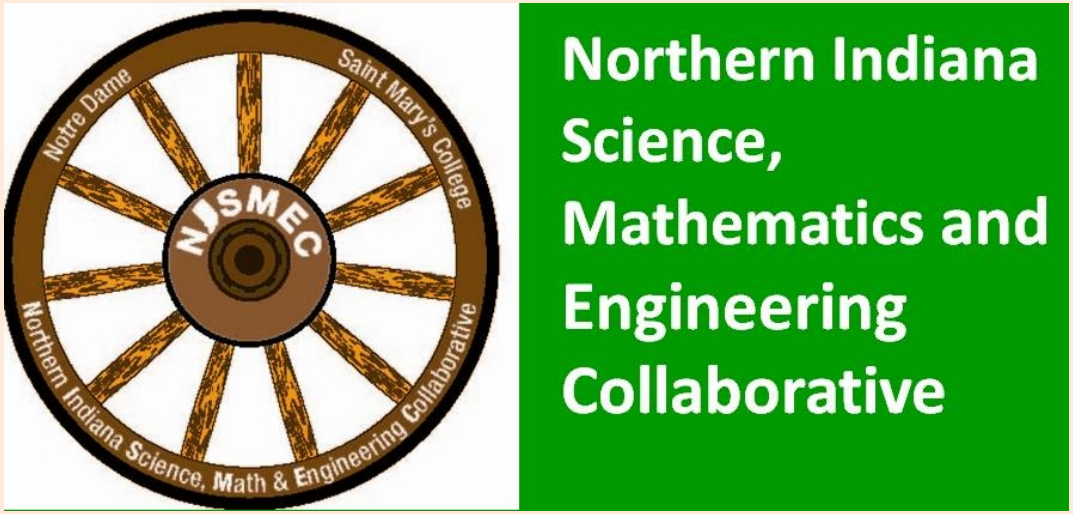
NISMEC Modeling program for Indiana STEM Teachers

Focus 2016: Mentoring and Peer-Peer Interactive Support

The *NISMEC* Modeling Academies

For 7th/8th grades and high school teachers



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The Plan for TODAY

First - ***an introduction to modeling:***

Second – an illustrative modeling experience

Third – 2015 - a brief report; Our plans for 2016…..

and beyond

Fourth – The NISMEC/MSF

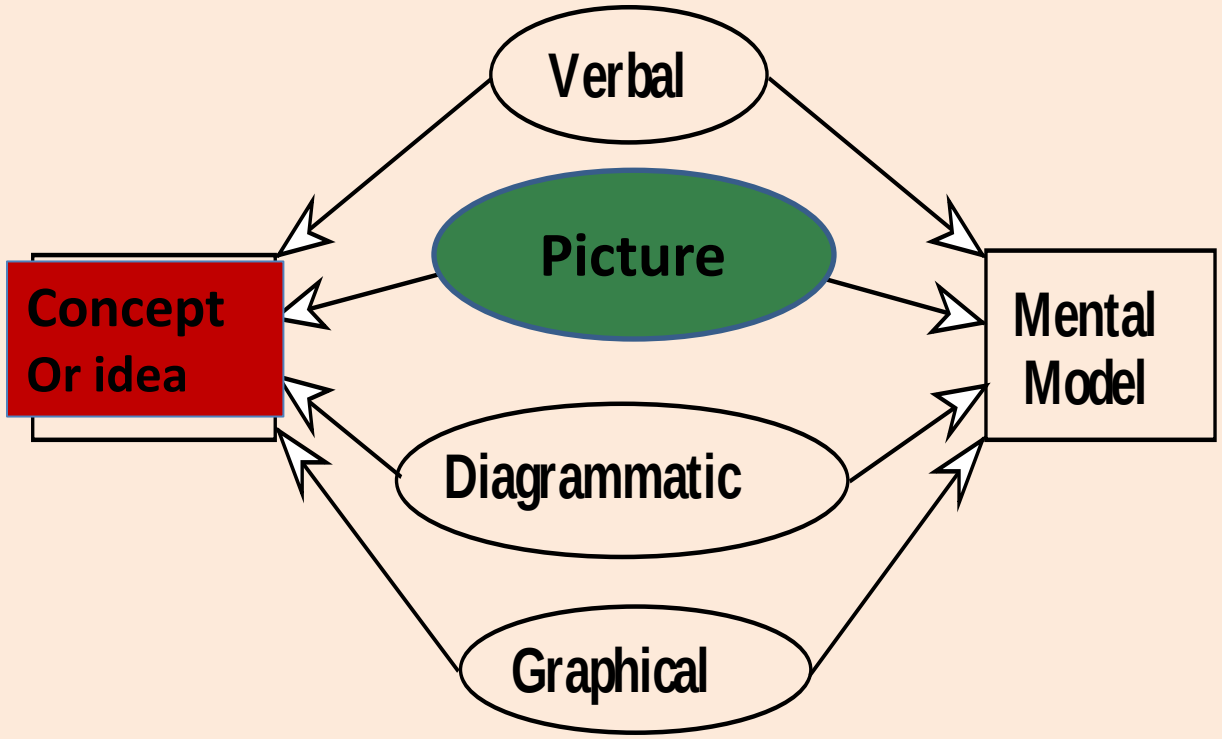
2016 Technology awards

Tonight – a party for all modeling teachers

and those interested in modeling……

What do we mean by "Modeling"*?

MULTIPLE! **Symbolic Representations**



*Modeling in physics & Chemistry as developed at Arizona State University
The American Modeling Association – AMTA - http://modelinginstruction.org/

Why modeling?!

- To help students see science as a way of viewing the world rather than as a collection of facts.
- To make the *coherence* of scientific knowledge more evident to students by making it more explicit (quantitative).
- *Models and Systems* are explicitly recognized as major unifying ideas for all the sciences by the *AAAS Project 2061* and the NGSS for the reform of US science education.

The NGSS Framework of Scientific and Engineering Practices

"The Practice Standards"

1. Asking questions & defining problems
2. Developing & using models ←←
3. Planning & carrying out investigations
4. Analyzing & interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations & designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, & communicating information

An important part of the modeling procedure is to give students a chance to show each other (and the teacher)

To help explain – in their own words
-what they have been learning …..

One way of achieving this ----
---- is to present the students' group activities to the other groups
by transferring their group ideas *to large whiteboards*
Which can then be presented (in various ways) to the other students

Are ALL your science and math classes Satisfying, Intentional and Problem-Solving (SIP) for all your students?

The **SIP principle** [***Satisfying, Intentional Problem-Solving***] describes an effective classroom which uses these characteristics to reach the goal of quality intellectual *student* work.

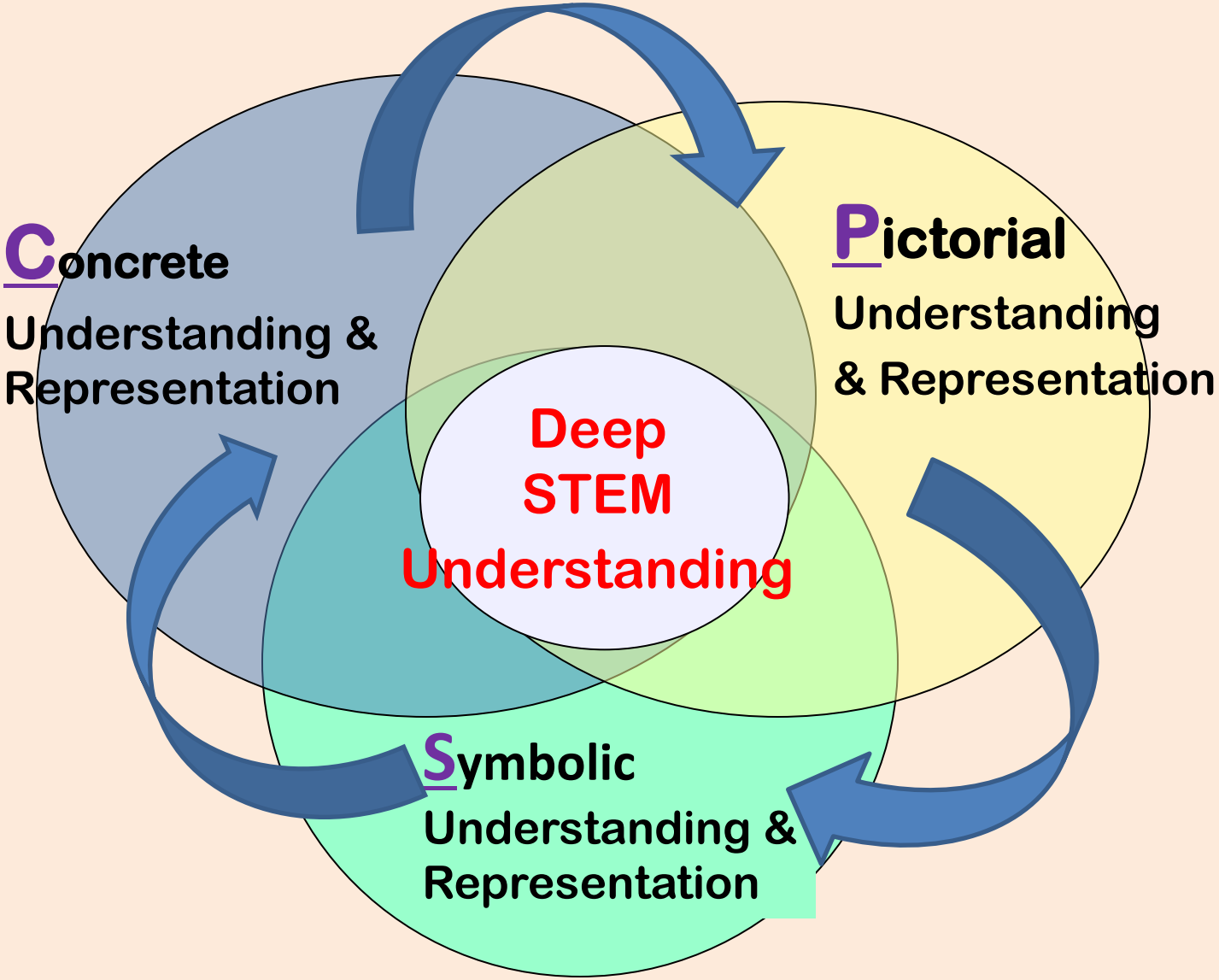
Satisfying: Quality intellectual work which is engaging, intrinsically rewarding, and develops competence and confidence for the student

Intentional: Students constructing models and strategies leading to the students' realization that they are building competence

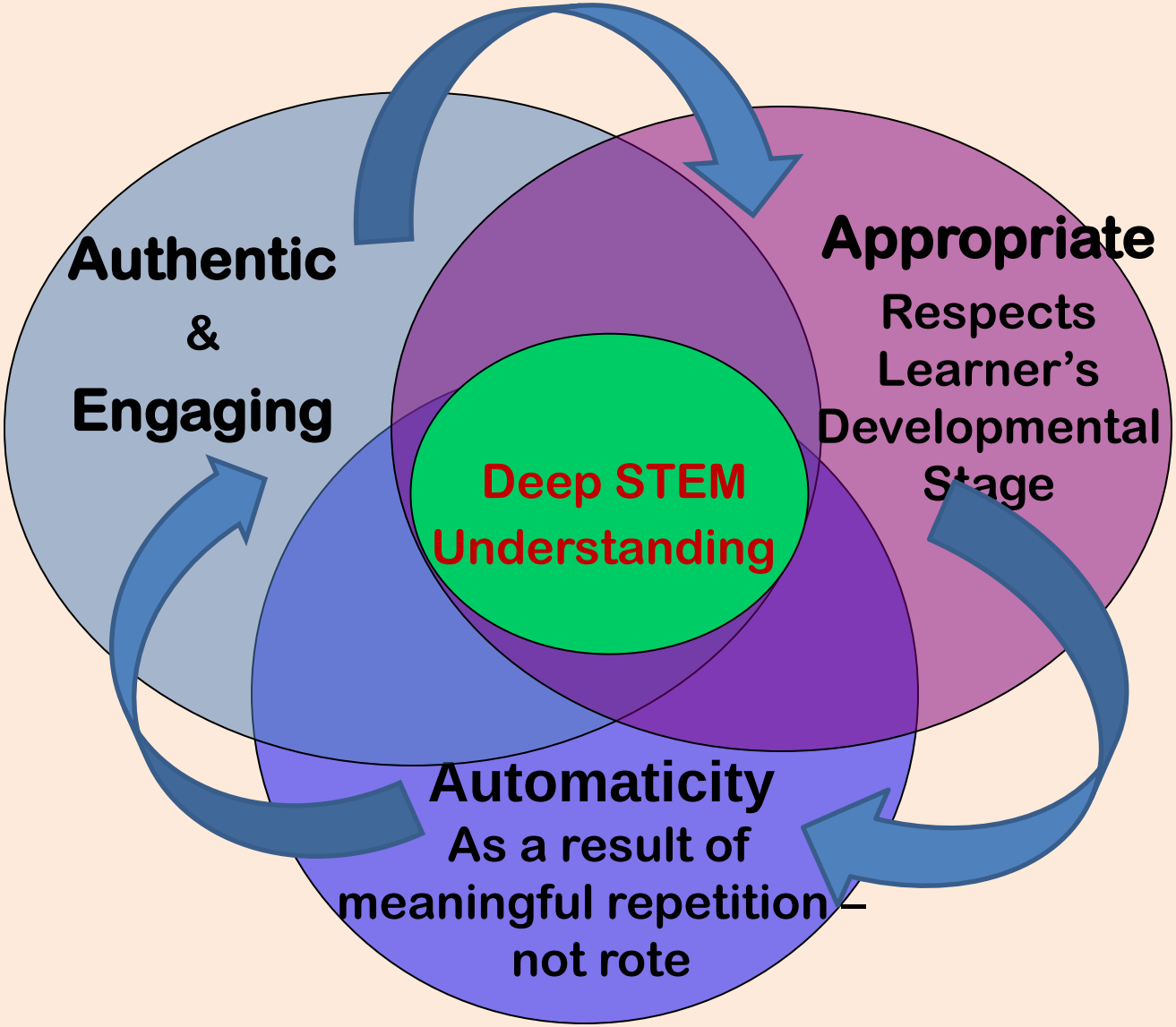
Problem-solving: Students developing their own progress milestones, accomplishing them and explaining their own achievements.

And ALL these characteristics MUST be part of Professional Learning Experiences

The dynamic C-P-S Principle



Learning from each other by DOING



An activity to illustrate modeling…

Form a group of 3-4 people – you will need a "whiteboard", plus some writing implements.

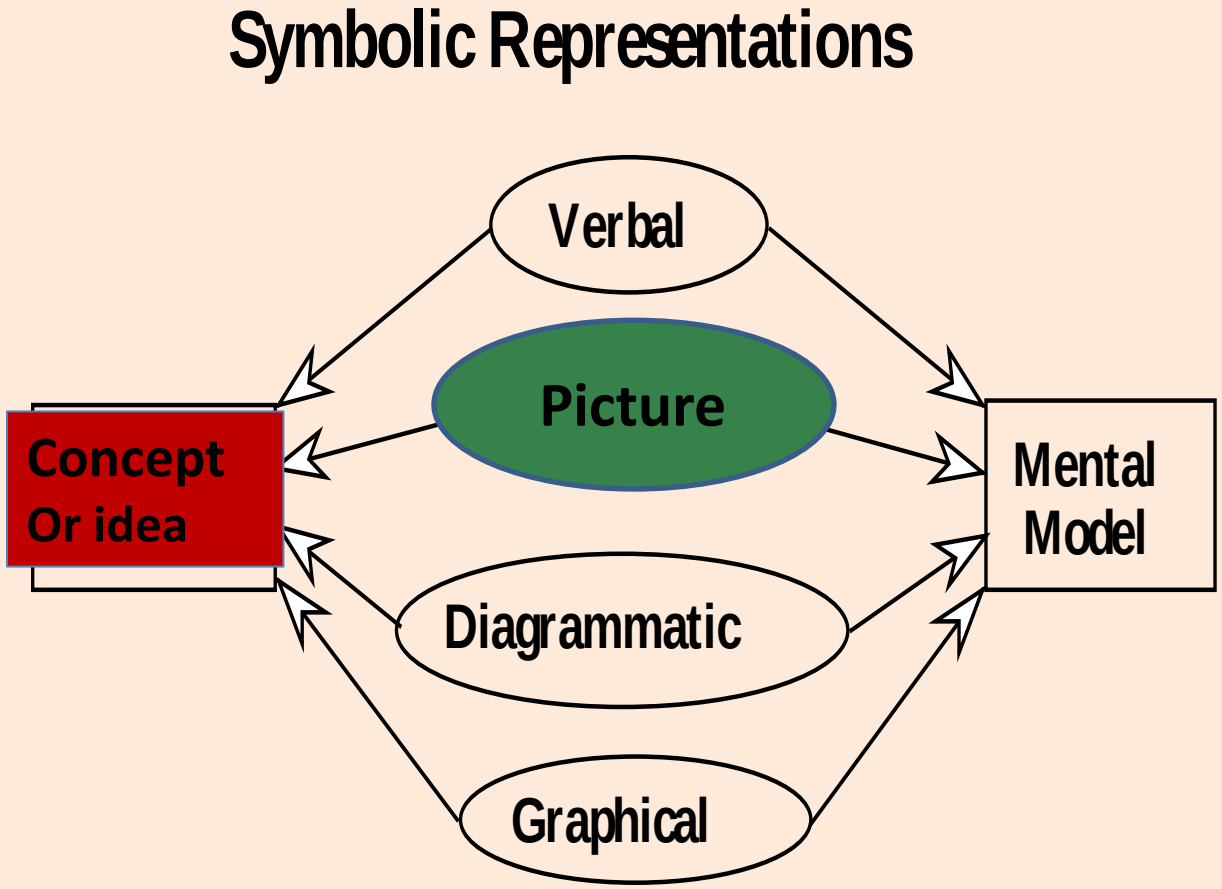
Two questions:
1 - What "turned you on" to science?
2 - What "turned you on" to science teaching?

1. Discuss ONE of these two questions amongst your group:
   Does the question trigger any thoughts about science learning takes place in **YOUR** classroom?

2. Prepare your whiteboard for a presentation to everybody,
   following the precepts laid out it the previous slide –
   Include several ***representations*** – e.g. verbal, algebraic, picture, diagram, graph….
   Also **include 2 questions** raised by your group……..

→ **Presentations**

1 - What “turned you on” to science?
2 - What “turned you on” to science teaching?



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NISMEC Modeling Academies – summer 2015

Introductory Modeling	15-19 June	Merrillville HS
Biology Modeling	22-26 June	Merrillville HS
Physics modeling (Adv.)	13-17 July	Guerin HS, Noblesville
Chemistry modeling (Adv.)	22-26 June	University HS, Carmel

2016 NISMEC Modeling Program

Emphasis: Support Interactions during the school year (peer-peer and mentoring)plus summer Academies

1- Funded: 2-year "Modeling for 7/8th grade math and science teachers" – at Gary CSC [Summer Academies open to others]

2 - Funding requested: Similar 3-year programs (p-p & m)

(a) Evansville-Vanderburgh and surrounding school districts

(b) IPS (Northwest HS and Broad Ripple HS) and other IPS high schools, and Indy area school districts

Sign up sheets today in this room, and at the NISMEC website.

http://www3.nd.edu/~nismec/nismec11.htm Contact: hgberry@nd.edu

Reflecting on today's session

Who is doing the thinking and learning?
Who is making connections?
Did you use all 8 science practice standards?

1. Asking questions & defining problems
2. Developing & using models
3. Planning & carrying out investigations
4. Analyzing & interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations & designing solutions
7. Engaging in argument from evidence
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The AIR Principle:

for teachers in all classrooms and all grades…

Attend & Intentionally Respond

Attend : *Keenly observe and reflect on the observable indicators of disposition, engagement, and of level of understanding or of misconceptions*

and

Intentionally*: plan what is likely to be a productive next step,* ***based on observations and knowledge of the student*** *as well as of developmental considerations*

Respond *in ways that will support the student in continuing to feel or be restored to feeling safe, valued and competent.*

The Essential ABCs of Learning

Always **B**e **C**onversing

Always **B**e **C**onnecting

Always **B**uild **C**ompetence
(**C**onfidence)

The First Annual NISMEC / Murgatroyd Science Foundation
Indiana STEM Teacher Technology Awards 2016

Three Awards to provide Classroom Measuring Equipment
for Indiana STEM K-12 Teachers

*To celebrate the 10 year anniversary of the founding of **NISMEC (the Northern Indiana Science, Mathematics and Engineering Collaborative)**, we held an annual competition open to all Indiana STEM K-12 teachers.*

1st prize: $5000 - choice of up to 6 Labquest II, and 6 Labquest I or Labquest-mini interfaces, plus (1st) choice of NISMEC-listed Vernier probes and other listed items.
2nd prize: $4000 - choice of up to 6 Labquest I, and 4 Labquest-mini interfaces, plus (2nd) choice of NISMEC-listed Vernier probes and other listed items.
3rd prize: $3000 - choice of up to 4 Labquest I, up to 4 Go!Link interfaces, plus (3rd) choice of NISMEC-listed Vernier probes and other listed items.

The First Annual NISMEC / Murgatroyd Science Foundation
Indiana STEM Teacher Technology Awards 2016

Winners:

Third Prize: Josie Miller

of the Western High School, Western School Corporation, Russiaville, Indiana

"When my Integrated Chemistry Physics (ICP) students discover the gas laws they use online simulations. To authenticate their experience with these laws a set of gas pressure sensors would provide the needed equipment to get reliable data. In this way they could each discover the relationship between pressure, temperature, number of particles and volume."

2nd Prize: Lance Brand

of Delta High School, Delcom Schools, Muncie, Indiana

"The generation of students that we teach today is the first to live in a technology driven society where the Internet, iPads, digital cameras, video games, cell phones and instant messaging have created new forms of communication, entertainment, and is transforming learning. Unfortunately, my school is not exactly at the forefront in the creative uses of such technology. Our students are like the jetsons, able to access information instantaneously and communicate across time and space, but they are being schooled in a Flintstones world."

The First Annual NISMEC / Murgatroyd Science Foundation
Indiana STEM Teacher Technology Awards 2016

Winner:

1st Prize: Karen Augustyn

Of Banneker Achievement Center (6/7/8th grades), Gary CSC, Gary, Indiana

"My goal is to allow students to complete inquiry based guided science lessons using the Vernier Labquest and probes. Using the Indiana Science Standards as an outline, my objective is to introduce the Vernier technology and probeware to my students as they matriculate through my science class from grades 6 to 7 to 8. I hope to assist them in becoming independent experimenters, creative thinkers and proficient science problem solvers."

Some specific uses of the probes will be:

Grade 6 (Earth Science): Exploring the Poles – magnetic field sensor

Grade 7 (Physical Science): Falling Objects – motion detector

Newton's Second Law – motion detector, dual range force sensor

Grade 8 (Chemistry and Biology): Cell Respiration – CO_2 sensor, O_2 sensor

Electrolytes and Non-Electrolytes – conductivity probe

Acid – base Properties of Household Products – pH sensor