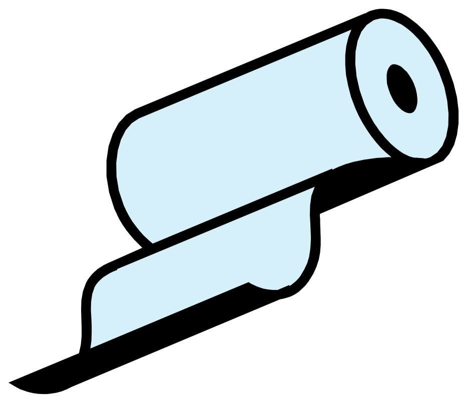
Curriculum Embedded Performance Task

Elementary School Science

Content Standards 3.1, 3.2 or 3.4



Soggy Paper

Teacher Manual

Connecticut State Department of Education
Bureau of Curriculum and Instruction

Acknowledgement

The Connecticut State Department of Education is grateful to the many dedicated science educators who contributed to the development of the elementary, middle and high school curriculum-embedded performance tasks and teacher manuals. Beginning with the initial ideas for tasks, through the classroom field testing and editing, to the guidelines for classroom implementation, these inquiry teaching and learning activities are the result of the creativity, experiences and insights of Connecticut's finest science educators. We thank all of you, too numerous to list, who gave your time and energy so generously to this project.

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OVERVIEW OF THE ELEMENTARY AND MIDDLE SCHOOL CURRICULUM-EMBEDDED PERFORMANCE TASK MODEL

The Connecticut State Board of Education approved the Core Science Curriculum Framework in October of 2004. The framework promotes a balanced approach to PK-12 science education that develops student understanding of science content and investigative processes.

WHAT IS A CURRICULUM-EMBEDDED PERFORMANCE TASK?

Curriculum-embedded performance tasks are examples of teaching and learning activities that engage students in using inquiry process skills to deepen their understanding of concepts described in the science framework. Developed by teachers working with the Connecticut State Department of Education, the performance tasks are intended to influence a constructivist approach to teaching and learning science throughout the school year. They will also provide a context for CMT questions assessing students' ability to do scientific inquiry.

The three elementary performance tasks are conceptually related to Content Standards in Grades 3 to 5 and the three middle school performance tasks are related to Content Standards in Grades 6 to 8. The elementary performance tasks provide opportunities for students to use the Inquiry Expected Performances for Grades 3 to 5 (see Science Framework B.INQ 1-10 skills) to understand science concepts. The middle school performance tasks provide opportunities for students to use the Inquiry Expected Performances for Grades 6 to 8 (see Science Framework C.INQ 1-10 skills) to understand science concepts.

Teachers are encouraged to use the state-developed curriculum-embedded performance tasks in conjunction with numerous other learning activities that incorporate similar inquiry process skills to deepen understanding of science concepts. Students who regularly practice and receive feedback on problem-solving and critical thinking skills will steadily gain proficiency.

HOW ARE THE PERFORMANCE TASKS STRUCTURED?

Each performance task includes two investigations; one that provides some structure and direction for students, and a second that allows students more opportunity to operate independently. The goal is to gradually increase students' independent questioning, planning and data analysis skills. The elementary performance tasks introduce students to understanding and conducting "fair tests". The middle school performance tasks focus on designing investigations that test cause/effect relationships by manipulating variables.

Mathematics provides a useful "language" for quantifying scientific observations, displaying data and analyzing findings. Each curriculum-embedded performance task offers opportunities for students to apply mathematics processes such as measuring, weighing, averaging or graphing, to answer scientific questions.

Not all science knowledge can be derived from the performance of a hands-on task. Therefore, each curriculum-embedded task gives students opportunities to expand their understanding of concepts through reading, writing, speaking and listening components. These elements foster student collaboration, classroom discourse, and the establishment of a science learning community.

A useful structure for inquiry-based learning units follows a **LEARNING CYCLE** model. One such model, the "5-E Model", engages students in experiences that allow them to observe, question and make tentative explanations before formal instruction and terminology is introduced. Generally, there are five stages in an inquiry learning unit:

- **Engagement:** stimulate students' interest, curiosity and preconceptions;
- **Exploration**: first-hand experiences with concepts without direct instruction;
- **Explanation:** students' explanations followed by introduction of formal terms and clarifications;
- **Elaboration:** applying knowledge to solve a problem. Students frequently develop and complete their own well-designed investigations;
- **Evaluation:** students and teachers reflect on change in conceptual understanding and identify ideas still "under development".

The performance tasks follow the "5-E" learning cycle described above. However, the teacher can decide the role the performance task will play within the larger context of the entire learning unit. Early in a learning unit, the performance task can be used for engagement and exploration; later in a learning unit, the performance task might be used as a formative assessment of specific skills.

HOW ARE PERFORMANCE TASKS USED WITH YOUR CLASS?

Curriculum-embedded performance tasks are designed to be used as part of a learning unit related to a Framework Content Standard. For example, while teaching a unit about human body systems (Content Standard 7.2,) the teacher decides the appropriate time to incorporate the "Feel The Beat" performance task to investigate factors affecting pulse rate. In this way, the natural flow of the planned curriculum is not disrupted by the sudden introduction of an activity sequence unrelated to what students are studying.

The performance tasks are NOT intended to be administered as summative tests. Students are not expected to be able to complete all components of the tasks independently. Teachers play an important role in providing guidance and feedback as students work toward a greater level of independence. Performance tasks provide many opportunities for "teachable moments" during which teachers can provide lessons on the skills necessary for students to proceed independently.

There is no single "correct" answer for any of the performance tasks. Students' conclusions, however, should be logical, or "valid" interpretations of data collected in a systematic, or "reliable" way. Variations in students' procedures, data and conclusions provide opportunities for fruitful class discussions about designing "fair tests" and controlling variables. In the scientific community, scientists present their methods, findings and conclusions to their peers for critical review. Similarly, in the science classroom, students' critical thinking skills are developed when they participate in a learning community in which students critique their own work and the work of their peers.

Performance tasks should be *differentiated* to accommodate students' learning needs and prior experiences. The main goal is to give all students opportunities to become curious, pose questions, collect and analyze data, and communicate conclusions. For different learners, these same actions will require different levels of "scaffolding" as they move toward greater levels of independence. For example, if students have had experiences creating their own data tables, the teacher may decide to delete part or all of the data table included in the performance task. Other possible adjustments include (but are not limited to):

- Text readability;
- Allowing students to control all or some of the variables;
- Whether the experimental procedure is provided or student-created;
- Graph labels and scales provided or student-created;
- Expectations for communication of results; or
- Opportunities for student-initiated follow-up investigations.

There are many science investigations that are currently used in schools that provide inquiry learning opportunities similar to those illustrated in the performance tasks. Students need a variety of classroom experiences to deepen their understanding of a science concept and to become proficient in using scientific processes, analysis and communication. **Teachers are encouraged to use the state-developed curriculum-embedded performance tasks in conjunction with numerous other learning activities that incorporate similar inquiry processes and critical thinking skills.**

HOW ARE THE PERFORMANCE TASKS RELATED TO THE CMT?

The new Science CMT for Grades 5 and 8 will assess students' understanding of inquiry and the nature of science through questions framed within the CONTEXT of the curriculum-embedded performance tasks. Students are not expected to recall the SPECIFIC DETAILS OR THE "RIGHT" ANSWER to any performance task. The questions, similar to the examples shown below, will assess students' general understandings of scientific observations, investigable questions, designing "fair tests", making evidence-based conclusions and judging experimental quality.

Here is an example of the type of multiple-choice question that might appear on the Grade 5 Science CMT. The question is related to the "Soggy Paper" performance task:

Some students did an experiment to find out which type of paper holds the most water. They followed these steps:

1. Fill a container with 25 milliliters of water.
2. Dip pieces of paper towel into the water until all the water is absorbed.
3. Count how many pieces of paper towel were used to absorb all the water.
4. Repeat with tissues and napkins.

If another group of students wanted to repeat this experiment, which information would be most important for them to know?

a. The size of the water container
b. The size of the paper pieces *
c. When the experiment was done
d. How many students were in the group

Here is an example of the type of constructed-response question that might appear on the Grade 8 Science CMT. The question is related to the "Feel The Beat" performance task:

Imagine that you want to do a pulse rate experiment to enter in the school science fair. You've decided to investigate whether listening to different kinds of music affects people's pulse rate.

Write a step-by-step procedure you could use to collect reliable data related to your question. Include enough detail so that someone else could conduct the same experiment and get similar results.

NOTE THAT THE CMT QUESTIONS DO NOT ASSESS A CORRECT "OUTCOME" OF A PERFORMANCE TASK OR STUDENTS' RECOLLECTION OF THE DETAILS OF THE PERFORMANCE TASK. Students who have had numerous opportunities to make observations, design experiments, collect data and form evidence-based conclusions are likely to be able to answer the task-related CMT questions correctly, even if they have not done the state-developed performance tasks. However, familiarity with the context referred to in the test question may make it easier for students to answer the question correctly.

INTRODUCTION TO "SOGGY PAPER"

In this performance task, students will explore the water-holding properties of different types of paper. Through observation, a guided investigation and the design of their own experiment, students will learn that to make a fair test of different properties, certain things should be kept the same so that results are more reliable.

SAFETY NOTES:

- Review expectations for appropriate behavior, handling of materials and cooperative group procedures prior to beginning this investigation.
- Water spills on tile floors can make the floors slippery. Provide each group with a damp sponge so that any water spills can be immediately mopped up.
- For more comprehensive information on science safety, consult the following guidelines from the American Chemical Society - http://membership.acs.org/c/ccs/pubs/K-6_art_2.pdf and the Council of State Science Supervisors - http://www.csss-science.org/downloads/scisaf_cal.pdf

FRAMEWORK CONTENT STANDARD(S): Soggy Paper can relate conceptually to any of the following learning units:

3.1 Materials have properties that can be identified and described through the use of simple tests:

Soggy Paper allows students to investigate some of the properties of paper. Although *absorbency*, or the ability to hold water, is the property focused on in the investigations, students will be observing the physical properties of different papers and theorizing about which properties might be related to the paper's ability to hold water.

3.2 Organisms can survive and reproduce only in environments that meet their basic needs. Plants and animals have structures and behaviors that help them survive in different environments.

A unit on plant adaptations may focus on the study of trees. In the context of learning about the parts of trees (roots, trunks, leaves, bark) and how they help the tree survive, students may learn that people use the parts of trees to make things such as paper, furniture or houses. If your students are learning about how paper is made from trees, Soggy Paper can be used as an interesting investigation comparing different types of paper.

3.4 Earth materials provide resources for all living things, but these resources are limited and should be conserved.

Soil, water and air are all "earth materials" that support the growth of plants. In this learning unit, students will be learning that people use plants for food, shelter, fabrics, medicines and other useful materials such as paper.

UNDERLYING SCIENCE CONCEPTS (KEY IDEAS):

- Observing means using the senses to get information.
- All substances have properties that can be observed and used to identify them.
- Some properties of matter are called "physical" properties. Physical properties can be observed using the five senses.
- Examples of physical properties are shape, color, texture, absorbency, transparency, and stretchability.
- Some physical properties can be observed directly (e.g., color or shape), while others are revealed through interactions with other materials (e.g., absorbency or magnetic attraction).

KEY INQUIRY SKILLS:

- Make scientific observations and recognize the difference between an observation and an opinion, a belief, a fact or a name.
- Identify steps to make a scientifically "fair test".
- Use a magnifying lens to make close observations.
- Use a graduated cylinder to accurately measure the metric volume of a liquid (in milliliters).
- Record data in an organized way.
- Use addition, subtraction, multiplication or division to process data.
- Use oral and written language to describe observations, ideas, procedures and conclusions.

MATERIALS NEEDED: Listed below are all the materials needed to complete the two experiments in Soggy Paper. Some materials are supplied in starter kits provided by the

Connecticut State Department of Education. These materials are marked with an asterisk (*). The remaining materials are supplied by the school district:

<u>For each group</u>:
12 squares of paper towel
12 squares of tissues
12 squares of napkin
3 zip-loc plastic bags (sandwich size)
3 plastic cups (8 oz)
1 plastic bottle of water (capped)
3 plastic plates (6”- 8” size)
1 plastic forceps *
1 plastic graduated cylinder (25 mL) *
A damp sponge to clean up accidental spills

<u>For each student:</u>
Magnifying lens *
Metric ruler
Crayons/colored pencils for bar graph
Scissors (optional-see Advanced Preparation)

<u>For Experiment #2:</u>
Several brands of paper towels

Teacher may want to use chart paper or an overhead transparency to display class data tables and graphs.

ADVANCE PREPARATION FOR THE TEACHER:

1. Carefully read through all teacher and student materials. Modify the Student Materials based on the needs of your students. Then print and photocopy Student Materials.
2. Obtain paper towels, tissues, napkins, plastic cups, plastic plates and bottled water. Since students will have preconceptions about which paper is most absorbent, it’s a great idea to choose papers that will give unexpected outcomes. For example, you might use the paper towels found in the school lavatories compared to a premium tissue – results may be a surprise!
3. To conduct a fair test, it is important that all the paper samples be the *same size*. 12cm x 12cm works well with a 6-8” plate. But…
    a. If your students are experienced at designing fair tests, OR IF YOU WANT TO USE THIS AS A “MINI-LESSON” TO TEACH ABOUT FAIR TESTS, you may want to give students one sheet of paper towel, tissue and napkin and allow the students to recognize the need to create equal-size and equal-ply paper samples. If the students will be cutting their own paper samples, check to see that the scissors they are given are sharp enough to cut the different papers; **OR**
    b. You may pre-cut equal-size paper samples and talk with students about why they think this is important.

c. Place the samples of each paper type in a labeled zip-loc bag. This will keep them dry during the experiment. Students or parent volunteers can be helpful in doing the advance cutting.

MATERIALS DISTRIBUTION:

Get students involved in distributing and returning materials. This saves time for the teacher and also teaches students collaborative skills and self-reliance. One way to distribute materials is through a "cafeteria style" distribution center. All materials are laid out on a table or counter, and each group sends a representative to pick up the required materials. Trays or plastic shoeboxes work well for transporting materials from the center to the lab groups.

ESTIMATED COMPLETION TIME AND PACING SUGGESTIONS: (45 minute blocks)

Day 1: Observation of paper types and completion of chart

Day 2: Experiment #1 – Data collection

Day 3: Experiment #1 – Data analysis (graphing) and discussion

Day 4: Experiment #2 - Planning

Day 5: Experiment #2 – Data collection

Day 6: Experiment #2 – Data analysis and discussion

Day 7/8: Communicate Your Learning – letter writing

PEDAGOGY: Consult the teacher notes accompanying each step of the performance task for suggestions related to classroom implementation, differentiation, assessment and extension strategies. The ▲ symbol is used to indicate a differentiation opportunity. Each Teacher Note is followed by a reference to the Framework inquiry skill featured in that task component. For example, the notation "**B INQ.3"** indicates an inquiry skill related to designing or conducting a simple investigation.

Soggy Paper

A Guided Exploration of Properties of Different Papers

ENGAGE:
Look around the room. How many things can you see that are made of paper? Is all paper the same? Can you find different kinds of paper?

Teacher notes: Encourage students to notice different kinds of paper, such as notebook paper, newspaper, poster paper, or textbook paper. Ask students to examine the papers and notice some of their properties. For example, Xerox paper is pure white while newspaper is off-white. Students will notice properties such as glossy, rough, smooth, soft, etc. You may want to list students' "Noticings" and "Wonderings" about the different papers in a 2-column chart. **B INQ.1**

EXPLORE:
In this activity, you will explore some of the properties of different kinds of paper.

1. GATHER these materials for your group:

12 squares of paper towel	Magnifying lens (1 per student)
12 squares of tissue	Ruler (1 per student)
12 squares of napkin	Crayons or colored pencils
1 plastic graduated cylinder (25 mL)	Damp sponge (1)
1 plastic forceps	Scissors (1 per student)
3 zip-loc plastic bags	
3 plastic cups	
1 plastic bottle of water	
3 plastic plates	

2. OBSERVE the properties of the different papers with and without the hand lens. Record your words and drawings in the following table:

Teacher notes: Help students understand that a scientific observation is an objective description of a feature that can be observed with the 5 senses. It is different from an opinion, a fact or a name. Adjectives that are objective (a "white" towel, for example) are appropriate for a scientific observation; but adjectives that are subjective (a "pretty" towel, *for example) are not. Sometimes students will struggle to find the right word to describe what they've observed. In many cases, a diagram or a picture is "worth a thousand words". For example, although the paper towel company may say its product is "quilted", the towel does not really have an insulating layer in the middle. More objectively, the towel may have a "pattern of crossing lines". This is a good opportunity to develop language fluency and introduce new vocabulary that will help the students express what they observe.*

Some students may need prompting to expand their observations. Ask questions such as:

- *What do you see on the surface?*
- *How does the paper feel?*
- *Does it stretch?*
- *Can you see through it?*
- *How are the papers alike? How are they different?*

▲ *Have students record their observations in an organized table, similar to the one shown here. If your students are experienced at using observation tables, they may want to design their own table. If so, delete the table shown here and leave space for students' own table designs.* **B INQ.1**

PAPER TYPE	Properties Observed Without Magnifier	Properties Observed With Magnifier
Paper towel		
Tissue		
Napkin		

Teacher notes: After students have had time to observe, ask students to share their findings and record a class list of the observed properties of each type of paper. As you record each observation, this is a good time to ask students to judge whether it is a "scientific observation" or a fact, a name or an opinion. **B INQ.1**

3. THINK about the properties you observed. Which properties might be related to how well the paper can hold water? This property is called "**absorbency**".

   ____

   ____

   ____

Teacher notes: This may be a good time to discuss the concept of absorbency. Students can generate examples of other objects that are absorbent (e.g., a sponge, a cotton ball, a towel, etc.) and discuss their ideas about properties that all absorbent objects seem to have. ***B INQ.1***

4. PREDICT which paper type might hold the MOST water, and which one might hold the LEAST water:

   Most: ___________________________ Least: _____________________________

   I think this because I noticed that ____

   ____

   ____

   ____

Teacher notes: Encourage students to think about which of the properties they observed might be related to the paper's ability to hold water. Students' predictions will be based on their prior experiences and preconceived notions about absorbency. Predictions are neither "correct" nor "incorrect"; they are, however, supported by students' explanations of the reasons for their ideas. For example, if a student predicts that white paper will be more absorbent than brown paper, ask the student to "Tell us why you think that."

Now you're ready to test your prediction.

EXPERIMENT #1: WHICH TYPE OF PAPER HOLDS THE MOST WATER? In this activity, you are going to compare different types of paper to find out which one holds the most water. You will pour some water onto a plate and then count how many squares of each paper type it takes to soak up all the water.

Teacher notes: This is a great opportunity to help students understand that scientific claims are based on evidence. Influenced by prior experiences or television commercials, students may have a preconceived idea that paper towels are more absorbent than tissue or napkin. In fact, paper absorbency depends on the properties of each paper rather than on the name of the paper. For example, a one-ply, smooth paper towel (like the type found in institutional lavatories) is not very absorbent; while a 3-ply, thick napkin may be highly absorbent. To encourage students to develop a respect for data, despite what they might expect, it's a good idea to use a variety of high-quality and low-quality towels, napkins and tissues so that students will see unexpected results that will lead them to make conclusions supported by evidence.

▲ *The main goal of this activity is to help students learn to think scientifically by conducting a fair test. There is no "right answer" that students will get by following directions. More important is the opportunity students will have to think about what makes a test "fair" so that accurate data can be collected in a consistent way. If you tell students to make all the paper squares the same size, to pour the same amount of water, and to keep the squares in the water for the same amount of time, they may get a predicted outcome but they may not learn why it is important to keep variables the same in a fair test. To differentiate this activity, you may want to modify the procedure below to remove SOME or ALL of the given quantities. For example, you might pre-cut all squares the same size, but allow students to decide the plate size, the spill amount or the soak time. During a class discussion comparing the methods and results of different groups, students will note variations in the findings. One group may have found paper towels to be most absorbent, while another group may have found tissues to be most absorbent. Ask students to think about possible explanations for these differences. Students will intuitively note that some groups used larger paper squares or smaller amounts of water, and these differences make it difficult to compare results. Ask students "What can we do differently to make our results more alike?" Then allow students to repeat the experiment once the class has agreed upon consistent quantities to use. By allowing the "unfair" test to occur, you've created an opportunity for students to solve the problem by creating a fair test.* **B INQ.3**

1. Label three plastic cups: “towel”, “tissue” and “napkin”. You will use the cups for storing the wet paper squares.
2. Measure 25 milliliters (mL) of water into the graduated cylinder. Decide which paper you want to test first.
3. Pour 25 mL of water onto the plastic plate.
4. Lay one paper square over the water spill, and leave it there until you can tell that it is not absorbing any more water.
5. Pick up the wet paper square with the forceps, and hold it over the plate until it stops dripping. Put the wet paper square in the labeled cup.
6. Keep using squares until there is no more water left in the plate.
7. Count how many paper squares you use to soak up all the spilled water. Record the number of squares you use for each paper type in a data table:

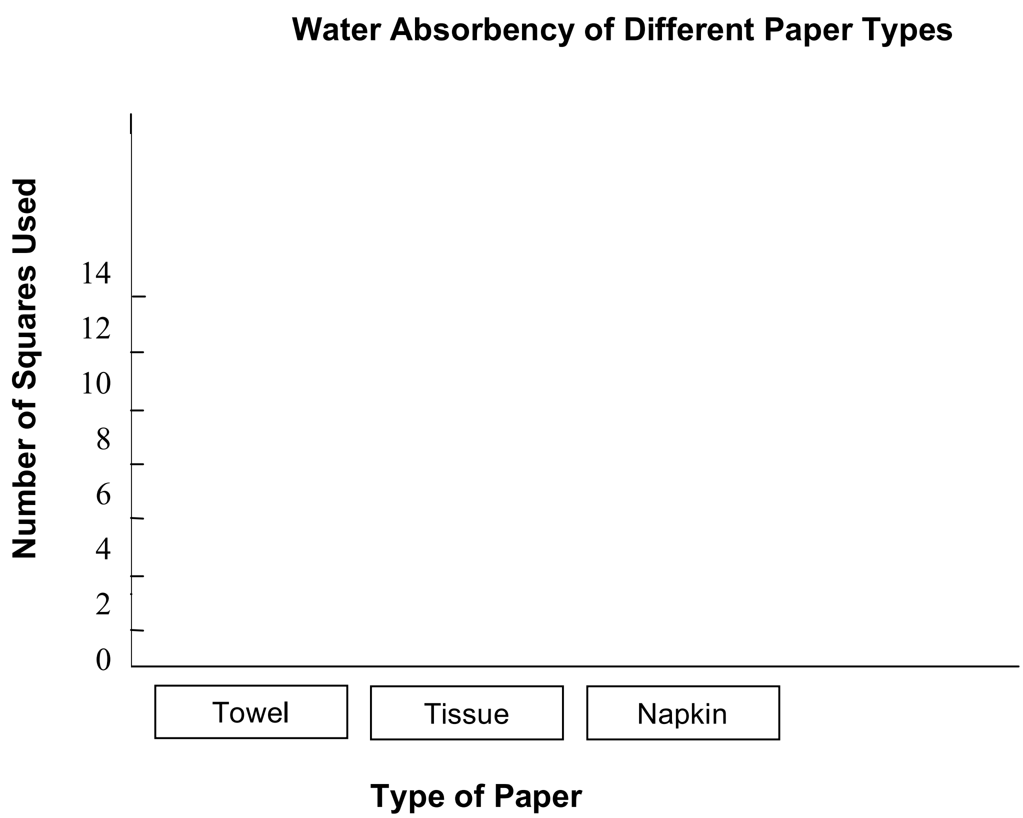
Type of Paper	**Amount of Water Spilled**	**Number of Squares Used**
Paper Towel	25 mL	
Tissue	25 mL	
Napkin	25 mL	

8. Repeat Steps 3 to 7 with the other paper types.

Teacher notes: ▲ *If your students are experienced data collectors, you may want to increase the challenge in this task by removing all (or parts) of the data table above and requiring students to create their own data table to record important information about their experiment.* **B INQ.4**

Graph Your Data:

Make a bar graph to compare how many squares of each paper type were needed to absorb 25 mL of water:



Teacher Notes: ▲ *The graph shown here has most of the work already done for the student. All that is required is correct plotting. Depending on your students' experience creating and using bar graphs to compare data, you may differentiate the difficulty level of this step by removing all (or parts) of the graph shown here, and requiring your students to label axes correctly, identify an appropriate scale, or create a title. This is a good opportunity to use an overhead projector to do a mini-lesson on parts of a bar graph.*
B INQ.10

EXPLAIN

Think About Your Data:

1. Which paper type used the fewest squares to soak up all the water? __________

Which paper type used the most squares to soak up all the water? ___________

Teacher notes: In this step, students simply report the data they recorded. **B INQ.5**

2. Which paper type is the most absorbent? __________

Which paper type is the least absorbent? ___________

Explain your conclusion:____

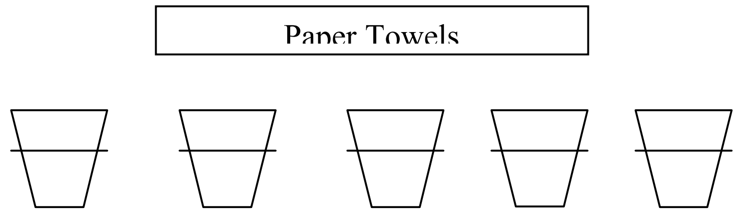
____

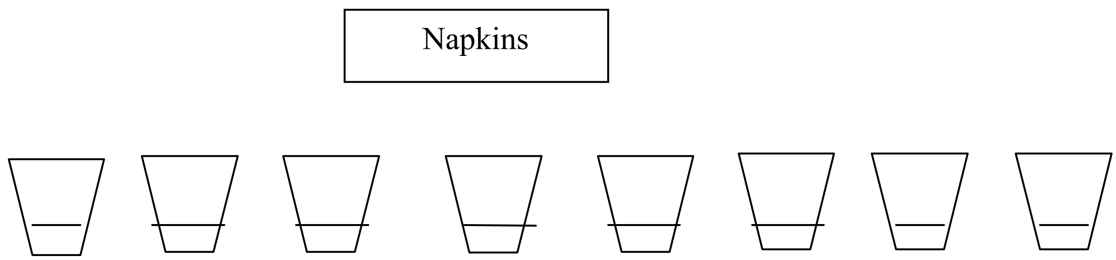
____

____

Teacher notes: There is no "correct" answer for this investigation since the outcomes depend on the properties of the different papers students are using. There should be, however, a logical ("valid") conclusion based on reliable data. For example, some students might make the invalid conclusion that tissues were the most absorbent because they had the "highest score". In fact, the paper with the "lowest score" is the most absorbent because less of it was required to soak up 25 mL of water. **B INQ.5**

▲ *Students who do not recognize this "inverse relationship" may need a first-hand experience. A concrete way to help students visualize the amount of water held by each paper square is to use plastic cups to represent the number of paper squares used. Then pour 25 mL of water into the cups so as to get equal amounts of water in each cup (this may take some "adjusting"). For example, suppose students' data tables show they used 5 squares of paper towel and 8 squares of napkin to soak up 25 mL of water. Here is how that data looks in "cups":*





This visual demonstration will help students to see that when FEWER cups (or paper squares) are used to hold 25 mL of water, there is MORE water in each cup. It is also a useful strategy for developing a conceptual understanding of division.

An alternative way to help students analyze the data is to use division to calculate how many mL of water was held by each paper square (e.g., 25 ÷ 8 = $3\frac{1}{8}$). **B INQ.10**

Help students understand that when they are asked to explain a conclusion, they need to do more than just restate the numerical data (e.g., 12 paper towels were used to soak up the spill). They need to interpret the data to describe an idea. For example, after examining the data in their data table, students might conclude that napkins are more absorbent than tissues because it took fewer napkins to soak up the same amount of water.

Some students might conclude that all paper towels are more absorbent than napkins because it took fewer paper towels to soak up the water in this experiment. Is this a reasonable conclusion? This is a good time to lead a class discussion about the need for many more tests to be conducted on different brands of paper towels and napkins to support such a generalized conclusion. Students may be interested in conducting tests to explore whether all paper towels are more absorbent than napkins. **B INQ.6**

3. What properties did the absorbent paper have that the less absorbent paper did not have? ____

____

____

Teacher notes: Encourage students to relate the results of the experiment to their initial observations and predictions. Were they surprised by any of their results? Ask them to compare the properties of the most absorbent paper (e.g., texture), stretchiness, color, size, or transparency) to the least absorbent paper. In light of their experiment, ask them again to consider what properties may be related to the paper's ability to hold water. Accept all reasonable theories that are supported by evidence. **B INQ.6**

4. SHARE your data and discuss your conclusions with the whole class.

Teacher notes: Lead a class discussion by asking questions such as: Was the data from other groups similar to yours, or was it different than yours? What might explain these differences? What changes can be made to the experiments to make everyone's results more similar? Questions such as these will help students develop their understanding of experiments that are "fair tests". **B INQ.6**

ELABORATE THROUGH RESEARCH

Learn more about paper, trees or conservation

Teacher notes: Some questions cannot be answered through observations or experiments. This is a good time to pursue students' interest in ideas related to Soggy Paper. For example, they may be interested in learning more about forests or paper and how it is made or recycled. Perhaps they're interested in the properties of some unusual materials. Incorporate the reading of nonfiction trade books related to the Soggy Paper task into your reading and writing instruction. Teach the literacy skills you are focusing on in the context of reading, writing and speaking about students' science investigations. You may ask students to do short research reports, poster presentations or skits to present what they learn.

You may want to have students read the following passage to introduce the connection between paper and trees. If you have other resources to accomplish this, simply delete the passage: **B INQ.7**

Many things we use every day are made of paper. We cut down trees and chop them into tiny pieces to make different kinds of paper. It takes many trees to make enough paper for all the things we use.

Trees are important to people and our environment in many other ways. People and animals eat the nuts and fruits that grow on trees. Birds, squirrels and other living things make their homes in trees. The roots of trees keep the soil from being washed away by rain. Many other plants grow in the soil.

We can conserve trees by using less paper. This can be done by recycling old paper or by reducing the amount of paper we use.

ELABORATE THROUGH INVESTIGATION

EXPERIMENT #2: WHICH PAPER TOWEL BRAND IS BEST?

You may have seen TV commercials that claim that a certain brand of paper towel is the "quicker picker upper". But, can you believe everything you hear on TV? Is one brand of paper towel really better than the others? In this experiment, you will use what you learned in Experiment #1 to find out more about the properties of different paper towels.

Teacher notes: ▲ *This experiment allows students to work more independently to plan and conduct a fair test to find the "best" paper towel. Feel free to change the experimental question to WHICH TOILET PAPER OR TISSUE IS BEST? (Students get a kick out of working with bathroom products!) Lead a class discussion about other ways to define the "best" paper product. Students may suggest properties such as the strength of different papers or their ability to stand up to scrubbing (durability). There are many other questions that have probably emerged during class discussions, and you are encouraged to use Experiment #2 as a chance for students to frame their own questions that can be investigated through an experiment.* **B INQ.1**

1. Cut squares from several brands of paper towels. Gather the same materials you used for Experiment #1.

Teacher notes: You can supply students with samples of three different paper towel brands, or you can ask the students to bring in samples from home. It works well to include "Brand X" towels, school towels, as well as premium brands. Students may be surprised at their results. Remind students about the importance of using the same size paper squares to make this a "fair test". **B INQ.3**

2. OBSERVE and COMPARE the properties of different brands of paper towels. Make an observation chart in your science notebook, and record your observations. TALK with your partners about which properties might make the paper towels absorbent.

Teacher notes: Students will draw on their experiences in Experiment #1 as they observe three different brands of paper towels. **B INQ.1**

3. PREDICT which towel brand will be the most absorbent. To make your prediction, think about the results of Experiment #1 and your observations of the different paper towels.

4. WRITE the question you are investigating in your science notebook.

Teacher notes: Help students to distinguish between a question that cannot be answered through an experiment (e.g., who invented paper towels?) and a question that can be answered through an experiment (e.g., which paper towel is the strongest when wet?). Some questions are best answered by looking up the information in a book, while others can be answered by collecting data. **B INQ.1**

5. PLAN an experiment that will compare different brands of paper towels to find out which brand is the most absorbent.

Teacher notes: Circulate and talk with lab groups about which parts of the experiment they will keep the same to make this a "fair test". Their experiences in Experiment #1 will enable them to consider aspects such as paper towel size, amount of water, length of time in the water, etc. **B INQ.3**

6. WRITE in your science notebook a list of the steps you will follow.

Teacher notes: Explain to students the importance of including enough details and measurements so that anyone could repeat their experiment exactly the way they did it. **B INQ.3**

7. DO your experiment, and record your findings in an organized way in your science notebook. Your data table from Experiment #1 will give you ideas for making your new data table.

Teacher notes: Suggest to students that they look back at the data table from Experiment #1 to get ideas for constructing their own data table for this experiment. **B INQ.4**

8. SHOW your paper towel absorbency data in a bar graph in your science notebook.

Teacher notes: Suggest to students that they look back at the bar graph from Experiment #1 so they can construct their own bar graph for this experiment. **B INQ.10**

9. What **conclusion** can you make based on your data? Are all paper towels the same? Is the most expensive brand also the most absorbent? WRITE about your findings in your science notebook. Then share and compare your findings with those of other groups in your class.

   Teacher notes: Lead a class discussion in which students share their findings. You can compare the data of different groups if they have all tested the same paper towels and used the same size squares. If your lab groups tested different paper towels or determined their own square size, you can help students recognize that these differences are responsible for the different findings and conclusions. **B INQ.5**

Communicate Your Learning:

You now have some important information to share with the person in your family who shops for groceries! Write a letter to this person and tell:

- What questions about paper products you explored;
- What you did to find answers to your questions;
- What you found out about different types and brands of paper products. Tell about some of the data you recorded in your experiments;
- What type of paper you recommend for use in the kitchen, and which brand you recommend buying;

You may want to draw a diagram of your experiment to include in your letter.

Teacher notes: Here is an opportunity to teach literacy skills in the context of the science investigation. You may want to do a mini-lesson on writing a friendly letter. You may also expect students to use their process writing skills to write a narrative account of their experiment, following the above prompts, with an introduction, body and conclusion.

B INQ.7

TEACHER RESOURCES

3.1 Properties of Matter:

Websites –

Nonfiction Trade Books:

- A Closer Look, Lewis, Natalie. Newbridge Publishers (big book)
- Bendy and Rigid, Royston, Angela. Heinemann Library, Chicago, IL. 2005
- Properties of Matter. Pearson Scott Foresman Leveled Readers.

3.2 Plant/Tree Adaptations:

Websites –

Other activities -

Nonfiction Trade Books:

- Green and Growing. Hammonds, Heather. Rigby/Harcourt Achieve, Austin, TX. 2004.
- Plants and Trees Growing. Race-Moore, Kara. Pearson Scott Foresman Leveled Readers.
- Tree Life., Black, Kara. Pearson Scott Foresman Leveled Readers.
- Forest Plants. Giesecke, Ernestine. Heinemann Library, Chicago, IL. 2005.
- New Plants. FOSS Science Stories. Delta Education, 2003.

3.4 Natural Resources & Conservation

Websites –

- http://www.tappi.org/ - "Paper University"
- http://www.straightdope.com/mailbag/mpapermaking.html - Science Advisory Board
- http://www.eia.doe.gov/kids/energyfacts/saving/recycling/solidwaste/paperandglass.html

Other activities -

Nonfiction Trade Books:

- How We Use Paper. Oxlade, Chris. Raintree, Chicago, IL. 2005.
- Paper., Oxlade, Chris. Heinemann Library, Chicago, IL. 2005.
- You Can Recycle. Walsh, Patricia. Pearson Scott Foresman Leveled Readers.