys invited students to state whether watching the film would make them change their behavior, and if so, how.

96.8% of the evaluation group reported that watching the documentary had changed their ideas about HIV/AIDS

83.9% of the evaluation group reported that watching the movie would change what they do, or how they act.

Overall, responses from pre-survey questions from the control group and the evaluation group were very similar. We therefore hypothesize that showing the documentary film to the control group students and having them complete the post survey would likely have similar results.

## Dissemination Strategies:

### 1)GRASS ROOTS DISSEMINATION

We have begun to conduct film screenings with community organizations.

We are applying for a dissemination supplement in order to screen the film at schools, churches, after-school programs, African-American social clubs, (Links, Girlfriends, 100 Black Men), black gay and or "same gender loving" organizations, and historically black colleges throughout the country.

We will also be happy to conduct screenings with other interested SEPA programs which focus on HIV/AIDS or health issues in minority populations.

### 2)FILM FESTIVAL DISSEMINATION

There are literally hundreds of film festivals in the United States and abroad. This is how film distribution companies acquire films for theatrical release as well as broadcast television, (PBS and HBO). We will enter as many film festivals, nationally and internationally, as we can afford.

### 3)INTERNET DISSEMINATION

To make this material even more widely available, we intend to develop an on-line video curriculum which will break down the documentary film into interactive chapters/modules which can be explored by anyone with access to a computer.

We intend to reconstruct our web site with enough bandwidth to stream the large amount of video needed to design and maintain this online curriculum for several years.

### 4)EDUCATIONAL DISTRIBUTION

We intend to contact companies which specialize in educational video distribution in order to disseminate DVDs of the film and teaching aids to schools and colleges.

## Materials/Products/Exhibits Produced:

DVD of the complete documentary film

DVD of film highlights for SEPA conference

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**Audience(s):**

Teenagers through adults

**Topics Addressed:**

Nutrition  
Physical activity  
Stress management  
Cardiovascular health

**Project Goals:**

1. To raise public awareness of recent research on cardiovascular risk factors, the diseases associated with these risk factors, and strategies for improving cardiovascular health.
2. To investigate the extent to which a museum-based health exhibit functions as an education intervention strategy that can lead to gains in students' knowledge about cardiovascular health and address
3. To disseminate the exhibit and complementary resources to other museums and alternative venues, extending and sustaining the impact of the project.
4. To evaluate the effectiveness of the museum/university collaboration for conducting research in an informal setting.

**Project Description:**

The overall goal of the project is to raise awareness among students, teachers and the general public about the process and the importance of health-related research, improving their ability to make better personal health decisions.

Through a unique collaboration between the University of Miami and the Miami Science Museum, a 500 square foot interactive, bilingual exhibit focused on risk factors associated with cardiovascular disease, and strategies for improving cardiovascular health has been designed. The exhibit is designed to serve a data collection purpose, allowing museum visitors to consent and anonymously contribute personal data that can be analyzed for scientific purposes. Furthermore, the project includes a randomized controlled trial research study aimed at determining whether a museum-based health exhibit and related materials (specifically, a discussion activity themed around cardiovascular health) are effective in changing cardiovascular health knowledge among high school students in Miami-Dade County Public Schools. Participating students will be selected from three high schools representative of the school district's diversity.

**Project Evaluation:**

We are conducting a formal project evaluation. Project evaluation will focus on evaluation of the exhibition, and assessment of the effectiveness of the museum/university collaboration. The front-end evaluation examined high school student and general visitor attitudes, pre-existing knowledge, and interests and misconceptions about cardiovascular health via interview. The formative evaluation was used to evaluate exhibit prototypes and the Heart Smart discussion activity. The formative evaluation for the prototypes was accomplished by interview while the interview evaluation of the discussion activity was supplemented by an anonymous written survey. The collaboration strand is used to explore the effectiveness of the Museum-University collaboration and is accomplished by interview. The summative evaluation will examine the impact of the exhibit on museum visitors at post-visit and at 3 months following their visit.

In addition, the data from the randomized controlled trial, the high school education study, will be analyzed using rigorous statistical procedures. The study self-report measures assessing health knowledge, readiness for behavior change, and confidence about behavior change have undergone psychometric evaluation.

**Materials/Products/Exhibits Produced:**

We are in the process of fabricating our 500 square foot interactive bilingual exhibit focused on risk factors associated with cardiovascular disease, and strategies for improving cardiovascular health.

**Dissemination Strategies:**

We will identify non-traditional local venues to host the exhibit (e.g., community centers, universities, and libraries). We will also identify museums and science centers with existing health-related exhibits and offer them Heart Smart to extend/refresh their installation. Following the completion of the randomized controlled trial, the Museum will conduct professional development on the use of the Heart Smart discussion activity for biology teachers at the three high schools involved in the study.

The Museum will develop a webpage, featuring aggregated visitor measurement data, relevant links and a downloadable version of the Heart Smart discussion activity.

The project partners will disseminate project resources and findings to both informal education audiences and the research community via presentations at national conferences and articles prepared for peer-reviewed publications.

# If a Starfish Can Grow a New Arm, Why Can't I?

## Pittsburgh Tissue Engineering Initiative, Inc.

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### Audience(s):

Targets middle-school (6th-8th) grade students and their teachers, general public and families

### Topics Addressed:

Tissue Engineering, Regenerative Medicine (TE/RM), Stem Cell Research

### Project Goals:

1. Provide informal and formal learning experiences for students that will increase their understanding of tissue engineering, regenerative medicine and stem cell research.
2. Provide professional development and novel curricular resources to middle and high school science educators that targets the principles of biology, chemistry, engineering and ethics of TE/RM.
3. With interest in system educational reform, facilitate meaningful connections across formal and informal learning environments.
4. Broad, national dissemination of "Starfish" resources and materials developed via travelling exhibit, web-based components and field kit version.

### Project Description:

This project is a partnership with formal and informal educators, clinicians, and researchers to develop a permanent science center exhibition and related, systemically integrated formal and informal educational programming—all of which are aimed at exciting and meaningfully engaging students to the wonders of science and the field of tissue engineering (TE) and stem cell research. To introduce basic TE/Regenerative Medicine concepts to middle-school students in a hands-on, engaging way, The Pittsburgh Tissue Engineering Initiative (PTEI), in collaboration with Achieving Student Success through Excellence in Teaching (ASSET), the Carnegie Science Center (CSC) and the University of Pittsburgh Learning Research and Development Center (LRDC), is developing a hands-on, interactive TE Exhibit to be first installed at the Carnegie Science Center in Pittsburgh, PA with a traveling exhibit component to seven other sites across the U.S. The exhibit, If A Starfish Can Grow a New Arm, Why Can't I? and accompanying standards- and inquiry-based curricula materials targets 6th–8th grade students and their teachers. This unique TE exhibit includes three activity clusters (kiosks), with 3–4 interactives/activities per kiosk. The first kiosk, The Natural World, presents as background the biology of the innate ability of lower life forms to self-regenerate body parts, and the loss of this ability in higher life forms. The second kiosk, The Science of TE, presents the components of TE and stem cell research, including types of natural and synthetic scaffolding materials; types of precursor cells that can be seeded onto scaffolds; and the growth factors, differentiating factors, and nutrients that enable these cells to grow into various tissues within the body. The third kiosk, Clinical Applications and Future Questions, features clinical cases in which cell-seeded scaffolds have successfully restored function in humans, interactive "ask the scientist" videos, and the future of TE for use in classrooms and in teacher professional development. With interest in systemic educational reform and facilitating meaningful connections across formal and informal learning environments, Life-science teaching modules currently used in PA and other U.S. cities planned for replicating the exhibit will have standards-inquiry-based TE curricula materials and enhancements constructed.

### Project Evaluation:

Evaluation follows the CIPP (context, input, process, product) model. This approach supports the symbiotic relationship between development and evaluation, enabling front-end, formative, remedial, and summative evaluation results to be directly linked to project evolution. Program evaluation examines the process and extent of program implementation including qualitative and quantitative methods to assess project progress and effectiveness and to document, measure, and report on impact of project activities. Evaluation will: 1) provide evidence of the impact, quality, and effectiveness of project activities and products in meeting project objectives; 2) document the quality and effectiveness of the basic strategies in bridging formal and informal education; 3) report on utilization of project resources by school districts regionally and nationally; and 4) monitor participating students' science course-taking trend when they get to high school. For CSC, this will be accomplished through standard evaluative procedures such as head counting, visitor tracking, capture rate of each interactive and text panel, and video-tape analysis of visitor conversations; and for ASSET through 2) pre- and post-visit classroom observations, professional development observations, teacher and student focus group interviews, surveys, and telephone interviews.

### Materials/Products/Exhibits Produced:

Permanent Exhibit at Carnegie Science Center (October 17, 2009, Starfish Exhibit Opening to the Public)

Traveling science center exhibit component (Current commitments are to install in seven other science centers across the U.S. See dissemination strategies below)

One week, informal tissue engineering summer camps for middle school students.

ASSET-led professional development workshops and curricula mapping to nationally disseminated science modules with new curricula enhancements/modules.

Additional educational resources to include pre- and post-visit classroom curricula materials, video games via collaboration with J. Pollock SEPA project, website resources exhibit (See dissemination strategies below)

### Dissemination Strategies:

Web-based Educators Manual will be made available on CSC's website and project website. The guide will contain an overview and map of the exhibit, a detailed description and explanation of each component, and instructions for related classroom activities. Professional Development Program using the targeted Educators Manual and TE enhancements to ASSET modules. PD will emphasize correlating TE science content with state and national standards and provide clear guidance for integrating TE as a topic into life- and physical-science classes and other academic areas. ASSET and CSC will hold workshops several times per year. PTEI will provide special content-deepening PD. Association of Science & Technology Centers Workshop: CSC will host a three-day, workshop as part of the Association of Science & Technology Centers (ASTC) RAP Session project. The workshop will cover the unique partnership, plans and research materials that went into our production. Materials relating to the NCRF-funded portion of the project will be made available to other science centers nationally at no cost. Electronic Distribution of Educational Materials through project website. SEPA Collaboration for video gaming component and related educational curricula resources with J. Pollock, Duquesne University, The TISSUE ENGINEERING SHOW (DVD) was produced with funding from the "Tissue Engineering Show and Educational Partnership" (NCRF SEPA R25 RR15619). Presentations and Workshops at NSTA, NABT, Tissue Engineering and Regenerative Medicine International Society annual meetings. Traveling Exhibit Component. Field Kit Version.

# Human Health and Human Bulletins American Museum of Natural History

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**Audience(s):**

high school students, teachers, adult public

**Topics Addressed:**

a variety of late-breaking health topics featured in the news

**Project Goals:**

1. To use visual Science Bulletins to teach about health
2. To teach teens about health-related science
3. To teach teens about health-related science careers
4. To teach adults about health-related science
5. To help the public understand different types of science media
6. To encourage museum visitors to pursue further knowledge about health-related topics

**Project Description:**

During this year, we have achieved four major accomplishments: (1) led by the Institute for Learning Innovation (ILI), we have conducted a thorough investigation of front-end attitudes about health science bulletins from teens and adults alike—something that has certainly shaped and strengthened our project conceptualization during this 08/09 planning year, (2) an Advisory Panel meeting that provided key program suggestions, (2) the production of one Science Bulletin feature on HPV and 6 Science Bulletin snapshots, (3) the curriculum design for a 6-week After-School course on HPV to be taught in the fall of '09 and in the spring of '10; and (4) the design of a monthly science cafe where members of the museum public can meet to watch a Science Bulletin and informally discuss current health-related topics with a leading researcher in the science field.

**Project Evaluation:**

To gain public perspective on human health science and research as well as the Science Bulletins, the Institute for Learning Innovation researchers conducted two focus groups of AMNH after-school students, online questionnaires of people who visited the Science Bulletins website, interviews with museum visitors watching Science Bulletins in the Museum's Hall of Human Origins.

Based on audience feedback and feedback from Museum peers, the following suggestions were made:

For the course, consider targeting adults such as college students, teachers and parents.

For the class, consider including a laboratory experience that incorporates the use of "real world tools" and physical contact with lab animals or animal products in the Human Bulletins curriculum. Also consider increasing the emphasis on public speaking or public presentations by offering community service or service-learning credit.

**Materials/Products/Exhibits Produced:**

The HPV feature was in production during the spring 2009 and is expected to be finished and in June 2009. This Human Bulletin feature documentary will follow the latest research on human papillomaviruses (HPV). These viruses are ubiquitous in human populations and have recently been identified to cause not only cervical cancer but also head and neck cancers. The story will feature molecular biologists such as Robert Burk of Albert Einstein College of Medicine, who is uncovering the mechanisms by which viruses cause cancer and is using the findings to chart the genetic evolution of the HPV viral family. The story will also follow the work of cancer researcher Maura Gillison at Ohio State University, a leader in uncovering HPV's role in head and neck cancer. The results of such studies are revolutionizing how we understand, prevent, and treat viral-mediated tumors.

The six health-related snapshots that were created this year to be incorporated in our SEPA classes and clubs:

- (1) September 22, 2008: Plastic Ingredient Raises More Health Questions: A new statistical study from researchers at the University of Exeter in the UK has brought fresh scrutiny to the controversial chemical Bisphenol-A, or BPA.
- (2) November 17, 2008: Full Gene Set Decoded for Three More People: This story highlights three individuals whose entire genomes were recently sequenced, and discusses the potential impact of full genome maps on understanding and treating genetic diseases.
- (3) December 15, 2008: Immune "Army" Can Fight HIV: Some people who contract the HIV virus stay healthy for decades. A recent study by researchers at the National Institute of Allergy and Infectious Diseases, part of the National Institutes of Health, reveals one of the mechanisms behind the uncommon ability of their immune systems to ward off AIDS.
- (4) March 9, 2009: Abuse Lingers in the Genes and Brain: Canadian scientists studying both rats and humans have uncovered a link between abuse and neglect in early life and a genetic change in how the brain regulates stress.
- (5) April 6, 2009: New Stem Cell Method Shows Promise: In 2007, researchers from the University of Wisconsin came up with a method to convert adult skin cells into stem cells by using a virus to insert "reprogramming" genes into the skin cells. There was one major problem: the new stem cells were cancer-prone.
- (6) April 20, 2009: Little Brain Gland has Big-Time Effect: The function of the brain's pineal gland has long been a puzzle to scientists. Recently, researchers from NIH's National Institute of Child Health and Human Development showed it does far more than produce melatonin to regulate the body's sleep/wake cycle. It actually synchronizes 24-hour rhythms of activity for 600 genes that control basic body functions.

**Dissemination Strategies:**

The project will be disseminated to all audience members that participate. And The Human Bulletins, in particular—such as those produced for NIH-SEPA—will go to 4 sites including the AMNH with an approx potential audience of 7,157,702: American Museum of Natural History, New York, NY; Frank H. McClung Museum, Knoxville, TN; Museum of Science and Industry, Chicago, IL; Great Lakes Science Center, Cleveland, OH.

# School for Science and Math at Vanderbilt Vanderbilt University

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**Audience(s):**

Students (grades 9-12)

**Topics Addressed:**

Interdisciplinary science

**Project Goals:**

1. Create a School for Science and Math at Vanderbilt that offers MNPS students formal, advanced science and math coursework and research training opportunities at a research university
2. Elevate the scientific insights and research capabilities of highly competent and motivated MNPS students by providing advanced studies and building skill sets that enhance critical thinking
3. Recruit a wide array of students into the STEM career pipeline by providing unique and advanced preparation to succeed in undergraduate, graduate and professional, and postgraduate academic studies
4. Establish a model of a research university-K-12 partnership for replication and integration of best practices by other school systems in urban communities
5. Disseminate information about clinical and basic research processes in the larger community through student-driven outreach and service learning

**Project Description:**

Through a joint venture between Vanderbilt University Medical Center (VUMC) and Metro Nashville Public Schools (MNPS), the School for Science and Math at Vanderbilt offers high school students a four-year, research-centered learning experience at Vanderbilt University. Student enrollment is limited to 25 per year per grade and now includes freshman, sophomore and modified senior classes. They earn seven honors credits for their four-year commitment.

Students pursue an interdisciplinary science- and math-based curriculum through meaningful and engaging hands-on exploration and tangible research. In our second year, SSMV continues its one day per week model with each day's lesson revolving around a question. Foundation building occurs through Interdisciplinary Science I. Cross-curricular questions include: "Can one degree make a difference?" and "Do animals compete for bandwidth?" Freshmen continued with Research I during their three-week summer experience highlighted by a week-long GIS research project at an urban greenway. In their second year, 10th graders are now developing skill sets to perform their own research. In the fall, the class isolated and sequenced a gene for an endangered plant species. This spring, students in teams of three have designed research protocols based on neuroscience and behavior and are collecting data, leading to the development of their own conclusions and their next questions in anticipation of summer Research II.

In addition to its small faculty corps, adjuncts throughout the University including faculty, fellows and graduate students contribute substantively each year. The program's integrity is maintained through seamless integration of its online Moodle community where students create discussion forums, access resources, post assignments and meet with faculty virtually. The modified senior program (ten students participating in summer research internship plus one academic year only) has produced two Siemens national semifinalists this year, alluding to the potential for four-year students.

**Project Evaluation:**

The School for Science and Math at Vanderbilt (SSMV) evaluation is being conducted by external evaluators Dr. Susan Kuner and Ms. Judy Butler. Evaluation findings indicate that students have a high degree of satisfaction with the interdisciplinary curriculum, benefit from planning and conducting their own research, and have formed a unique learning community. Other findings suggest a strong partnership between Vanderbilt University Medical Center and Metro Nashville Public Schools (MNPS). MNPS awards high school honors course credits to SSMV students and promotes the School as an exemplary program. Diverse freshmen and sophomore classes represent applicants from over 80% of MNPS middle schools. SSMV is having an impact on the culture of the medical center with involvement of over 100 university scientists.

Data collection and analysis have begun for a quasi-experimental research study to determine the impact of SSMV on student achievement and preparation for STEM careers. The evaluators and SSMV staff worked with the MNPS Office of Assessment to develop protocols that meet school system and university guidelines for research with minors. MNPS randomly selected control group students matched to the SSMV students based on science and math 7th grade achievement test scores. MNPS provided achievement test scores, courses taken in science and math, grades, and scores for the mandated end-of-course test in biology for all students in the research study. As students progress through high school, MNPS will provide additional data including science and math end-of-course test scores, ACT and SAT scores, AP enrollment, and AP test scores.

Additional evaluation methods include analysis of responses to anonymous online "blog" surveys deployed through the Moodle e-learning platform; pre- and post-self report surveys based on science reasoning, communication, and preparation for STEM careers; student accomplishments in science competitions, publications, or patents; and attributes of a successful school system/medical center partnership.

**Materials/Products/Exhibits Produced:**

N/A

**Dissemination Strategies:**

N/A (Project is not being disseminated yet)

# Caltech-Exploratorium Summer Teacher Institutes in Life Sciences Exploratorium

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**Audience(s):**

Middle and high school life science teachers, graduate and postdoctoral students in biomedical research

**Topics Addressed:**

Modern biomedical research techniques and findings.

**Project Goals:**

1. Create a successful museum-university-district partnership that strengthens teacher and student knowledge of “cutting edge” biology content and biomedical research techniques.
2. Develop a successful, high quality professional development program that helps science teachers integrate current life science content and modern research methods into their curriculum.
3. Develop the content knowledge, leadership skills and capacities of life science teachers so they can successfully disseminate what they learn to their colleagues.
4. Strengthen student understanding and appreciation for key concepts, questions, and techniques that are the foundation of modern life science research.
5. Engage Caltech graduate biology students and postdocs in working to strengthen science teaching and learning in schools, thus developing their own skills and capacities to engage in science education

**Project Description:**

The Caltech-Exploratorium Summer Institute in the Life Sciences (CESTI) Project combines the science education skills of the Exploratorium Teacher Institute, the research expertise of the California Institute of Technology Division of Biology, and the school district leadership of the San Mateo County Office of Education to develop a professional development program for middle and high school biology teachers that can be disseminated to a broader local and national audience. The CESTI project also provides training in educational outreach to Caltech graduate and postdoctoral biology students.

Science teachers, Caltech graduate students, and Caltech postdoctoral students collaboratively participate in a professional development program that includes a four-week (110-hour) CESTI Summer Institute, up to eight Saturday CESTI Workshops (totaling 40 hours), and a two-week Advanced CESTI Summer Institute (55-hours). The content of CESTI workshops and institutes focuses on contemporary biomedical research techniques and findings. Caltech Division of Biology faculty provides content support to workshop and summer institute participants by coming to the Exploratorium and presenting lectures about their current biology research.

The primary goal of the CESTI program is to develop a successful museum-university partnership that strengthens teacher knowledge of biomedical research techniques, helps science teachers integrate modern life science content into their curriculum, and ultimately strengthens student understanding and appreciation for key concepts, questions, and techniques that are the foundation of current science. The CESTI project also seeks to engage Caltech graduate biology students and postdocs in working to strengthen science teaching and learning in schools, thus developing their own skills and capacities to engage in science education reform.

**Project Evaluation:**

The CESTI project is being evaluated by Inverness Research Associates. IRA focused their initial phase of evaluation on program improvement. In the first two years of the project, IRA documented the evolving quality and effectiveness of the partnership and institutional capacity building, the quality and value-added of programs and activities for teacher participants, and the evolving value added to graduate students. Methodology included formal observations of all CESTI workshops and summer institutes, analyses of lessons and other written materials created by the project, analysis of formal interviews with Caltech graduate students and Caltech faculty, and analyses of interview data collected from participating teachers. Results of this phase of the evaluation was regularly shared with Exploratorium staff to strengthen the partnership and improve the program.

In the next phase of the evaluation, the project's impact on the knowledge and educational outreach interests of Caltech graduate students in the Division of Biology was initially assessed. Baseline interview and survey data was collected, focusing on initial interest in and strategies for increasing public understanding of science. Data collection continues over the course of their participation to determine what impact the CESTI project has on the knowledge, beliefs, capacities and plans of the graduate students.

The final summative evaluation design relies upon making a series of qualitative and quantitative measurements over time to determine to what extent the CESTI project has had an impact on the knowledge, beliefs, and capacities of all program participants –middle and high school biology teachers as well as Caltech graduate students, postdoctoral students, and faculty. To improve validity and enhance the rigor of the study, qualitative and quantitative data is collected from matched controls (Caltech participants and biology teachers not participating in the CESTI program).

**Materials/Products/Exhibits Produced:**

The project has produced a suite of hands-on activities that focus on current biomedical research techniques and findings.

**Dissemination Strategies:**

Hands-on activities developed by the CESTI project will be disseminated on the Exploratorium-Caltech CESTI website. This web site is currently under construction.

# Building Bridges To Health Science Literacy

## University of Tennessee Health Science Center

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### Topics Addressed:

Health Science Literacy, Science Education, Genetics

### Audience(s):

K-12 Teachers, K-12 Students and their Families

<http://bbhsl.mecca.org/>

### Project Goals:

1. Introduce authentic Problem Based Learning (PBL) into Memphis learning communities
2. Promote health through genetic literacy
3. Build Community Partnerships that promote the dissemination of Health Science Content

### Project Description:

Problem Based Learning (PBL) is an educational pedagogy that provides real-life learning for students. Introducing PBL involves facilitating training for K-12 teachers to integrate PBL case development, and teaching paradigms into their instructional strategies. These strategies conform to local, national and the recently revised Tennessee State Standards. The training also facilitates the incorporation and alignment of health science into current Memphis City Schools' curriculum. Our second aim is to develop educational interventions that are focused and actionable. We have developed modules on type 2 diabetes, including; how genes move through families. In addition, we have disseminated recommendations encouraging families to develop a family health history. The benefit is that when families develop a generic history, it becomes a component of overall health literacy.

Our goals also include expansion beyond the classroom and into the community. We have partnered with a local museum to incorporate exhibits into PBL cases. These cases still retain the promotion of health science literacy and standard principles of PBL. This year we have partnered UTHSC staff with other agencies to continue to promote common goals and expand partnerships. We recently partnered with staff in the Pathology department for a NANO Technology outreach week that presented information at local libraries and venues; which shared health and science information and brought out diverse groups of youth and adults.

### Project Evaluation:

The efficacy of introducing authentic problem-based learning into Memphis schools: The design is a mixed-methods evaluation approach, encompassing qualitative and quantitative data on multiple project processes, products and outcomes.

Instruments included: (1) School Observation Measure (SOM) which gathers information regarding student engagement and the extent to which 24 different classroom practices are utilized. (2) Rubric for Student-Centered Activities (RSCA) specifically assesses the application of PBL practices which teachers trained in this approach should utilize.

In addition to the teacher surveys and student questionnaires, a problem-solving rubric has been added to the evaluation plan in order to further assess students' progress in problem-solving. There were positive results with regard to increasing teacher training in PBL and improving students' higher-order thinking skills and persuasive writing skills. To date over 2000 students have participated in PBL activities delivered by over 40 teachers. Recommendations from the CREP evaluation team include continued year round instruction and support for teachers, increased supplies for teachers and grade specific PBL's.

The second evaluation goal is to gauge the public's level of genetic literacy in order to establish familiarity and interest to enable health promotion. The design encompasses assessments, questionnaires and feedback. Instruments include a wireless audience response system coupled to multiple choice questions posed within PowerPoint presentations. Additionally, CREP reviews the PowerPoint presentation for instructional design, layout, sequencing, readability and comprehension. Knowledge and attitudes are assessed by pre-test/ post-test comparisons, and Likert scale analyses. Based on the review, CREP developed the initial perceptual and reviewed the knowledge level questions that were subsequently embedded in the presentation. Validation of the first deliverable focused on genetic risk of type 2 diabetes and has produced two booklets for dissemination that encourage families to create a family health history.

### Materials/Products/Exhibits Produced:

PBL Website –We have published an interactive website for providing PBL information to teachers; it is password protected, but available to those teachers who receive training at the summer workshops and the staff at CERTL (Wake Forest University School of Medicine). We have also published an informational website providing students and the public with PBL content.

We have published materials to promote genetic literacy. "Does it run in the Family" is a collection of two booklets that are customized versions of the family health history tool. They will be available at the SEPA Conference in 2009.

We have promoted PBL and genetics content integrated into museum exhibits through a collaborative partnership with the Pink Palace Museum located in Memphis, TN.

Future Projects:

PBL Manual –We are currently working on a PBL Manual to assist with training teachers in the summer Workshop on June 1-5, 2009.

Heredity website- We look forward to publishing the heredity website, which is in development at [www.heredityproject.org](http://www.heredityproject.org).

### Dissemination Strategies:

The Minority K-12 Initiative Grant for Teachers and Students, Memphis Science Partners, BBHSL, and the Memphis Educational Computer Connectivity Alliance collaborate to provide integrated hands-on professional development for science teachers. Science Teachers Spotlight (STS) highlighted 3 teachers this year. More than 250 students, administrators and parents attended these events.

March 3, 2009, Memphis Organization of Science Teachers, BBHSL, and the Memphis Academy of Health Sciences hosted PBL Demonstrations for area Science Teachers; resulting in BBHSL 2009 Summer Workshop applications from 20 attendees.

BBHSL participated in NANO Days Outreach week was held March 27- April 3, 2009, and was a huge success with 519 participants. The event was a collaboration between the Pathology Department and The Office of Medical Education.



# Diseases and Decisions: Infectious Disease Exhibition

## Marian Koshland Science Museum of the National Academy of Sciences

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### Audience(s):

This exhibition is intended for non-scientist adults in the general public, teachers, school groups at the level of middle school and above, journalists, and policy makers.

### Topics Addressed:

There have been many gains in public health and in our understanding of infectious disease, but many challenges remain. This exhibit focuses on six main concepts: characteristics of microbes (viruses, bacteria, fungi, and parasites), host-microbe interactions, vaccines, anti-infectives, evolution, the global burden of infectious disease, and gains in life expectancy over time. The tone of the exhibit is factual and informative. The emphasis is on the decision and actions that visitors can take to improve their health and the health of communities.

### Project Goals:

1. Create an interactive exhibit focused on decisions surrounding infectious disease
2. Create a companion web site for the exhibit
3. Offer free, inquiry-based field trips to middle and high school students
4. Develop online educational materials that relate to the exhibit topics for middle and high school students
5. Engage a wide range of audiences through innovative public programs that make infectious disease relevant to their lives
6. Evaluate the effectiveness of these approaches

### Project Description:

The Marian Koshland Science Museum produced an interactive exhibit and supporting educational and programmatic materials for a non-scientist audience 13 and older using the reports of the National Academies on infectious disease. A special emphasis was placed on helping the visitor use science in making decisions about issues related to disease.

Within this broad framework, some specific learning goals for all audiences include:

- Science is a tool for decision making.
- Infectious disease affects individuals, society, and the environment.
- Actions can be taken to modify the effect of a disease.
- There are costs and benefits resulting from actions and inaction relating to disease.
- The study of disease is a personal endeavor.

The exhibit's companion web site is located at [http://www.koshland-science-museum.org/exhib\\_infectious/index.jsp](http://www.koshland-science-museum.org/exhib_infectious/index.jsp). Field trip information and educational materials related to the exhibit can be found online at <http://www.koshland-science-museum.org/teachers/index.jsp>.

### Project Evaluation:

The previous project description described the front end evaluation, prototyping of evolutions storyboard, remedial evaluation of vaccines and tuberculosis displays, and summative evaluation of exhibition and web site.

Currently, we are in the process of conducting a summative evaluation of our field trip program.

Summative evaluation of field trip program:

Goals: To answer the overarching questions

- Are there areas of the program that can be improved or updated?
- Are the worksheets appropriate to the targeted age groups?
- To what extent are outcomes being met?
- In what ways are the outcomes constructed throughout the field trip program?

Design: A combination of approaches will be taken to evaluate the program from the perspective of the museum, the students, and the teachers.

Instruments: Include Teacher Survey, ethnographic observation, museum educator reflection, scoring of field trip worksheets, and post visit survey.

Type of data collected: The data include quantitative measurements of satisfaction with the field trip and student answers to worksheet questions. Qualitative data included observations of the field trip program including preparation by coordinators and quality of student discussion.

Results: This evaluation is ongoing. Results will be available later this summer.

### Materials/Products/Exhibits Produced:

The Koshland Science Museum has several different types of products that can be shared including:

- Plans and software to replicate our high-quality, field-tested displays,
- Materials on our interactive web site,
- Innovative public program ideas for families and adults,
- And educational materials for middle and high school students related to infectious disease.

Additionally, there are funds available to underwrite the replication of our displays in other museums.

### Dissemination Strategies:

This exhibit opened at the Koshland Science Museum in March 2007. A companion web site ([http://www.koshlandscience.org/exhib\\_infectious/index.jsp](http://www.koshlandscience.org/exhib_infectious/index.jsp)) launched at the same time. The following are a sample of our dissemination strategies.

- Exhibit Licensing – Partner with ASTC to advertise the opportunity to replicate displays from the exhibit in other museums.
- Public Programs – Broadcast short videos of the public programs on video hosting sites (e.g. YouTube, Google Video, Teacher Tube) in partnership with MicrobeWorld.
- Field Trip Programs – Advertise education materials in NSTA and NABT publications. Promote field trip through local and state-wide teacher meetings.
- Exhibit – Advertise through print and local radio.

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**Audience(s):**

9th & 10th Grade Students, Teachers, UCSF Scientists  
(graduate students & postdocs), students' families

**Topics Addressed:**

Current topics in biomedical research  
Achievement gap  
Scientist-teacher partnerships

**Project Goals:**

1. For students, to deepen their scientific problem solving skills; increase their self-confidence in their academic abilities; and develop their understanding of biomedical research
2. For teachers, to increase their understanding of and ability to implement teaching behaviors that promote students' scientific thinking skills and the engagement of all students with science; and to
3. For scientists, to develop their teaching and mentoring skills, and specifically their ability to engage learners from a variety of backgrounds; and to improve their ability to effectively communicate
4. For the entire group, to use evaluation to improve the programmatic work (including science teaching and learning) and document its outcomes; and to share our products and findings with the science

**Project Description:**

Pathways is a unique science education initiative that combines robust science learning opportunities for high school students with an intensive professional development program for SFUSD teachers and UCSF scientists. The initiative is specifically designed to promote access to and engagement in science learning among students traditionally underrepresented in the sciences. Pathways first received funding in September 2008.

Pathways brings together high school teachers (teaching 9th or 10th grade Biology or Life Science) and UCSF scientists in year-long partnerships that will use current discoveries in biomedical research to inspire students' interest in science and develop their understanding of the concepts in the California Science Content Standards, the dynamic nature of scientific progress, and how modern biology relates to the students' own lives. Adult participants will learn about and practice teaching strategies that promote underrepresented students' success in science and critically that increase students' beliefs in their own potential for success and thus their overall academic achievement.

Pathways will:

- Provide the opportunity for large numbers of students to develop sustained relationships with scientist role models
- Provide science learning experiences that are relevant to students' lives and convey the excitement of scientific discovery
- Support teachers and early career scientists as they integrate strategies for promoting the success of underrepresented minorities (URM) in science into classroom appropriate, standards-aligned, investigative lessons based on current research developments
- Create a professional community of educators focused on promoting URM student success in science and reducing the achievement gap.

**Project Evaluation:**

SEP has three overarching goals for evaluation of Pathways. We seek to: a) evaluate the effectiveness of our model; b) document its outcomes; and c) continually refine and improve our work. While the last goal is of particular interest and usefulness to SEP, findings from the others will be of broad interest to the science education community and will be disseminated through publications and presentations. Project evaluation will be conducted working in collaboration with an external evaluator, the TCC Group.

To obtain the richest description possible of the outcomes of this work, SEP and TCC will use multiple strategies to evaluate Pathways. These strategies include a careful comparison study of participating teachers and classrooms, evaluation of the outcomes for all participants, and measures of program quality for all stakeholder groups. TCC will utilize a mixed-methods approach and will combine quantitative and qualitative tools – using both existing instruments and developing new tools as necessary that will be shared with the science education community.

The overarching evaluation question is:

The degree to which, and in what ways, the Pathways model, including the partnership between teachers and scientists, affects the science teaching of participating teachers and the learning environment for students (and with what results for students)?

Pathways staff and the program evaluators are in the process of assessing existing instruments and designing others to be used in the study. As we have not yet begun a participant cycle, no data has been collected to date, though we look forward to sharing more at the 2010 SEPA Director's meeting.

**Materials/Products/Exhibits Produced:**

Each scientist teacher team will produce at least two instructional units that 1) use current topics in biomedical research to engage students; and 2) integrate research-based strategies to increase students' academic success. These units, after quality assurance review, will be posted on the online science lesson resource SEPLessons (<http://seplessons.ucsf.edu>). In addition Pathways students will produce Pathways Projects, multimedia student-created resources explaining science concepts, discussions of the importance of scientific research, and interviews with biomedical researchers, that will ultimately be posted online as a resource for the education community.

**Dissemination Strategies:**

As described above, Pathways Lessons and Projects will be available online for general use by the science education community. In addition, SEP plans to further disseminate these lessons through presentations at conferences such as NSTA and CSTA as well as by hosting a regional conference for teachers to learn about the lessons. Finally, SEP will disseminate outcomes of the program through publications and presentations at science education conferences such as ASTE and NARST.

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**Audience(s):**

Middle and high school students and teachers; public

**Topics Addressed:**

Cell biology and cell signaling, epigenetics, developmental biology, stem cells, molecular genetics, and clinical trials

**Project Goals:**

Educate secondary-level students about the role of NIH-funded basic research, translational science, and clinical trials in improving health care  
Engage secondary-level life science teachers in learning about the Genome Science for Health module topics and in drafting the curriculum supplement module  
Prepare teachers to use the Genome Science for Health curricula through professional development courses and workshops at the local, regional and national levels

**Project Description:**

The "Genome Science for Health" project is developing and producing four, secondary-level, web-based curriculum supplement modules that focus on cell biology, developmental biology, molecular genetics, and clinical trials. The modules include online, multi-media, interactive materials for students as well as supplemental materials for teachers, such as lesson plans, assessment questions, and videos of scientist talks on the topic.

Development of each module begins with a 5-day Master Teacher summer institute. Fifteen high school biology teachers, representing diverse student populations and geographic areas, are selected from a US-wide applicant pool. They first learn about the module topic through scientist talks and readings. Next they work with Genetic Science Learning Center staff to develop key learning objectives for the module, that address national science education standards. The teachers then work in small groups to draft online, hands-on, and print-based learning experiences that address the learning objectives. Center staff utilize these ideas in developing and producing the module. After testing and evaluation, the curriculum supplement modules are disseminated worldwide via the Center's Learn. Genetics (<http://learn.genetics.utah.edu>) and Teach.Genetics (<http://teach.genetics.utah.edu>) websites.

Once each module has been published, the Center conducts teacher professional development programs that prepare teachers to use the materials. Short workshops at state, regional and national science education conferences introduce teachers to the materials. A 5-day summer institute in the final year of the grant will enable 22 teachers from across the US to thoroughly experience the curricula and prepare them to present dissemination workshops for their colleagues.

**Project Evaluation:**

Rockman Et Al, an independent research, evaluation and consulting firm in San Francisco, is serving as the project evaluator and is working closely with project staff.

**Evaluation Goals**

1. To measure students' performance in the piloted curriculum supplement modules
2. To assess teachers' reactions to the Master Teacher Program and summer dissemination institute
3. To track dissemination of the curricula via teacher professional development workshops
4. To track online usage of the curriculum supplement modules

To evaluate students' knowledge gain as a result of using each curriculum supplement module we are developing multiple-choice pre and post tests. Individual, cognitive interviews with a small number of students are first being used to identify any problems in how students understand the test items. We will next pilot the tests with several classrooms of ninth grade students who have not yet had high school biology in order to further identify any problematic items. For the classroom field test we planned to recruit approximately 30 teachers from across the US. Teachers would be randomly assigned to use the curriculum supplement module or their standard curriculum materials on the topic. The pre and post knowledge tests would be administered to students of both treatment and control teachers. Given the considerable amount of time required to obtain permission from each district's research committee, we are currently reconsidering this model.

Teachers participating in the Master Teacher summer institutes submitted daily feedback as formative assessment for the institute facilitators. The feedback format changed throughout the five days, to stimulate fresh responses. Participants also completed an end-of-session survey.

Teachers attending dissemination workshops at science education conferences are asked to complete a half-page survey. Survey items include rating the likelihood of their using the materials and of sharing them with colleagues, grade level taught, the number of students/year, and state.

**Dissemination Strategies:**

- Websites: Educational materials developed as part of the Genome Science for Health project are disseminated worldwide via our Learn.Genetics (<http://learn.genetics.utah.edu>) and Teach.Genetics (<http://teach.genetics.utah.edu>) websites.
- Email announcements: We send an announcement about each curriculum supplement module to our email list of educators worldwide.
- Courses and workshops for teachers: These professional development opportunities introduce teachers to the curriculum supplement modules and enable them to experience using the materials. Week-long summer courses are advertised via our email list and are held at the University of Utah. Shorter workshops for teachers are presented at science education conferences and hosted by school districts. Conferences include the National Science Teachers Association national and regional conferences, the National Biology Teachers Association, and state science education conferences.

**Materials/Products/Exhibits Produced:****"Amazing Cells" curriculum supplement module**

- Online, multi-media and interactive student materials address organelles and their function in animal and plant cells, cell size and scale, cell communication using the fight or flight stress response as an example, and more. Available at <http://learn.genetics.utah.edu/content/begin/cells/>
- Supplemental materials for educators include accompanying lesson plans for Print-and-Go classroom activities and videos of scientists' talks given during the development course. Available at <http://teach.genetics.utah.edu/content/begin/cells/>

**"Epigenetics" curriculum supplement module**

- Online, multi-media and interactive student materials address the epigenome and how it influences gene control, as well as epigenetics and inheritance, behavior, nutrition, and the human brain. Available at <http://learn.genetics.utah.edu/content/epigenetics/>
- Supplemental materials for educators include accompanying lesson plans for Print-and-Go classroom activities assessment questions for each activity and video of the talk on epigenetics given by Moshe Szyf, PhD, McGill University during the development course. Available at <http://teach.genetics.utah.edu/content/epigenetics/>

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**Audience(s):**

Teachers (9-12) Students (9-12)

**Topics Addressed:**

Inquiry-based methods in teaching science, Molecular Biology, Genomics, Physiology, Neuroscience

**Project Goals:**

1. Engage high school science teachers and students in inquiry-based approaches to learning about science
2. Bring cutting-edge research into the biology classroom
3. Improve awareness of the relevance of science to everyday life
4. Allow students the opportunity to think, read, write and speak as scientists

**Project Description:**

Engage high school teachers and students in inquiry-based approaches to learning about science. During each summer of the program, fifteen Rhode Island high school biology teachers, hereafter referred to as "Fellows," learn active, inquiry-based teaching methods and content in neuroscience, physiology, molecular biology and bioinformatics.

Bring cutting-edge research into the biology classroom. During the academic year, fellows have access to mobile laboratory equipment as well as qualified scientific advisors, so they may implement new curriculum into their classroom.

Improve awareness of the relevance of science to everyday life. The program will address fundamental scientific questions: How do drugs effect physiology and behavior? How do we learn and remember? How do our genes determine who we are? Can genomic studies show how we have evolved? Because exploration of these questions is highly relevant to major social issues, including learning disorders and addiction, genetic testing and making informed health care choices, students and teachers will learn to connect physiology, brain science and genomics to the larger world.

Allow students the opportunity to think, read, write and speak as scientists. The annual Nature of Discovery Symposium provides students with the opportunity to present their original scientific experiments and questions, experience the importance of collaboration and communication among scientists and hear from Brown University graduate students and faculty. This past symposium was attended by over 300 RI teachers, high school students and their family members. Sixty-three posters were presented by 148 high school students. Additionally, eight posters were presented by Brown University graduate students involved in Project ARISE. John Donoghue, a professor in the Department of Neuroscience, presented the keynote address and a panel of graduate students discussed their research and how they became interested in studying science with ample opportunity for active question and answer sessions.

**Project Evaluation:**

The evaluation of the professional development component uses questionnaires, observations, and interviews to measure the understanding and implementation of concepts and practices discussed in the course and to measure the students' responses to the new teaching methods. The evaluation also examines the quality of materials produced by the Fellows and assesses the involvement of Brown students and faculty in the Nature of Discovery project. The evaluation has both formative and summative components.

The formative evaluation determines how successfully Fellows achieve the learning goals of the course and build concepts and scientific inquiry into pedagogy, and how successfully this learning is transferred to the classroom. This evaluation has informed the refinement of the course for cohorts two and three. Interviews at the end of each summer or academic year session provide opportunities for feedback on the progressive model of integration and for reviewing the effectiveness of course content, structure and pedagogy.

An external summative evaluation is also being conducted. Observation, interviews, and journals are used to assess the outcomes for course participants. The criteria for the outcomes include: understanding the course content; engagement with scientific inquiry; and ability to integrate new inquiry-based strategies in the classroom. High-school students will complete surveys in order to determine their level of enthusiasm and their awareness of and involvement in the process of scientific inquiry. This approach to summative evaluation provides the opportunity to compare classes in years one through three in terms of satisfaction, usefulness of materials, and outcomes regarding learning and teaching. Fellows also will be evaluated based on the teaching materials they develop which will be expected to indicate gains in content knowledge and scientific inquiry skills.

**Materials/Products/Exhibits Produced:**

Mobile laboratory equipment - Trained fellows have access to mobile lab equipment and reagents to conduct both lab exercises and independent research.

Shared lesson plans - Fellows produce teaching materials such as lesson plans, mini-units, or curricular modules based on information learned in the program and these are posted on the program wiki. Selected materials are presented during the summer workshops.

Nature of Discovery Symposium - Students have the opportunity to present their research and engage in discussions with scientists from Brown University.

Website - The program wiki contains lab protocols, lesson plans and best practices. This material will serve NH and VT teachers given the alignment of science standards. Future plans are to organize information housed on the wiki into a more accessible database.

**Dissemination Strategies:**

The current project will have reached 48 high school science teachers in RI. Future plans include partnering with the Providence RI school system to include 30 high school science teachers from this district. Lab protocols, lesson plans and best practices material from current web page will be organized into a more accessible and searchable resource. In addition, this content will be integrated with the Rhode Island Electronic Portfolio System which is a web-based learning environment for teachers and students.

# Spectrum: Building Pathways to Biomedical Research Careers for Girls and Women of Color San Francisco State University

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## Topics Addressed:

Biomedical research areas of women of color biomedical researchers (including genetics, developmental biology, neuro-endocrinology, cell biology, and health equity), as well as science topics related to women's health.

## Audience(s):

1) Middle & high school girls of color, 2) Biomedical research trainees (undergraduate, masters, & doctoral students) who are women of color, 3) Biomedical research faculty who are women of color, 4) Middle & high school teachers.

## Project Goals:

1. To educate local middle & high school students, especially girls of color, and teachers about research on women's health & NIH-funded biomedical researchers who are women of color
2. To develop a community of biomedical research role models & mentors that include females of color at multiple stages along the biomedical research career pathway
3. To develop a series of biomedical science activities tailored to the interests of adolescent girls and linked to the research programs of NIH-funded biomedical researchers who are women of color
4. To partner with the local and national Expanding Your Horizons organizations to pilot and disseminate the resulting activities on the science of women's health and this mentoring model nationwide
5. To investigate the role of participation in this program on the interest of girls of color in biomedical science and retention of women of color in the biomedical research career pathway.

## Project Description:

Spectrum is a project of SEPAL: The Science Education Partnership and Assessment Laboratory in the Department of Biology at San Francisco State University. While progress has been made in encouraging girls in science, women of color are still largely absent from the biomedical research community and few materials or models currently exist that are designed specifically to attract girls of color to these careers. Through the Spectrum initiative, SEPAL seeks to pioneer a multi-pronged program that brings together K-12 teachers and students with individuals from multiple stages on the biomedical research career pathway to learn together about the biology behind women's health issues and about research being conducted by women biomedical researchers of color. Together, a community composed of biomedical scientists who are women of color – including SFSU undergraduate students, SFSU Masters students, SFSU alumni in local doctoral and biotechnology positions, and SFSU Faculty – and middle and high school students and teachers will partner to address the project's goals by: 1) co-sponsoring after-school science clubs targeted at girls of color in high needs public schools, 2) developing a mentoring community of women of color in biomedical research, 3) developing a series of science activities and video biographies that highlight the research programs of NIH-funded biomedical researchers who are women of color, 4) partnering with the local and national Expanding Your Horizons organizations to pilot and disseminate Spectrum activities, 5) engaging a SEPAL Master's research student in investigating the experiences in the Spectrum Program and attitudes towards biomedical research careers of girls and women of color. Spectrum is so named to reflect its dual emphasis on developing scientists of color and on involving individuals from the entire spectrum of positions along the biomedical research career track.

## Project Evaluation:

Spectrum's program structure includes the involvement of scientific trainees from points along the biomedical research career pathway – from middle school students to faculty. As such, evaluation will analyze the impact of Spectrum on middle and high school girls of color, as well as the impact on the SFSU-affiliated scientific trainees who are women of color. Specific questions focused on each population will guide research and evaluation:

For middle and high school students, how does participation in Spectrum affect their understanding of:

- their own confidence and interests in science?
- educational pathways to careers in biomedical science?
- science learning as relevant, interesting, and attainable?
- the biology concepts related to girls' and women's biology and health issues?
- the biomedical research happening in NIH-funded laboratories at SFSU?

For SFSU undergraduate, Master's, and alumni scientific trainees, how does participation in Spectrum affect their understanding of:

- their own confidence and self-identity as a biomedical scientist?
- a career in biomedical research as relevant, interesting, and attainable?
- the skills involved mentoring and being a role model?
- effective approaches to communicating and teaching science to non-scientists?
- the biology concepts related to girls' and women's biology and health issues?
- the biomedical research happening in NIH-funded laboratories at SFSU?

Evaluation evidence will be collected from multiple sources at a variety of time points for each participant population, and will use either 1) pre/post research design to allow tracking of change within individuals over time, and/or 2) matched comparison group design to analyze differences between Spectrum participants and non-participants, when possible. Data collection tools will include surveys, focus groups, written reflections, and individual interviews. Evaluation activities will be collaboratively designed and conducted by project staff, the external evaluator, and Master's-level Spectrum Research Fellows under the direction of the PI.

## Materials/Products/ Exhibits Produced:

As a newly funded project, our materials and products are still in development. Please see the SEPAL website (<http://sepal.sfsu.edu/>) for periodic updates.

## Dissemination Strategies:

- Spectrum Science Activity Collection: In collaboration with Exploratorium staff, Spectrum is developing a science activity collection designed for adolescent girls of color that will include both 1) case-based activities about biological processes in females and 2) inquiry-based lessons based on the biomedical research programs of women of color.
- Spectrum Video Biographies: Spectrum is developing a series of video biographies designed for middle and high school girls that will profile women of color in biomedical research and give insights into their personal pathways in science.
- The Expanding Your Horizons Network: Spectrum will partner with the National Expanding Your Horizons Network and local San Francisco EYH Conference to evaluate, refine, and disseminate developed materials to educators with interests in equity and access.

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**Audience(s):**

Students, K-12, Families, Communities

**Topics Addressed:**

Health Disparities, Clinical Research and Clinical Trials

**Project Goals:**

1. To educate the general public through student enrichment and community outreach.
2. To determine if programs and activities emphasizing clinical research and trials for students and families increases their knowledge, interest and participation in clinical research and trials.
3. To disseminate the programs and science/research based health information to K-12 schools, libraries and homes in Greater Kansas City and nationally via the Library System and web-based technology.

**Project Description:**

Path0logical Life Sciences Training Program for Students and Families is targeted to a very diverse and underserved community in Wyandotte County, Kansas with a primary goal of providing young people the opportunity to experience the joy of learning biology and how biology relates health and health issues all through interactive learning. Further, the program provides high school students interaction and 5 weeks of work in the GCRC side-by-side with researchers and medical students who are conducting clinical trials. Finally, students will take the learning and enthusiasm back to their community and their families through the development of multi-media programs. Connecting with the youth in the community is key to working with the families and larger population. For it is the youth who can take the learning back to their families many who are immigrants and speak no English or limited English. This is an opportunity for the youth of the community to experience science and research and to find the hope and encouragement to continue their education.

**Project Evaluation:**

Evaluation goals address all five program components.

- Monitor the number and demographics of participating students.
- Assess participation of Biomedical Library Interns in planning and coordinating research projects
- Assess increased knowledge of students, teachers, and parents participating in family seminar nights.
- Assess participants' increase in knowledge and interest in life sciences
- Monitor number of participants' who pursue post-secondary education and intended or chosen area of study
- Assess student involvement in clinical and translational research projects
- Assess participants' increase in knowledge of video and computer technology
- Assess participants' increase in knowledge of health disparities, life sciences, and clinical trials

A variety of evaluation design and instruments will be used to determine the effectiveness of the KU SEPA project in meeting its goals. While some programmatic components are currently planned, others are in curricular planning stages. To date, a wide range of evaluation activities have been integrated into programming, including: focus groups, pre/post-surveys, reflective pre/post-surveys, quasi-experimental designs comparing camp participant outcomes with a similar control group, long-term follow up with program participants.

**Materials/Products/Exhibits Produced:**

1. Brochure and program for first Family Genetics Night, April 28, 2009
2. Summer 2009 Camp Path0logical curriculum
3. Annotated bibliography prepared by Biomedical Research Interns
4. Summer 2009 clinical research areas for GCRC Research Interns

**Dissemination Strategies:**

1. Website in development in which all products and curriculum will be available and searchable.

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**Audience(s):**

Students middle school - high school; families, adult (public)

**Topics Addressed:**

Evolution and health topics

**Project Goals:**

1. Understand human evolution
2. Role of evolution in influencing health
3. Understand evolution trade-offs
4. View health issues eg obesity from an evolution perspective
5. Understand that health issues are the result of genes, or gene environment interactions

**Project Description:**

The project is designed to introduce visitors to the idea of human evolution a difficult topic as is. But we intend to pick several health topics that resonate with our visitors or excite, and interest them and show how our understanding of human evolution can bring new insights and understanding to these topics. For example, bipedalism though affording hominid and homo sapiens opportunities that other primates do not have are the reason for a number of anatomically based problems (lower back pain, knee difficulties and decreased brain size for offspring). Another is obesity. In short we are living a life style that is out of synch with the environment and life style our genes evolved under and this is one of the lenses to look at the current obesity problems of modern life. Other examples that we are exploring are our immune system, the struggle we have with pathogens, lactose intolerance, sensitivity to alcohol. An idea we wish to pursue is that we are just fit enough, not the fittest, to survive and reproduce in our environment and this is in line with the idea of trade-offs; some adaptations are to our advantage but also contain some inherent difficulties eg lower backpain and excessive immune responses.

**Project Evaluation:**

The project is in its first year so we have not done extensive evaluation. We did a front end evaluation about visitors understanding of health issues we might cover in the project. It was an interview with visitors to the NYHoS. 1-How comfortable are visitors' talking about these health topics?

(e.g. Are these topics personally relevant, easy to identify with, and familiar to visitors?)

2-How deeply are these topics understood?

(e.g. Do visitors' explanations reveal both accurate knowledge and overgeneralizations?)

3-How clear is the connection between these health topics and evolutionary processes? (e.g. Are visitors' responses including everyday experiences as well as evolutionary concepts?)

Forty visitor groups participated in short interviews conducted at the New York Hall of Science. The target audience for the exhibition will be upper middle school and high school students. However, for the purposes of this study, the design team agreed that adults would be the primary target. With the exception of one 16 year old, all participants were over 18 years. All data in this convenience sample was collected over a holiday weekend in February. Many participants answered questions on these topics through the lens of personal experience. This suggests that the filter for selecting topics that "apply to the majority of visitors" was successful.

b. Familiarity has tradeoffs, too. Visitors are likely to come to this exhibit with fairly strong beliefs about personal health. Selecting examples that resonate with visitors is going to be very important.

a. Examining the language used throughout visitors' answers, the depth of understanding of most topics is quite shallow. Even for items ranked most familiar, there were multiple examples of over-generalization.

Visitors' responses offer some important insights into areas where this exhibit can build on and places where understanding is more limited.

b. While there were some spontaneous connections to evolutionary thinking or processes, on the whole, participants do not think about these relationships first when they think about health topics. This presents the exhibition with an excellent opportunity to put an interesting twist on the understanding of familiar health topics by offering evolutionary explanations that are likely to be unfamiliar to most visitors.

**Materials/Products/Exhibits Produced:**

N/A. This is the first year of the project

**Dissemination Strategies:**

N/A This is the first year of the project but our dissemination plans are to interest science centers, natural history museums and other informal science venues to present the exhibition and programs to their audiences. In addition, we would interest schools, libraries and universities to explore the exhibition,

# HealthWISE: Health=Winning Investigations for Students + Elders

## San Joaquin County Office of Education

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### Audience(s):

elementary grade students, pharmacy students, families

### Topics Addressed:

Elementary science + health education utilizing two curricula that target immunizations (5th grade) and the promotion of healthy living by studying insects (2nd grade).

### Project Goals:

1. Improve health science education in K-6 students with pharmacy student volunteers who are effectively trained, provided with curriculum resources, successfully matched with teachers, and who receive u

### Project Description:

The HealthWISE program is a Phase II partnership between second year pharmacy students at the University of Pacific in Stockton, California; the University of Arizona in Tucson; and Washington State in Spokane, Was with second or fifth grade teachers in Tucson, Stockton and Spokane, in an effort to promote health literacy and science in the local schools. Pharmacy students sign up and attend an elective course that trains them in the HealthWISE procedures and over the course of seven weeks, pharmacy students work closely with teachers and the provided curriculum, to enhance the understanding of science and health in the classroom.

The second grade curriculum "Insects", involves learning the scientific method and health, through the examination of a variety of insects. A typical weekly lesson involves a piece of literature that relates to an insect, followed by discussion and a check for understanding. The pharmacy students then present the insects to the students, who make predictions, observations and record data. Upon collection of data, students are shown how to graph or chart the data for easy interpretation and analysis.

The fifth grade curriculum "IZ+", targets body systems and its ability to ward off infection. Through a series of labs and activities, students are able to grasp a better idea as to how the human body works to ward off infection. The expertise of the highly trained pharmacy student greatly enhances the students' understanding of these concepts.

The benefit of having pharmacy students' work with elementary students 1) provides the elementary students with positive role models and a resource who has had in depth training in science, 2) offers teachers a new perspective on how to teach science and 3) gives the pharmacy student an opportunity to give back to his/her community and refine key communication skills necessary in their profession.

### Project Evaluation:

For the Phase II, dissemination phase of HealthWISE, two on-line curricula, Using Live Insects for 2nd grade and , Immunization Plus for 5th grade, are evaluated to examine the impacts of the curriculum on students in selected classrooms, as well as to assess the degree to which the program is implemented as planned. Both outcome and process study design and measurement instruments are used. The outcome aspect of the evaluation provides insight on the following issues: Have the expected results of the program been met? To what extent have knowledge, attitudes, and beliefs of the students changed as a result of the program? Are target populations (teachers and students) satisfied with the quality of the curriculum, and how is it implemented? To what extent does gender, ethnicity and SES and acculturation mediate treatment impact?

The evaluation is similar to that previously carried out and reported in Phase I, however for Phase II, the number of outcome measures for students has been expanded to include beliefs and attitudes about the content areas as well as more generic attitudes about science education. The first year of the grant was spent educating partners, and designing the elective course for pharmacy students. Years 2 of the grant entailed field implementation of the evaluation measures. Based upon suggestions from the previous reviewers, the study follows a lagged baseline design. In this type of design all schools will get the intervention. However, "proxy" control schools will get the intervention after the intervention schools. For all schools, data from student self report questionnaires consisting of structured questions will be collected before and after the implementation of the curricula to assess program effectiveness. To increase the power of test, a longitudinal panel design strategy will be followed, where student data on baseline questionnaires will be linked to their data on follow up questionnaires. Year 3(08/09NCE1) is the evaluation year. Questionnaires have been administered by the evaluation investigators to student participants in conjunction with the implementation of the HealthWISE curricula by the pharmacy students. Compilation of this evaluation is now in progress. Results will be posted on the website by mid-summer ('09)

### Materials/Products/Exhibits Produced:

All information, resources and directions for the provision of the elective course for pharmacy students, tips on implementation of the curriculum, online training modules for the pharmacy student to be utilized in the elective course as homework, and information for the adopting school. In addition, a HealthWISE Family Events Manual has been developed and it utilized for family events that further implements the curriculum and involved families in HealthWISE learning.

### Dissemination Strategies:

All materials for replication are on website:  
[www.healthwiselearning.org](http://www.healthwiselearning.org)

Conference presentations:  
Capitol Area Science Education Leaders, American Association of Colleges of Pharmacy, California and National Science Teachers Association, Association of Supervision and Curriculum Development



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<http://metablast.org/>

**Audience(s):**

High School students and teachers. Also college students

**Topics Addressed:**

Cell biology, metabolic biology, energy flow in the biosphere,

**Project Goals:**

1. Complete the development of the art and computational assets for the Meta!Blast application
2. Expand the educational content in the context of the Meta!Blast interactive module.
3. Integrate characters, music, plot, and built-in assessment components to enhance the learning experience and improve student engagement.
4. Perform iterative formative and summative testing to fully assess our hypothesis.
5. Use formative testing results to enhance the final product

**Project Description:**

The overarching hypothesis of this project is that interactive, dynamic learning environments can facilitate student learning of complex biological concepts. To address this hypothesis, we will develop Meta!Blast, an interactive module on cell biology. Students will be immersed in a three-dimensional, biologically accurate plant cell. Individual biological concepts will be parsed into student tasks, while keeping these tasks in the context of the whole environment. The fundamental principles and content underlying Meta!Blast development are based on the Content Standards of the National Academy of Sciences for life science, grades 9-12. Careful scaffolding of science content through the use of dialogue, interactive experiences, and built-in assessments, will increase the complexity of the experience, and require students to use previous information to succeed at new challenges. In-module assessment tools will enable teachers to monitor student progress. Meta!Blast will combine sophisticated simulation technology with accurate biological information, to allow students to explore and interact with a cell and during this process to discover cellular energetics, gene function, cellular defenses against pathogens, and the consequences of compartmentation. The ability to change environmental scales can make the student aware of not only the individual parts and processes in the cell but how they work together to allow the whole to function.

**Project Evaluation:**

As Meta!Blast is developed, it will be subjected to external formative and summative evaluations by target audiences consisting of students and their teachers. Target audiences will be drawn from Iowa, with its rural population, and from New Mexico, which has a high proportion of underrepresented groups. The results of these evaluations will be discussed with Meta!Blast developers, and used to drive changes in the module.

**Materials/Products/Exhibits Produced:**

Exhibits have been arranged for Iowa Science Center (2010) and for Hyderabad, India UNICEF-sponsored museums (November-2009 to Jan 2010, pending funding).

**Dissemination Strategies:**

On-line and DVD distribution of Meta!Blast game, teacher's guide, students guide via project website

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[www.uab.edu/cond](http://www.uab.edu/cond)

**Audience(s):**

Middle school teachers, students, parents, and medical, graduate, and undergraduate honors students

**Topics Addressed:**

environment and health, nutrition, obesity, cardiovascular and pulmonary systems, genetics, molecular chemistry, chemical solutions, HIV, sickle cell

**Project Goals:**

1. Provide inquiry-based science training for middle school teachers
2. Promote biomedical science education and health care literacy for students
3. Facilitate effective health literacy, biomedical science training, and cultural awareness among health profession students
4. Enhance health literacy and good health practices among the general public

**Project Description:**

The project addresses health issues and science literacy in a predominately underserved population of students and families. The aims of the project are to:

- Promote excellence in biomedical science education and literacy among Birmingham City Schools (BCS) students
- Provide outstanding training in inquiry-based biomedical education to middle school science teachers in BCS
- Enhance health literacy and good health practices among the general public, especially among the parents and siblings of the middle school students
- Foster an appreciation of biomedical education among UAB science and professional students to create a cadre of scientists and clinicians who will support and provide leadership for K-12 science education throughout their careers.

**Project Evaluation:**

Data are collected by BCS teachers and staff under the direction of BCS administration and analyzed by the project external evaluator in a blind fashion. All GPA and standardized test data are tracked by the BCS computer system (SchoolMax) and categorized according to the participation of the individual students in the program. We expect to be able to track the students' performance through high school and determine the effect of the programs on college entrance. The performance of classes taught by teacher participants is tracked and compared to classes taught by non-participants.

Our initial data are from pre- and post-test scores on all modules in the project. The results allow us to respond to lack of student success in a module by immediately revising the module and/or teacher training. Frequent meetings with the teachers and health care professional university students who are facilitating the modules will provide input on needed modifications. Our research design includes end of year assessments of all participating students as well as a control group of students from middle schools not participating in this project. This will allow us to document the long-term effect of the program.

Analyses of pre-post tests from students in the Summer Science Camps demonstrate very significant gains in biomedical and general science knowledge. Comments by parents clearly demonstrate their engagement in the process. Reports from teachers suggest that they are translating their inquiry-based training into the classroom and developing new science experiences for their students.

**Materials/Products/Exhibits Produced:**

Full protocols for activities developed by the program including:  
6 Summer Science camps, 3 middle school Classroom experiences, McWane Science Center labs

**Dissemination Strategies:**

Protocols for each program will be made publicly available on CORD's website. Students will teach their parents and siblings the lessons that they learned, thus disseminating the health information to the general public. Staff will present program results at annual meetings of the Alabama Science Teachers Association, National Science Teachers Association, Experimental Biology, and/or Society for Neuroscience.

# Phase 1/II Study: Going to Middle and Early High School Classes with Near-Peer Mentors Walter Reed Army Institute of Research

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## Audience(s):

Middle and High School Students

## Topics Addressed:

Genetics, chemistry, computational biology and other fields

## Project Goals:

1. Expand partnerships with the District of Columbia Public Schools through contact with administration and specific schools (District of Columbia STEM Alliance, Science Director of the DCPS, McKinley
2. Guide teachers in the use of new curricula such as Fascinating Education and other material for in-classroom use.
3. Using carefully selected and trained near-peer mentors, develop and introduce after-school activities for enhancing retention of biology and chemistry concept knowledge through inquiry-centered act
4. Expand/disseminate this program to both a suburban and a rural site to test program efficacy in additional environments.
5. Publish and disseminate results for program development at more schools.

## Project Description:

Using the Walter Reed Army Institute of Research investigators' continuing collaboration with the District of Columbia Public Schools and their development of the Gains in the Education of Mathematics and Science (GEMS) program, this project is an in-classroom and after-school intervention to improve the learning of science concepts with true experimentation for participants while guided by experienced college students called near-peer mentors. Students are from several middle and high schools with mixed ethnic, economic and academic backgrounds. Student standardized test scores are insufficient to support college admission to study in STEM fields and low interest in STEM is present. With teacher and school administration involvement, the approaches are: 1) to use specialized curricula from several sources to enhance the in-classroom teaching of biology and chemistry; 2) during after-school sessions, to guide participants in inquiry-centered activities trained and guided by near-peer mentors; and 3) to introduce music making to improve STEM concept learning and raise interest in STEM learning. With promising results on efficacy, the investigators will move this urban program to suburban and/or rural environments to address similar aspects of this multifaceted problem.

## Project Evaluation:

1. Pre- and Post-program Questionnaires address changes in interest with regard to biology, chemistry and other fields as well as student attitudes toward learning. On the pre-survey, some questions address the students' backgrounds including parental education, parental involvement in school and projects and other baselines. The post-survey asks where students learned specific techniques and addresses lesson content with regard to students' changing attitudes toward teachers (near-peer mentors), learning and inquiry-centered science activities.
2. Near-peer Mentor Evaluations of participant understanding of the project material and concept learning. Assessment completed on a 10-point scale, pre- and post-lesson.
3. Near-peer Mentor Interviews and Evaluations, throughout the activities, characterize the mentor-student interaction, near-peer mentor learning and near-peer mentor changes toward teaching and mentoring.
4. Improvements in Grades are quantified by participating teachers.
5. Interviews with Teachers and Administrators, throughout the activities, capture their attitudes with respect to success or failure of the project.
6. Post-participation Inquiries, with Parents/Grandparents, will be used to determine if participants had improved grades, class room participation or attitudes toward learning as can be evident at home and during interactions with parents.

## Materials/Products/Exhibits Produced:

NA

## Dissemination Strategies:

Currently NA.

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