3M STEM Education Fellows
Curricula Development through a University-Corporate-School District Partnership

Tamara Moore, Gillian Roehrig,
Emily Dare, Kristina Tank, Aran Glancy
3M STEM Fellows Program

• Grant given to the STEM Education Center at the University of Minnesota from 3M Foundation

• Purpose:
  – To work with districts in the vicinity of 3M

• Mutually beneficial partnership
  – Provides our graduate students with a place to study research-to-practice innovations
  – Provides districts with high-level professional development with no additional cost to them
3M STEM Fellows

Partner Schools:
• St. Paul Public Schools
• North St. Paul School District
• South Washington County Schools
• White Bear Lake School District
Saint Paul Public Schools

3M STEM Education Fellow:
Emily Dare
St. Paul Public Schools (SPPS)

• 2011 – 2012
  – Inquiry-based physics for middle school teachers
  – Grades 5-8
  – Summer professional development (2 weeks)
  – Follow-up support during school year
  – Taught by Nancy Bresnahan (Hopkins)
St. Paul Public Schools (SPPS)

- Toy Rocket Project
- Greg Childs, Ashley Cannaday
- 5th grade
- 10 day unit
St. Paul Public Schools (SPPS)

- Toy Rocket Project
  - Engineering Design Process
  - Multiple final marketing products developed by students
  - Strong focus on creativity
St. Paul Public Schools (SPPS)
St. Paul Public Schools (SPPS)

• 2012 – 2013
  – Inquiry-based physics for physical science teachers
  – Grades 5-12
  – Summer professional development (2 weeks)
  – Follow-up support during school year
  – Taught by Emily Dare
St. Paul Public Schools (SPPS)

• 2012 – 2013
  – Data collection of SPPS science teachers to inform professional development topics for summer 2013
  – All levels (focus on middle and high)
  – Working with SPPS Science Team
    • Marty Davis, Nancy Geving, Molly Leifeld, Greg Childs, and Jamie Dery
North Saint Paul-Oakdale-Maplewood School District (ISD#622)

3M STEM Education Fellows:
Kristina M. Tank & Christina Miller
The Collaboration (2010-Present)

• Providing ongoing support to meet district needs:
  • Focused on Elementary (K-5)
  • STEM, Engineering and nonfiction Literature

• Worked with:
  • District center staff,
  • Curriculum and staff development coordinator,
  • Elementary principals,
  • District Science Committee
  • STEM specialists,
  • K-6 classroom teachers at several buildings
Projects and Support

• **District Level (District-wide)**

• Develop and support the implementation of elementary STEM specialists

• Assisted with curriculum mapping of science standards and units

• Integration of Literacy into Science
  • Alignment of Nonfiction Units and Texts
  • Implementation of Science Notebooks
Projects and Support

• **District Level (District-wide)**

• Professional Development
  • Engineering
  • New FOSS Unit (Models & Designs)

• Week-long Summer Professional Development (STEM Integration)
Projects and Support

• **Building/School Level**
• Afterschool engineering - 2 elementary buildings over 2 years
• Facilitated Professional Learning Communities (PLC) with 3rd, 4th and 5th grade teachers in one elementary building to help them implement science and engineering.
• Worked closely with a 5th grade team to integrate engineering into science units
• Worked closely with Lead STEM Specialists and building STEM Specialists
PictureSTEM

- Using Literature as a Means to Integrate STEM in the Elementary Classroom
  - High-quality trade books (fiction and nonfiction)
  - How those could facilitate STEM learning

- Create STEM integration modules
  - Include an engineering component
  - Meaningful and intentional connections between STEM fields to highlight interdisciplinary and not a “silo” approach
  - Flexible implementation
  - Best practices/pedagogies in each discipline
Designing Animal Habitats

<table>
<thead>
<tr>
<th>Science Connections</th>
<th>Technology Connections</th>
<th>Engineering Connections</th>
<th>Mathematics Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animals, habitats and basic needs, designed and natural systems</td>
<td>Designed habitats and “cage” components</td>
<td>Engineering design process, testing materials</td>
<td>Characteristics of basic shapes, compose and decompose objects, measurements with emphasis of making 20</td>
</tr>
</tbody>
</table>
## Designing Animal Habitats

<table>
<thead>
<tr>
<th>Sample First Grade Module: Designing Animal Habitats</th>
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</thead>
<tbody>
<tr>
<td><strong>Literacy Focus:</strong> Suggested guided reading theme: animals, habitats</td>
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<tr>
<td><strong>Day 1 - Animals</strong></td>
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<tr>
<td><strong>STEM integration activities</strong></td>
</tr>
<tr>
<td>Sort animals by characteristics and basic needs</td>
</tr>
</tbody>
</table>
Implementing PictureSTEM

• STEM Specialists piloted the unit with all first and second graders (over 30 classrooms)
  – Observe classrooms to look at implementation, and student learning
  – Teachers provided feedback
  – Help us revise the unit
• Implement the revised curriculum next year
5th grade work for 2011-2012

- Developed integrated curriculum combining FOSS and EiE
- Worked with all 5th grade teachers on implementation
- Worked with after school engineering program for girls
- Science MCA scores for 5th grade improved by approximately 20%, while the remainder of district 5th grade scores stayed statistically same
South Washington County Schools

3M STEM Education Fellows:
Aran Glancy & Sousada Chidthachack
Partnership Overview

• 2010-Present
• STEM Integration
  – STEM Class
  – Mathematics
    • 6th & 7th Grade
    • 3 Teachers
• Signs of Success
  – MCA-III 2011-2012: 18% Improvement
Themes

• Engineering
  – Realistic Context
  – Meaningful Applications
• Technology
  – Excel, Geometers Sketchpad, Google Sketchup
• Interactive Explorations
• Science Connections
Engineering Design Challenges: Big Foot
Engineering Design Challenges

Paper Airplanes
Engineering Design Challenges

- Summer Job
- Volleyball Team
- Pelican Colonies
Technology

Compound Interest with Excel
Technology

Scale, Measurement, & Proportionality with Geometer’s Sketchpad

Can you estimate my height in inches?
Technology

Geometry with Google Sketchup
Exploring Math through Games
Exploring Math through Games
Connections to Science
3M STEM Education Fellows Program

• Mutually beneficial partnership that bridges research-to-practice
• 5 research papers either published, in review, or in development
• 2 dissertations
• $8M NSF grant born out of this partnership
• Questions?
Contact Information

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Aran Glancy: aran@umn.edu

STEM Education Center: http://stem.umn.edu