NISMEC Modeling program for Indiana STEM Teachers
Focus 2016-17: Mentoring and Peer-Peer Interactive Support
Northern Indiana Science, Mathematics and Engineering Collaborative
Gordon Berry, University of Notre Dame, and NISMEC gberry@nd.edu

Tonight – a party for all modeling teachers and those interested in modeling......
starting at 6:00 p.m at the RAM restaurant downtown
140 S. Illinois Street, between Maryland & Georgia

The Plan for this session
First - an introduction to modeling: activity-based student learning
Second – a hands-on modeling experience
Third – NISMEC program of Modeling Academies 2016-17 and beyond
Tonight – a party for all modeling teachers and those interested in modeling......

What do we mean by “Modeling”*?
Symbolic Representations

*Modeling in physics & Chemistry as developed at Arizona State University
Why modeling?! 

• To help students see science (& math) as a way of viewing the world rather than as a collection of facts.
• To make the coherence of scientific (& math) 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 (& math) 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 also be part of Professional Learning Experiences.

The dynamic C-P-S Principle

Learning from each other by DOING

As a result of meaningful repetition—not rote
An activity to illustrate modeling...
As a conservative estimate, the average temperature of the atmosphere has increased by 0.4 deg C over the last thirty years.

1 - Estimate how much energy has gone into warming up the planet in this way.

2 - Estimate how much burned fuel would be needed to give rise to this increase on the assumption that this were the only cause of changes in the earth's temperature.

3 - How much fuel burned per week over the last thirty years per person on the planet would this correspond to?

Form groups of 3-4 people – each group needs a “whiteboard”, plus some markers. Use any source or estimate to help solve the problem – but justify your work and answers…..

Prepare your whiteboard for a presentation to everybody, Include several representations – e.g. verbal, algebraic, picture, diagram, graph.... Also include 2 questions raised by your group........

→ Presentations

Does this exercise trigger any thoughts about how science and/or math learning takes place in YOUR classroom?

Discuss this question amongst your group, and write down a few constructive thoughts for discussion with the whole class.

An activity to illustrate modeling...
Form a group of 3-4 people – you will need a “whiteboard”, plus some writing implements.

Question:
What “turned you on” to science?

1. Discuss this question amongst your group: Does the question trigger any thoughts about science learning has taken place in your life and/or 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

How many “representations” are on your whiteboard?
Application form / request for more information about the Summer 2017 Modeling Academies

Evansville and SW Indiana Districts—(at North HS)
Year 2 high school math and (chem, phy, bio) 1 week June 12-16 [closed]
Year 1 high school math and (chem, phy, bio) 2 weeks July 10-21
contact: Vic Chamness - vic.chamness@evck12.com

Gary and NW Indiana—(at Bailly Preparatory Academy)
Middle school science and math teachers 2 weeks July 24 – August 4
contact: Gordon Berry – gberry@nd.edu

IPS and nearby districts – (at IPS Professional Development Center)
7-12 grade math and (chem, phy, bio) teachers 2 weeks June 19 – 30
contact: Ashlee Scherwinski - scherwinski@ips.k12.in.us or HG Berry

Name __________________________ Grade ______ Subject (circle) Ma Ph Ch Bio MS
School/District ______________________ Email ______________________
Workshop (circle one) Evansville Gary IPS [email or hand in or mail]

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
8. Obtaining, evaluating, & communicating information

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 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 Be Conversing**

**Always Be Connecting**

**Always Build Competence** *(Confidence)*

*Thank you for being here! ...Any Questions? (Please Pick up the “generic” application form) And/or sign in for 1 or more workshops...*