Welcome NMSA teachers

Guided Inquiry Science using Vernier LabQuest Probes

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NISMEC
Northern Indiana Science, Mathematics & Engineering Center
The PASCO hand-held device - SPARK

The SPARK costs the same as the Labquest-
$329
(less if you buy more at the same time)

Middleschool examples

1. Varying Reaction Rates
2. Are you Speeding?
3. Bright Lights
4. Varying Lights
5. Operation Deep Freeze
6. Why Do We Brush Our Teeth?
7. Thermoregulation of the Body Temperature
8. Recovery Heart Rate
9. Acid Rain and Plant Growth
10. Soil Characteristics
11. Exploring Environmental Temperatures
12. Mapping the Ocean Floor
<table>
<thead>
<tr>
<th>Experiment</th>
<th>Temperature</th>
<th>Motion</th>
<th>Force</th>
<th>Conductivity</th>
<th>Gas Pressure</th>
<th>Heart Rate</th>
<th>Light</th>
<th>Magnetic Field</th>
<th>pH</th>
<th>Voltage</th>
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<td>A Hot Hand</td>
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<td>The Greenhouse Effect</td>
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<td>Soil Study</td>
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<td>What Causes Seasons?</td>
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<td>Ocean Floor Mapping</td>
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Twelve of the 38 suggested Middle school Vernier / Labquest experiments
A good reference

Ready, Set, SCIENCE!

Putting Research to Work in K-8 Science Classrooms

Sarah Michaels, Andrew W. Shouse, and Heidi A. Schweingruber

Four Strands of Science Learning

Strand 1: Understanding Scientific Explanations
Strand 2: Generating Scientific Evidence
Strand 3: Reflecting on Scientific Knowledge
Strand 4: Participating Productively in Science
Middle-School Science Inquiry:

• What is Science?

Science is devoted to formulating and testing naturalistic explanations for natural phenomena. It is a process for systematically collecting and recording data about the physical world, then categorizing and studying the collected data in an effort to infer the principles of nature that best explain the observed phenomena.

*Note the key action verbs* - science is formulating, testing, collecting, recording, categorizing, studying, inferring, explaining – all active, dynamic and procedural... Klayman et al 1986:
What is a scientist?

What is Guided Inquiry (GI) (in science teaching)?

How can we implement GI in the classroom?

In this workshop

- We will be scientists
- We will be learning how to implement GI in our classrooms
- During this school year, our students will be scientists

The old Chinese proverb:

I hear…. And I forget
I see….. And I remember
I DO….. And I understand
(1) Introducing yourselves to yourselves and (2) to your Labquest
And (3) Experiment #1

Your group needs

**log book/science notebook (one each)**

One set of Guidelines for the “HOT HANDS” experiment

1 Labquest, 1 temperature probe
1 beaker of water, and some paper towels

After all groups have their experimental results, we will come back together, compare our data (are they the same? or different? What do they mean? Etc… We will discuss the concepts and standards (by grade level) covered.
<table>
<thead>
<tr>
<th>Essential Feature</th>
<th>Variations</th>
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<tbody>
<tr>
<td><strong>GI value --&gt;</strong></td>
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<tr>
<td>1</td>
<td>Learner engages in scientific questions</td>
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<tr>
<td>2</td>
<td>Learner gives priority to evidence in responding to questions</td>
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<td>3</td>
<td>Learner formulates explanations from evidence</td>
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<td>4</td>
<td>Learner connects explanations to scientific knowledge</td>
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<tr>
<td>5</td>
<td>Learner communicates and justifies explanations</td>
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</table>

MORE -----------  
LESS -----------  

Amount of learner self direction
Amout of direction from teacher or material ---

LESS
MORE
Quality intellectual work, learning, and play are different angles in the process of inquiry.
The SIP Principle

Play is

✓ Satisfying
✓ Intentional
✓ Problem solving

Do you feel the same way about your students’ learning in class?
Inquiry calls for deep engagement with the question;

Misconceptions and error are essential to the process of problem-solving
Quality intellectual work

Has three essential features:

Construction of knowledge that actively involves the learner in developing his/her understanding

Through the use of Guided/disciplined Inquiry

To produce discourse, products, or performances that have Value beyond the classroom.

Experiment #2  Motion, motion, motion
“a policeman’s work is never done...”

Learning about the concepts/meaning of:

Graphs, slopes

And ..... The relationships between

Distance, time, speed, velocity and acceleration

Experiment with your group on producing and understanding linear motions (with and without acceleration)..... – see handout
Every child is a scientist at play: Wondering and problem-solving about how the world works.
Every scientist/teacher was a child at play.
Consider

The science you do

The science you teach

IS IT WORK?

or

IS IT PLAY?
Key Concept

Reflection

Is a part of Evaluation
(usually thought as part of the student’s learning progress)

One of the richest sources for learning is the learner herself.
Does your testing of students follow this model?

**Best Practices from the Far Side**

- Assessment
- It’s not one size fits all……at least it shouldn’t be.