4/26/2014

Assessing with Learning Progressions in Science

FOSS VARIABLES

Photo by Joanne Johnson

Instructional Tools | **Contributors: Jennifer Bader, Andrea Clancy, Rocky Diaz, Dale Fournier, Wende Hilyard, Lisa Lockwood, Zan Peterson-Moens, Tracie Martin, Linda Reichlin, Elise Roberson, and Thirza Zagelow**

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.

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Variables Unit Plan with Formative Assessment (NW ALPS)

Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Before Kit: Administer System Pre-Assessment, "Is it a System?" (pg. 81) (Keely, Uncovering Student Ideas, vol. 4, teacher notes: Uncovering Student Misconceptions, pg. 82-87)					
Investigation 1: Swingers					
Inv. 1-1 Swingers *Exploring Swinger*	**Systems**	Systems contain subsystems. A system is a set of related objects that can be studied in isolation. ✓ I can identify the system and its constituent subsystems (i.e. pendulum – string, bob, pencil, paperclip)	Addressing misconceptions with pendulum: "The Swinging Pendulum", (pg. 201), (Keely, Uncovering Student Ideas in Physical Science. Teacher support pgs. 202-204.) At the end of 1-1, have students work with a partner to identify the subsystems of the pendulum system. Extension: Identify a system in real life. Identify the subsystems and how they work together to make a system.	○ Pendulum ○ Cycle ○ Variable	○ Strings ○ Paper clips ○ Pennies ○ Pencils ○ Meter tape
Inv. 1-2 *Testing Variables*	**Inquiry**	Variables that affect our investigations can be controlled or not controlled. Variables are controlled (kept the same) except the manipulated variable. ✓ I can set up and conduct a controlled experiment that identifies controlled, manipulated and responding variables.	With a partner, identify the variables in the pendulum system on a whiteboard (controlled, manipulated, and responding).	○ Standard ○ Controlled Experiment	○ Swingers from Inv. 1:1 ○ Strings ○ Paper clips ○ Pencils ○ Pennies ○ Meter tapes ○ Scissors ○ Masking tape ○ Glue ○ Strip of cardboard ○ Teacher Sheet no. 4 "Swinger Number Line" ○ "Facts First" Questioning Sheet

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
	Systems	A system can do things that none of its subsystems can do by themselves. ✓ I can determine how a change in one subsystem (variable) may affect another subsystem (variable) in a system.	Pendulum Probes 1 & 2 (NWALPS) (preferred) OR Student Response Sheet 6 – "Swingers" (Foss)		Student Sheet 6 – "Swingers" Pendulum Probes 1 & 2 (in NWALPS notebook)
Inv. 1-3 *Predicting Swings*	Inquiry	Investigations involve systematic collections and recordings of relevant observations and data. ✓ I can measure and record my observations and organize my data on a chart.	Student Sheet 7 – "Swings Two-Coordinate Graph" (Foss)	○ Two-coordinate graph	○ Paperclips ○ Pencils ○ Pennies ○ Student sheet 7 – "Swingers Two-Coordinate Graph" ○ String
	Systems	Systems have inputs and outputs, also known as variables. Changes in inputs may change the output of a system. A variable is anything that you can change in an experiment that can affect the outcome. ✓ I can identify the variables in a given system. .	Given Student Sheet 7, the student will identify the input (change in length of string) and the output (Number of cycles/swings), and reflect on how the input effects the output.		

Lesson	Learning Targets & Success Criteria	Assessment	Vocabulary	Materials

Investigation 2: Lifeboats

TEACHER NOTES	INVESTIGATION	SUGGESTIONS/TIPS	OTHER

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
2-1 *Exploring Boats*	**Inquiry**	Variables that affect our investigations can be controlled or not controlled. Variables are controlled (kept the same) except the manipulated variable. ✓ I can set up and conduct a controlled experiment that identifies controlled, manipulated and responding variables.	Foss, Student Sheet 9 – Have students explain and discuss the variables (controlled, manipulated, and responding) when they change the boat size.	○ Capacity	○ Paper cups ○ Sponge ○ Pencil ○ Sharpie ○ Scissors ○ Pennies ○ Meter Tape ○ Plastic cups ○ Syringe ○ Graduated cylinder, 50-ml ○ Basin
2-2 *Lifeboat Inspection*	**Inquiry**	Generate a scientific conclusion based on data gathered. ✓ I can use evidence from my data to write a conclusion.	Foss, Student Sheet 8 – Using their two-coordinate graph, have students explain the relationship of an experimental variable (independent variable) to the outcome (dependent variable) - -Work on drawing conclusions specific to the capacity of the boats and number of passengers a boat will hold.	None	○ 4 Lifeboats from 2-1 ○ Sponge ○ Pennies ○ Basin ○ Plastic cup ○ Student sheet 10 – "Lifeboats"
2-3 *Inspecting Other Boats*	**Inquiry**	Investigations involve systematic collections and recordings of relevant observations and data. ✓ I can measure and record my observations and organize my data on a chart.	Foss, Student Sheet 7 – "Swings Two-Coordinate Graph"	None	○ 4 Lifeboats from 2-1 ○ Sponge ○ Ruler ○ Pennies ○ Basin ○ Water ○ Paper towels ○ Plastic cup ○ Student sheet 10 – "Lifeboats"

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Lesson	Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Design Challenge		VB_DC1_draft 1`		○ Corks ○ Paperclips ○ Sponges ○ Rubber stoppers ○ Aluminum foil ○ Duct tape ○ Straws ○ Craft sticks ○ Paper cups ○ Rubberbands ○ Tape ○ Scissors ○ Staplers ○ Glue

TEACHER NOTES	INVESTIGATION	SUGGESTIONS/TIPS	OTHER

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Investigation 3: Plane Sense					
3-1 *Exploring Flight*	**Systems**	Systems contain subsystems. A system is a set of related objects that can be studied in isolation. ✓ I can identify the system and its constituent subsystems.	Have students identify the parts of the subsystems in the FOSS plane - - either in writing or orally.	○ System	○ Propeller ○ Hook ○ Rubber band ○ Soda straw, jumbo ○ Soda straw, super jumbo ○ Craft sticks ○ Coarse sandpaper ○ Fishing line ○ Zip bag ○ Scissors ○ Duct tape ○ Hole punches ○ Staplers ○ Student Sheet 12, "FOSS Plane Construction"
3-2 *Investigating Variables*	**Inquiry**	Variables that affect our investigations can be controlled or not controlled. Variables are controlled (kept the same) except the manipulated variable. ✓ I can set up and conduct a controlled experiment that identifies controlled, manipulated and responding variables.	Student Sheet 13 "Flight Log"	None	○ FOSS plane (from 3-1) ○ Fishing line ○ Meter tape ○ Student Sheet 13 "Flight Log" ○ Duct tape ○ Paper clips ○ Masking tape ○ Rubber bands
		Adminster Inquiry Reflective Prompt			

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
3-3 *Flights of Fancy*	Inquiry	Variables that affect our investigations can be controlled or not controlled. Variables are controlled (kept the same) except the manipulated variable. ✓ I can set up and conduct a controlled experiment that identifies controlled, manipulated and responding variables. Repeated trials are necessary for reliability and to ensure continuity. ✓ I can repeat trials for reliability and report them honestly, even when they don't match my prediction Generate a scientific conclusion based on data gathered ✓ I can use evidence from my data to write a conclusion.	Student Sheet 15 or Investigation Blank Form	None	○ FOSS plane (from 3-1) ○ Fishing line ○ Meter tape ○ Duct tape ○ Paper clips ○ Masking tape ○ Rubber bands ○ Student Sheet 15 and/or Investigation Blank Form
3-4 *Graphing the Results*	Inquiry	Generate a scientific conclusion based on data gathered ✓ I can use evidence from my data to write a conclusion.	After students have graphed their data, have small group or whole group discussions to draw conclusions. (Optional: Work on writing conclusions on yesterday's blank investigation form)	None	*"Design an Experiment: Plane Sense" sheet from 3-3 *Student sheet 16 "Two-coordinate graph"
Design Challenge			VB_DC2_draft1		○ Plane system & 4m flight path ○ Pennies ○ One 8 ½ x 11 paper ○ String ○ Scotch tape ○ 2 paper clips ○ Mater tape

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Lesson		Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Investigation 4: Flippers					
4-1 *Flip-Stick Construction*	Inquiry	Systems contain subsystems. A system is a set of related objects that can be studied in isolation. ✓ I can identify the system and its constituent subsystems.	Have students identify the parts of the subsystems in the FOSS flipper - - either in writing or orally.	None	○ Craft sticks ○ Craft stick pieces ○ Student sheet 17 "Flip-Stick Construction" ○ White glue ○ Scrap paper
4-2 *Flip Out*	Inquiry	Variables that affect our investigations can be controlled or not controlled. Variables are controlled (kept the same) except the manipulated variable. ✓ I can set up and conduct a controlled experiment that identifies controlled, manipulated and responding variables.	Student Response Sheet 19, "Flippers"	None	○ Flip sticks from 4-1 ○ Flipper base ○ Meter tape ○ Cork ○ Rubber stopper ○ Craft stick ○ Angle brace ○ Large foil sheet ○ Small foil sheet ○ Zip bag ○ Pencil Student Response Sheet 19 "Flippers"
4-3 *Controlled Experiments*	Inquiry	Investigations involve systematic collections and recordings of relevant observations and data. ✓ I can measure and record my observations and organize my data on a chart.	Students set up a data table in their science notebook to record their data. They show the manipulated and responding variables. Transfer their data onto a class data chart and observe the results. Add a mean, median, or mode column to compare results.		○ Bag with flipper, base, and foil balls (from 4-2) ○ Meter tape ○ Angle braces ○ pennies

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Lesson	Learning Targets & Success Criteria	Assessment	Vocabulary	Materials
Design Challenge		VB_DC3_draft1		○ 1 plastic spoon ○ 1 foil ball (10cm or 20cm) 4 craft sticks ○ 1 yd. masking tape ○ 1 cork (rubber or wooden) ○ 2 straws (jumbo or super jumbo) ○ 1 plastic cup ○ 1 yard string ○ 5 large paperclips ○ 5 small paperclips ○ 3 rubber bands ○ One 12” ruler ○ scissors
	Administer Inquiry Reflective Prompt			

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Lesson			Reinforcement of Concept	Vocabulary	Materials
Unit Culmination Assessement					
Systems	Systems	✓ To cement the Big Idea of "Systems"	• Page Keeley's "card sort" of various systems – students sort card of various systems into groups – Page Keeley's Vol. 4 p. 85-86 Suggestions for Instruction and Assessment • Students come up with examples of systems with the word system in it – then state components of the system • Students generate examples of systems without the word system – then justify why components belong in the system	None	○ Cards of various systems
	Inquiry				
	Inquiry				○

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Lesson			Reinforcement of Concept	Vocabulary	Materials
Design Challenge			VB_DC3_draft1		○ 1 plastic spoon ○ 1 foil ball (10cm or 20cm) 4 craft sticks ○ 1 yd. masking tape ○ 1 cork (rubber or wooden) ○ 2 straws (jumbo or super jumbo) ○ 1 plastic cup ○ 1 yard string ○ 5 large paperclips ○ 5 small paperclips ○ 3 rubber bands ○ One 12” ruler ○ scissors
		Administer Inquiry Reflective Prompt			

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Learning Progression

FOSS Variables EALR 2 Inquiry

Prerequisite skill:

Make observations and record data from their observations.

2-3 INQB-C

Learning Target 1:

A controlled experiment starts with a question from an observation.

4-5 INQB

Success Criteria:
I can…

Ask a scientific question

Formative Assessment:

Write a question with one manipulated variable.

Plane Sense Questions

Learning Target 2:

Variables that affect our investigations can be controlled or not controlled.

Variables are controlled (kept the same) except the manipulated variable.

4-5 INQC

Success Criteria:
I can…

Set up and conduct a controlled experiment that identifies controlled, manipulated and responding variables.

Formative Assessment:

Pendulum Probe 1 & 2
OR
Swingers, Inv. 1, Student sheet 6. Swingers

Learning Target 3:

A controlled experiment starts with a question from an observation. Variables are *controlled* except the one *manipulated variable.* 4-5 INQB

Success Criteria:
I can…

Measure and record my observations and organize my data on a chart.

Formative Assessment:
Set up a data chart in their journal to record their data that shows the manipulated and responding variables. Transfer their data onto a class data chart and observe the results; add a mean, mode or median column to compare results

a) Science notebook

b) Inv.1 Swingers Student Sheet 5 & 7

C) Lifeboat Inspection Inv. 2 Student Sheet 10 part 1 & 2

Learning Target 4:

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

4-5 INQD

Success Criteria:
I can…

Repeat trials for reliability and report them honestly even when they don't match my prediction

Formative Assessment:
A) Inv. 3 Plane Sense Passengers

B) Commit and Toss Keely p. 65:

Example-

Sara added mass to her swinger pendulum system. She thought that this would decrease the number of cycles. However, she found that her data stayed the same. What should she do?

a) Fix her data to make it fit her prediction

b) Retest her swinger to see if she gets the same results. Report those results.

c) Look for answers on the Internet.

Explain your thinking and describe reasons for your answers.

Learning Target 5:

Generate a scientific conclusion based on data gathered.

4-5 INQE & G

Success Criteria:
I can…

Use evidence from my data to write a conclusion

Formative Assessment:
Write a conclusion based on information from a data table.

A) Science Notebooks
B) Sloping Flight Line
C) Plane Controlled Investigation

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

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.

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VARIABLES

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

Formative Assessment Task Cover Sheet

Inquiry Learning Target #1 Assessment Task: Plane Sense Questions	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Write a question with one manipulated variable.	**Administration Tips:** To show mastery of ability to write a one manipulated variable question through repeated practice.
Learning Target: A controlled experiment starts with a question from an observation. 4-5 INQB	**Suggestions for Instructional Adjustments:** Make sure to teach the concept of writing a scientific question and look at models or examples.
Success Criteria: I can… Ask a scientific question	**Use a white board or paper for student documentation.**
Student Task Sheet Included: No Student Work Samples Included: no	

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VARIABLES

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

Inquiry Learning Target #2 Assessment Task: Pendulum Probe 1 & 2 OR Swingers, Inv. 1, Student sheet 6. Swingers	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Response sheet: Pendulum Probe 1 & 2 OR Swingers, Inv. 1, Student sheet 6. Students design pendulum experiment. Students evaluate whether this was a good example of a one-variable controlled experiment.	**Administration Tips:** There are three assessments available. Teachers prefer using Pendulum Probe 1 & 2 as formative assessments. Note: this formative assessment helps identify student learning for both Big Ideas from the Inquiry and Systems Learning Progressions.
Learning Target: Variables that affect our investigations can be controlled or not controlled. Variables are controlled (kept the same) except the manipulated variable. 4-5 INQC	
Success Criteria: Set up and conduct a controlled experiment that identifies controlled, manipulated, and responding variables.	
Student Task Sheet Included: yes Student Work Samples Included: no	

VARIABLES

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

<table>
<tr><th colspan="2">Inquiry Learning Target 3 Assessment Task: Inv. 1, Swingers Student Sheet 5 & 7 & Inv. 2, Student Sheet # 10 Part 1 and Part 2</th></tr>
<tr><th>Assessment Task Details</th><th>Teacher Background</th></tr>
<tr><td>Brief Description of the Assessment Task: Set up a data chart in their journal to record their data that shows the manipulated and responding variables.
Transfer their data onto a class data chart and observe the results; add a mean, mode or median column to compare results

A) Science Notebook

B) Inv. 1 Swingers Student Sheet 5 & 7
C) Lifeboat Inspection Inv. 2 Student Sheet # 10 Part 1 and Part 2</td><td rowspan="4">Administration Tips: Need four in a group for Lifeboats. Make sure data is recorded accurately on Swingers student sheet 5.

Suggestions for Instructional Adjustments:
Notebook entries included collecting Swinger’s data on Release Position, Mass, Length of the Pendulum
Lifeboats capacity

Tip: During the swingers Investigation is an appropriate time to introduce maximum, minimum, median, mean and mode. As the Investigations progress this process should become more standardized. See Plane Sense Marlis-December 26</td></tr>
<tr><td>Learning Target: A controlled experiment starts with a question from an observation. Variables are controlled except the one manipulated variable. 4-5 INQB</td></tr>
<tr><td>Success Criteria: I can…

Measure and record my observations and organize my data on a chart.</td></tr>
<tr><td>Student Task Sheet Included: no
Student Work Samples Included: no</td></tr>
</table>

VARIABLES

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

<table>
<tr><th colspan="2">**Inquiry Learning Target #4 Assessment Task:** Inv. 3 Plane Sense Passengers, #7 Commit and Toss, Example on Learning Progression</th></tr>
<tr><th>**Assessment Task Details**</th><th>**Teacher Background**</th></tr>
<tr><td>**Brief Description of the Assessment Task:**
A) Inv 3 Plane Sense Passengers

B) #7 Commit and Toss: Science Formative Assessment, Keeley pgs.65-68;
C) Example on Learning Progression</td><td rowspan="4">**Administration Tips:** The idea of repeated trials for reliability is progressive throughout the investigation. This is meant as a formative assessment after practice and understanding is better established.

Suggestions for Instructional Adjustments: The scenario can be changed to fit the investigation.</td></tr>
<tr><td>**Learning Target:** Investigations involve systematic collections and recording of relevant observations and data.

4-5 INQD</td></tr>
<tr><td>**Success Criteria:** I can…

Use evidence from my data to write a conclusion</td></tr>
<tr><td>Student Task Sheet Included: yes
Student Work Samples Included: no</td></tr>
</table>

VARIABLES

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

<table>
<tr><th colspan="2">Inquiry Learning Target #5 Assessment Task: Sloping Flight Line & Plane Controlled Investigation</th></tr>
<tr><td>Assessment Task Details</td><td>Teacher Background</td></tr>
<tr><td>Brief Description of the Assessment Task: Write a conclusion based on information from a data table.
A) Science Notebook
B) Sloping Flight Line
C) Plane Controlled Investigation</td><td rowspan="4">Administration Tips:
The skill of developing conclusions is progressive throughout the investigations. In the science journals as students collect data they create conclusions based on that data. In the beginning it is teacher directed; working toward independent thinking.
The Sloping Flight Line and Plane Controlled Investigation sheets are formative assessments to be used when students are ready to make independent conclusions.

Suggestions for Instructional Adjustments: The Plane Controlled Investigation Conclusion Sheet can be adjusted to fit any investigation.</td></tr>
<tr><td>Learning Target: Generate a scientific conclusion based on data gathered.

4-5 INQE & G</td></tr>
<tr><td>Success Criteria: I can…

Use evidence from my data to write a conclusion</td></tr>
<tr><td>Student Task Sheet Included: yes
Student Work Samples Included: no</td></tr>
</table>

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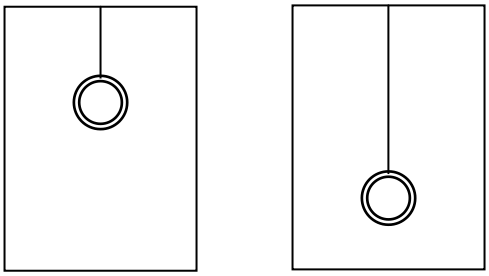
Name_____ Date_____

PENDULUM PROBE #1
VARIABLES



Pendulum A Pendulum B

Pendulum A has a string, which is 4 inches long. Pendulum B's string is 8 inches long. The washer attached to both is 2 inches in diameter and weighs 3 grams. Students count how many times the pendulum will swing back and forth in 15 seconds.

Put an X next to each choice which best reflects your ideas about this investigation.

The variable that was **changed** (manipulated) is the

_____ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

The variable that was kept the **same** (controlled) is the

_____ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

The variable that was **measured** (responding) is the

_____ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

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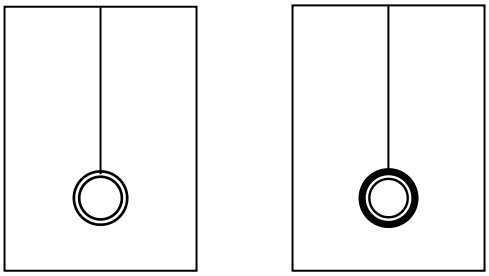
Name_____ Date_____

PENDULUM PROBE #2
VARIABLES



Pendulum A Pendulum B

Pendulum A and Pendulum B have strings, which are 6 inches long. There is one washer attached to Pendulum A and is 2 inches in diameter and weighs 3 grams. There are two washers attached to Pendulum B, which are each 2 inches in diameter and weigh 3 grams. Students count how many times each pendulum will swing back and forth in 15 seconds.

Put an X next to each choice which best reflects your ideas about this investigation.

The variable that was **changed** (manipulated) is the

_____ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ amount of washers

The variable that was kept the **same** (controlled) is the

_____ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ amount of washers

The variable the was **measured** (responding) is the

_____ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ amount of washers

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Name_____ Date _____

Investigation 3: Plane Sense Passengers

Question: *Will the number of passengers affect the distance the plane travels using a standard set of winds?*

Prediction:

_____

_____

_____

_____

_____

The standard set of winds is_____.

The distance traveled is_____.

Record your data:

Number of passengers	Distance (cm)

Graph your information on the two-coordinate grid.

Plane Sense Standard system graphing
by Marlis Kuusela - Thursday, 26 December 2013, 3:20 PM

The students were absolutely enthralled about making the plane shoot across the line. In order to slow them down and hold them accountable for recording and graphing their findings I had them record standard system winds for a plane that ran exactly 4 meters and just lightly touched the end. We then measured 1/2 way and recorded this information as well. We used class data on the two coordinate graph and set trend lines to see if the 1/2 way number matched the trend. We graphed the half way count with a circle around it to keep confusion at a minimum. We also discussed relationships between the number of winds and the distance traveled.

As far as the flight line set up went... We set chairs on their desks and ran 6 flight lines across the width of the room with a few feet in between each side of the lines. Students needed to stay in their areas and be sure to duck under lines if they had to. This system worked fairly well with two classes using the flight lines one after another so we didn't have to set the lines up twice.

Name_____ Date _____

Planes: Design an Investigation

Question: Write a question with one manipulated variable.

SCIENTIFIC INVESTIGATION TEMPLATE

Our **question** is:

Our **prediction** is:

Our **materials list** is:

The step-by-step **procedure** is:

The **variable** we are **changing** is:

The **measured** (responding) **variable** is:

These are the **controlled variables** (things kept the same):

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DATA TABLE

_____

CHANGED (Manipulated) VARIABLE		*Trial One*	*Trial Two*	*Trial Three*	*Average*

Conclusion:

- ☐ Prediction
- ☐ Low data
- ☐ High data
- ☐ Wrap it all up

Next investigation:

What question might you ask next to lead you into another investigation?

Name_____ Date_____

Plane Controlled Investigation

Write a conclusion for your plane controlled investigation.

In your conclusion, be sure to:

- Answer the experimental **question**.
- Include **supporting** data from your table.
- Include the **least** and the **greatest** data.
- Use the words **increase** or **decrease**.
- Explain **how** these data **support** your conclusion.

Question:

Name_____ Date_____

Plane Controlled Investigation

Scoring Guide	Points
Conclusive Statement: Yes/No	
Supporting Data from Manipulated (changed)**Variable/ Supporting Data from Measured Variable:** first trial compared to last trial	
Explanatory Language: increased, decreased, less, more, distance traveled, height, number of……..	
Connection to prior knowledge: I think……..	
Total Points	

_____

_____

_____

_____

Name_____ Date_____

Sloping Flight Line

Data Collection and Two Coordinate Graph

Trial 1 height_____ Distance_____

Trial 2 height_____ Distance_____

Trial 3 height_____ Distance_____

Trial 4 height_____ Distance_____

Trial 5 height_____ Distance_____

Trial 6 height_____ Distance_____

Trial 7 height_____ Distance_____

Name_____ Date_____

Sloping Flight Line

Data Collection and Two Coordinate Graph

Trial 1 height_____ Distance_____

Trial 2 height_____ Distance_____

Trial 3 height_____ Distance_____

Trial 4 height_____ Distance_____

Trial 5 height_____ Distance_____

Trial 6 height_____ Distance_____

Trial 7 height_____ Distance_____

Name_____ Date_____

Write a conclusion for the Sloping Fight Line investigation.

In your conclusion, be sure to:

Answer the experimental question.
Include **supporting** data from the Increased Height vs. Distance table/graph.
Explain how these data **support** your conclusion.

Question: Will increasing the slope (+10 cm, +20 cm……) of the flight line, increase or decrease the distance the plane travels?

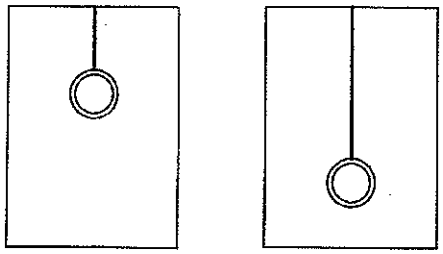
Name_____ Date_____

Sloping Flight Line Scoring Rubric

Scoring Guide	Points
Conclusive Statement: The slope increases and distance decreases.	
Supporting Data Flight Line: first level……. last +60 cm	
Supporting Data Distance: first _____ cm…. last ____ cm	
Explanatory Language:…… as the slope increased the plane flew a shorter distance	
Total Points	

Name [redacted] Date Jan. 16, 2014

PENDULUM PROBE #1
VARIABLES



Pendulum A Pendulum B

Pendulum A has a string, which is 4 inches long. Pendulum B's string is 8 inches long. The washer attached to both is 2 inches in diameter and weighs 3 grams. Students count how many times the pendulum will swing back and forth in 15 seconds.

Put an X next to each choice which best reflects your ideas about this investigation.

The variable that was **changed** (manipulated) is the

_____ size & weight of the washer

__X__ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

The variable that was kept the **same** (controlled) is the

__X__ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

The variable that was **measured** (responding) is the

_____ size & weight of the washer

_____ length of the string

__X__ amount of swings in 15 seconds

_____ color of washer

This hit what we taught much more clearly.

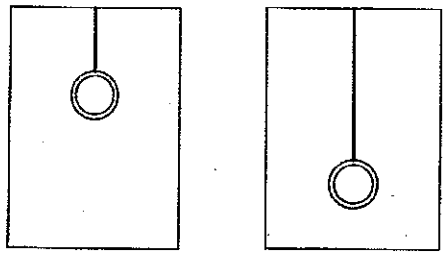
Created by Terence Diffley Ferndale School District

Assessing with Learning Progressions in Science
Math Science Partnership
File Name: VB_LT2C

Funding information:
Mathematics & Science Partnership under Title II, Part B
Program Code: 62
CFDA 84.366B

Name [redacted] Date Jan 6, 2014

PENDULUM PROBE #1
VARIABLES



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_____ amount of swings in 15 seconds

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The variable that was **measured** (responding) is the

_____ size & weight of the washer

_____ length of the string

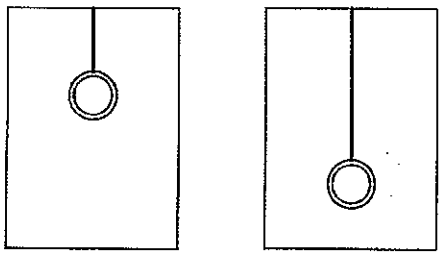
__X__ amount of swings in 15 seconds

_____ color of washer

Funding Information:
Mathematics & Science Partnership under Title II, Part B
Program Code: 62
CFDA 84.366B

Name [redacted] Date Jan 6, 2014

PENDULUM PROBE #1
VARIABLES



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Pendulum A has a string, which is 4 inches long. Pendulum B's string is 8 inches long. The washer attached to both is 2 inches in diameter and weighs 3 grams. Students count how many times the pendulum will swing back and forth in 15 seconds.

Put an X next to each choice which best reflects your ideas about this investigation.

The variable that was **changed** (manipulated) is the

_____ size & weight of the washer

__X__ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

The variable that was kept the **same** (controlled) is the

__X__ size & weight of the washer

_____ length of the string

_____ amount of swings in 15 seconds

_____ color of washer

The variable that was **measured** (responding) is the

_____ size & weight of the washer

_____ length of the string

__X__ amount of swings in 15 seconds

_____ color of washer

Created by Terence Diffley Ferndale School District

Assessing with Learning Progressions in Science
Math Science Partnership
File Name: VB_LT2C

Funding information:
Mathematics & Science Partnership under Title II, Part B
Program Code: 62
CFDA 84.366B

Learning Progression: Engineering Design Process

Materials: FOSS Variables **Grade level: 5**

Prerequisite skill:

Define:
Defining and delimiting engineering problems involves stating the problem to be solved as clearly as possible in terms of criteria for success, and constraints or criteria.

Develop Solutions:
Designing solutions to engineering problems begins with generating a number of different possible solutions, then evaluating potential solutions to see which ones best meet the criteria and constraints of the problem.

Optimize:
Optimizing the design solution involves a process in which solutions are systematically tested and refined and the final design is improved by trading off less important features for those that are more important.

Learning Target: A problem needs to be solved.

Success Criteria: I can identify and clearly understand the problem.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: A problem's solutions will have constraints or criteria.

Success Criteria: I can specify the constraints and criteria of a successful solution to a problem.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: A problem may have more than one solution.

Success Criteria: I can research in order to refine the solutions. *Gain prior knowledge?*

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: A problem's solution needs to address real world constraints.

Success Criteria: I can evaluate successful solutions based on criteria and constraints.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: Generate multiple solutions to a problem.

Success Criteria: When given a problem, I can generate multiple solutions.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: Evaluate your solution designs to ensure they meet the criteria and constraints.

Success Criteria: I can choose solutions that meet the criteria and constraints.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: Design and/or develop models of possible solutions.

Success Criteria: I can create models of my solutions.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: Test:

- Systematic
- Check criteria & constraints
- Record data

Success Criteria: I can design a process to systematically test the solutions.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: Analyze:

- Which solves the problem?
- Looking at the data
- Communicate other ideas

Success Criteria: I can evaluate the data from testing to determine how well it met the criteria or constraints of the problem.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Learning Target: Refine:

- Change the designs to solutions
- Best meet criteria
- Trade off less important features

Success Criteria: I can change my solution using the information we gathered to better meet the criteria or know that the optimal solution has been found.

Formative Assessment:

Lifeboats

Plane Sense

Flippers

Big Idea:

Engineers use the engineering design process to solve human problems.

Later big ideas that build on this big idea include:

Variables

Challenge Title: Plane Sense

Targeted Engineering Practices
☐ Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. ☐ Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem ☐ Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Connected Scientific Content Ideas
Description of Student Success Criteria:
At the completion of this task students will be able to: Students will be able to design a transport system for an airplane that carries the greatest amount of passengers at least one meter on the flight path.

 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 84.366.

Plane Sense Design Challenge

Challenge: Design a transport system for your air plane.

Criteria: Transport the greatest amount of passengers at least one meter on the flight path.

Modify the plane system by only one variable at a time to carry the greatest amount of passengers at least one meter on the flight path.

Constraints: Use the plane system and 4 meter flight path from previous investigations, pennies (passengers), one 8.5 x 11 paper, string, scotch tape, 2 paper clips, and a meter tape. Time constraint: 30 minutes.

- Record your team's brainstormed (tested or not) solutions:
- Draw and label a diagram of your basic solution.
- How did you optimize your new system? What failure points did you encounter? What modifications did you make to your initial design?

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Variables

Challenge Title: Flippers

Targeted Engineering Practices
☐ Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. ☐ Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem ☐ Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Connected Scientific Content Ideas
Description of Student Success Criteria:
At the completion of this task students will be able to: The student will be able to build a new flipper system that propels the foil ball the greatest distance.

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Build Your Own Flipper

Design Brief

Problem:

Create a new flipper system.

Specifications:

Success Criteria: Build a new flipper system that propels the foil ball the greatest distance.

Constraints: Final design may use any of the following materials:

- (1) plastic spoon*
- (1) Foil ball (10cm or 20cm)
- (4) Craft sticks
- 1 yd. masking tape*
- (1) cork (rubber or wooden)
- (2) straws (jumbo or super jumbo)
- (1) plastic cup
- (1) yard string
- (5) large paperclips
- (5) small paperclips
- (3) rubber bands
- Use of table or desktop is allowable
- (1) 12” ruler*
- scissors*

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Record your team's brainstormed (tested or not) solution**s**:

Draw and label a diagram of your basic solution.

How did you optimize your new system? What failure points did you encounter? What modifications did you make to your initial design?

Teacher tips:

1) Students need to be given a time limit for this design challenge, as there are no listed time constraints.
2) All supplies available were not utilized so it is suggested to modify supply list.
3) Information needs to be added about whether or not the flipper system should be free standing.

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Variables

Teacher Instructions: Implementation Support
Timing of the task: *please indicate the best time during the course of the kit to do this activity* Required additional materials (not included in the kit): *please list any materials needed for the design challenge that are not included in the kit* **Teacher Instructions:** *describe how to implement this task with students, include any helpful hints or other information a teacher will need to do this task with students*

Challenge Title: Lifeboats

Targeted Engineering Practices
☐ Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. ☐ Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem ☐ Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
Connected Scientific Content Ideas
Description of Student Success Criteria:
At the completion of this task students will be able to: The student will be able to design a system that will support the most passengers possible without sinking.

 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 84.366.

Lifeboats Engineer Design Challenge

Challenge: Design a system that will support the most passengers possible

Criteria: Modify the standard system (the 3 cm cup) by only one variable at a time to hold the most passengers possible without sinking

Constraints: Time limit on construction time (20 min) System uses these materials from the kit:

Corks, paperclips, sponges, rubber stoppers, aluminum foil, duct tape, straws, craft sticks, paper cups, rubber bands

Have available: Design challenge graphic organizer; tape, scissors, staplers, glue etc for construction

TEACHER TIPS:

1. Students need lots of practice with two coordinate graphs and making trend lines to predict outcomes.
2. Teacher needs to limit materials students are using, as material options are too many.

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Learning Progression

FOSS Variables EALR 1 Systems

Prerequisite skill:

Understand how the parts of objects, plants, and animals are connected and work together.

Grades 2-3 SYS A-E
Give Pre-Assessment: Is it a System?
Keeley p. Vol.4 p. 81

Learning Target 1:

Systems contain subsystems
A system is a set of related objects or parts that can be studied in isolation.

4-5 SYS A

Success Criteria:
I can…

I can identify the system and its constituent parts (Eg. Pendulum – string, bob, pencil, paper clip)

Formative Assessment:

With your partner identify the parts of the pendulum system.

Learning Target 2:

Systems have inputs and outputs, also known as variables. Changes in inputs may change the output of a system.

A variable is anything that you can change in an experiment that can affect the outcome.

Grades 4-5 SYS C

Success Criteria:
I can…

Identify and label the variables in a given system.

Formative Assessment:

With your partner label the variables in the pendulum system on a whiteboard or in your science notebook (controlled, manipulated, and responding).

Learning Target 3:

A system can do things that none of its subsystems can do by themselves.

Grades 4-5 SYS B

Success Criteria:
I can…

Determine how a change in one subsystem (variable) may affect another subsystem (variable) in a system.

Formative Assessment:

a) Students complete "if … then" statements about changing one variable in a system

b) I-Check Investigation 1 – Question #10

c) Pendulum Probe 1 and 2

Learning Target 4:

One defective part can cause a subsystem to malfunction, which in turn will affect the whole system.

Grades 4-5 SYS D

Success Criteria:
I can…

Predict what will happen if one variable is changed, or if one subsystem is changed in some way.

Formative Assessment:
Flight Log – Investigation 3, student sheet 13

*This is a group task.

Big Idea:
Complex Systems
Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.

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 84.366.

VARIABLES

Big Idea: **Complex Systems. Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.**

Formative Assessment Task Cover Sheet

Systems Learning Target Pre-Assessment: *Is It a System?* Keeley	
Assessment Task Details	Teacher Background
Brief Description of the Assessment Task: *Is It a System?* Keeley	**Administration Tips:** Use Keeley probe, *Is it A System?* Volume 4 pg. 81 Teacher Notes and Curricular and Instructional Considerations are provided and are very helpful. **Suggestions for Instructional Adjustments:** See related ideas in benchmarks for Science Literacy pgs. 84-85
Learning Target: The purpose of this assessment probe is to elicit students' ideas about systems. Grades 2-3 SYS A-E	
Success Criteria: I can… Understand how the parts of objects, plants, and animals are connected and work together.	
Student Task Sheet Included: no Student Work Samples Included: no	

Systems Learning Target #1 Assessment Task : Parts of a Pendulum	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: With a partner identify the parts of the pendulum system.	**Administration Tips:** Use this assessment with Investigation 1 part 1. As a preparation for the assessment a white board activity may be helpful. In a group have the students decide on the parts of the pendulum system and label them appropriately. May also be done as a teacher lead lesson with the students telling what to include in the pendulum system.
Learning Target: Systems contain subsystems. A system is a set of related objects or parts that can be studied in isolation. 4-5 SYS A	
Success Criteria: I can… I can identify the system and its constituent parts (Eg. Pendulum – string, bob, pencil, paper clip)	
Student Task Sheet Included: no Student Work Samples Included: no	

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VARIABLES

Big Idea: **Complex Systems. Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.**

<table>
<tr><th colspan="2">Systems Learning Target #2 Pre-Assessment: The Swinging Pendulum, Vol. 1 pg. 201 Keeley</th></tr>
<tr><th>Assessment Task Details</th><th>Teacher Background</th></tr>
<tr><td>Brief Description of the Assessment Task: Use probe The Swinging Pendulum, Volume 1, pgs. 201</td><td rowspan="4">Administration Tips:
Use this pre-assessment with Investigation 1 part 2.
As a preparation for the assessment a white board activity may be helpful. In a group have the students decide on the parts of the pendulum system and label them appropriately.
May also be done as a teacher lead lesson with the students telling what to include in the pendulum system.</td></tr>
<tr><td>Learning Target: Systems have inputs and outputs, also known as variables. Changes in inputs may change the output of a system. A variable is anything you can change in an experiment that can affect the outcome.

4-5 SYS C</td></tr>
<tr><td>Success Criteria: I can…

Identify and label the variables in a given system.</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 84.366.

VARIABLES

Big Idea: **Complex Systems. Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.**

Systems Learning Target #1 Assessment Task: Identify Variables of the pendulum system (student work)	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: With your partner label the variables in the pendulum system on a whiteboard or in science journals.	**Administration Tips:** This assessment should be given with Investigation 1 part 1.
Learning Target: Systems contain subsystems. A system is a set of related objects or parts that can be studied in isolation. 4-5 SYS A	
Success Criteria: I can… Identify the system and its constitute parts.	
Student Task Sheet Included: no Student Work Samples Included: no	

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VARIABLES

Big Idea: **Complex Systems. Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.**

<table>
<tr><th colspan="2">Systems Learning Target #2 Formative Assessment: Pendulum Probe 1 & 2</th></tr>
<tr><th>Assessment Task Details</th><th>Teacher Background</th></tr>
<tr><td>Brief Description of the Assessment Task: With a partner identify and label the variables of the pendulum system.</td><td rowspan="4">Administration Tips:
Use this assessment after Investigation 1 part 2.

Suggestions for Instructional Adjustments: Students may benefit from group reading of the task.</td></tr>
<tr><td>Learning Target: Systems have inputs and outputs, also known as variables. Changes in inputs may change the output of a system. A variable is anything you can change in an experiment that can affect the outcome.

4-5 SYS C</td></tr>
<tr><td>Success Criteria I can…

Identify and label the variables in a given system.</td></tr>
<tr><td>Student Task Sheet Included: yes
Student Work Samples Included: no</td></tr>
</table>

VARIABLES

Big Idea: **Complex Systems. Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.**

<table>
<tr><th colspan="2">Systems Learning Target #3 Assessment Task: If… then./I-Check Question #10</th></tr>
<tr><td>Assessment Task Details</td><td>Teacher Background</td></tr>
<tr><td>Brief Description of the Assessment Task
A) Students complete an “if… and then… “statement about changing one variable in a system.
B) I-Check investigation 1-Swingers question # 10</td><td rowspan="4">Administration Tips:
If and then statements can be used after testing each variable.
I-Check should be given at the end of Investigation 1.</td></tr>
<tr><td>Learning Target: A system can do things that none of its subsystems can do by themselves.

Grades 4-5 SYS B</td></tr>
<tr><td>Success Criteria: I can…

Determine how a change in one subsystem (variable) may affect another subsystem (variable) in a system.</td></tr>
<tr><td>Student Task Sheet Included: yes
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 84.366.

VARIABLES

Big Idea: **Complex Systems. Analyze a system in terms of subsystems and larger, more inclusive systems. See the connections between mechanical and natural systems.**

<table>
<tr><th colspan="2">Systems Learning Target #4 Assessment Task: Flight Log Investigation 3 #13/ Flipper Investigation 4 Sheet #20</th></tr>
<tr><th>Assessment Task Details</th><th>Teacher Background</th></tr>
<tr><td>Brief Description of the Assessment Task:
A) Flight Log Investigation 3 #13 Students share information on their plane and predict number of winds needed to fly a preset distance.
B) Flipper Investigation 4 Sheet 20 Design an Experiment Add a prediction piece to the experiment design.</td><td rowspan="4">Administration Tips: Smallest group possible will be more effective. (Four is too many)

Suggestions for Instructional Adjustments:
On the Flight Log worksheet Part 2 should be adjusted as individual predictions. Each student could record predictions on another paper to be collected and reviewed later. Be sure to include the plane’s name.</td></tr>
<tr><td>Learning Target: One defective part can cause a subsystem to malfunction, which in turn will affect the whole system.

Grades 4-5 SYS D</td></tr>
<tr><td>Success Criteria: I can…

Predict what will happen if one variable is changed, or if one subsystem is changed in some way.</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 84.366.

Rubric Systems

	Chooses a system	Diagram	Labels	Explanation
4	Good example of a system	Clear and complete, demonstrates craftsmanship	Clear and complete, has title	Shows understanding of a system and subsystems within the system
3	Good example of a system	Clear and complete	Clear and complete	Shows understanding of a system
2	Questionable system	Partial diagram	Labels not complete	Shows partial understanding
1	Not a system	Incomplete or inaccurate	Many labels are missing	Does not show understanding

All additional assessment as an option.

Student Growth Reflection

Teacher: [redacted]

Kit: Variables

Big Idea/learning targets assessed: Systems, Variables

Student #1: Ron

Describe how the student's learning changed over the course of the kit, site evidence from their assessment tasks.

His learning is essentially exactly the same. Statement virtually same.

Student #2: Nick

Describe how the student's learning changed over the course of the kit, site evidence from their assessment tasks.

His response shows more depth of understanding but he selects the same "person."

Student #1: Damon

Describe how the student's learning changed over the course of the kit, site evidence from their assessment tasks.

Displays good thinking but not the "correct" answer. He selects Wende the first time and Dale the second time.

*This assessment does not match what we taught in the Variables Kit.

Student Growth Reflection

Teacher [redacted]
Kit: Variables
Big Idea/learning targets assessed:

Assessment does not assess student's understanding of variables / does not fit to the information taught

Student #1: Peyton

Describe how the student's learning changed over the course of the kit, site evidence from their assessment tasks.

test ① and ③, student picked Wende and kept his same arguement as to why he picked Wende

Student #2: Shane Niemela

Describe how the student's learning changed over the course of the kit, site evidence from their assessment tasks.

Shane chose Wende twice, had interesting arguement for and against the other students. inconsistant

Student #1: Carey

Describe how the student's learning changed over the course of the kit, site evidence from their assessment tasks.

Choose Adrienne all three times. Answers were Sophisticated in thought

Mrs. Martin (1)

Name [redacted] Date October 21, 2013

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

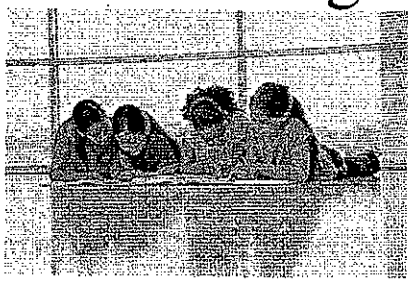
I agree with Adrienne because I think that all investigations involve doing experiments, but not all investigations use the same method, because there are different types of investigations. I disagree with Kathy because I think that scientists would need to come up with one reasonable and

reliable method according to what type of investigation they are doing. I disagree with Dale because different types of investigations will need different methods. I disagree with Wende because all investigations need to be experimented with and don't just need strategies or methods.

(2)

Name [redacted] Date November 15, 2013

Scientific Investigations



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Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Adrienne because I think that depending on the type of experiment, they would use different methods to get a reliable answer and to get that, you have to do some sort of experiment. I disagree with Kathy because all scientists would have to do an experiment to get an accurate result and they couldn't do a bunch of different ways because they would get all kinds of answers and they wouldn't

now what answer to use as their final one. I disagree with Dale because different kinds of experiments would require different methods to get an answer they could use and trust. I disagree with Wende because although different test require different strategies, they would still need to do multiple experiments that they could follow.

(3)

Name [redacted] Date December 19, 2013

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrianne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Adrianne because depending on the thing you are testing you may need to use different methods, and they do involve experiments to find the answer, you can't just assume something random without getting any information. I disagree with Kathy because you have to come up with a method that

makes sense for the question, and not something
that is totally random, because then you wouldn't
get a reliable answer. I disagree with Dale because
to test different questions, you need to have a
testing method that makes sense for the
question, depending on what it is. I disagree with
Wende because even though you do use different
methods, you still need to do an experiment.

Mrs. Martin's Class

1

Name [redacted] Date 10/21/13

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Adrienne because, first off, you can't use the same method with air pressure and electricity although they do connect. Second of all, no person that I know can know something without testing it multiple times. I don't agree with Kathy, because if you have a deadline, I don't think they could find a acceptable excuse for not having

(Continued on seperate paper)

the solution ready on time if they keep trying every single thing they're able and coming up with the right answer, a little days or two later. I don't agree with Dale because like I wrote before you can't use the same method for different things. I think we're all on the same track as Advanne. Using different methods for different things is useful to the question.

(2)

Name [redacted] Date 11-25-13

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Wende
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Wende because you can't use the same experiment on electricity and ocean dynamics. I disagree with Kathy because if you use her method, you won't meet your deadline. I disagree with D also because if the scientific method doesn't work they won't be able to figure out what to do next.

[redacted]
Nov. 25. 2013

I don't agree with Adrienne as much as I do Wendee, but I agree with her all the same

2

Name [redacted] Date 19/12/13

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

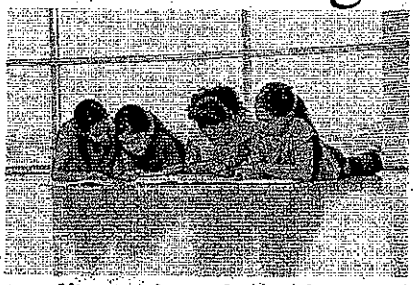
Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Wende
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Wende because Scientists can't use the same method twice for two different subjects. I disagree with Kathy because if they keep trying different things. They can't meet the deadline. I disagree with Dale because you can't use the same method for two completely different things. I don't disagree with Adrienne because she is practically saying the same thing as Wende.

1 Name [redacted] Date 10-21-13

Scientific Investigations



Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Wende
- Explain why you agree with that student.
- Explain why you disagree with the other students.

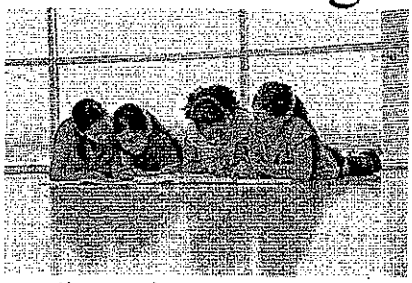
I agree with Wende because if Scientist's keep doing the same methods something could go wrong or they could end up with the same answer. I disagree with Kathy because, if you try something over and over

and you can't find the right answer, you might pick the best answer you can find, but really it's wrong. I disagree with Dale because, if you are new you might not get the method, and if you don't, you might get the answer wrong. I disagree with Adrienne because, some method's don't involve experiments, but if you do an experiment when you're not supposed to do it, something could go wrong and something bad could happen.

Name [redacted] Date 11-26-13

Scientific Investigations

2



Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Kathy
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with this student because you have to keep trying until you find something that works. I disagree with Dale because if scientists all follow one method some experiments may end up the same. I disagree with Wende because if they think that it is the same question they will do an experiment they already know.

On Back →

I disagree with Adrienne because not all of the things that Scientists have to figure out, does it mean that they always have to do an experiment.

Name [redacted] Date 12/19/13

Scientific Investigations

3

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Wende
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I chose Wende because if scientists only use one method for each experiment or question, they will end up with the same answer. I disagree with Kathy because if scientists think that an experiment is right, even

though its not, it may have a huge effect. I disagree with Dale because if all scientists follow one certain "Procedure," they will always end up with the same idea. I disagree with Adrienne because I know that, not everything involves doing experiments, but if everything did take an experiment, what if they experimented wrong?

Name [redacted] Date Jan, 6, 2014

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

Because she's basically saying: Scientists use different ways to change experiments, to get what they need to know.
I kind of agree with the first statement, they're sort of the same idea, but not entirely, they don't study questions only, and they sort of do use other ways, if it didn't work.

Name [redacted] Date Oct. 22, 2013

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

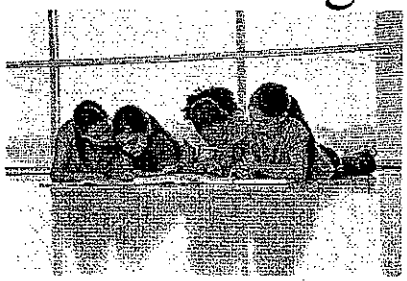
Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

scientists need to gather data to prove it's true, they can't just say this is true without any proof, no one will believe it is actually true.

Name [redacted] Date Oct. 22, 2013

Scientific Investigations



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Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Adrienne because scientists must have a method, and an investigation always needs experiments. I disagree with the others because they don't mention experiments.

Name [redacted] Date Jan 6, 2014

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Adrienne
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Adrienne because, you always need experiments so that you know what you're experimenting works. I disagree with everyone else because none of them mentioned experiments.

Name [redacted] Date Oct. 22, 2013

Scientific Investigations

Four students were having a discussion about the work that scientists do. This is what they said:

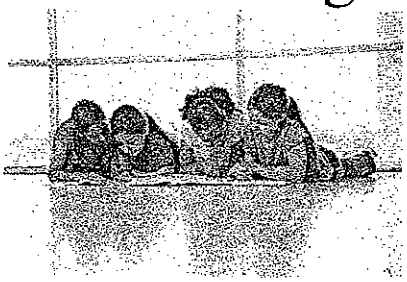
Kathy: "I think scientists try out different things until they find something that works."
Dale: "I think there is a procedure all scientists follow called the scientific method. This is how scientists study all questions."
Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Wende
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with Wende. Because for all of experiments that scientist do they always have a question that they have to answer and to answer it they usually use trial and error

Name [redacted] Date Jan. 6, 2014

Scientific Investigations



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Kathy: "I think scientists try out different things until they find something that works."
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Wende: "I think scientists use different methods or strategies depending on their question."
Adrienne: "I think scientists use different methods, but they all involve doing experiments."

- With which student do you most agree? Dale
- Explain why you agree with that student.
- Explain why you disagree with the other students.

I agree with dale the most because scientist do use the scientific method to study and answer all of there questions. I disagree with Kathy, Wende, and Adrienne because, they all dont really explain the ideas that well.

Variables

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