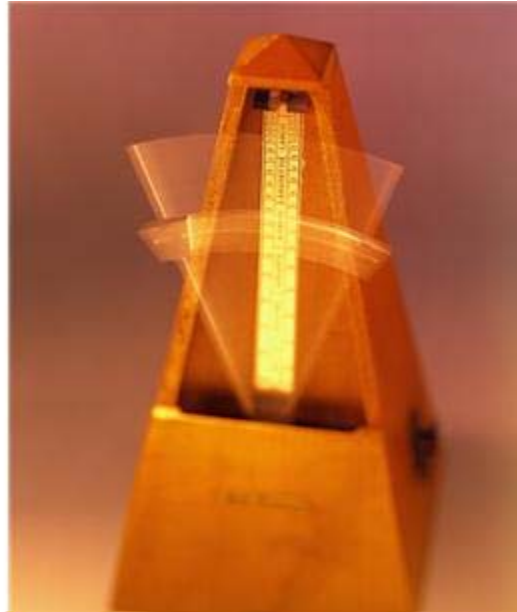


8/1/2012



Assessing with
Learning
Progressions in
Science

FOSS VARIABLES

Photo source: Microsoft

Instructional Tools | Contributors: Jennifer Bader, Andrea Clancy, Rocky Diaz, Dale Fournier, Wende Hilyard, Linda Reichlin and Thirza Zagelow,



**Northwest Educational
Service District 189**
Together We Can

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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

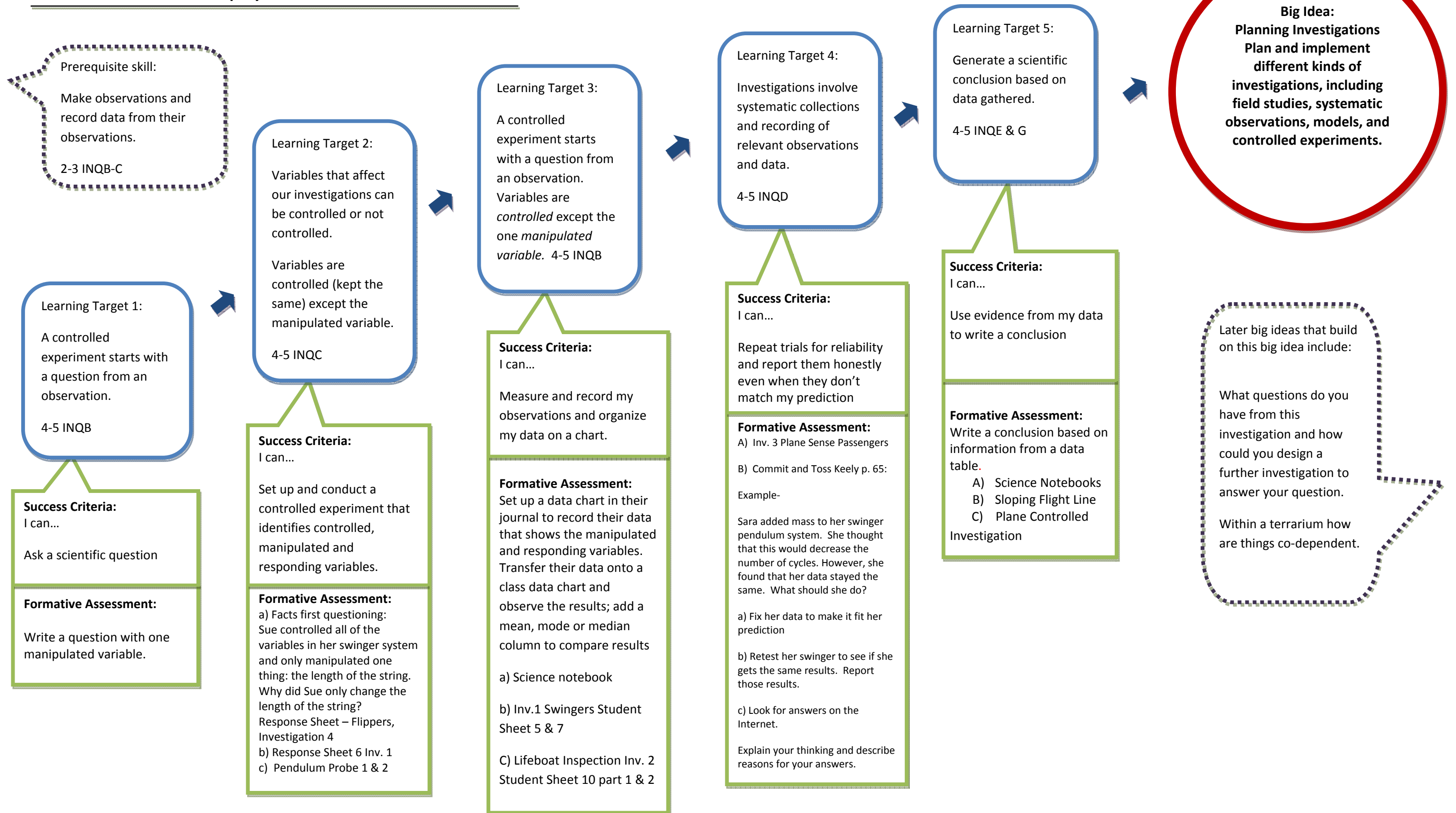
The suggested formative assessment tasks are examples of tools used by the teachers in the ALPS project to gather evidence of student understanding. The *Assessment Task Cover Sheet* details each assessment and gives administration tips and suggestions for instructional adjustments based on some of the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

Learning Progression

FOSS Variables EALR 2 Inquiry



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	
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. Suggestions for Instructional Adjustments: Make sure to teach the concept of writing a scientific question and look at models or examples.
Learning Target: A controlled experiment starts with a question from an observation. 4-5 INQB	
Success Criteria: I can... Ask a scientific question	
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.

Inquiry Learning Target #2 Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task: Response sheet:</p> <p>A) Facts first questioning: Sue controlled all of the variables in her swinger system and only manipulated one thing: the length of the string. Why did Sue only change the length of the string?</p> <p>B) Swingers, Inv. 1, Student sheet 6. Student designed pendulum experiment. Evaluate whether this was a good example of a one-variable controlled experiment.</p> <p>C) Pendulum Probe 1 & 2</p>	<p>Administration Tips: Use A as formative assessment and B as summative assessment</p>
<p>Learning Target: Variables that affect our investigations can be controlled or not controlled.</p> <p>Variables are controlled (kept the same) except the manipulated variable.</p> <p>4-5 INQC</p>	
<p>Success Criteria: Set up and conduct a controlled experiment that identifies controlled, manipulated, and responding variables.</p>	
<p>Student Task Sheet Included: yes</p> <p>Student Work Samples Included: no</p>	

VARIABLES

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

Inquiry Learning Target 3 Assessment Task	
Assessment Task Details	Teacher Background
<p>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</p> <p>A) Science Notebook</p> <p>B) Inv. 1 Swingers Student Sheet 5 & 7</p> <p>C) Lifeboat Inspection Inv. 2 Student Sheet # 10 Part 1 and Part 2</p>	<p>Administration Tips: Need four in a group for Lifeboats. Make sure data is recorded accurately on Swingers student sheet 5.</p> <p>Suggestions for Instructional Adjustments: Notebook entries included collecting Swinger's data on Release Position, Mass, Length of the Pendulum Lifeboats capacity</p>
<p>Learning Target: A controlled experiment starts with a question from an observation. Variables are controlled except the one manipulated <i>variable</i>. 4-5 INQB</p>	
<p>Success Criteria: I can...</p> <p>Measure and record my observations and organize my data on a chart.</p>	
<p>Student Task Sheet Included: no</p> <p>Student Work Samples Included: no</p>	

VARIABLES

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

Inquiry Learning Target #4 Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task:</p> <p>A) Inv 3 Plane Sense Passengers</p> <p>B) Commit and Toss: Keeley Page 65 # 7; Example on Learning Progression</p>	<p>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.</p> <p>Suggestions for Instructional Adjustments: The scenario can be changed to fit the investigation.</p>
<p>Learning Target: Investigations involve systematic collections and recording of relevant observations and data.</p> <p>4-5 INQD</p>	
<p>Success Criteria: I can...</p> <p>Use evidence from my data to write a conclusion</p>	
<p>Student Task Sheet Included: yes</p> <p>Student Work Samples Included: no</p>	

VARIABLES

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

Inquiry Learning Target #5 Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task: Write a conclusion based on information from a data table.</p> <ul style="list-style-type: none"> A) Science Notebook B) Sloping Flight Line C) Plane Controlled Investigation 	<p>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.</p> <p>Suggestions for Instructional Adjustments: The Plane Controlled Investigation Conclusion Sheet can be adjusted to fit any investigation.</p>
<p>Learning Target: Generate a scientific conclusion based on data gathered.</p> <p>4-5 INQE & G</p>	
<p>Success Criteria: I can...</p> <p>Use evidence from my data to write a conclusion</p>	
<p>Student Task Sheet Included: yes Student Work Samples Included: no</p>	

Name _____

Planes: Design an Investigation

Question:

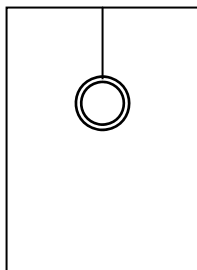
Will
the _____

Prediction:

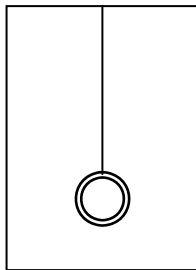
Name _____

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

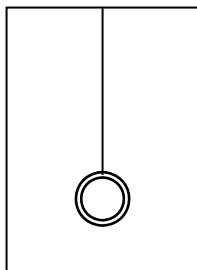
- size & weight of the washer
- length of the string
- amount of swings in 15 seconds
- color of washer

Created by Terence Diffley Ferndale School District

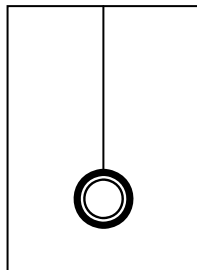
Name _____

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

Created by Terence Diffley Ferndale School District

Name _____

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 _____.

Data:

Number of passengers	Distance (cm)

Graph your information on the two-coordinate grid.

Name _____ 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 _____

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 Flight 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_____

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_____

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	

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

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.

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 #1 Assessment Task	
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	

Funding information:

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 #2 Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task: With your partner label the variables in the pendulum system on a whiteboard or in science journals.</p>	<p>Administration Tips: This assessment should be given with Investigation 1 part 2.</p> <p>Suggestions for Instructional Adjustments: Depending on student knowledge you can introduce controlled, manipulated, and responding variables.</p>
<p>Learning Target: Systems have inputs and outputs, also known as variables. Changes in inputs may change the output of a system.</p> <p>A variable is anything that you can change in an experiment that can affect the outcome.</p> <p>Grades 4-5 SYS C</p>	
<p>Success Criteria: I can...</p> <p>Identify and label the variables in a given system.</p>	
<p>Student Task Sheet Included: no Student Work Samples Included: no</p>	

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 #3 Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task</p> <p>A) Students complete an “if... and then...” statement about changing one variable in a system.</p> <p>B) I-Check investigation 1- Swingers question # 10</p> <p>C) Pendulum Probe 1 & 2</p>	<p>Administration Tips:</p> <p>If and then statements can be used after testing each variable. I-Check should be given at the end of Investigation 1. Pendulum Probe 1 & 2 can be used at anytime.</p>
<p>Learning Target: A system can do things that none of its subsystems can do by themselves.</p> <p>Grades 4-5 SYS B</p>	
<p>Success Criteria: I can...</p> <p>Determine how a change in one subsystem (variable) may affect another subsystem (variable) in a system.</p>	
<p>Student Task Sheet Included: yes</p> <p>Student Work Samples Included: no</p>	

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 #4 Assessment Task	
Assessment Task Details	Teacher Background
<p>Brief Description of the Assessment Task:</p> <p>A) Flight Log Investigation 3 #13 Students share information on their plane and predict number of winds needed to fly a preset distance.</p> <p>B) Flipper Investigation 4 Sheet 20 Design an Experiment Add a prediction piece to the experiment design.</p>	<p>Administration Tips: Smallest group possible will be more effective. (Four is too many)</p> <p>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.</p>
<p>Learning Target: One defective part can cause a subsystem to malfunction, which in turn will affect the whole system.</p> <p>Grades 4-5 SYS D</p>	
<p>Success Criteria: I can...</p> <p>Predict what will happen if one variable is changed, or if one subsystem is changed in some way.</p>	
<p>Student Task Sheet Included: no Student Work Samples Included: no</p>	

Variables

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