4/25/2014

Assessing with Learning Progressions in Science

FOSS ENVIRONMENTS

Photo by Joanne Johnson

Instructional Tools | **Contributors: Jennifer Bader, Shaun Capper, Andrea Clancy, Kathy Darrow-Joiner, Dale Fournier, Wende Hilyard, Lisa Lockwood, and Kathryn Peck**

Northwest Educational Service District 189
Together We Can

 This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

Instructional Tools

In this packet you will find a set of instructional supports for science materials. These documents represent the work-in-progress of teachers in the Assessing with Learning Progressions in Science Project, a Math Science Partnership through the Northwest Educational Service District in Washington State. While we encourage others to use the materials, please know the power of these tools lies in the collaborative discussion and analysis that occurs during their creation. We strongly suggest that anyone utilizing these tools make them your own, adjusting them to fit your teaching context and district priorities. Professional development tools to aid you in this process are available on the ALPS project web page www.nwesd.org/nwalps. For access to editable versions of these documents please contact Nancy Menard nmenard@nwesd.org.

Overview of the Tools (not every unit tool-set will include all of these tools)

Unit Overview

The unit overview grid lays out learning targets or important scientific ideas from Washington State Standards for each investigation in the module and clarifies the success criteria for each learning target. It also details the formative assessments that have been designed to assess each target in the investigation.

Learning Progressions

A learning progression is a graphical representation of the path students take toward mastery of a science "big idea". The ALPS *Learning Progression* documents include a description of an important big idea from the *Washington State Science Learning Standards* and the progression of building-block learning targets that students master on their way toward an understanding of that big idea. For each building-block learning target the student success criteria is identified and one or more formative assessment tasks to elicit evidence of student understanding are suggested.

Formative Assessment Tasks

The suggested formative assessment tasks are examples of tools used by the teachers in the ALPS project to gather evidence of student understanding. The *Assessment Task Cover Sheet* details each assessment and gives administration tips and suggestions for instructional adjustments based on some of the common student struggles they encountered.

Student Work Samples

Selected student work samples from students in ALPS classrooms give a picture of the range of student responses gathered from sample formative assessments. The *Student Work Sample Cover Sheet* describes the student work samples and the teacher's interpretation of student understanding.

 This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

Environments Unit Overview

Lesson	Learning Targets & Success Criteria		Assessment
Pre requisite knowledge	Life	Living and nonliving things are subsets in every environmental system. ✓ Identify living and nonliving things.	Use the formative assessment probe " Is it Living?" (Keely, *Uncovering Student Ideas in Science*, Vol. 1, pg. 123-130, #17)
Prerequisite Skills	Inquiry	Make observations and record data from observations	
Investigation 1 Part 1		Living and nonliving things are subsets in every environmental system. √ I can explain why something is living or nonliving.	Use Investigation 1: Terrestrial Environments No. 4—Modified Student Sheet
Investigation 1 Part 1	Inquir	There are different types of investigations: Observations and controlled experiments using models.	Talking head scenarios Doing Science – Keeley 2008
Investigation 1 Parts 1-2		Living organisms depend on living and nonliving factors of the environmental system. √ I can explain how non-living factors (variables) influence living organisms.	Use Investigation 1: Terrestrial Environments No. 4—Modified Student Sheet *WA Edition, parts b, c, d.
Investigation 1 Part 1 & 2	Inquiry	Investigations involve systematic collection and recording of relevant observations and data. I can measure and record my observations and organize my data on a table or chart.	Student Sheet #3 – Terrarium Map

This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

Lesson	Learning Targets & Success Criteria		Assessment
Investigation 2 – Parts 1, 2, and 3	Inquiry	A controlled experiment starts with a question from an observation. Variables are *controlled* except the one *manipulated variable.* I can ask a question and conduct a fair experiment that identifies controlled, manipulated, and responding variables.	Investigation 2: student sheet # 6 Animal Investigations Students identify their question and white board which variables will be controlled, manipulated, and responding.
Investigation 2 Part 4	Inquiry	A controlled experiment starts with a question from an observation. Variables are *controlled* except the one *manipulated variable.* I can ask a question and conduct a fair experiment that identifies controlled, manipulated, and responding variables.	Investigation 2, Part 4 – Designing an Animal Investigation. Use Rubric on Page 9 of Assessment Folio for scoring.
Investigation 3 Part 1 & 2	Inquiry	Investigations involve systematic collection and recording of relevant observations and data. I can measure and record my observations and organize my data on a table or chart.	Investigation 3: Student Sheet #10 Plant Observations
Investigation 2 Part 4	Inquiry	Variables that affect our investigations can be biotic or abiotic. I can… identify 3 – 4 variables that could affect an investigation.	Investigation 2, Part 4 – Designing an Animal Investigation. Use Rubric on Page 9 of Assessment Folio for scoring.

This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

Lesson		Learning Targets & Success Criteria	Assessment
Investigation 3 Part 3	Inquiry	Investigations involve systematic collection and recording of relevant observations and data. I can measure and record my observations and organize my data on a table or chart.	Student Sheet #12 Plant Profile
Investigation 4 Parts 1, 2, and 3	Inquiry	Investigations involve systematic collection and recording of relevant observations and data. I can measure and record my observations and organize my data on a table or chart.	Investigation 4: Student Sheet #14 Aquarium Log
Investigation 5 Part 3	Inquiry	A scientific conclusion can be generated a based on data gathered. I can use my evidence to write a conclusion.	Complete: "Writing a Conclusion in Science" using data from Investigation 5 Student Sheet #17 Brine Shrimp Hatching Response Sheet #18 – Brine Shrimp Hatching

This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

Learning Progression

FOSS Environments: EALR 4 – Food Webs

Prerequisite skill:

Students can identify living and nonliving things.

Pre-assessment: Is it Living? (Keely, *Uncovering Student Ideas in Science*, Vol. 1, pg. 123-130, #17)

2-3 LS2A

Learning Target 1:

Living and nonliving things exist in every environmental system.

4-5 LS2A

Success Criteria:
I can…

Explain why something is living or nonliving.

Formative Assessment:
Response Sheet
Investigation 1
Part A

Learning Target 2:

Living organisms depend on living and nonliving factors of the environmental system.

4-5 LS2A

Success Criteria:
I can…

Explain how nonliving factors (variables) influence living organisms.

Formative Assessment:
Response Sheet
Investigation 1
Part B, C and D

Learning Target 3:

Organisms have a range of tolerance within their preferred environmental system. The optimum condition for a living organism is within its range of tolerance.

Success Criteria:
I can…

I can evaluate data to determine an organism's optimum environment and range of tolerance.

Formative Assessment:
Animal Investigations - Planning: student sheet # 6 – *(modified for Washington State.)*
Investigation 3: Student sheet #10 : Plant Observation s,
Student sheet # 12: Plant Profile,
Student sheet #17: Brine Shrimp Hatching

Learning Target 4:

Changes in ecosystems can affect the organisms within the environmental system.

4-5 LS2D & E

Success Criteria:
I can…

Predict how a slow or rapid change might affect the living and non-living factors of the environment.

Formative Assessment:
Science Stories: Mono Lake Story, respond to "after the story" questions.

If…then statements:
Predict what would happen to the organism in the environmental system if _____ (*we had a rapid change such as freezing temperatures, sand instead of dirt, removed all access to sunlight, fertilized, added salt to water, removed dirt)*.

Habitat Change (Keeley, *Uncovering Student Ideas in Science*, Vol. 2, pp.143- 148, #19)

Learning Target 5:

All plants and animals change the ecosystem where they live.

4-5 LS2D & E

Success Criteria:
I can…

Identify how an organism can change an ecosystem where it lives.

Formative Assessment:
Describe the relationship between the environment and the organisms that live there.

Environments I-Check : Question #15

Big Idea:

Living and nonliving changes in ecosystems can affect the populations they support.

This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

ENVIRONMENTS

Big Idea: **Living and nonliving changes in ecosystems can affect the populations they support.**

Formative Assessment Task Cover Sheet

Learning Target #1	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Students label living and non-living parts of a terrestrial environment. Response Sheet Investigation 1 Part A	**Suggestions for Instructional Adjustments:** Simultaneously discuss the variables that exist within your terrariums in the classroom. Address the idea that this is not a controlled experiment but meant to be observations and continually asking questions and adjusting terrarium.
Learning Target 1: Living and nonliving things are subsets in every environmental system. - 4-5 LS2A	
Success Criteria: Explain why something is living or nonliving**.**	
Student Task Sheet Included: yes Student Work Samples Included: yes	

Learning Target #2	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Parts B, C and D of response sheet 1 from investigation 1	
Learning Target 2: Living organisms depend on living and nonliving factors of the environmental system. - 4-5 LS2A	
Success Criteria: Explain how nonliving factors (variables) influence living organisms.	
Student Task Sheet Included: yes Student Work Samples Included: yes	

ENVIRONMENTS

Big Idea: **Living and nonliving changes in ecosystems can affect the populations they support.**

Learning Target #3	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Student Sheet 6 is where students plan the Beetle investigation. Animal Investigations - Planning: student sheet # 6 – *(modified for Washington State.)* Investigation 3: Student sheet #10 : Plant Observation s, Student sheet # 12: Plant Profile, Student sheet #17: Brine Shrimp Hatching	**Suggestions for Instructional Adjustments:** The modified version is better but student sheet 6 from the kit will work too. Make sure to have students analyze data to discover Range of Tolerance and Optimum Conditions
Learning Target 3: Organisms have a range of tolerance within their preferred environmental system. - 4-5 LS1B-D	
Success Criteria: I can manipulate an organism's environment in order to determine their optimum conditions.	
Student Task Sheet Included: yes Student Work Samples Included: no	

Learning Target #4	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: If…Then statements. Example on Learning Progression. Science Stories: Mono Lake Story, respond to "after the story" questions. Habitat Change (Keeley, *Uncovering Student Ideas in Science*, Vol. 2, pp.143- 148, #19)	
Learning Target 4: Changes in ecosystems can affect the organisms within the environmental system. - 4-5 LS2D & E	
Success Criteria: Predict how a slow or rapid change might affect the living and non-living factors of the environment.	
Student Task Sheet Included: no Student Work Samples Included: no	

ENVIRONMENTS

Big Idea: **Living and nonliving changes in ecosystems can affect the populations they support.**

Learning Target #5	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Describe the relationship between the environment and the organisms that live there. Environments I-Check : Question #15	
Learning Target 5: All plants and animals change the ecosystem where they live. - 4-5 LS2D & E	
Success Criteria: Identify how a change in resources affects the living and non-living factors of the environmental system.	
Student Task Sheet Included: no Student Work Samples Included: no	

Name _____ Date _____

ANIMAL INVESTIGATIONS—PLANNING

Question

What _____ conditions do _____ (isopods or beetles) prefer in their environment?

Planning the Investigation

Prediction

I think there will be more _____ (isopods or beetles) in the _____ environment after _____ amount of time because _____.

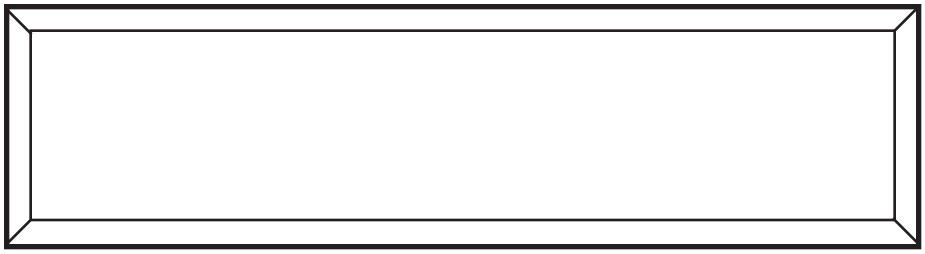
Materials

List the materials and put a check by each material that is kept the same for all conditions.

Procedure

Describe, draw, and label how you set up the runway. Be sure to include

- one variable kept that stays the same (controlled)
- one variable that changes (manipulated)



_____

_____

_____

_____

_____

_____

_____

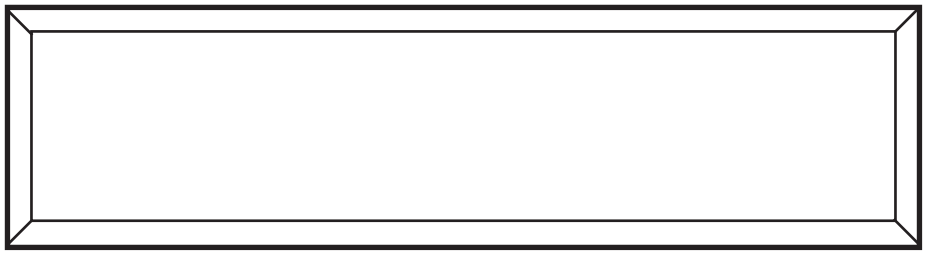
Name _____ Date _____

ANIMAL INVESTIGATIONS—RESULTS

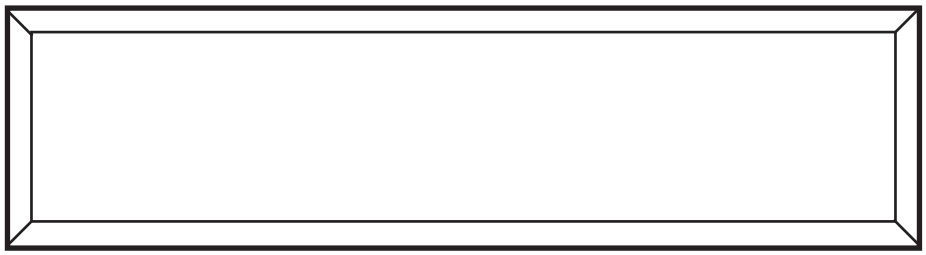
Part 1. Data Collection:

Record where each animal was and what it was doing (on surface, buried, or moving).

Short run. This is where the animals were after _____ minutes.



Long run. This is where the animals were after _____ hours.



Part 2. Conclusion

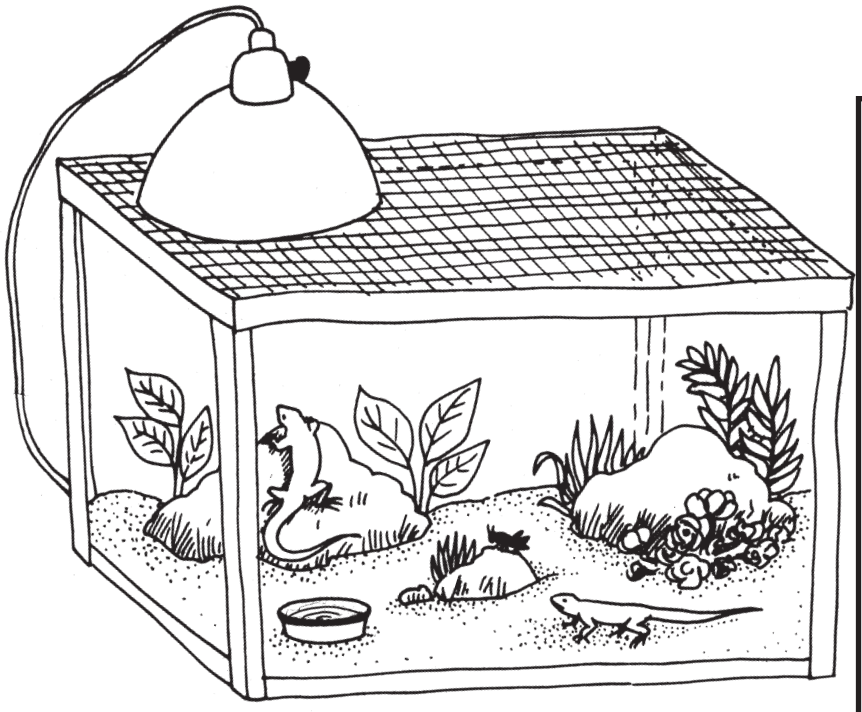
In order to make a reliable conclusion, scientists perform repeated trials. How does your conclusion compare to those of other students who investigated the same animal?

What did you find out about the animals' environmental preferences? Your conclusion should include these parts.

- Supporting data
- An explaination of how this data supports your conclusion.

Name _____ Date _____

RESPONSE SHEET—INVESTIGATION 1



salamanders L
cricket L
rocks
pan of water
broad-leafed plants L
light L
grassy plants L
glass terrarium
thin-leafed plants L
soil L
flowering plants L
temperature

Sayo used the picture above to make a list of all the environmental factors she saw in this terrestrial environment. She put an L next to each factor she identified as a living factor. The list Sayo made is shown above.

a. Do you agree that all the factors Sayo marked with an L are living? _____ If not, tell which selected factors you don't agree with and explain why they should be changed.

_____

_____

_____

b. Describe how two of the nonliving factors might influence the living factors in this terrarium.

1. _____

_____

2. _____

_____

Name _____ Date _____

RESPONSE SHEET—INVESTIGATION 1 (continued)

c. Sort the living things on Sayo's list into two groups: plants and animals.

Plants	Animals

d. State one characteristic that distinguishes plants from animals.

_____

_____

_____

_____

_____

Learning Progression

FOSS Environments: EALR 2 Inquiry

Prerequisite skill:

Make observations and record data from observations

2-3 INQB & C

Learning Target 1:

There are different types of investigations:

Observations and controlled experiments using models are one type.

4-5 INQB

Success Criteria:
I can…

differentiate between a controlled and non-controlled investigation when given a scenario...

Formative Assessment:

Talking head scenarios

Doing Science – Keeley 2008

Learning Target 2:

Variables that affect our investigations can be biotic or abiotic.

4-5 INQB

Success Criteria:
I can…

identify 3 – 4 variables that could affect an investigation.

Formative Assessment:

Investigation 1 (student sheet 4 modified) labeling living and non-living and how the factors influence the terrarium investigation.

Learning Target 3:

A controlled experiment starts with a question from an observation.

Variables are *controlled* except the one *manipulated variable.*

4-5 INQ C

Success Criteria:
I can…

ask a question and conduct a fair experiment that identifies controlled, manipulated, and responding variables.

Formative Assessment:
Investigation 2: student sheet # 6 Animal Investigations
Students white board which variables will be controlled, manipulated, and responding.
Investigation 2, Part 4 – Designing an Animal Investigation

Investigation 6: Student Sheet #9 Plant Experiment Setup

Learning Target 4:

Investigations involve systematic collection and recording of relevant observations and data.

4-5 INQD

Success Criteria:
I can…

measure and record my observations and organize my data on a table or chart.

Formative Assessment:

Investigation 1: Student Sheet #3 Terrarium Map

Investigation 3: Student Sheet #10 Plant Observations, Student Sheet #12 Plant Profile

Investigation 4: Student Sheet #14 Aquarium Log

Learning Target 5:

Scientific conclusions can be generated based on data gathered.

4-5 INQG

Success Criteria:
I can…

use my evidence to write a conclusion.

Formative Assessment:
Complete: "Writing a Conclusion in Science" using data from Investigation 5 Student Sheet #17 Brine Shrimp Hatching AND/OR Investigation 6 Student Sheet #10 Plant Observations

Response Sheet #18 – Brine Shrimp Hatching

Investigation 6: Student Sheet #9 Plant Experiment Setup

Big Idea:
Planning Investigations
Plan and implement different kinds of investigations, including field studies, systematic observations, models, and controlled

Later big ideas that build on this big idea include:

What questions do you have from this investigation and how could you design a further investigation to answer your question.

Within a terrarium how are things co-dependent.

This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

Northwest Educational Service District 189
Together We Can

Writing a Conclusion in Science

Your conclusion summarizes how your results agree with (support) or do not agree with (contradict) your experimental prediction. Your conclusion does not tell whether you were right or wrong.

1. Restate your original prediction. Tell whether your results support or contradict your prediction, or are your results unclear (may need additional work).
2. Restate your specific data results and make the connection between your data and your original prediction.
3. Evaluate your procedure and explain how it was successful or not.
4. Suggest changes in the procedure and explain what further work could be done.

 This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

ENVIRONMENTS

Big Idea: **Plan and implement different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.**

Formative Assessment Task Cover Sheet

Learning Target #1	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Students decide which scenario they agree with from a "Talking Heads" sheet. Doing Science – Keeley 2008	Investigation 1 Part 1
Learning Target 1: There are different types of investigations: Observations and controlled experiments using models are one type.	
Success Criteria: Differentiate between a controlled and non-controlled investigation when given a scenario.	
Student Task Sheet Included: yes Student Work Samples Included: yes	
Learning Target #2	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: (student sheet 4 WA - modified) labeling living and non-living and how the factors influence the terrarium investigation.	Investigation 1
Learning Target 2: Variables that affect our investigations can be biotic or abiotic, and controlled or not controlled. - 4-5 INQ B	
Success Criteria: I can identify 3 – 4 variables that could affect an investigation.	
Student Task Sheet Included: yes Student Work Samples Included: no	

ENVIRONMENTS

Big Idea: **Plan and implement different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.**

<table>
<tr><th colspan="2">Learning Target #3</th></tr>
<tr><th>Assessment Task Details</th><th>Teacher Background</th></tr>
<tr><td>Brief Description of the Assessment Task: Investigation 2: student sheet # 6 Animal Investigations
Students white board which variables will be controlled, manipulated, and responding.
Investigation 2, Part 4 – Designing an Animal Investigation
Investigation 6: Student Sheet #9 Plant Experiment Setup</td><td rowspan="4">Investigation 2 and Investigation 6

Suggestions for Instructional Adjustments:
The WA modified version is better but student sheet 6 from the kit will work too.</td></tr>
<tr><td>Learning Target 3: A controlled experiment starts with a question from an observation. Variables are controlled except the one manipulated variable. - 4-5 INQ C</td></tr>
<tr><td>Success Criteria: I can ask a question and conduct a fair experiment that identifies controlled, manipulated, and responding variables.</td></tr>
<tr><td>Student Task Sheet Included: no
Student Work Samples Included: no</td></tr>
<tr><th colspan="2">Learning Target #4</th></tr>
<tr><th>Assessment Task Details</th><th>Teacher Background</th></tr>
<tr><td>Brief Description of the Assessment Task: Students transfer their raw data and observations to a table.

Investigation 1: Student Sheet #3 Terrarium Map

Investigation 3: Student Sheet #10 Plant Observations, Student Sheet #12 Plant Profile

Investigation 4: Student Sheet #14 Aquarium Log</td><td rowspan="4">Investigation 1. Investigation 3, and Investigation 4</td></tr>
<tr><td>Learning Target 4: Investigations involve systematic collection and recording of relevant observations and data. - 4-5 INQ D</td></tr>
<tr><td>Success Criteria: I can measure and record my observations and organize my data on a table or chart.</td></tr>
<tr><td>Student Task Sheet Included: no
Student Work Samples Included: no</td></tr>
</table>

 This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

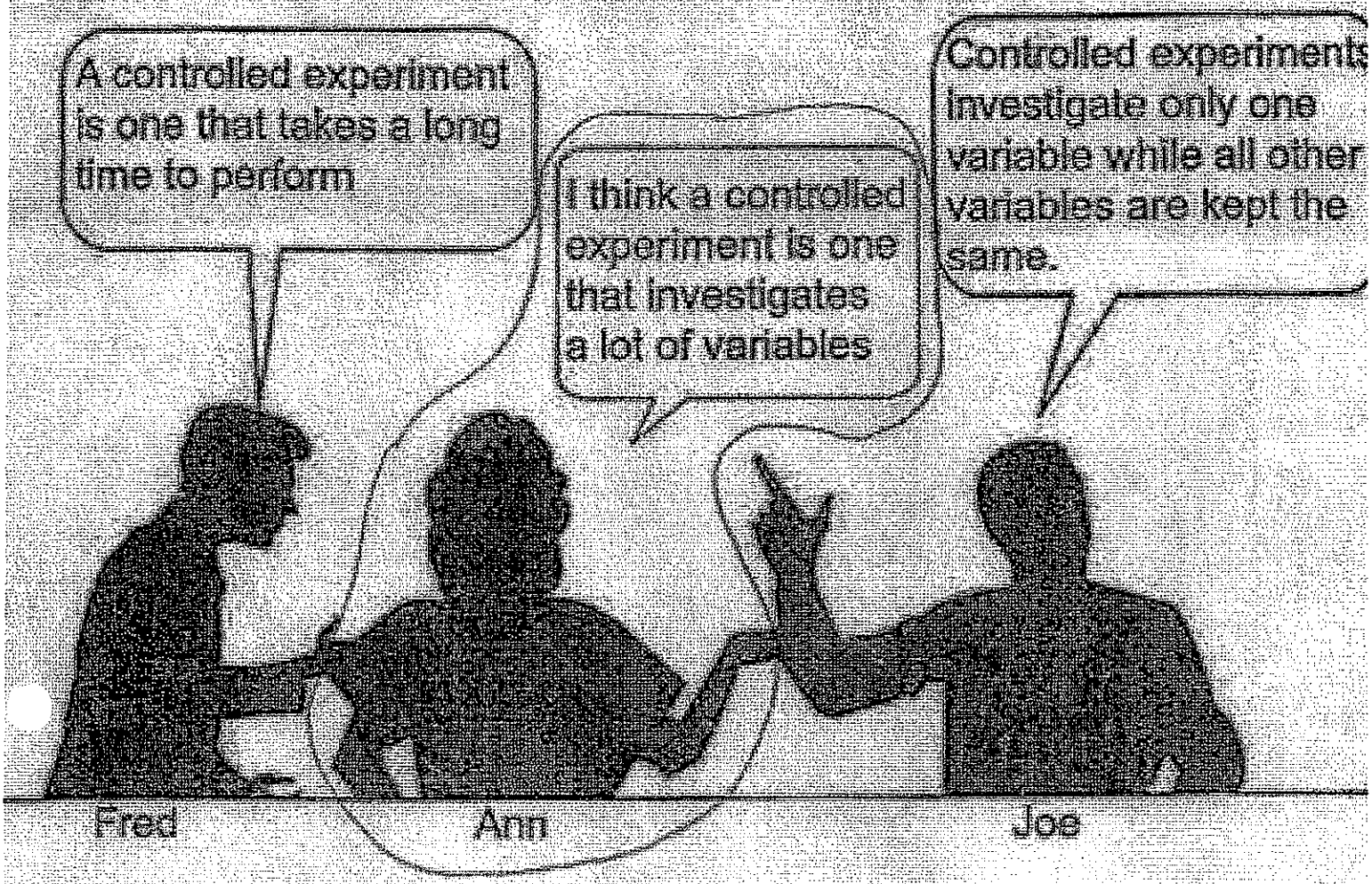
ENVIRONMENTS

Big Idea: **Plan and implement different kinds of investigations, including field studies, systematic observations, models, and controlled experiments.**

Learning Target #5	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Complete: "Writing a Conclusion in Science" using data from Investigation 5 Student Sheet #17 Brine Shrimp Hatching AND/OR Investigation 6 Student Sheet #10 Plant Observations Response Sheet #18 – Brine Shrimp Hatching Investigation 6: Student Sheet #9 Plant Experiment Setup	Investigation 5 and Investigation 6
Learning Target 5: Generate a scientific conclusion based on data gathered. -4-5 INQ G	
Success Criteria I can use my evidence to write a conclusion.	
Student Task Sheet Included: yes Student Work Samples Included: no	

 This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

The science teacher wanted to find out what students understood about controlled experiments. Three students gave their answers to the class.

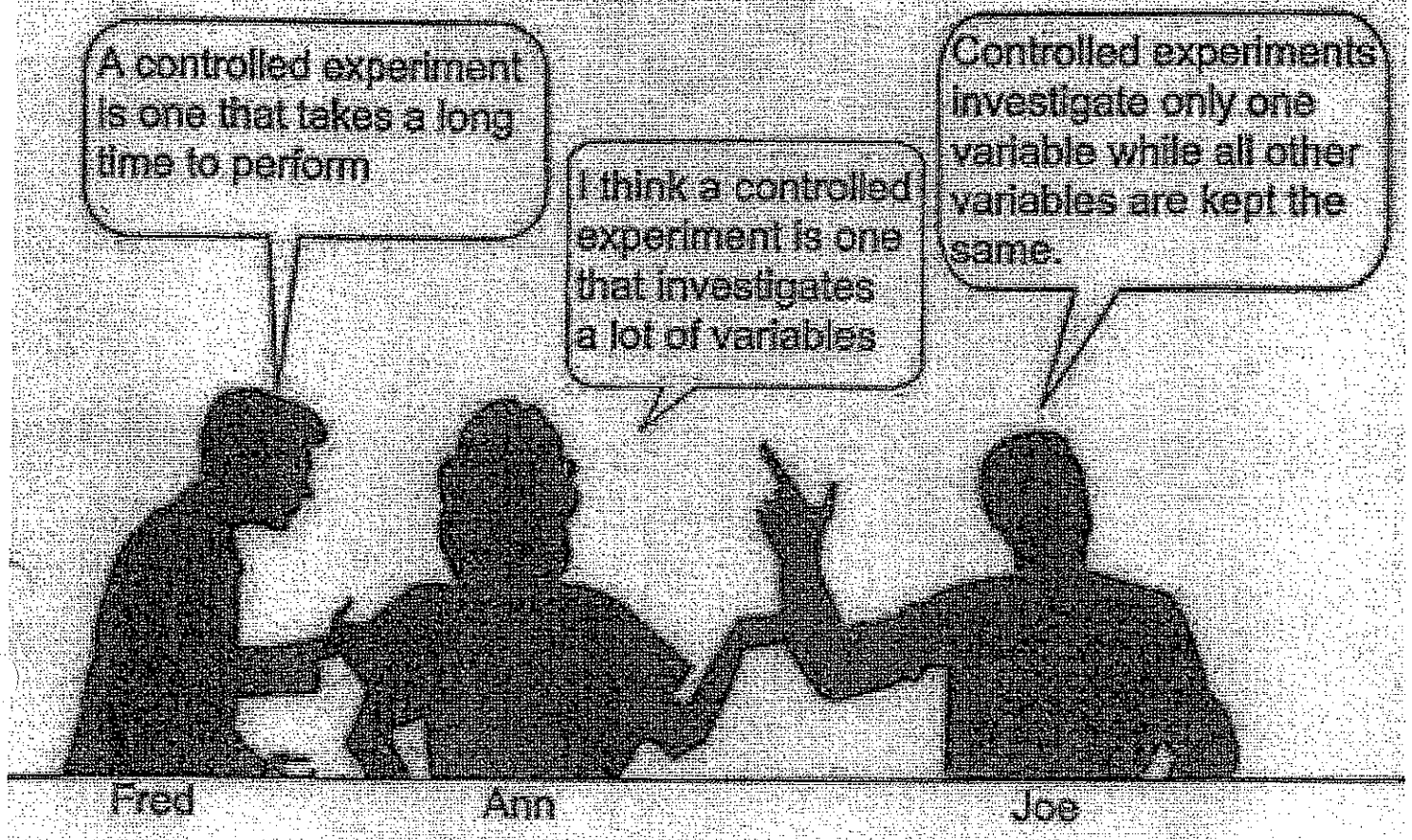


Choose which student you agree with about controlled experiments and explain why.

I agree with Ann because she thinks that a controlled experiment is one that investigates a lot of variables and that is right because they test lots of variables to investigate the controlled experiment

Talking Heads Clipart

The science teacher wanted to find out what students understood about controlled experiments. Three students gave their answers to the class.



Choose which student you agree with about controlled experiments and explain why.

I agree with Joe because

I remember that a controlled experiment investigation only has one variable while the others are the same as before.

Talking Heads Clipart

Environments

Additional Information

A useful supplementary video is "The Mono Lake Story"
www.Mono Lake.org/about/film

 This work is funded by the Washington State Office of Superintendent of Public Instruction Mathematics & Science Partnership under Title II, Part B Program Code: 62CFDA 84.366B.

.

Environments

Bibliography

Dylan, William. *Embedded Formative Assessment.* Bloomington, IN: Solution Tree, 2011. Print.

Keeley, Page, F. Eberle, and . Farrin. *Uncovering Student Ideas in Science: 25 Formative Assessment Probes, Volume 1*. Arlington, VA: NSTA Press, 2005. Print.

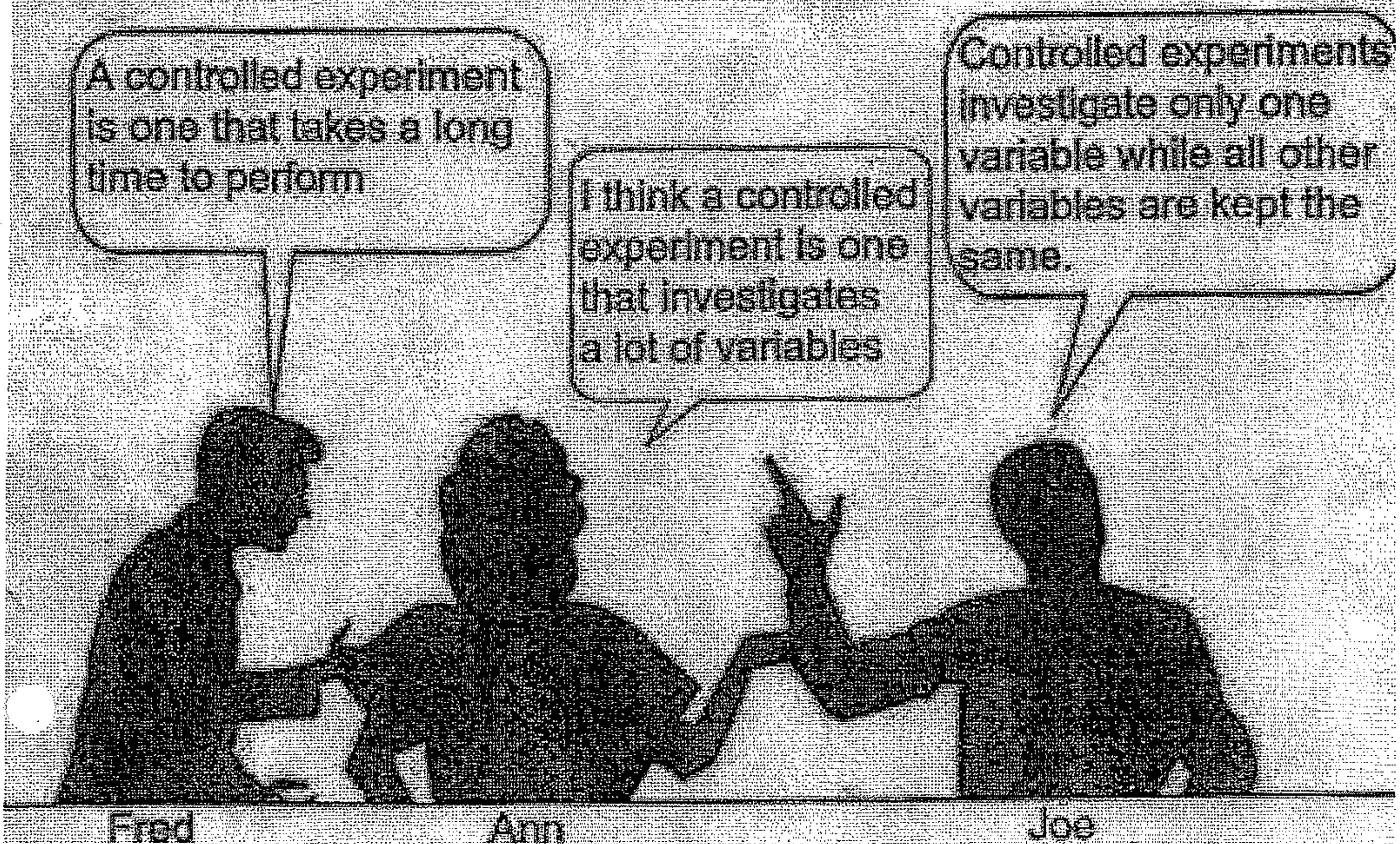
Keeley, Page, F. Eberle, and J. Tugel. *Uncovering Student Ideas in Science: 25 More Formative Assessment Probes, Volume 2*. Arlington, VA: NSTA Press, 2007. Print.

Keeley, Page. *Science Formative Assessment: 75 Practical Strategies for Linking Assessment, Instruction, and Learning*. Thousand Oaks, CA: Corwin, 2008. Print.

Keeley, Page, F. Eberle, and C. Dorsey. *Uncovering Student Ideas in Science: Another 25 Formative Assessment Probes, Volume 3*. Arlington, VA: NSTA Press, 2008. Print.

Popham, W. James. *Transformative Assessment*. Alexandria, VA: Association for Supervision and Curriculum Development, 2008. Print.

The science teacher wanted to find out what students understood about controlled experiments. Three students gave their answers to the class.



Choose which student you agree with about controlled experiments and explain why.

I agree with FrEd because
he might be right. I mean
like it might take forever
like a year more.

Talking Heads Clipart