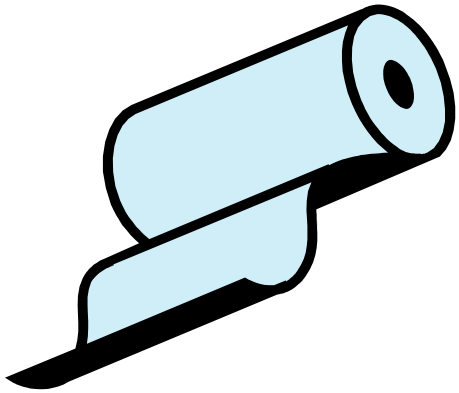
Connecticut State Department of Education Bureau of Curriculum and Instruction

Curriculum Embedded Performance Task

Grade 4 Science

Content Standard 3.1, 3.2, or 3.4



Soggy Paper

Exploration of the water-holding properties of different types of paper
(tissue, napkins and paper towels)

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Teacher Manual

Modified By Wallingford Public Schools
June 2006

This electronic document can be accessed by teachers on the W drive.

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DESCRIPTION OF "Soggy Paper" INQUIRY INVESTIGATION

Students will explore the water-holding properties of different types of paper. Materials tested include, but are not limited to paper towels, tissues, and napkins. Through investigations students will learn that to make a fair test of different properties, certain things (variables) should be kept the same so that results are more reliable.

Approximate Time: 2 weeks

Materials Found in Wallingford's Kit

4 rolls	Paper towels • 2 rolls of Brand A, 1 roll of Brand B and 1 roll of Brand C • all different prints
1 box	tissues
1 package	napkins
45	plastic Hefty plates - 3 per group
45	10oz clear plastic cups - 3 per group
30	magnifying lenses - 1 per student
15	forceps - 1 per group
15	graduated cups - 1 per group

Additional Materials Teachers will Supply:

- Metric rulers
- Scissors
- Sponge to clean up accidental spills (optional)
- Additional brands of paper towels, tissues, and/or napkins. Students may also choose to bring these assorted materials from home (optional)
- Chart paper and/or an overhead transparency to display class data tables and graphs (optional)

Underlying Science Concepts (Big 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 (Process Skills):

- Make scientific observations and recognize the difference between an observation and an opinion, a belief, a fact or a name
- Observe objects and describe commonalities and differences among them
- Generate investigable (testable) and non-investigable (research) questions
- Predict what might happen
- Design an investigation to help answer a testable question
- Identify steps to make a scientifically “fair test”
- Collect and record data utilizing simple equipment and measuring tools (magnifying glass, graduated cup, ruler)
- Conduct simple investigations
- Organize results in an appropriate manner, using:
    - Charts and graphs, graphic organizers, illustrations or diagrams, simple reports, etc.
- Use addition, subtraction, multiplication or division to process data
- Communicate results (oral and written) or information in an appropriate manner, using:
    - Presentations, visuals, simple reports, etc.

INQUIRY STARTER

ENGAGE:
Spill a small amount of water on a desk. Show students one type of tissue, napkin and paper towel; ask them which one would be the best for cleaning up the spilt water? Why? What is it about the different papers that might make one more absorbent than the other? Explain that we will be investigating to find out which type of paper is the most absorbent, or best for picking up spilt water. First we will use a hand lens to observe some of the properties of the different papers, before we test them.

Teacher notes: You may want to make a poster for your classroom that includes the wrappers and one piece of the different paper samples. If the paper towel samples get mixed up (during the next investigation), students can check the poster to identify their paper towel sample. Your poster should also include the napkins and tissues. Additional samples that students bring from home to test should also be posted.

EXPLORE:
1. Pass out hand lenses and one piece of paper towel (the brand that you have the most paper towel rolls), one piece of tissue and one piece of napkin to each group.
OBSERVE the properties of the different papers with and without the hand lens. Record your words and drawings in your science notebook.

As a class discuss how students may be able to organize their information in their notebooks. As a class you may design a chart like the one below.

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

*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?*
- *How does it stretch?*
- *Can you see through it?*
- *How are the papers alike? How are they different?*
- *How can we describe the shape? Color? Texture? Absorbency? Transparency? Stretchability?*

Teacher notes: The templates found on page 23 (Towel Properties Graphic Organizer) and 24 (Observation Starters) can be used and taped or glued into student notebooks.

2. 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 an **observation**, a **fact**, a **name** (brand name) or an **opinion**.

3. In their notebook have them write to the following question:

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.

4. While discussing student answers, chart questions as they arise. Then discuss which of the questions are TESTABLE QUESTIONS and which are RESEARCH QUESTIONS. Testable questions can be investigated in the 'hear and now' with materials. The research questions are often "why" questions.

5. Explain to students that you will be doing two investigations/experiments. The first investigation will focus on "Which type of paper holds the most water, tissues, napkins or paper towels". Then each group will be able to investigate one of the TESTABLE questions that is listed on our list.

Teacher note: Students will raise additional questions throughout the investigation; add these questions to the class list of testable questions.

INVESTIGATION #1:

Which type of paper (tissue, napkin, or paper towel) holds the most water?

How many squares does it take to soak up all the water on the plate?

In this investigation, students are going to compare different types of paper (tissue, napkin or paper towel) to find out which one holds the most water.

1. Provide the following materials to each group:
    - several pieces of paper towel (the brand that you have the most of)
    - several pieces napkin squares
    - several pieces of tissues
    - 3 cups
    - 3 plates
    - 1 forceps
    - 1 plastic graduated cup/cylinder
    - 1 pair scissors (provided by teacher)

Teacher notes: Have a few additional materials on a central table, in case groups need additional materials.

Teacher notes: 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.

2. Pour some water onto a plate. Ask students "How we could we conduct an investigation to find out how which type of paper (tissue, napkin or paper towel) is the best for cleaning up the spilt water? How many squares does it take to soak up all the water on the plate?".

3. **Write a Plan**

In their science notebooks have students copy down the question and start to draft their plan or procedure. Encourage students to use not only written directions but also pictures or diagrams. Allow students time to discuss their ideas in their groups. After initial ideas have been drafted, students may need to start "testing" before they see the potential flaws in their experimental design. Let students know that revisions to their plans are expected and that scientists often make revisions to their plans.

Teacher notes: The templates found on page 25 (Planning Template) or 26 (Sample Plan for Experiment #1) can be used and taped or glued into student notebooks.

***One of the main goals 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 decide to all test the same amount of spilt water, but allow students to decide the size of towel they are going to use or the soak time.*

It may be helpful to assign roles to each member of the group. For example, materials manager, recorder, counter, etc.

SAMPLE PROCEDURE FOR FAIR TEST

1. Label three plastic cups: "towel", "tissue" and "napkin". You will use the cups for storing the wet paper squares.
2. Measure 15 milliliters (mL) of water into the graduated cylinder. Decide which paper you want to test first.
3. Pour 15 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. Tally the number of papers used in the data chart.
8. Repeat Steps 3 to 7 with the other paper types.

Type of Paper	Amount of Water Spilled	Number of Squares Used
Paper Towel	15 mL	
Tissue	15 mL	
Napkin	15 mL	

4. Perform the Experiment

Have groups follow their plans and collect and record observations and data while investigating their question.

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.

5. Have different groups share their methods of testing the different papers. Discuss 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?"

By allowing the "unfair" test to occur, you've created an opportunity for students to solve the problem by creating a fair test.

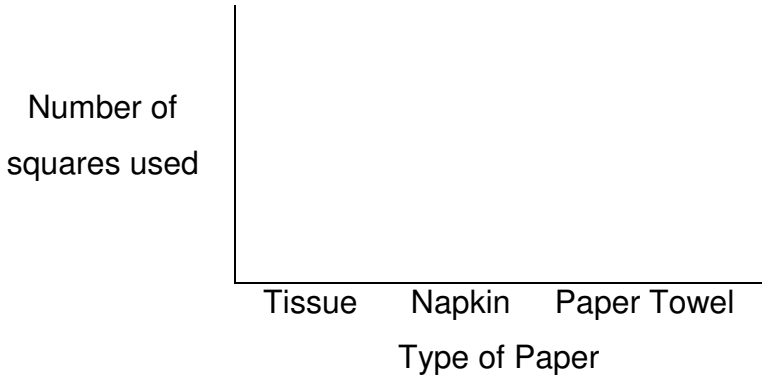
Optional: Allow students to repeat the experiment once the class has agreed upon consistent quantities to use.

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.

6. Graph Your Data:

Have students graph their group's data or the average class data. Make a bar graph to compare how many squares of each paper type were needed to absorb XX mL of water. A sample graph is shown below.

Water Absorbency of Different Paper Types



Teacher notes: The template found on page 28 (Graph Template) can be used and taped or glued into student notebooks.

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.

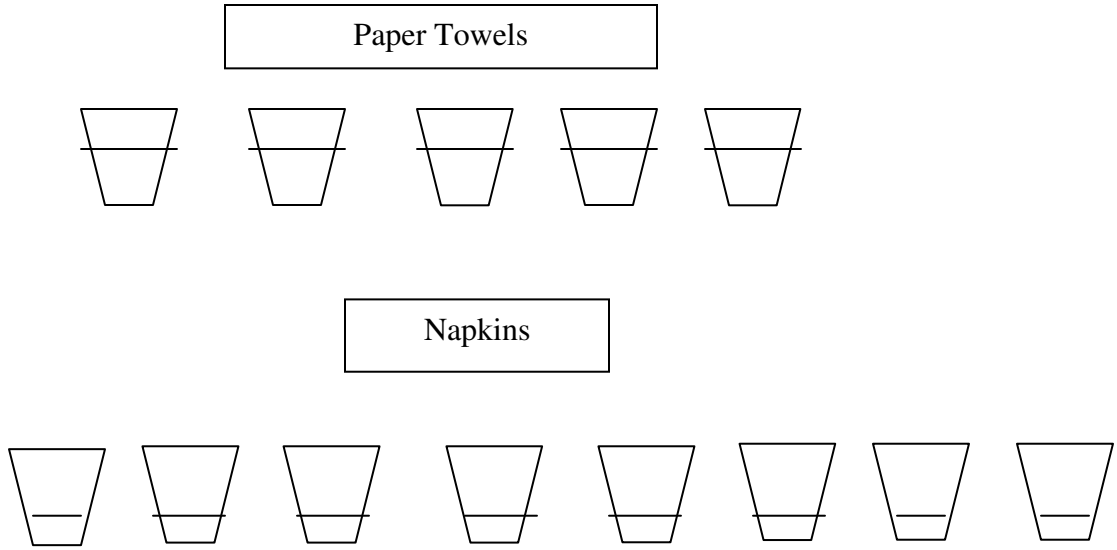
7. Explain – Conclusion

Have students write a conclusion and summarize their data or findings. Have them consider and write about the following:

- Which paper type used the fewest squares to soak up all the water? How many?
- Which paper type used the most squares to soak up all the water? How many?
- Which paper type is the most absorbent? How do you know this?
- Which paper type is the least absorbent? How do you know this?
- How did your experiment results compare with your predictions? Where you surprised by anything?
- If you did this experiment over, how might you improve it?

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 15 mL of water.

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 15 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 15 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 15 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., 15 ÷ 8 = 1.9)

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.

8. Have students relate their conclusion and data back to the physical properties they observed before the investigation. "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.

9. SHARE your data and discuss your conclusions with the whole class. 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".

Teacher notes: The template found on page 29 (Preparing to Share Results) can be used and taped or glued into student notebooks.

INVESTIGATION #2:

The purpose of experiment #2 is to provide students another opportunity to work in small groups to again plan and conduct a fair test. You can decide to organize this investigation different ways such as:

- **Option 1** – Revisit the testable questions that students have raised in class and have each group select one of the questions from the list to investigate. Students may have additional testable questions that they want to add to this list.
- **Option 2** - Have all students conduct some type of investigation related to "Which brand of paper towels are the most absorbent?" *"Discuss different TV commercials and advertisements 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?"* You will be amazed at the different ways that groups will decide to test this question.
- **Option 3** – Investigate questions such as "Which tissue is the best?" or "Which paper towel is the strongest?" or "Which napkin is the best?" or other questions that your students are interested in.

Use experiment #2 as a chance for students to frame their own questions that can be investigated, develop a fair test, collect data and observations, draw conclusions and share their results.

Teacher notes: Students may chose to bring additional materials from home for experiment #2.

Help students use their science notebooks to do the following as they are working through their investigation. Remember that you may need to stop and do mini lessons, where needed.

> *Teacher notes: Templates found on pages 23 - 29 may be used and taped or glued into student notebooks.*

1. OBSERVE and COMPARE the properties of different papers. Make an observation chart in your science notebook, and record your observations.
2. TALK with your partners about which properties might make the papers absorbent/ strongest, etc.
3. WRITE the TESTABLE QUESTION you are investigating in your science notebook.
4. PREDICT - To make your prediction, think about the results of Experiment #1 and your observations of the different papers.
5. PLAN a FAIR TEST to find out which paper is the most absorbent/strongest, etc. WRITE/DRAW in your science notebook a list of the steps you will follow.

   > *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.*
   >
   > *Explain to students the importance of including enough details and measurements so that anyone could repeat their experiment exactly the way they did it.*

6. 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.
7. Create a GRAPH of your results 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.*

8. What CONCLUSION can you make based on your data? WRITE about your findings in your science notebook.

9. Then SHARE and COMPARE your findings with those of other groups in your class.

Teacher notes: There are various ways you can have students communicate what they have learned. Some examples include:

- *Informal presentations to the class with or with out a visual*
- *Posters*
- *Write a letter to the person in your family who shops for groceries. Tell them about:*
    - *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.

10. Lead a class discussion to summarize the class 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. Summarize the class findings on chart paper and/or in student notebooks.

Teacher notes: Additional math can be integrated into this inquiry investigation by doing a cost analysis of the different brands. "Which brand is a better buy?" In order to do this you would need to analyze cost and absorbency.

OPTIONAL

ELABORATE THROUGH RESEARCH **(Answer some of the "why" questions they have)**

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 that can not be investigated. 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:

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.

Related Teacher Resources Include:

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

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.

WHAT IS A CURRICULUM EMBEDDED PERFORMANCE TASK?

(revised from CSDE)

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 CT 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 elementary performance tasks are conceptually related to Content Standards. 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 and high school performance tasks provide opportunities for students to use the Inquiry Expected Performances for Grades 6 to 8/ 9-10 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 THE PERFORMANCE TASKS RELATED TO THE CMT?

The Science CMT for Grades 5 and 8 (starting 2008) 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 15 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.
5.

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

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.

RELATED CT State Department of Education CONTENT STANDARDS:

CSDE Content Standards (CSDE Science Framework 2004)	**CSDE Primary Expected Performances** (CSDE Science Framework 2004**)**
Properties of Matter – How does the structure of matter affect the properties and uses of materials? **3.1 - Materials have properties that can be identified and described through the use of simple tests.** ♦ Heating and cooling cause changes in some of the properties of materials.	**B 1.** Sort and classify materials based on properties such as dissolving in water, sinking and floating, conducting heat, and attracting to magnets. **B 2.** Describe the effect of heating on the melting, evaporation, condensation and freezing of water.
Heredity and Evolution – What processes are responsible for life's unity and diversity? **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.	**B 3.** Describe how different plants and animals are adapted to obtain air, water, food and protection in specific land habitats. **B 4.** Describe how different plants and animals are adapted to obtain air, water, food and protection in water habitats.
Science and Technology in Society – How do science and technology affect the quality of our lives? **3.4 - Earth materials provide resources for all living things, but these resources are limited and should be conserved.** ♦ Decisions made by individuals can impact the global supply of many resources.	**B 5.** Describe how earth materials can be conserved by reducing the quantities used, and by reusing and recycling materials rather than discarding them.

Towel Properties

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

Observation Starters

Think of the five senses

- What kind of information does your five senses tell you? Size, shape, color, lines, texture, smell, weight, patterns, sound, behavior
- I observed…….
- I noticed…….

Connect it with what you know.

- It reminds me of _____ because _____.

Observe and record cause and effect

- When I _____, it _____.

Note any changes

- It changed after _____, and now it _____.

Be curious and full of wonder.

- I am curious about _____.
- I wonder what would happen if _____.

Source: Seattle's K-5 Inquiry Based Science Program, Betsy Rupp Fulwiller, March 2002

What Belongs in a Science Notebook?

- The *QUESTION* that you are trying to answer.
- A *PREDICTION* about how the inquiry (experiment) will turn out.
- Your *PLAN* for the inquiry and the *MATERIALS* that you will use.
- Your *DATA* and *OBSERVATIONS* (including words, tables, graphs, and illustrations.
- Your *CONCLUSIONS*.

Rubric for Science Journal Entry

2	€ Response provides a **complete** explanation to the question. € Includes **accurate details**. € **Correctly uses science words** in writing. € **Conclusions** are thorough and **supported by specific observations.** € **Drawing** is **labeled** and **accurate**.
1	€ Response provides a partial explanation to the question. € Includes some accurate details. € Correctly uses science words in writing most of the time. € Conclusions are not thorough and/or are not supported by specific observations € Drawing is partially labeled and/or mostly accurate.
0	€ Response does not answer the question. € Few of the details are accurate. € Uses little or no science words. € Conclusions are not related to the observations. € Now drawings or inaccurate drawing.

Investigation Template

Team member names:_____
_____

Our **question** is:_____
_____

Our **prediction** is:_____
_____

Materials we will use:_____
_____
_____

PLAN
First, we will_____
_____
_____
_____
Then we will_____
_____
_____
_____
Next we will_____
_____
_____
_____
Finally we will_____
_____
_____
_____

What **changes/revisions** did you make to your original plan?
_____
_____
_____

Draw or sketch your plan in your notebook

SAMPLE PLAN

EXPERIMENT #1: WHICH TYPE OF PAPER PICKS UP THE MOST WATER?

In this activity, you are going to spill a small amount of water onto a plate. Then you will count how many squares of each paper type it takes to soak up all the water.

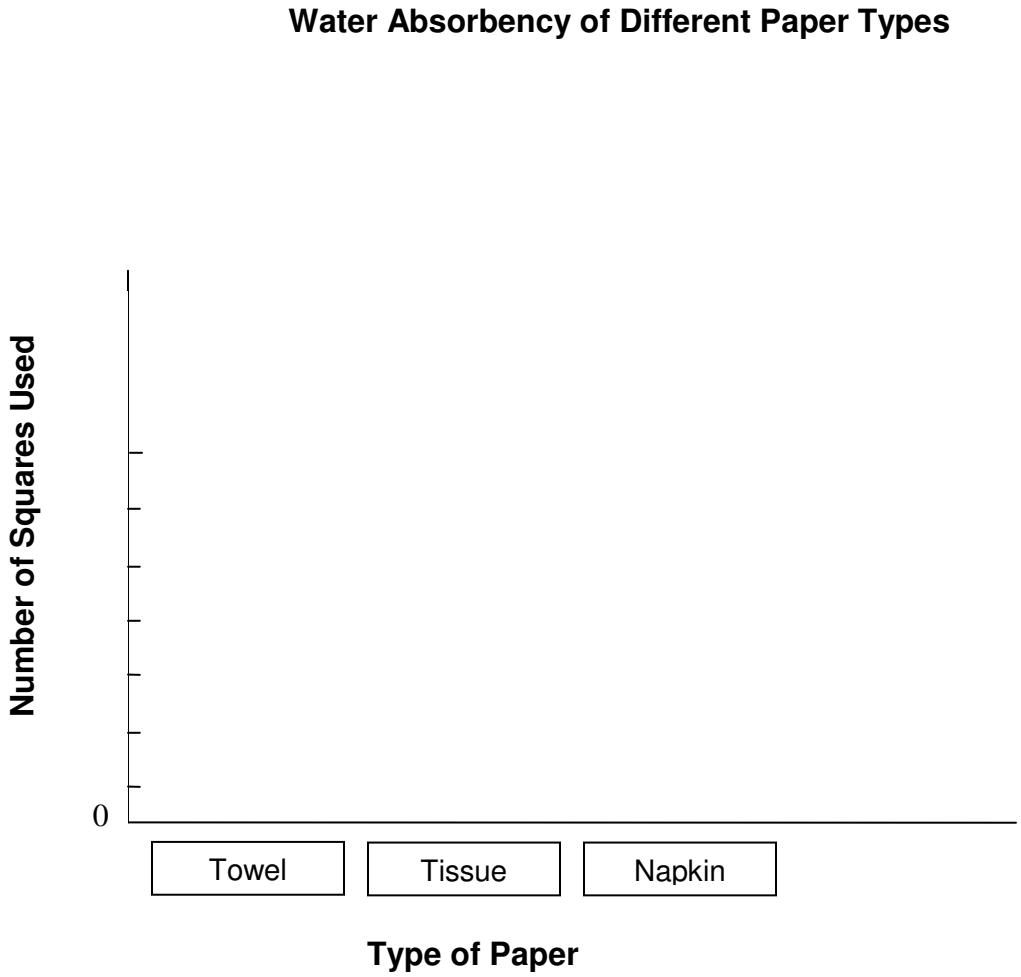
Plan:

1. Cut the paper towels (one brand), napkins, and tissues into squares of equal size (approximately 10 cm X 10 cm). You will need approximately 10 paper towels, napkins, and tissue squares.
2. Label three plastic cups: “towel”, “tissue” and “napkin”. You will use the cups for storing the wet paper squares.
3. Fill one of the cups approximately half full of water.
4. Measure 15 milliliters (mL) of water into the graduated cylinder/ graduated cup.
5. Pour 15 mL of water onto the plastic plate.
6. Decide which paper you want to test first.
7. Lay one paper square over the water spill, and leave it there until you can tell that it is not absorbing any more water.
8. Pick up the paper square with the forceps, and hold it over the plate until it stops dripping. Put the wet paper square in the labeled cup.
9. Repeat Steps 5 and 6, counting the number of paper squares you use to soak up all the spilled water. Use the data table below to keep track of the number of squares you use for each paper type. Tally the number of papers used as you go in the data chart.
10. Repeat Steps 5 and 6 with the other paper types.

Data Chart:

Type of Paper	Amount of Water Spilled	Number of Squares Used
Paper Towel	15 mL	
Tissue	15 mL	
Napkin	15 mL	

Graph Template



Preparing To Share Results

Question: _____

Prediction: _____

_____

Summary of what you did (plan) _____

_____

_____

_____

_____

We found out that (data or results)_____

_____

Conclusion (WHY?) _____

_____

_____

Space for illustration/diagram of investigation plan and/or results.

Soggy Paper Assessment

Use the plan in the box below to answer questions 1 and 2.

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 15 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.

1. 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. Number of students in the group

2. Explain two ways the plan above could be improved.

Use the following chart to answer questions 3-5.

Number of Squares Used to Absorb 25 mL of Water

Brand	**Trial 1**	**Trial 2**	**Average**
Brawny	20	21	20.5
Bounty	17	11	14
Viva	8	8	8

3. What conclusions can be drawn from the chart above?

4. What might have caused the different results in trial one and two for Bounty?

5. On graph paper, create a graph for the **average** number of towels used to absorb 25 mL of water. (see chart above)

6. Explain what a “fair test” is.

7. Identify each statement as an **observation**, **name**, **opinion**, or **fact.**

a. Paper towels are made from trees. _____

b. Brawny paper towels are the best. _____

c. The tissues are two ply. _____

d. The napkins are folded into four equal squares. _____

e. I think that Shaw’s paper towels will be the most absorbent. _____

f. The paper towel has a green butterfly print. _____

g. This paper towel is Bounty. _____

h. The napkins have small squares that look raised on them. _____

i. Brawny took 12 squares to absorb 10 mL of water. _____

k. I think it will take 120 squares to absorb 100 mL of water. _____

l. I liked this experiment. _____

8. Identify which questions are **testable** and which questions are **research** questions.

a. Which brand of paper towel is the strongest? _____

b. How are paper towels made? _____

c. Do tissues and napkins come from different kinds of trees? _____

d. How long will it take for the whole roll of paper towels to absorb the water? _____

e. How many squares of tissue will it take to absorb 5 mL of water? _____

f. Why are Viva paper towels so strong? _____

g. Do manufacturing companies use bleach when making paper towels? _____

h. How many trees does it take to make 100 boxes of tissue? _____

9. Tom's group wanted to test what kind of toilet paper is the most absorbent. In order for his experiment to be a "fair test", what are some things (variables) that he should keep the same or constant? Explain three things that Tom should keep the same.