


**HASTI – 2014**  
**ISI - Science in 5<sup>th</sup> through 8<sup>th</sup> grades**  
**Today: How we apply the NGSS Practice Standards**



**Northern Indiana  
 Science,  
 Mathematics and  
 Engineering  
 Collaborative**

**Science and Math Professional Development Workshops  
 at Notre Dame**

<http://www3.nd.edu/~nismec/nismec11.htm>  
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**NGSS SCIENCE  
 AND ENGINEERING  
 PRACTICES**

<b>ASK QUESTIONS AND DEFINE PROBLEMS</b> • Formulate scientific questions and problems • Establish what is already known • Determine what questions have yet to be answered • Define constraints and specifications for a solution	<b>DEVELOP AND USE MODELS</b> • Construct mental and conceptual models to represent and understand phenomena • Use models to explain and predict behaviors of systems, or test a design • Refine the models in light of new empirical evidence
<b>PLAN AND CARRY OUT INVESTIGATIONS</b> • Identify questions to be investigated • Identify variables and controls • Design and perform experiments to test my hypotheses • Decide what data will be collected and how much, and what tools are needed	<b>ANALYZE AND INTERPRET DATA</b> • Use tables, graphs, spreadsheets, etc. to display and analyze data • Recognize patterns in data and see relationships between variables • Revise my initial hypothesis when the data doesn't support it • Analyze performance of a design under a range of conditions
<b>USE MATHEMATICS AND COMPUTATIONAL THINKING</b> • Apply mathematical and computational thinking to science, engineering, and design problems • Use mathematical representations to analyze a situation and solve problems • Apply mathematics as a tool to investigate and solve problems	<b>CONSTRUCT EXPLANATIONS AND DESIGN SOLUTIONS</b> • Construct explanations and design solutions • Construct explanations to describe a phenomenon • Design a solution to a problem • Change a design or solution as needed
<b>ENGAGE IN AN ARGUMENT FROM EVIDENCE</b> • Engage in argument from evidence • Construct an argument from evidence • Evaluate the arguments made by others • Engage in constructive and respectful argument • Evaluate the validity of the arguments of others	<b>OBTAIN, EVALUATE AND COMMUNICATE INFORMATION</b> • Obtain, evaluate, and communicate information • Communicate findings and conclusions • Work together to analyze data and evaluate evidence • Engage in constructive and respectful argument • Evaluate the validity of the arguments of others

## ASK QUESTIONS AND DEFINE PROBLEMS

- I formulate empirically answerable questions
- I establish what is already known
- I determine what questions have yet to be answered
- I define constraints and specifications for a solution

NGSS-practice 1

## DEVELOP AND USE MODELS

- I construct mental and conceptual models to represent and understand phenomena
- I use models to explain and predict behaviors of systems, or test a design
- I refine my models in light of new empirical evidence

NGSS-practice 2

## PLAN AND CARRY OUT INVESTIGATIONS

- I identify questions to be investigated
- I identify variables and controls
- I design and perform experiments to test my hypotheses
- I decide what data will be collected and how much, and what tools are needed

NGSS-practice 3

## ANALYZE AND INTERPRET DATA

- I use tables, graphs, spreadsheets, etc. to display and analyze data
- I recognize patterns in data and see relationships between variables
- I revise my initial hypothesis when the data doesn't support it
- I analyze performance of a design under a range of conditions

NGSS-practice 4

**USE MATHEMATICS AND COMPUTATIONAL THINKING**

- I use mathematics and statistics to analyze data
- I express relationships between variables by writing mathematical models or equations
- I use technology to collect and analyze data
- I use mathematical models and computer simulations to test my predictions and designs

**NGSS-practice 5**

**CONSTRUCT EXPLANATIONS AND DESIGN SOLUTIONS**

- I evaluate information and form hypotheses
- I construct explanations or models of phenomena
- I design a variety of solutions to a problem

**NGSS-practice 6**

**ENGAGE IN AN ARGUMENT FROM EVIDENCE**

- I defend my explanation
- I formulate evidence based on solid data
- I examine my own understanding in light of the evidence
- I collaborate with my peers in searching for the best explanation

**NGSS-practice 7**

**OBTAIN, EVALUATE AND COMMUNICATE INFORMATION**

- I communicate findings clearly and persuasively
- I derive meaning from scientific text
- I engage in discussions with scientific peers
- I evaluate the validity of the findings of others

**NGSS-practice 8**

**Experiments**

Collecting data  
Analyzing data  
Discussing data

**(Listening to everybody)**

**Today's Topic:**

**SHOES**




**Experiment #1 – Introduction to the possibilities**

**Question: What is different or the same about your shoes?**

(around the room, alternating...)

**Experiment #2: Data Collection**

- Make **a list** of all the footwear you own.
- **Categorize/sort** the different types in a way that make sense to you.
- Include a count of **how many** in each category.

(Sheet of paper)

**Discussing/analyzing the data**

- You sorted and counted your shoes in a way that made sense to you
- Form a group of 3-4 people
- Look at and discuss how others in your group sorted their shoes.
- Decide on one focus question about your group’s shoes

**Analyzing/presenting the data**

- Prepare a “whiteboard” to present your focus (and data) to the whole class
- Try to include several different “REPRESENTATIONS” of the focus/data (By “REPRESENTATIONS” we mean – pictures, graphs, equations, diagrams, verbal descriptions)

(each group - 32” x 24” whiteboard, markers, eraser)

**Presentations**

**Reflecting on today’s session**

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

**The SIP process:**  
**Satisfying, Intentional Problem-solving**

**The ABCs of learning** (Mary Hynes-Berry)  
**Always Be Connecting**  
**Always Be Communicating**  
**Always Build Confidence**

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