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 and mathematics 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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What are the Goals of Project SMILE?

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 will use:

InspireData Grades 4-12

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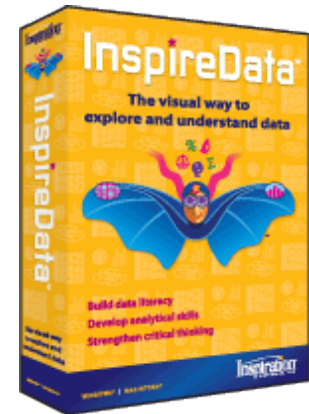
- The **Iowa Chautauqua Model** of Professional Development as the vehicle for teacher learning

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

Mahoodle

The Essence of Project SMILE

Iowa Chautauqua Model

Development of Teachers' Content Knowledge

Development of Teachers' Pedagogical Knowledge

Integrated Science and Math

STS

Problem Solving as Modeling

Inspire Data

Classroom Practice

Students' Learning Progressions

Analysis of Classroom Discourse

Analysis of Students' Work

What Questions will Project SMILE Investigate?

Teacher Learning:

- 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?

What Questions will Project SMILE Investigate?

<u>Student Learning</u>:

- 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?

- To what extent can an integrated math and science curriculum that emphasizes technological tool use in applied learning improve students' performance on authentic assessments of mathematical and scientific proficiency, compared to current instructional practices?

What Questions will Project SMILE Investigate?

<u>Student Learning</u>:

- 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?

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

- 8 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
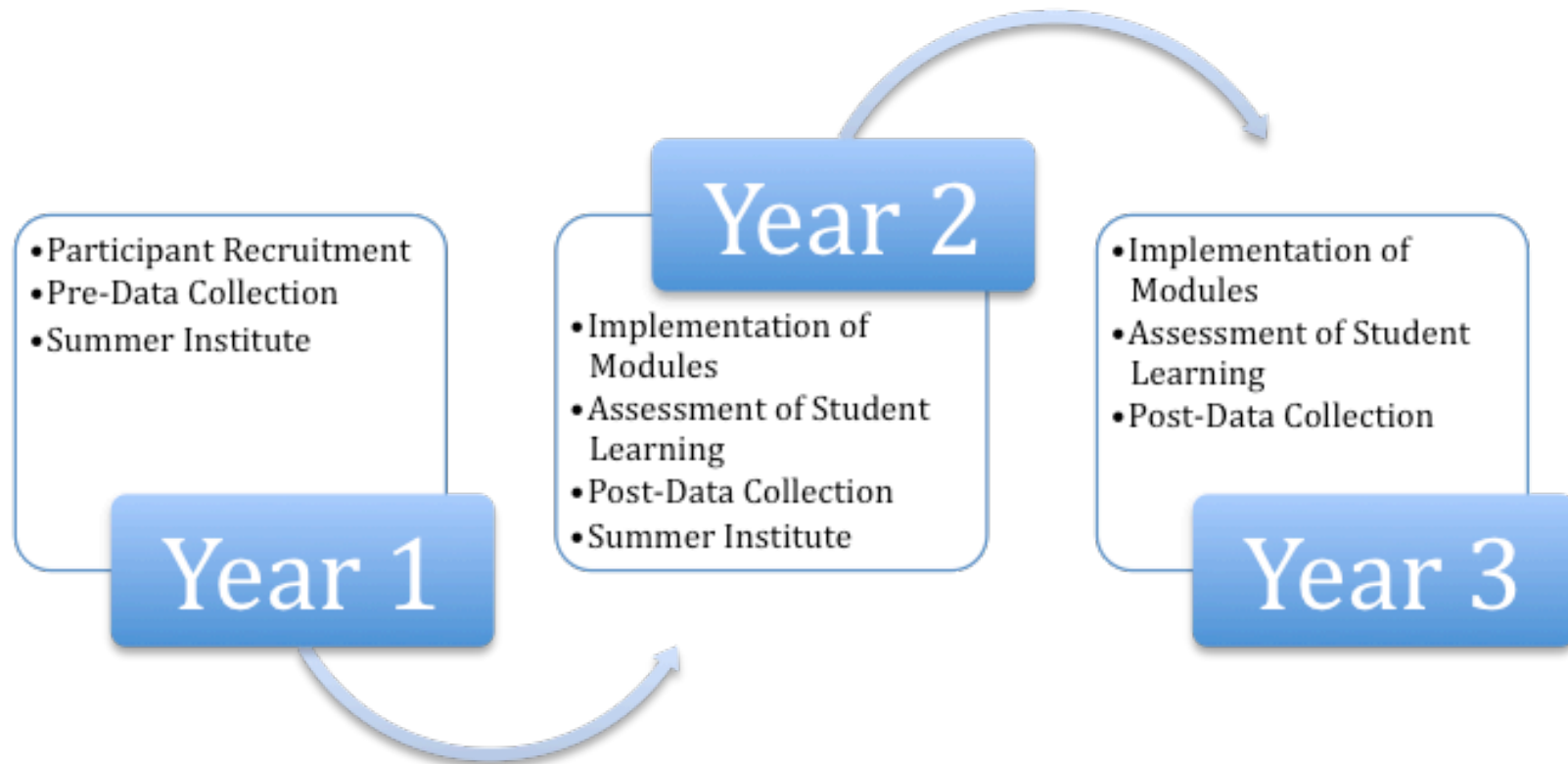
Project SMILE Summer Institute

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

STMS

Science Technology Mathematics 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 will be asked to brainstorm possible ways of gathering/generating information that will help answer their particular question.

STMS

*Science Technology Mathematics and Society*

The EXPLANATION Phase:

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

The EXPLORATION Phase:

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

Data Analysis with InspireData
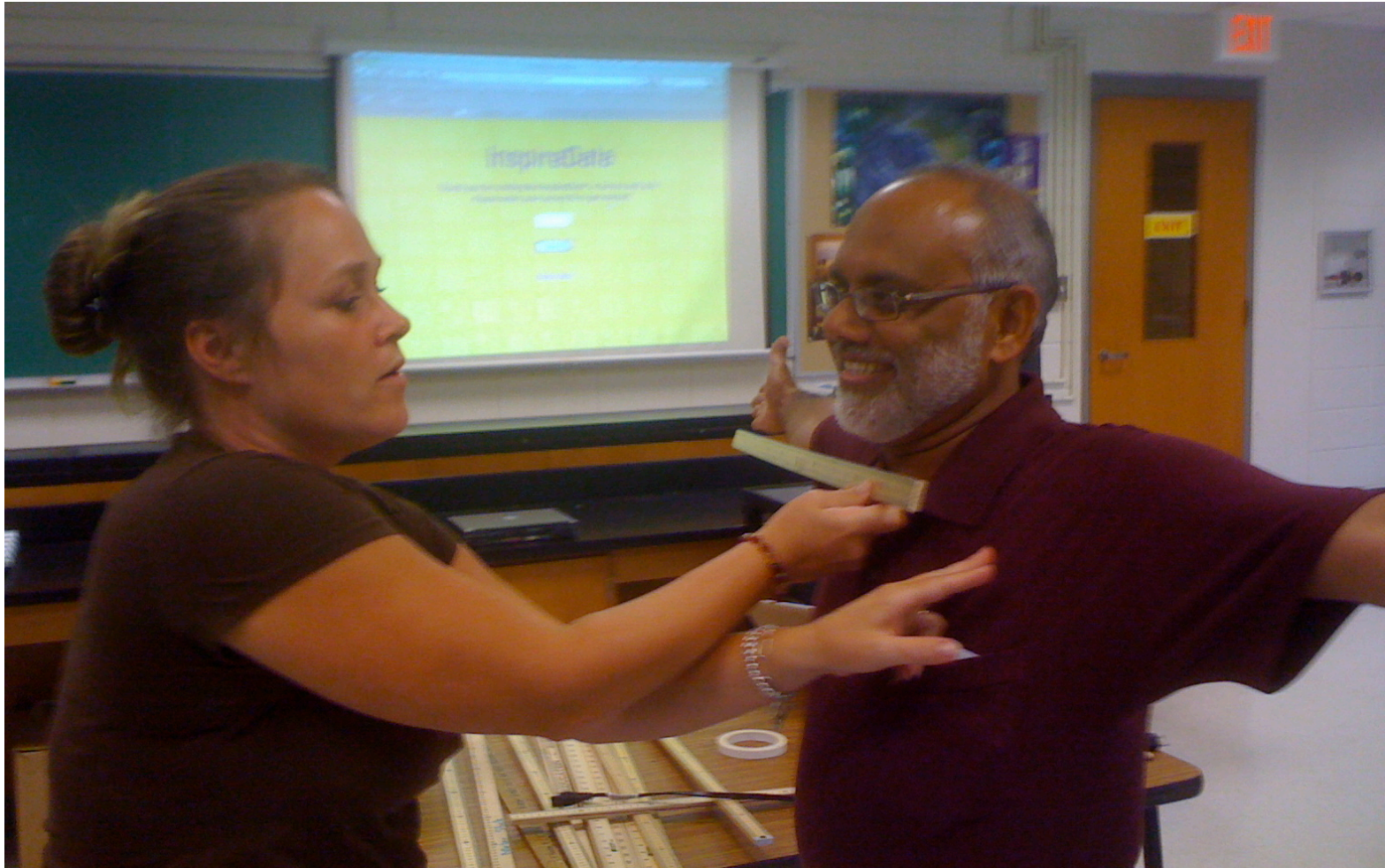
InspireData Data Table

Sorbent	Sorbent Effectiveness			Mean of all trials
	trial 1	trial 2	trial 3	
Blue To...	2	2	2.5	2.17
Hair	0.16	0.16	0.16	0.16
Paper T...	5	5	4	4.67
litter	7	6.5	6.5	6.67
Hair	6.25	6.25	5	5.83
Cotton	5	5	5.5	5.17
Hair	4.67	5.5	6.11	5.43
Hair	6	6	6	6.00

Effectiveness of Various Sorbents to absorb oil

Sorbent: ☐ Hair ☐ litter
☐ Cotton ☐ Blue Towel
☐ Paper Towels ☐ sponge

Sorbent
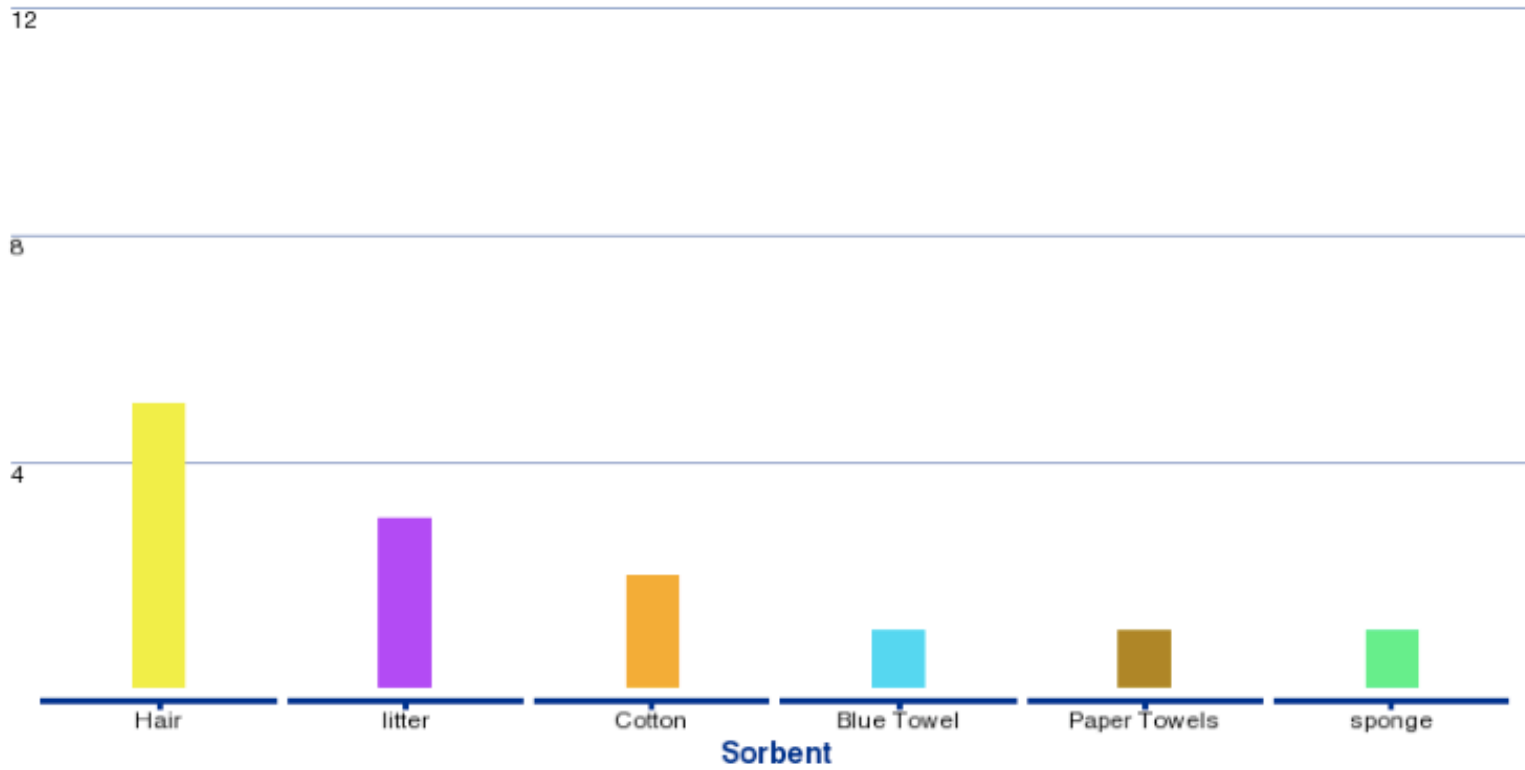
What Data will Project SMILE Collect?

Teacher Data:

- Teacher Survey Questionnaire

- SCOOP Notebook

- Classroom Observations/Videos analyzed through Reformed Teaching Observation Protocol (RTOP)

- Inquiry Questionnaire

What Data will Project SMILE Collect?

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 analysis will employ 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 Tangible Products?

- Project SMILE will result in the 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 will be developed for use by other teachers