Science & Mathematics Integration for Literacy Enhancement (Project SMILE)
What is Project SMILE?

A DR K-12 Exploratory Project addressing Challenge 3: *How can the ability of teachers to provide STEM education be enhanced?*

Promoting a nexus of science, mathematics and technology to inquire and solve problems of real life relevance, using modern technological tools, in middle school classrooms: That is the essence of Project SMILE!

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The overarching goal of the project is two-fold:

1. To promote integration of *Scientific Inquiry* with *Mathematical Problem Solving*, using *InspireData*, in exploring real world situations, questions, issues or problems.

2. To study the effectiveness of *InspireData* in enhancing teachers’ ability to teach and students’ ability to learn these components of STEM “literacy”.
What are the Tools of Project SMILE?

In order to promote integration of *Scientific Inquiry* and *Mathematical Problem Solving*, Project SMILE has been using:

- **InspireData** as the primary instructional software

- The **Iowa Chautauqua Model** of Professional Development as the vehicle for teacher learning

- **Moodle & Mahara** e-learning software as the primary means of communication during the academic year
The Essence of Project SMILE

Iowa Chautauqua Model

Integrated Science and Math

- Development of Teachers’ Content Knowledge
- Development of Teachers’ Pedagogical Knowledge
- STS
- Problem Solving as Modeling
- Inspire Data

Classroom Practice

- Students’ Learning Progressions
- Analysis of Classroom Discourse
- Analysis of Students’ Work
Teacher Learning Questions

• To what extent can *InspireData* improve the integration of scientific inquiry with mathematical problem solving in exploring real world situations, issues and questions in grades 6 – 8 math and science classes?

• To what extent can professional development focused on integration of science and mathematics instruction, mediated by *InspireData*, enhance middle school teachers’ ability to teach scientific inquiry and mathematical problem solving?
Student Learning Questions

• To what extent can an integrated math and science curriculum that emphasizes technological tool use in applied learning improve students’ scores on math and science achievement, compared to current instructional practices?

• What changes are evident among students whose teachers become involved in Project SMILE? To what extent can an integrated math and science curriculum that emphasizes technological tool use in applied learning improve students’ motivation and attitudes toward math and science, compared to current instructional practices?
Who are the Participants in Project SMILE?

• 15 Middle Grades (grades 6 – 8) In-Service Teachers who teach Either Science or Mathematics or Both

• 7 Schools from 6 Counties (School Districts) Participating
What is Project SMILE’s Plan of Action?

**Year 1**
- Participant Recruitment
- Pre-Data Collection
- Summer Institute

**Year 2**
- Implementation of Modules
- Assessment of Student Learning
- Post-Data Collection
- Summer Institute

**Year 3**
- Implementation of Modules
- Assessment of Student Learning
- Post-Data Collection
Project SMILE Summer Institute

Three-Week Summer Institute to:

• Experience a math-science integrated module designed using STMS pedagogy
• Learn to use *InspireData* to collect, analyze and visualize data within the module
• Develop an integrated module for use in teachers’ own classrooms
Summer Institute in Progress
The SMTS Pedagogy

Science Mathematics Technology and Society

The INVITATION Phase:
What, in your opinion is the most significant news event you have heard/seen/read lately?

The EXPLORATION Phase:
Groups were asked to brainstorm possible ways of gathering/generating information that will help answer their particular question.
The SMTS Pedagogy

Science Mathematics Technology and Society

The EXPLANATION Phase:

Participant groups make presentations of the results of their data and findings, etc.

The TAKING ACTION Phase:

Participant teachers brainstorm about how middle school students might use the scientific and mathematical knowledge gained through this module?
Data Analysis with InspireData
InspireData Data Table

<table>
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<th>Sorbent Effectiveness</th>
<th>Mean of all trials</th>
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<tr>
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</table>
Effectiveness of Various Sorbents to absorb oil

- Hair
- Litter
- Cotton
- Blue Towel
- Paper Towels
- Sponge
Teacher Data

- Teacher Survey Questionnaire (Pre-Post)
- Focus Group Interviews (Pre-Post)
- SCOOP Notebook
- Classroom Observations/Videos analyzed through Reformed Teaching Observation Protocol (RTOP)
- Inquiry Questionnaire (end of year)
Student Data

• North Carolina End-of-Grade Exam Scores
• Inquiry Questionnaire
• Modified Attitudes toward Science Inventory
What is Project SMILE Data Analysis Approach?

Progressive Comparison Analysis:

• Data are being analyzed using appropriate Statistical and Qualitative methods

• Comparison of data analysis results from Pre-data to first year, to second year, and to third year in order to document progress and change toward project goal accomplishment
What are Project SMILE’s “Deliverables”?

• Production of several math-science integrated instructional modules based on real world situations, issues, problems and questions, focusing on major content objectives in North Carolina Standard Course of Study for Mathematics and Science

• A web-based repository of Instructional Modules for reference and use by other teachers
Examples of Teacher Generated Modules

• Bacteria: Can we be Friends?
  An exploration of Microbiology content in 8th grade science and math classes

• CSI: Scientific Method and Problem Solving.
  An exploration of the “inquiry” goals in 7th grade science class

• Water Quality: How good is our water supply?
  An exploration of part of the Hydrosphere goals in 8th grade science and math classes

• Energy Sources: Alternatives to Oil!
  An exploration of alternative energy sources in 8th grade science class