



Author(s): Michael Lucky Voiselle			Lesson Title: TINY SEE SAWS			
Grade Span			ICLE Application Model			
K-4	5-8	9-12 X	A	B	C	D X

Instructional Focus:

Reading

Students read a variety of grade level materials, applying strategies appropriate to various situations

Measurement

Students use a variety of tools and techniques of measurement in a problem-solving situation. Students communicate the reasoning used in solving these problems

Science as Inquiry

Students demonstrate knowledge and skills necessary to perform scientific inquiry.

Communication

Students communicate and apply scientific concepts.

Performance Task

Your overall task is to investigate the Law of Torques in a balanced system. We will use a seesaw type set up to represent a turning motion about one point called a fulcrum. Obtain a meter stick that you can drill a hole precisely at the midpoint (50 centimeter mark). Or obtain a straight tree branch or old broom handle and use a centimeter tape measure to find and drill a hole at the midpoint.

Obtain some known masses such as 50-100-200-300 grams. Tie four 10centimeter lengths of fishing twine together to form small circles of string that can slide back and forth on your seesaw. Place two of these circular strings on each side of the seesaw.

Task 1

Place a 100gram mass 10 centimeters on one side by measuring and sliding the circular string to the correct spot. Predict where you need to put a 100gram mass on the other side to balance out the stick. (The stick is balanced when it is parallel to the floor.) Record all predictions in a science journal prior to placing the mass to verify the prediction. Record all predictions and actual measurements in a well-organized data table for each of the next tasks presented. This will be valuable to refer to during your future predictions and when writing the conclusion summary. What did you notice? Was the distance the same?

Task 2

Place a 100gram mass at the 20centimeter mark on one side. Predict where you place a 100gram mass on the other side and record in the journal. Determine where it balances and record the actual result in your table. How close was your prediction to the actual? What do you see happening in the predictions? What can you conclude from the pivot point when the same weight mass is placed on both sides? Try placing the 100gram mass at the 25centimeter mark and determine the distance on the other side will be. What can you conclude about the mass and distance relationship on both sides of the seesaw at this point?

Task 3

Place a 100gram mass 10 centimeters from the pivot point. Where would you place a 50gram mass on the other side to balance? Predict then experiment. How close was your prediction? Place a 200gram mass at the 10centimeter mark. Where would you place a 100gram mass on the other side to balance out? Remember, keep predicting before you try. Try again using a 300gram mass at the 10centimeter mark. Where would you place a 100gram mass on the other side? What can you conclude about the mass and distance relationship on both sides of the seesaw at this point?

Task 4

Place a 600gram mass at the 10centimeter mark. Where would you place a 100gram mass on the other side? Where would you place a 200gram mass? Where would you place a 50gram mass? What can you state about the mass and distance relationships at this time?

Task 5

Make another data table, conduct the following investigations, and verify or dispute your mass-distance relationships.

1. Place a 150gram mass at the 10centimeter mark. Where would you place a 50gram mass on the other side?
2. Place a 200gram mass at the 10centimeter mark. Where would a 50gram mass be placed on the other side?
3. Place a 300gram mass at the 10centimeter mark. Where would a 50gram mass be placed on the other side?
4. Place a 250gram mass at the 10centimeter mark. Where would a 50gram mass be placed on the other side?

Task 6

You are to verify your thoughts about the mathematical relationship between distance and mass on two sides of a fulcrum. Mathematically show where a 75gram mass would be placed to balance out a 400gram mass at 10centimeters on the other side? Include all units and cancellations in your work. Then perform the experiment to verify.

Task 7

You are to write a summary of all your thoughts and answers to the questions during the experiment. The summary must be free from spelling and grammatical errors and well organized. The summary must also address the following thoughts or questions.

1. What is torque? Include clockwise and counterclockwise torques in your explanation.
2. One application of your new found knowledge applies to Archimedes, a famous Greek mathematician. He stated, "Give me a stick and a place to stand and I will move the earth." Explain this remark clearly outlining its relation to the ideas developed in this performance task.
3. Another application can help to use a balanced meter stick to determine the mass of an unknown object. Explain mathematically using uneven numbers you made up such as 37grams on one side and 158grams on the other side.
4. There are 3 types of levers. Research the three types and give five every day examples of each one in use. Use words like load arm, effort arm, fulcrum, load force, and effort force to describe the 3 types of levers.

ICLE Essential Skills

Apply in writing the rules and conventions of grammar, usage, punctuation, paragraphing and spelling. (ela1)

Gather information from a variety of sources, including electronic sources, and summarize, analyze, and evaluate its use for a report. (ela3)

Use writing as a tool for learning in formats such as learning logs, laboratory reports, note-taking, journals and portfolios. (ela40)

Present information in well-organized fashion that will be clear to the target audience. (ela11)

Understand **basic algebraic properties** (i.e., commutative: $ab = ba$; associative: $ab(c) = a(bc)$; and distributive: $a(b+c) = (ab)+(ac)$). (m3)

Know and apply the principles of scientific inquiry. (*Implicit in this statement are the processes of prediction, estimation, developing hypotheses, drawing conclusions, evaluation, and following ethical principles and professional procedures.*) (Not Ranked s114)

Make observations using senses and instruments. Inferences and interpretations are arrived at based on observations. Classify observable properties and organize observations in a meaningful and logical way. (s5)

Exhibit good data management skills by collecting, organizing, and graphing data. (s19)

Understand the concepts and uses of machines (e.g., levers and pulleys). (s49)

Scoring Guide:

RATE THE CRITERIA: 3=Excellent, 2=Satisfactory, 1=Unsatisfactory, 0=Does not attempt or does not understand

CRITERIA

SCORE

Student was able to set up the experiment independently with their group

All directions were followed and recorded in a well organized data table	_____
All experiments were conducted in a proper manner and recorded in their table	
Task 1	_____
Task 2	_____
Task 3	_____
Task 4	_____
Task 5	_____
Task 6 Mathematical verification of uneven numbers were correct and verified through investigation	_____
Task 7 All questions were answered correctly in their write-up	_____
Task 7 Write-up was well organized and free from spelling and grammatical errors	_____
Student demonstrated an understanding for the different types of levers	_____

Keywords

English Language Arts	Mathematics	Science
Reading Comprehension Research	Algebra Algebraic Operations Computations Indirect Variation	Earth Science
Writing Grammar Spelling Journal Technical Writing	Geometry	Life Science
Communications	Statistics	Chemistry
Literature	Calculus	Physics Simple Machines Scientific Inquiry
Other	Trigonometry	Other
	Other	