



“Inquiry” in The Science Standards

Pick Up

1. Folder
2. Pre-Assessment
3. Complete Pre-Assessment

hamilton
county



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2.11/12/14

Learning Outcomes of Workshop

- To gain an understanding of Inquiry Application and Skills in the Science Standards.
- Understand the Essential Features of Inquiry and the Inquiry Process in Science Classrooms.
- Development and Application of Different Levels of Inquiry and Questions.
- Application of 5E's Learning Cycle and Scientific Inquiry in Lesson Development
- Application of Different Levels of Inquiry in your classroom and Development of Inquiry Lessons-Classroom Use!!
- Understanding the Assessment of Inquiry Learning.

Agenda

- Why Inquiry?
- Science Quality Rubric vs. Inquiry Application and Skills vs. Essential Features
- Bugs-O-Copter Activity- **Inquiry Investigation**
- Seven Segments of Scientific Inquiry
- Inquiry Process- / 15 Investigation Steps
- Exploratory Questions and Prompts
- 5E's Learning Cycle and Instructional Model--Lesson Unit (Pendulum Activity)
- Cannon Activity.- CPS- 5E's-**Inquiry Investigation**
- Scientific Explanations- Cannon Activity- Claims, Evidence, Explanation(CER)
- Levels of Science Inquiry- Douglas Llewellyn- Review
- Confirmatory Labs- Self-Directed (Open Inquiry)
- 5E's Inquiry Lesson Unit Development- **Pendulum Activity-Inquiry Investigation**
- Modification of Labs to Inquiry -- Investigation Labs- Teacher Choice
- Inquiry Self- Assessment- Survey
- Post- Assessment Inquiry Workshop

What Is Inquiry and Why Do It?



What should students proficient in science be expected to do? *

- **Know, use, and interpret scientific explanations** of the natural world
- **Generate** and **evaluate** scientific **evidence** and **explanations**
- **Understand** the **nature and development** of **scientific knowledge**
- **Participate productively** in **scientific practices** and **discourse**

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Science

Reading and Writing Standards- Science and Technical Subjects

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY IN HISTORY/SOCIAL STUDIES, SCIENCE, AND TECHNICAL SUBJECTS

Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6–12

W.12.1

The standards below begin at grade 6; standards for K–5 writing in history/social studies, science, and technical subjects are integrated into the K–5 Writing standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

Grades 6–8 students:	Grades 9–10 students:	Grades 11–12 students:
Text Types and Purposes		
<p>1. Write arguments focused on <i>discipline-specific content</i>.</p> <p>a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.</p> <p>b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.</p> <p>c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.</p> <p>d. Establish and maintain a formal style.</p> <p>e. Provide a concluding statement or section that follows from and supports the argument presented.</p>	<p>1. Write arguments focused on <i>discipline-specific content</i>.</p> <p>a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.</p> <p>b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.</p> <p>c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <p>d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>e. Provide a concluding statement or section that follows from or supports the argument presented.</p>	<p>1. Write arguments focused on <i>discipline-specific content</i>.</p> <p>a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.</p> <p>b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.</p> <p>c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <p>d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>e. Provide a concluding statement or section that follows from or supports the argument presented.</p>

Ohio's Cognitive Demands for Science

Cognitive Demand	Description
Designing Technological/ Engineering Solutions Using Science Concepts (T)	Requires students to solve science-based engineering or technological problems through application of scientific inquiry . Within given scientific constraints, propose or critique solutions, analyze and interpret technological and engineering problems, use science principles to anticipate effects of technological or engineering design, find solutions using science and engineering or technology, consider consequences and alternatives and/or integrate and synthesize scientific information.
Demonstrating Science Knowledge (D)	Requires students to use scientific inquiry and develop the ability to think and act in ways associated with inquiry , including asking questions, planning and conducting investigations, using appropriate tools and techniques to gather and organize data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments. (Slightly altered from National Science Education Standards) Note: Procedural knowledge (knowing how) is included in Recalling/Identifying Accurate Science.
Interpreting and Communicating Science Concepts (C)	Requires students to use subject-specific conceptual knowledge to interpret and explain events , phenomena, concepts and experiences using grade-appropriate scientific terminology, technological knowledge and mathematical knowledge. Communicate with clarity, focus and organization using rich, investigative scenarios, real-world data and valid scientific information.
Recalling Accurate Science (R)	Requires students to provide accurate statements about scientifically valid facts , concepts and relationships. Recall only requires students to provide a rote response, declarative knowledge or perform routine mathematical task . This cognitive demand refers to students' knowledge of science fact, information, concepts, tools, procedures and basic principles.

Science Inquiry and Application Skills
Science Standards
PK- 12

During the years of **PreK-4** all students must become proficient in the use of the following scientific processes, with appropriate laboratory safety techniques, to construct their knowledge and understanding in all science content areas:

Observe and ask questions about the natural environment

Plan and conduct simple investigations

Employ simple equipment and tools to gather data and extend the senses

Use appropriate mathematics with data to construct reasonable explanations

Communicate about observations, investigations and explanations

Review and ask questions about the observations and explanations of others

During the years of **grades 5-8** all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

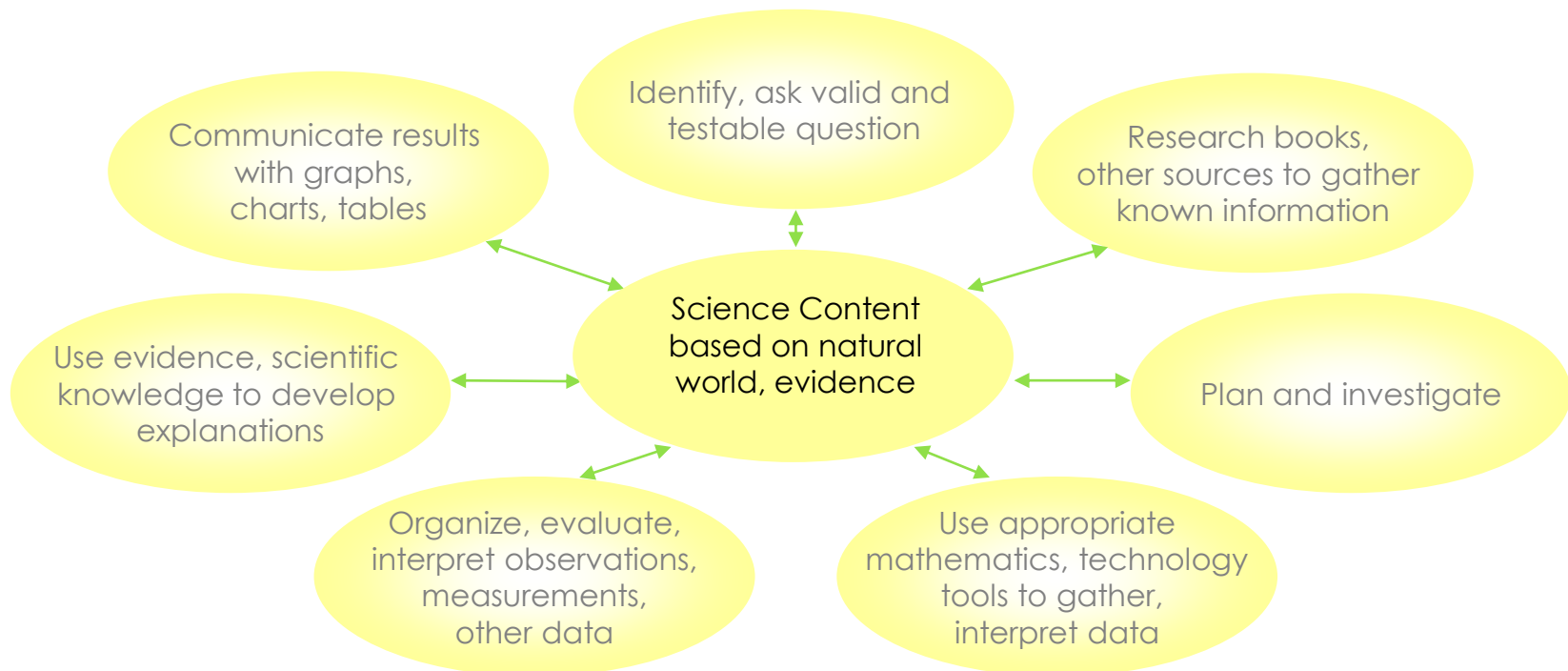
- *Identify questions that can be answered through scientific investigations*
- *Design and conduct a scientific investigation*
- *Use appropriate mathematics, tools and techniques to gather data and information*
- *Analyze and interpret data*
- *Develop descriptions, models, explanations and predictions*
- *Think critically and logically to connect evidence and explanations*
- *Recognize and analyze alternative explanations and predications*
- *Communicate scientific procedures and explanations*

During the years of **grades 9 through 12** all students must use the following scientific processes with appropriate laboratory safety techniques to construct their knowledge and understanding in all science content areas:

- *Identify questions and concepts that guide scientific investigations*
- *Design and conduct scientific investigations*
- *Use technology and mathematics to improve investigations and communications*
- *Formulate and revise explanations and models using logic and evidence (critical thinking)*
- *Recognize and analyze explanations and models*
- *Communicate and support a scientific argument*

Science Practices and the Learning Cycle (5Es)

evaluate...engage...explore...



explain...extend...evaluate

S.W.O.T.

- **Strengths**
- **Weaknesses**
- **Opportunities**
- ***Threats / Challenges***
- **Share Out**

Cognitive Classroom Rigor Activity

- **Brainstorm All Classroom Activities**
 - Place on Post-Its
- **Place on Cognitive Demands Poster**
 - What trends do you see? Discuss**
 - Discuss Relevance and Rigor- Challenges
 - How do you make your activities more Rigorous?
 - What are some opportunities with the Cognitive Demands?
- Share Out

Bugs-O-Copter- Inquiry

- **Inquiry Activity**
 - 15 Steps of Inquiry / ODE
 - Intro
 - **Inquiry Flipbook**
 - Inquiry Flipbook/Worksheet
 - **7 Segments of Inquiry Questions and Prompts-WS**
 - **Bugs-O-Copter**

5 E's Learning Cycle

- Card Sort
 - Share Out
- 5E's Packet
 - Explain

Double Pendulum

- **5Es –Lesson**
 - Double Pendulum Activity
 - 5 E's Model Lesson

Cookbook – Inquiry Labs

- **Cookbook/Confirmatory – Inquiry**
 - Levels of Inquiry
 - Modification of Labs

5E's Model Development- Inquiry

- **5Es- Unit Development**
 - Inquiry Based Activity
 - Teacher Developed
 - Work in Grade Level Groups