Welcome NMSA teachers

Guided Inquiry Science using Vernier LabQuest Probes

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NISMEC
Northern Indiana Science, Mathematics & Engineering Center

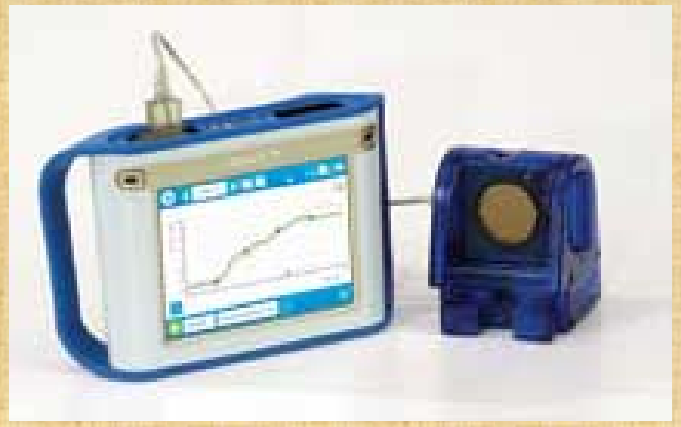
The PASCO hand-held device - SPARK

The SPARK costs the same as the Labquest-

$329

(less if you buy more at the same time)

Middleschool examples



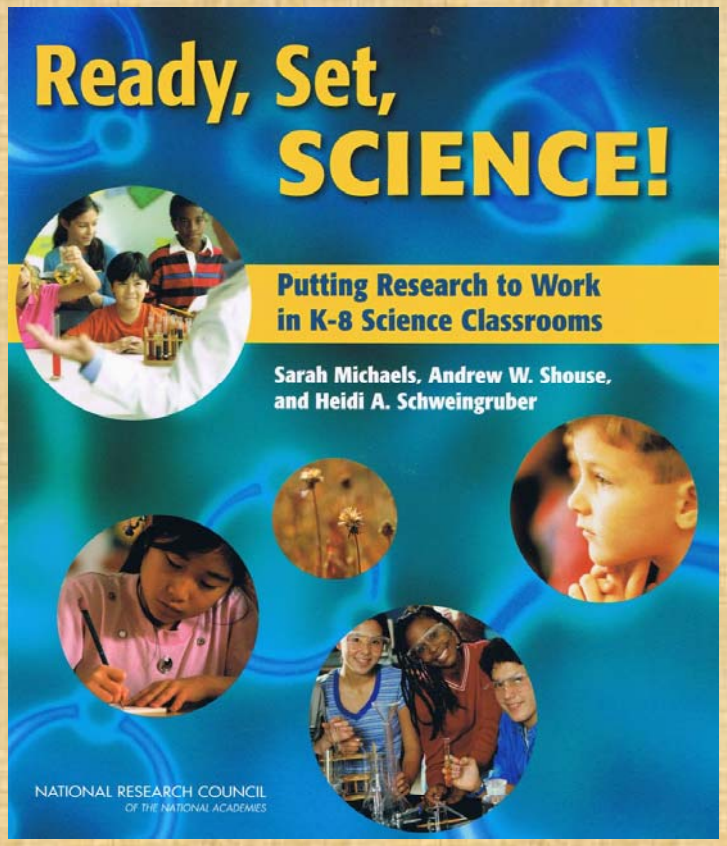
1. Varying Reaction Rates
2. Are you Speeding?
3. Bright Lights
4. Varying Lights
5. Operation Deep Freeze
6. Why Do We Brush Our Teeth?
7. Thermoregulation of the Body Temperature
8. Recovery Heart Rate
9. Acid Rain and Plant Growth
10. Soil Characteristics
11. Exploring Environmental Temperatures
12. Mapping the Ocean Floor

Experiments by Sensor

		Temperature	Motion	Force	Conductivity	Gas Pressure	Heart Rate	Light	Magnetic Field	pH	Voltage
1	A Hot Hand	1									
2	Heating of Land and Water	2									
3	The Greenhouse Effect	2									
4	Relative Humidity	2									
5	Soil Study									1	
6	Absorption of Radiant Energy	2									
7	Reflectivity of Light							1			
8	Schoolyard Study	1						1			
9	A Good Sock	2									
10	What Causes Seasons?	1									
11	Solar Homes	2									
12	Ocean Floor Mapping		1								

Twelve of the 38 suggested Middle school Vernier / Labquest experiments

A good reference



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

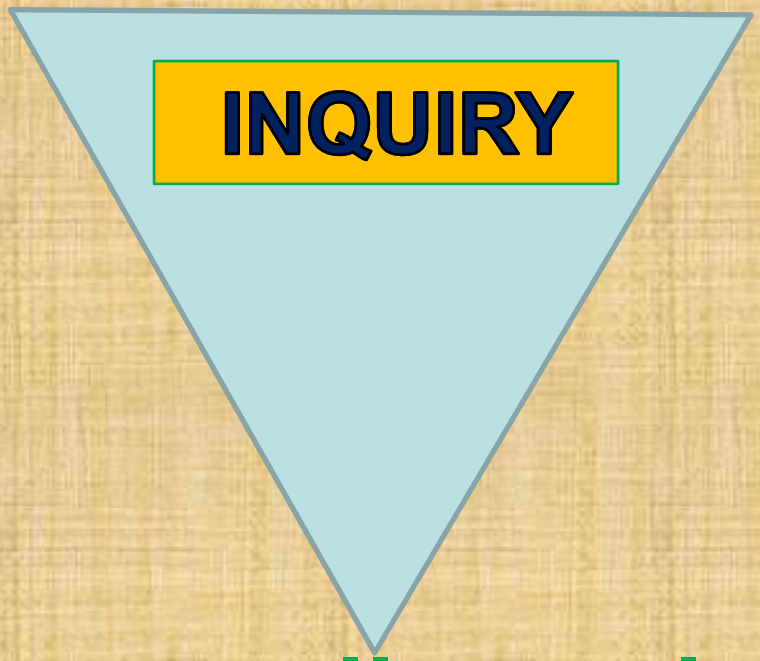
After all groups have their experimental results, we will come back together, compare our data (are they the same? or different? What do they mean? Etc…
We will discuss the concepts and standards (by grade level) covered.

Essential Features of classroom inquiry and their variations
Table 2-6, page 29, Inquiry in the National Education Standards

	Esssential Feature	Variations			
	GI value -->	**D**	**C**	**B**	**A**
1	Learner engages in scientific questions	Learner poses questions	Learners selects among questions, poses questions	Learner sharpens or clarifies question provided by the teacher, materials, or other source	Learner engages in question provided by the teachers, materials or other source
2	Learner gives priority to **evidence** in responding to questions	Learner determines what contitutes evidence and collects it	Learner directed to collect certain data	Learner given data and asked to analyze	Learner given data and told how to analyze
3	Learner formulates **explanations** from evidence	Learner formulates explanations after summarizing evidence	Learner guided in process of formulating explanations from evidence	Learner given possible ways to use evidence to formulate explanations	Learner provided with evidence
4	Learner connects explanations to scienctific knowledge	Learner independently examines other sources and forms the links to explanations	Learner directed toward areas and sources of scientific knowledge	Learner given possible connections	
5	Learner communicates and justifies explanations	Learner forms reasonable and logical arguments to communicate explanations	Learner coached in development of communication	Learner provided broad outlines to sharpen communication	Learner given steps and procedures for communication
		MORE ----------	**Amount of learner self dir**	**ection ----------**	**LESS**
		LESS ----------	**Amount of direction from**	**teacher or material ----**	**MORE**

Key concept 1

Learning



Play

Quality Intellectual Work

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?

Key Concept 2

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.

cf: Newman, F. and associates. (1996) *Authentic achievement: Restructuring schools for intellectual quality.* San Francisco: Jossey-Bass.

Experiment #2 Motion, motion, motion

"a policeman's work is never done…"

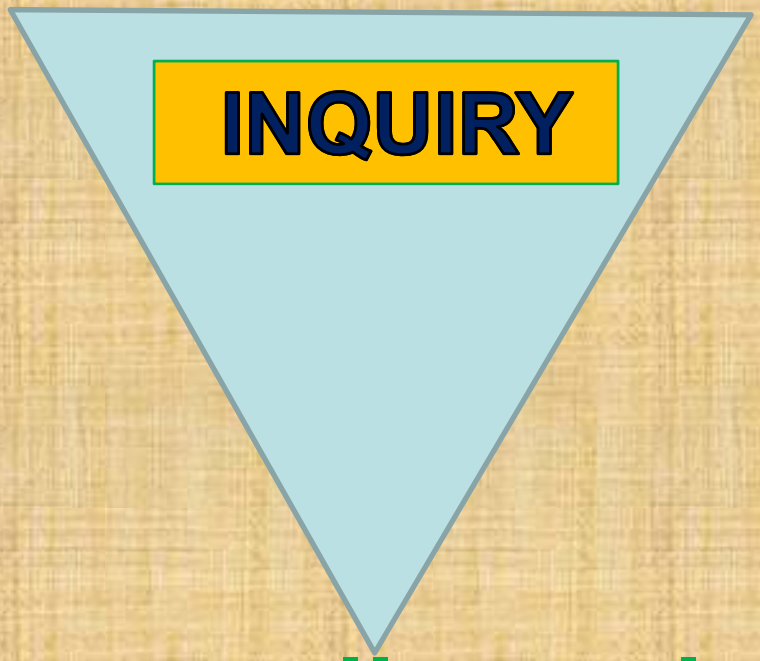
Learning about the concepts/meaning of:

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**

Learning  **Play**

Quality Intellectual Work

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

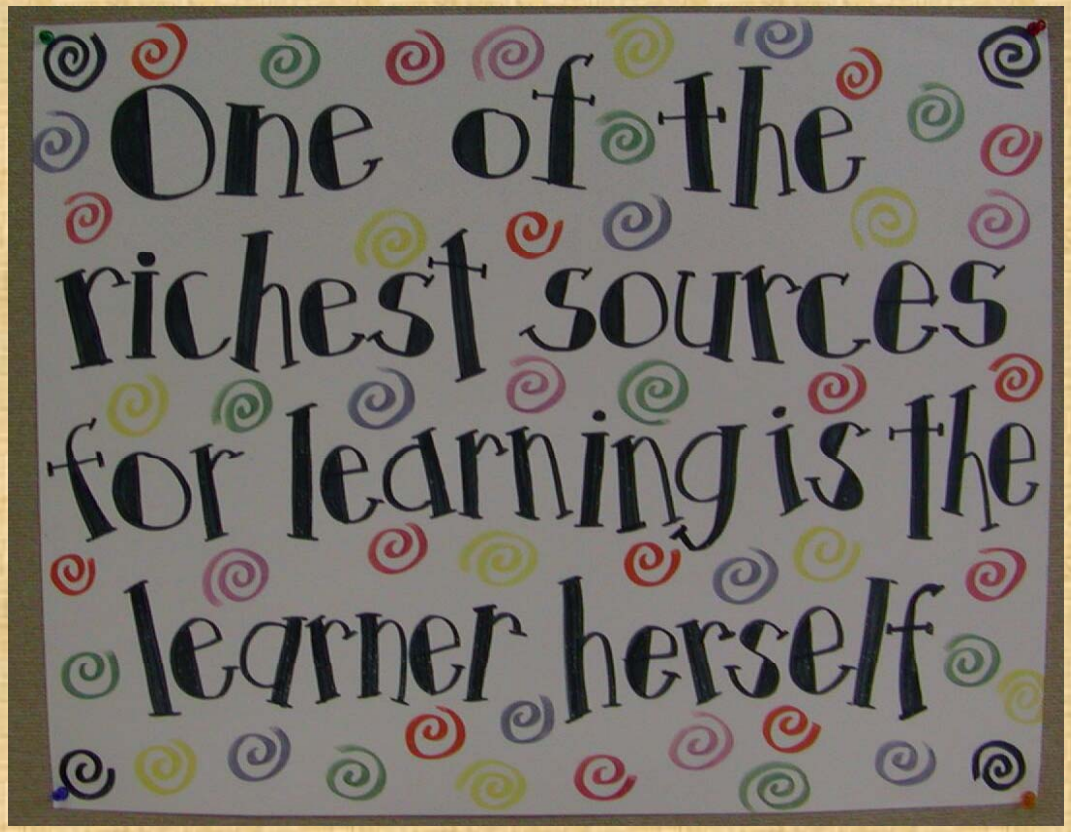
The science you **teach**

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)



Does your testing of students follow this model?