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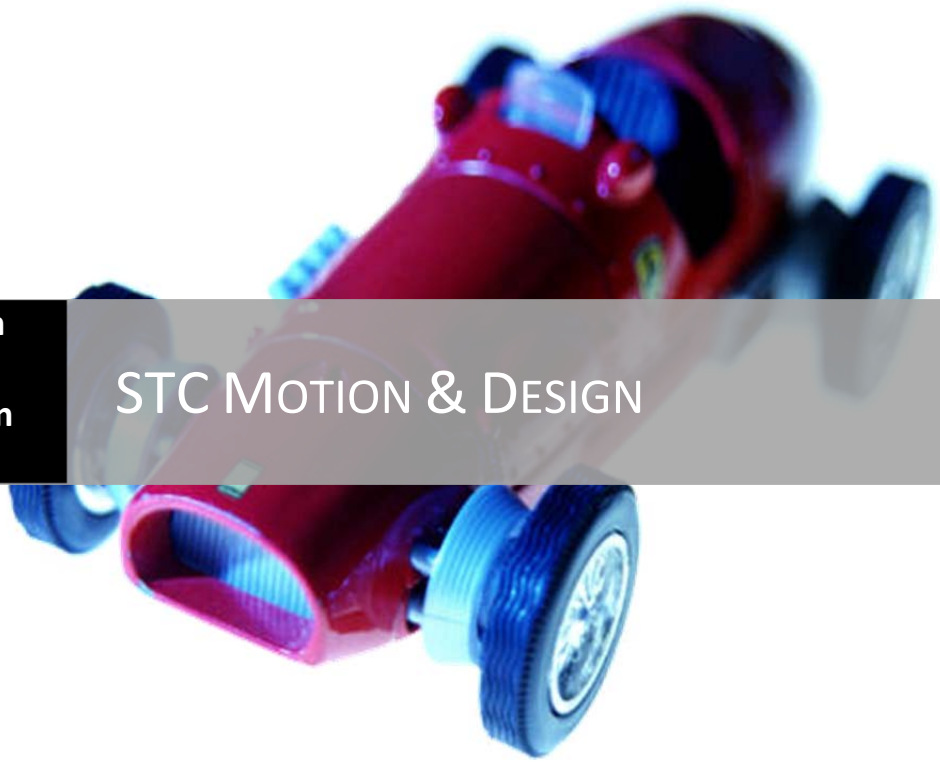

Assessing with Learning Progressions in Science

STC MOTION & DESIGN

Instructional Tools | **Contributors: Lisa Lockwood and Fred Eckes**

Northwest Educational Service District 189
Together We Can

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

STC Motion and Design

Learning Target 1:

Technology involves changing the natural world to meet human needs or wants.

4-5 APPA, Lesson 3

Success Criteria:
I can…identify five ways that technology has been used to meet human needs or wants.

Formative Assessment: Student Response Sheet
A) List five inventions that meet human needs or wants and explain how each invention enhances our lives.

Learning Target 2:

Problems of moderate complexity can be solved using the technological design process. This process begins by defining and researching to problem to be solved.

4-5 APPC, Lesson 9

Success Criteria:
I can…identify a problem and list several criteria for a successful solution.

Formative Assessment: Student Response Sheet
Use Student Self-Assessment A, Lesson 9. Replace questions 7, 8 with "Identify the problem for your favorite design challenge.
A) Students list several criteria for their successful solutions

Learning Target 3:

Possible solutions should be tested to see if they solve the problem. Building a model or prototype is one way to test a possible solution.

4-5 APPE, Lesson 14

Success Criteria:
I can…build a model to test a solution to a problem.

Formative Assessment: Student Model/Response Sheet 14-A
A)Students will design and build a model based on challenge cards A, B, C, D, or E provided with the kit, and then respond to the question, "How will we test whether our vehicle meets the challenge?"
B) Students complete MSP template practice item.

Learning Target 4:

Science and technology have greatly improved transportation.

4-5 APPG, Lesson 15

Success Criteria:
I can…identify how science and technology have greatly improved transportation overtime.

Formative Assessment: Student Response Sheet
A) Students will be able to list three or more different forms of transportation, and explain how they have evolved over time.

Big Idea: Application

Scientist and engineers work individually and collaboratively to design and produce a product to solve a problem.
4-5 APP A, C,E & G

Later big ideas that build on this big idea include:

People have always used technology to solve problems.

Science and technology are interdependent.

Scientists and engineers often work together to generate creative solutions to problems.

Grades 6-8 APP A, C, & E

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MOTION AND DESIGN

Big Idea: **Scientist and engineers work individually and collaboratively to design and produce a product to solve a problem. 4-5 APP A, C, E & G**

Formative Assessment Task Cover Sheet

Learning Target #1, Assessment Task Letter A	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: List five inventions that meet human needs or wants and explain how each invention enhances our lives.	**Administration Tips:** Use after lesson 3. This is a two-sided document, copy both sides. **Suggestions for Instructional Adjustments:** Prior to giving the assessment to students be sure to define the word" enhance."
Learning Target: Technology involves changing the natural world to meet human needs or wants.	
Success Criteria: I can…identify five ways that technology has been used to meet human needs or wants.	
Student Task Sheet Included: Yes Student Work Samples Included: Yes	

Learning Target #2, Assessment Task Letter A	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Students list several criteria for their successful solutions.	**Administration Tips:** Use Student Self-Assessment A, lesson 9. Replace questions 7 & 8 with "Identify the problem for your favorite design challenge," and "List several criteria for your successful solution." **Suggestions for Instructional Adjustments:** Use the new sheet with changes made. Our students did not use this newly typed up sheets and therefore often did not answer the questions 7 & 8.
Learning Target: Problems of moderate complexity can be solved using the technological design process. This process begins by defining and researching to problem to be solved.	
Success Criteria: I can…identify a problem and list several criteria for a successful solution.	
Student Task Sheet Included: Yes Student Work Samples Included: Yes	

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MOTION AND DESIGN

Big Idea: **Scientist and engineers work individually and collaboratively to design and produce a product to solve a problem. 4-5 APP A, C, E & G**

Learning Target #3, Assessment Task Letter A	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Students will design and build a model based on challenge cards A, B, C, D, or E provided with the kit, and then responds to the question, "How will we test whether our vehicle meets the challenge?"	**Administration Tips:** Lesson 14. Use Record Sheet 14-A titled "Planning our Final Design Challenge" page provided in the kit. This formative assessment focuses solely on the student responses recorded in the box, "How we will test whether our vehicle meets the design challenge." **Suggestions for Instructional Adjustments:** Most groups will create an initial design, test it informally and hopefully, go back and refine it several times. As they do these interrelated steps, make sure that they continue to document their new information either on this sheet or on additional sheets.
Learning Target: Possible solutions should be tested to see if they solve the problem. Building a model or prototype is one way to test a possible solution.	
Success Criteria: I can…build a model to test a solution to a problem.	
Student Task Sheet Included: No Student Work Samples Included: No	

Learning Target #3, Assessment Task Letter B	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: B) Students complete MSP template practice item.	**Administration Tips:** This is an alternate formative assessment that can be used to help prepare students for the 5th grade MSP. The template is provided through OSPI. **Suggestions for Instructional Adjustments:** The extensive nature of this assessment requires additional time for student work. Plan at least one additional lesson period if using this assessment.
Learning Target: Possible solutions should be tested to see if they solve the problem. Building a model or prototype is one way to test a possible solution.	
Success Criteria: I can…build a model to test a solution to a problem.	
Student Task Sheet Included: Yes Student Work Samples Included: No	

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MOTION AND DESIGN

Big Idea: **Scientist and engineers work individually and collaboratively to design and produce a product to solve a problem. 4-5 APP A, C, E & G**

Learning Target #4, Assessment Task Letter A	
Assessment Task Details	**Teacher Background**
Brief Description of the Assessment Task: Students will be able to list three or more different forms of transportation, and explain how they have evolved over time.	**Administration Tips:** Use any time after lesson 15. **Suggestions for Instructional Adjustments:** Additional reading materials are provided in a variety of formats for this unit. In addition to reading selections that are a part of the Student Investigation booklet. Additionally our district provided 30 copies of Science and Technology for Children Books: Motion and Design and an additional 30 copies to the Kids Discover Wright Brothers. These provided a great deal of background information and enjoyment for our students, as well as offering a great deal of understanding about the many ways that science and technology have greatly improved transportation. If these magazines are not available a library can be made utilizing any school and/or public library.
Learning Target: Science and technology have greatly improved transportation.	
Success Criteria: I can…identify how science and technology have greatly improved transportation overtime.	
Student Task Sheet Included: No Student Work Samples Included: No	

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Science
Motion and Design: Application FA #1 (Lesson #3)
Name _____
Date _____

List five inventions that meet human needs or wants. Explain how each invention enhances or makes our lives better.

Invention

1. _____
Explain how this invention enhances or makes our lives better.

_____

_____

_____

Invention

2. _____
Explain how this invention enhances or makes our lives better.

_____

_____

_____

Invention

3. _____
Explain how this invention enhances or makes our lives better.

_____

_____

_____

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Invention

4. _____

Explain how this invention enhances or makes our lives better.

_____

_____

_____

Invention

5. _____

Explain how this invention enhances or makes our lives better.

_____

_____

_____

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[redacted]

+19

Science
Motion and Design: Application FA #1 (Lesson #3)
Name [redacted]
Date [redacted]

List five inventions that meet human needs or wants. Explain how each invention enhances or makes our lives better.

Invention

1. Cars

Explain how this invention enhances or makes our lives better.

This invention makes our lifes easier So we wont have to walk everywhere we go.

Invention

2. Clock

Explain how this invention enhances or makes our lives better.

This invention makes our life easier by telling what time it is.

Invention

3. Computers

Explain how this invention enhances or makes our lives better.

This makes our life easier becuse it helps us do research.

4. cell phones. so we can call people if we need [redacted]

5. stoves. so it can be easier to cook.

[redacted]

#7

Science
Motion and Design: Application FA #1 (Lesson #3)
Name [redacted]
Date May 23, 2012

List five inventions that meet human needs or wants. Explain how each invention enhances or makes our lives better.

Invention

1. Car

Explain how this invention enhances or makes our lives better.

This invention helps people get places faster and easier.

Invention

2. fork

Explain how this invention enhances or makes our lives better.

This invention helps you eat easier and not get dirty.

Invention

3. Computer

Explain how this invention enhances or makes our lives better.

This invention helps you reaserch things that you don't know but you want to know.

4. Clock

This invention helps us know what time it is.

[redacted]

5. desk

This invention gives you a flat serfice to write or something else.

Science

Motion and Design: Application FA #2 (Lesson 9)

Name _____

Date _____

1. Write two or three things you have learned so far in the Motion and Design unit that you think are important.

_____

_____

_____

2. How well do you think you and your partners are working together? Give some examples.

_____

_____

_____

3. How do you feel about working with the materials in the unit? Are your feelings changing as you work through the unit? Give examples.

_____

_____

_____

4. Write down some activities in the unit you have enjoyed. Explain why you liked them.

_____

_____

_____

5. Are there any activities so far in the unit that are confusing or hard to understand? Explain your answer.

_____

_____

_____

6. Look at your record sheets and your science notebook. Describe how well you think you recorded you observations and ideas.

_____

_____

_____

7. Identify the problem for your favorite challenge.
Challenge:_____

8. List several criteria for your successful solution.

_____

_____

_____

9. How do you feel about science now? Circle the words that apply to you.

a. Interested b. Relaxed c. Nervous d. Excited e. Bored f. Confused

g. Successful h. Happy I. Write down one word of your own _____

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Blackline Master

Motion and Design
Student Self-Assessment A

Name: [illegible]

Date: June [illegible]

1. Write down two or three things you have learned so far in the *Motion and Design* unit that you think are important.

I learned about, friction, traction, gravity, motion, force, design,

2. How well do you think you and your partners are working together? Give some examples.

Me and my partners are all working awesome together we are a little slow but we finish up nicely

3. How do you feel about working with the materials in the unit? Are your feelings changing as you work through the unit? Give examples.

I feel good its hard to keep them without losing them.

4. Write down some activities in the unit you have enjoyed. Explain why you liked them.

I like two activities the best the one with the washers and the one with the rubber band.

5. Are there any activities so far in the unit that are confusing or hard to understand? Explain your answer.

Nope no activities are confusing they're actually quit easy.

Blackline Master

Motion and Design
Student Self-Assessment A, *continued*

Name: [redacted]

6. Look at your record sheets and your science notebook. Describe how well you think you recorded your observations and ideas.

I did o.k. There are things I could have done better but its pretty good.

7. ~~How well do you think you used the materials to meet each of the design challenges?~~ Look back at your previous design challenges. Identify the problem for your favorite challenge.

I think I did really good using the materials the only material problem the wheels fall off.

8. ~~Think about the work you have done so far in this unit. What do you think you have done very well?~~ List several criteria for your successful solution.

Learning the new vocabulary and the new things.

In what area of your work do you think you could improve?

Listening and following direction First time givin right away.

9. How do you feel about science now? Circle the words that apply to you.

a. Interested	b. Relaxed	c. Nervous	d. Excited
e. Bored	f. Confused	g. Successful	h. Happy

i. Write down one word of your own _____

Blackline Master

Motion and Design
Student Self-Assessment A

Name: _____

Date: _____

1. Write down two or three things you have learned so far in the *Motion and Design* unit that you think are important.

Cars move by force.
Cars can be cardesined to.
I learnd how to buld a car.

2. How well do you think you and your partners are working together? Give some examples.

Good we all work on some project and whene it comes down we all do our part.

3. How do you feel about working with the materials in the unit? Are your feelings changing as you work through the unit? Give examples.

Yes at first I thout I would brake it if I pressed to hard not true.

4. Write down some activities in the unit you have enjoyed. Explain why you liked them.

Well the first design challenge was realy fun I think.

5. Are there any activities so far in the unit that are confusing or hard to understand? Explain your answer.

The rubber band one was kinda hard at first then we all did it to make it work.

Motion and Design
Student Self-Assessment A, *continued*

Name: _____

6. Look at your record sheets and your science notebook. Describe how well you think you recorded your observations and ideas.

Good because I did all I was supposed to do it.

7. ~~How well do you think you used the materials to meet each of the design challenges?~~ Look back at your previous design challenges. Identify the problem for your favorite challenge.

Good because everything ended up working in the end.

8. ~~Think about the work you have done so far in this unit. What do you think you have done very well?~~ List several criteria for your successful solution.

Working together

In what area of your work do you think you could improve?

Talking more with the team.

9. How do you feel about science now? Circle the words that apply to you.

a. Interested	b. Relaxed	c. Nervous	d. Excited
e. Bored	f. Confused	g. Successful	h. Happy

i. Write down one word of your own _____

Blackline Master

Motion and Design
Student Self-Assessment A

Name: _____

Date: _____

1. Write down two or three things you have learned so far in the *Motion and Design* unit that you think are important.

The defition of traction and friction also I learned the purpose for traction.

2. How well do you think you and your partners are working together? Give some examples.

Good because we are not fighting over objects not yelling at each other and we are sharing objects.

3. How do you feel about working with the materials in the unit? Are your feelings changing as you work through the unit? Give examples.

Good. Yes because our ideas are starting to work more and more better

4. Write down some activities in the unit you have enjoyed. Explain why you liked them.

Buffing the cars because we got to design our own cars.

5. Are there any activities so far in the unit that are confusing or hard to understand? Explain your answer.

NO because everything is simple.

Blackline Master

Motion and Design
Student Self-Assessment A, *continued*

Name: _____

6. Look at your record sheets and your science notebook. Describe how well you think you recorded your observations and ideas.

pretty good I mixed up on one part only I did not put the right number of ~~took~~ washers thats it.

7. ~~How well do you think you used the materials to meet each of the design challenges?~~ Look back at your previous design challenges. Identify the problem for your favorite challenge.

I think I could have done better on the first design challenges, like the

8. ~~Think about the work you have done so far in this unit. What do you think you have done very well?~~

List several criteria for your successful solution, working with the group I am in I try to work as hard as possible.

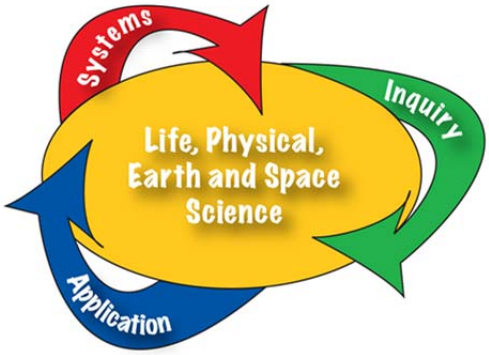
In what area of your work do you think you could improve?

doing the ruber band chalenge it was hard for me and mygrope.

9. How do you feel about science now? Circle the words that apply to you.

a. Interested	b. Relaxed	c. Nervous	d. Excited
e. Bored	f. Confused	g. Successful	(h) Happy

i. Write down one word of your own _____



Elementary School

Plan & Test Item Template

Science Measurements of Student Progress

The documents on the following pages are designed to provide item and rubric templates for classroom practice.

Directions for use:

Use the templates by making the following modifications:

On Items: Revise text in red with prompts appropriate to the item used in classroom practice.

On Rubrics: Revise text in *red italics* with student responses appropriate to the item used in classroom practice. Revise text in red with information from the item.

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0 Choose a challenge card. Circle your choice. A B C D E

Describe how to design and test a way of solving the challenge.

Be sure to describe these stages in your design process:

- **Plan Summary:** Write a summary of the plan, including a scientific reason for choosing this solution.
- **Test Solution**: Describe the process to measure or observe how well this solution may solve the problem.

Problem: Restate your challenge in your own words.
Plan Summary:
Test Solution:

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Scoring Rubric for: Plan & Test

Performance Description	Attributes
A **2-point response** demonstrates the student understands the Content Standard APPE: Possible solutions should be tested to see if they solve the problem. Building a model or prototype is one way to test a possible solution. Item Specification 1: Write a summary of a scientific solution and/or describe a scientific test of the solution given a description of a problem that can be solved using a technological design process.	3-4
A **1-point response** demonstrates the student partially understands the Content Standard.	2
A **0-point response** demonstrates the student has almost no understanding of the Content Standard.	0-1

Attributes of a Scientific Design Process

Design Process Stage	Description	Attributes
Plan Summary	A simple plan summary is given which could solve the problem.	1
Summary Scientific Reason	A scientific reason is given for the plan. Stage Notes: 1. The given problem cannot be credited as a reason.	1
Test Solution	The test describes at least one measurement or observation that relates to the effectiveness of the solution. Stage Notes: 1. This attribute may not be credited when the test gives or implies artificial data (e.g., *my solution worked.*).	1
Scientifically Test Solution	The test includes measuring the before-after or input-output of all pertinent variables (e.g., *measure the xxx before the solution and after the solution*) OR the test includes regularly measuring all pertinent variables in a consistent manner (e.g., *measure the xxxx every day for two weeks*). Stage Note: 1. This attribute may be credited even if a test gives or implies artificial data.	1
	Total Possible Attributes	**4**

General Notes:

1. **Copying the Scenario:** Responses that copy the whole scenario cannot be credited for any attributes. However, responses that appropriately copy a stage from the scenario may be credited.

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Learning Progression
STC Motion and Design: Forces and Motion

Prerequisite skill:

Forces are pushes and pulls.
Motion is a change in position.
Pushes and pulls make things move. 2-3 PS1

Learning Target 1:

Energy can be transferred from one place to another.

4-5 PS3B

Lesson 1 & 11

Success Criteria:
I can…identify force and motion in an energy transfer system.

Formative Assessment:
Whiteboard diagram:
A) Students will be able to correctly label the force and motion in a hand and car drawing they create on their white board.

Use technical drawing figure 11-4
B) Students identify the parts of each vehicle that transfer energy into motion.

Learning Target 2:

The *weight* of an object is a measure of how strongly it is pulled down toward the ground by gravity. A spring scale can measure the pulling force.

Success Criteria:
I can use a spring scale to measure the pulling force of an object. (washers, lesson 4)

Formative Assessment:
Teacher interview of student, add measurement recording line to Record Sheet 4-A:
Students measure and record on a spring scale the pulling force of 10 washers.

Learning Target 3:

The relative speed of two objects can be determined in two ways: 1 if two objects travel the same distance, the object that takes the least time to travel the distance is the fastest.

Success Criteria:
I can…compare our axle driven and propeller driven vehicles and identify the fastest vehicle.

Formative Assessment:
Student Response Graph:
Students will be able to create a bar graph of vehicle time and distance, after racing both vehicles. Students will be able to determine the fastest vehicle.

Big Idea:

Forces and motions can be measured.

4-5 PS1 A & B

Later big ideas that build on this big idea include:

6-8 PS1A Balanced and unbalanced forces.

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Motion and Design

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