



March 13-15, 1997

Matter Matters: Solids, Liquids, and Gases

Grade Level: First Grade

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Length of Unit: Ten Days

I. ABSTRACT

Young scientists will participate in a variety of hands-on experiments throughout this ten day unit on the three states of matter. Designed for first graders, this unit will develop the concept of matter and make it interesting and relevant to six and seven year olds. By integrating literature, audio-visual materials, and poetry, the unit provides opportunities for problem solving, sequencing, graphing, comparing and contrasting. At the conclusion of the unit, students will be able to differentiate between solids, liquids and gases, and give characteristics and examples of each.

II. OVERVIEW

- A. The specific content from the Core Knowledge Sequence to be covered is matter and its three states.
- B. Skills to be taught are identifying, sequencing, observing, using key vocabulary for oral and written communication, graphing, and predicting.
- C. Students will gain an understanding that all matter in the world can be classified as a solid, liquid, or gas.

III. BACKGROUND KNOWLEDGE

All things, living and nonliving are made up of matter. All matter has mass and takes up space. Matter exists in three states or phases: solids, liquids, and gases.

All matter is made up of parts too small to see called atoms. Atoms that are joined together are called molecules. For example, one oxygen atom and two hydrogen atoms join together to form the molecule water. (H₂O)

The properties of a solid include maintaining size, shape and visibility. The molecules of a solid are very close together and cannot move out of their places. Therefore, solids keep their shape. Examples of a solid include rocks, pencils, trees, and books.

The properties of a liquid include the ability to change shape based on its container while not changing in volume. For example, water poured into a square container will appear square and the same water poured

into a round container will appear round. Most liquids are visible. The molecules of a liquid are not as close together as those of a solid. They are free to move, which explains why they take the shape of the container which they occupy.

The properties of a gas include invisibility and the ability to change shape easily. Gas molecules move about freely. They fill all available space in a container. The molecules of a gas are spread very far apart from each other. Examples of gases include helium, oxygen, neon, and hydrogen.

Some matter can change from one state to another depending on the temperature. Heating can cause a solid to melt to a liquid. Further heating can cause a liquid to become a gas. To return a liquid to a solid or a gas to a liquid, the heat must be removed. For example, if ice (a solid) is heated it will become water (a liquid). Further heating will cause the water to become steam (a gas).

IV. RESOURCES

Delacre, Lulu. Nathan's Balloon Adventure. New York: Scholastic, 1991. ISBN 0-590-44977-x

Hirsch, Jr. E.D. What Your First Grader Needs to Know: Fundamentals of a Good First-Grade Education. New York: Dell Publishing, 1991. ISBN 0-385-31026-9

Magic School Bus Gets Baked in a Cake. New York: Scholastic, 1995. ISBN 0-590-22295-3

Robinson, Fay. Solid, Liquid, or Gas?. Chicago: Children's Press, 1995. ISBN 0-590-06041-4

Wilkin, Fred. Matter. Chicago: Children's Press, 1986. ISBN 0-516-01284-3

V. LESSONS

A. Lesson One: Introduction to Matter

1. Objective/Goal:

The student will become familiar with the three states of matter by identifying properties and examples of each.

2. Materials:

a. Mystery Box Items

1) block

several different shaped containers

plastic bag

4) food coloring

water

b. Chart For Student Responses

c. Magazines

Scissors and Glue

e. Three Pieces Of Butcher Paper For Charts With Labels Solids, Liquids, Gases

Chant (SEE APPENDIX F)

3. Prior Knowledge for Students

a. When beginning this unit assume the students have no prior knowledge of the subject.

4. Key Vocabulary

Solid - A form of matter that is not a liquid or a gas. It keeps its shape instead of flowing or spreading out.

b. Liquid - A form of matter that is not a solid or a gas. A liquid can flow easily. It can take the shape of any container into which it is poured.

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

Matter - What all things are made of; anything that has weight and takes up space. Matter can be a solid, liquid, or a gas.

Visible - Able to be seen.

f. Molecule - The smallest particle into which a substance that can be divided without being changed chemically.

Atom - The smallest part of a chemical element. All matter is made up of atoms. Atoms combine to form molecules.

5. Procedures/Activities

a. Teacher collects all materials in the mystery box. The mystery box is a decorated box used throughout the unit to heighten students' interest.

Teacher shows the block and poses the following questions: Can you see the block? Does the block change shape as I put the block in different containers? Teacher places block in various containers. (short, tall, round, square)

c. Teacher records the student responses on a chart labeled SOLIDS. 1) Solids are visible.

Solids do not change shape.

d. Teacher repeats the above process with colored water and records responses on a chart labeled LIQUIDS. 1) Liquids are visible.

2) Liquids become shaped like their containers.

e. Teacher fills a clear plastic bag with air and asks "Do you see the air?"

Teacher lets the air escape and asks "Did the air change shape?"

f. Teacher records student responses on chart labeled GASES.

1) Most gases are not visible.

2) Most gases change shape easily.

g. In three cooperative groups (one for liquids, one for gases, and one for solids), students classify a given state of matter by cutting out pictures from magazines and gluing onto a poster. Before gluing, students conference with teacher on choices. Students present and discuss their posters to the class.

h. Teacher will display the student-made posters and the response posters for use in later lessons.

i. Class practices stanzas one and two of the matter chant together.

6. Evaluation/Assessment

Evaluation will consist of participation, following directions, encouraging dialogue among groups and accuracy of final product.

B. Lesson Two: Solids

1. Objective/Goal:

a. The student will identify solids in their everyday life.

2. Materials

Mystery Box Items

paper lunch bags

Masking Tape To Mark Off A Square On The Floor

c. Matter by Wilkin

3. Prior Knowledge for Students

Students will have basic understanding of matter.

4. Key Vocabulary

Solid - A form of matter that is not a liquid or a gas. It keeps its shape instead of flowing or spreading out.

Visible - Able to be seen.

c. Matter - What all things are made of; anything that has weight and takes up space. Matter can be a solid, liquid, or a gas.

5. Procedures/Activities

a. Teacher refers to chart from lesson one to review the characteristics of a solid.

Solids are visible.

2) Solids do not change shape.

Read Matter pages 11-14 and discuss.

b. As guided practice, cooperative groups will choose one solid from the classroom to share. Groups will place the object in a large square previously marked on the floor with tape. Groups share and discuss why

their object is indeed a solid.

c. As independent practice, cooperative groups participate in a scavenger hunt. Each group will be given a lunch-size paper bag. Groups circulate around the room, selecting solids and placing them in their bag.

d. Members of each group will display their "finds". As they are displayed, fellow class members will show the thumbs up sign if the object is a solid, and a thumbs down sign if the object is not a solid. Discuss, as needed, objects which are questionable.

e. Class practices stanzas one, two, and three of matter chant.

6. Evaluation/Assessment

Evaluations will be based on participation, appropriate cooperative group behaviors, and the ability to explain why a certain object is or is not a solid.

C. Lesson Three: Liquids

Objective/Goal:

The student will identify the properties of a liquid through experimentation.

2. Materials

Various sized/shaped containers

b. Coke bottle

Funnel

d. 16 ounce or larger clear plastic cups

Various liquids: kool-aid, cooking oil, honey, vinegar, water

3. Prior Knowledge for Students

a. The student will have a basic understanding of matter, particularly solids and their properties.

4. Key Vocabulary

Matter - What all things are made of; anything that has weight and takes up space. Matter can be a solid, liquid, or a gas.

Liquid - A form of matter that is not a solid or a gas. A liquid can flow easily. It can take the shape of any container into which it is poured.

c. Shape - The way something looks because of its outline; form.

5. Procedures/Activities

a. The teacher will set up five stations. Four stations will be student directed and one will be teacher-directed. Containers of different sizes and shapes will be located at each student station. The teacher directed station will have various containers as well as various liquids.

b. Each cooperative group will receive one 16-ounce clear plastic cup. The cup will contain about 8 ounces of water.

- c. In groups, students rotate through each station taking turns pouring the water into the new container. Groups will observe and discuss changes. Students pour water back into original container and move to the next station at a given signal.
- d. When students rotate through teacher station, students will experiment pouring liquids of various consistencies (kool-aid, cooking oil, honey, vinegar) from one container to another.
- e. Students will share with teacher and class their observations. Teacher will guide the discussion to include the properties of a liquid: liquids are visible and become shaped like their containers.
- f. Class practices stanzas one, two, three and four of matter chant.

6. Evaluation/Assessment

Evaluation will be based on participation, following directions, and discussion.

D. Lesson Four: Gases

1. Objective/Goal:

- a. The students will identify characteristics of gases.

2. Materials

Mystery Box Items

hot plate

2) glass bottle

balloon

Flannel Board Pieces (SEE APPENDIX A)

Nathan's Balloon Adventure by Delacre

3. Prior Knowledge for Students

- a. The students will have a basic understanding of matter.

4. Key Vocabulary

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

- b. Molecule - The smallest particle into which a substance that can be divided without being changed chemically.

Heating - High temperature; warmth.

Air - The mixture of gases that surrounds the Earth. Air cannot be seen, but it can spread to fill a space.

5. Procedures/Activities

- a. Review properties of a gas: most gases are not visible and can change shape easily. Teacher reads Nathan's Balloon Adventure.

- b. Teacher displays mystery box and removes bottle, balloon, and hot plate. Teacher poses question, "How can we blow up the balloon?". By placing the balloon over the neck of an empty bottle, the teacher demonstrates the lack of gas to inflate the balloon.
- c. Place the bottle in a pan of water (1 inch of water) and heat on medium. Add water as needed to ensure the pan doesn't get dry. Students predict and observe what happens. Teacher explains that when gas molecules are heated, they spread out. As they spread out, they leave the bottle and fill the balloon.
- d. Using flannel board pieces, students retell what happened during the experiment and why.
- e. Class practices one, two, three, four, and five of matter chant.

6. Evaluation/Assessment

Evaluation will be based on participation of experiment and discussion.

E. Lesson Five: Gases continued

1. Objective/Goal:

a. Students will learn that although gas is invisible, its presence is known by its ability to move objects. Students will discover the greater the amount of gas (air) the more an object will move.

2. Materials

Mystery Box Items

straws

2) graph

Solid, Liquid, or Gas? by Robinson

3. Prior Knowledge for Students

a. Students will have a basic understanding of matter particularly gases and its properties.

4. Key Vocabulary

Matter - What all things are made of; anything that has weight and takes up space. Matter can be a solid, liquid, or a gas.

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

c. Air - The mixture of gases that surrounds the Earth. Air cannot be seen, but it can spread to fill a space.

Heating - High temperature; warmth.

e. Predict - To tell what one thinks will happen in the future.

5. Procedures/Activities

a. Teacher reads Solid, Liquid, or Gas? and discusses. Students brainstorm things that are moved by a gas

(air). Examples are: sailboat, flag, kite, leaves, pin wheel.

b. Teacher collects materials in mystery box. Teacher shows packing material (popcorn) and asks students "How can we move the popcorn?" Teacher records responses on chart.

c. Teacher chooses two different sized students (one large and one small). The teacher will act as the third participant. Predict and graph who will be able to move the popcorn the farthest with one blow of air through the straw.

d. Participants each blow air into straws to move the popcorn. Class measures the distance the popcorn moved. Return to predictions and graph.

e. Discuss the similarity between balloons and lungs. Refer to lesson four story. The bigger the lungs are, the greater the amount of air. Therefore, the teacher was able to move the popcorn the farthest.

f. Repeat process with other students.

g. Class practices stanza one, two, three, four, and five of matter chant.

6. Evaluation/Assessment

Evaluation will be participation in activity and discussion.

F. Lesson Six: The Three States of Matter

1. Objective/Goal:

a. The student will observe that different temperatures can cause various materials to change states of matter.

2. Materials

Mystery Box Items

ice cube trays

electric burner

3) kettle

Small Ice Chest

four baggies with one ice cube in each bag

juice

3. Prior Knowledge for Students

The students will have a basic understanding of the three states of matter. The student will be able to identify the properties of each state.

4. Key Vocabulary

Matter - What all things are made of; anything that has weight and takes up space. Matter can be a solid, liquid, or a gas.

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

c. Liquid - A form of matter that is not a solid or a gas. A liquid can flow easily. It can take the shape of any container into which it is poured.

Solid - A form of matter that is not a liquid or a gas. It keeps its shape instead of flowing or spreading out.

Heating - High temperature; warmth.

f. Steam - Water in the form of a gas. Water turns into steam when it is heated to a boiling point.

Temperature - The degree of heat or cold. Temperature is often measured with a thermometer.

Freezing - To harden because of the cold.

5. Procedures/Activities

a. In cooperative groups, students work together to melt ice cube in baggie without breaking the ice cube. Each group will plan a course of action. Teacher sets timer for about three minutes. Groups carry out plans to melt the ice cube. Class discusses observations.

b. Teacher records the various ways students melted the ice cube. Class discusses the effect of changes in temperature. For example, baking a cake, cooling Jell-O, etc.

c. Teacher discusses how greater heat will cause the liquid to change into a gas (steam). Teacher demonstrates by heating water in a kettle on an electric burner.

d. After reminding students that heating a solid can change it into a liquid, teacher poses the question, "How can a liquid be changed into a solid?" Discuss responses.

e. Students pour juice and water into separate ice cube trays and predict what will happen when placed in the freezer. Make enough juice cubes for students to have in the next lesson. Teacher will place trays in the freezer and return to student predictions the next day.

f. Class practices all stanzas of matter chant.

6. Evaluation/Assessment

Evaluation will be participation in group activity and discussion.

G. Lesson Seven: Matter Book

1. Objective/Goal:

a. The student will observe that different temperatures can cause various materials to change states. The student will illustrate water in all three states.

2. Materials

Mystery Box Items

b. Magic School Bus Gets Baked in a Cake

Paper for Flap Book (for example and words see APPENDIX B)

3. Prior Knowledge for Students

a. Students will have a basic understanding of matter and its three states. Students will have experimented with temperatures to cause materials to change states.

4. Key Vocabulary

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

b. Liquid - A form of matter that is not a solid or a gas. A liquid can flow easily. It can take the shape of any container into which it is poured.

Solid - A form of matter that is not a liquid or a gas. It keeps its shape instead of flowing or spreading out.

Heating - High temperature; warmth.

e. Steam - Water in the form of a gas. Water turns into steam when it is heated to a boiling point.

Freezing - To harden because of the cold.

g. Ice - Water that is solid; frozen water.

5. Procedures/Activities

a. Review lesson six. Teacher shows juice and ice cubes. Return to student's predictions from previous lesson and discuss.

b. Students eat juice cubes. Teacher reads Magic School Bus Gets Baked in a Cake.

c. Students create a three fold flap book illustrating water as a solid, liquid, and a gas. Each student will need one piece of white paper. Fold paper in half lengthwise. Cut top half only into thirds. Cut and glue words as shown in example. Illustrate on inside.

d. Class practices all stanzas of matter chant.

6. Evaluation/Assessment

Comprehension will be evaluated using the student-made flap book.

H. Lesson Eight: Matter Story

1. Objective/Goal:

a. The student will use key vocabulary to write a story about the three states of matter.

2. Materials

Story Frame (see APPENDIX C)

b. Scissors and glue

Crayons

d. List of Words for Wordbank (see APPENDIX C)

3. Prior Knowledge for Students

a. Students will have a basic understanding of matter. Students will be able to identify and give examples of the three states of matter. Students will be able to verbalize the effects of a change of temperature on a given substance.

4. Key Vocabulary

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

Liquid - A form of matter that is not a solid or a gas. A liquid can flow easily. It can take the shape of any container into which it is poured.

Solid - A form of matter that is not a liquid or a gas. It keeps its shape instead of flowing or spreading out.

d. Heating - High temperature; warmth.

Steam - Water in the form of a gas. Water turns into steam when it is heated to a boiling point.

f. Freezing - To harden because of the cold.

Temperature - The degree of heat or cold. Temperature is often measured with a thermometer.

5. Procedures/Activities

a. Students are given a story frame and word bank. The teacher will read the story to the class.

b. Students use their word bank to complete their story. After completing their story students cut between paragraphs and glue each paragraph onto a separate page. Students conference with teacher prior to compiling story into book form and illustrating.

c. Class practices all stanzas of matter chant.

6. Evaluation/Assessment

Evaluation will be based on the students final copy of their book.

I. Lesson Nine: Making a Movie

1. Objective/Goal:

a. The student will reenact previously performed experiments describing the process and explaining the results.

2. Materials

task tags (see APPENDIX D)

b. various liquids

various containers

d. straws

packing filler (popcorn)

electric burner

g. kettle

glass bottle

balloon

ice cubes

k. Water

Ice Cube Trays

m. Variety of Props - lab coats, microphone, name tags, etc.

3. Prior Knowledge for Students

Students will have a basic understanding of matter. Students will be able to identify and give examples of the three states of matter. Students will be able to verbalize the effects of a change of temperature on a given substance.

4. Key Vocabulary

Gas - A form of matter that is not a solid or a liquid. A gas can move about freely and does not have a definite shape.

b. Liquid - A form of matter that is not a solid or a gas. A liquid can flow easily. It can take the shape of any container into which it is poured.

Solid - A form of matter that is not a liquid or a gas. It keeps its shape instead of flowing or spreading out.

d. Heating - High temperature; warmth.

Steam - Water in the form of a gas. Water turns into steam when it is heated to a boiling point.

f. Freezing - To harden because of the cold.

Matter - What all things are made of; anything that has weight and takes up space. Matter can be a solid, liquid, or a gas.

Temperature - The degree of heat or cold. Temperature is often measured with a thermometer.

5. Procedures/Activities

a. Teacher gathers the needed materials for four experiments into four separate containers. The four experiments that will be performed are: pouring liquids into containers (see lesson three), water as seen in each state (see lesson six), blowing up a balloon (see lesson four), and moving an object using a gas (see lesson five).

b. Teacher explains that the students will be working in groups to reenact a specific matter experiment for a class-made video. The video will resemble a television news show as one child will be a reporter.

c. Cooperative groups draw name of experiment and pick up container with the materials needed to reenact their specific experiment. Students assign tasks to group members. The tasks are: Speaker, Materials Handler, and Performer. Students pin correct task card on their shirt. The task of speaker and performer may require more than one student.

d. Groups practice reenacting their experiment performing their assigned task. Teacher circulates around room helping students with their experiments and offering suggestions.

e. Groups perform experiments while teacher records using a video camera. A student "reporter" (previously chosen by the teacher) interviews groups throughout the experiment. Groups that are not performing will act as the audience.

f. Video ends with matter chant performed by entire class.

6. Evaluation/Assessment

Evaluations will be based on the students performance with their group as well as appropriate audience behavior.

VI. CULMINATING ACTIVITY

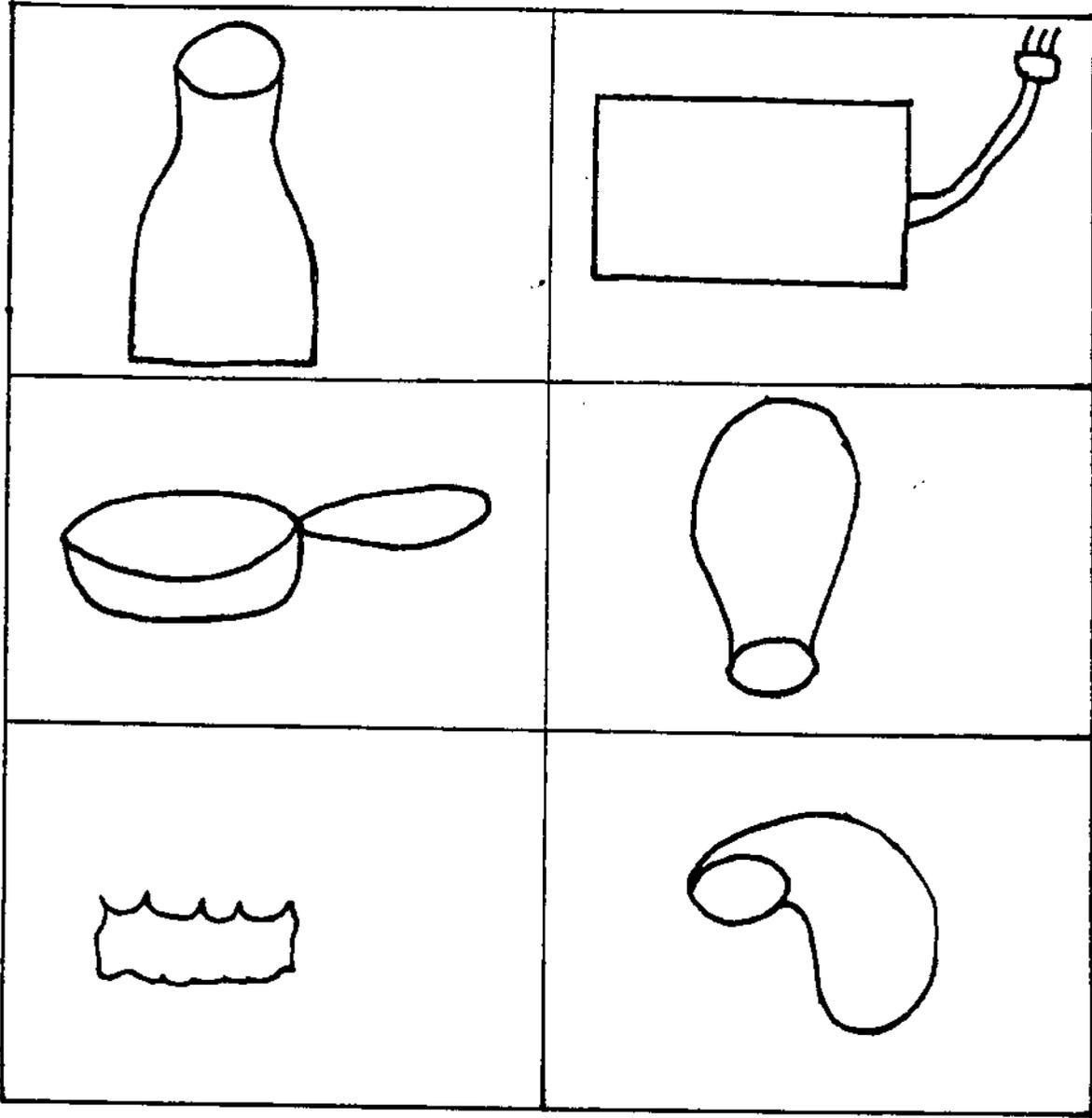
A. Students will watch the class-made video. Students will vote and construct a "living graph" of their favorite matter experiment. Class will play Matter Bingo. (see APPENDIX E)

Students cut and glue the bingo words and pictures onto bingo card.

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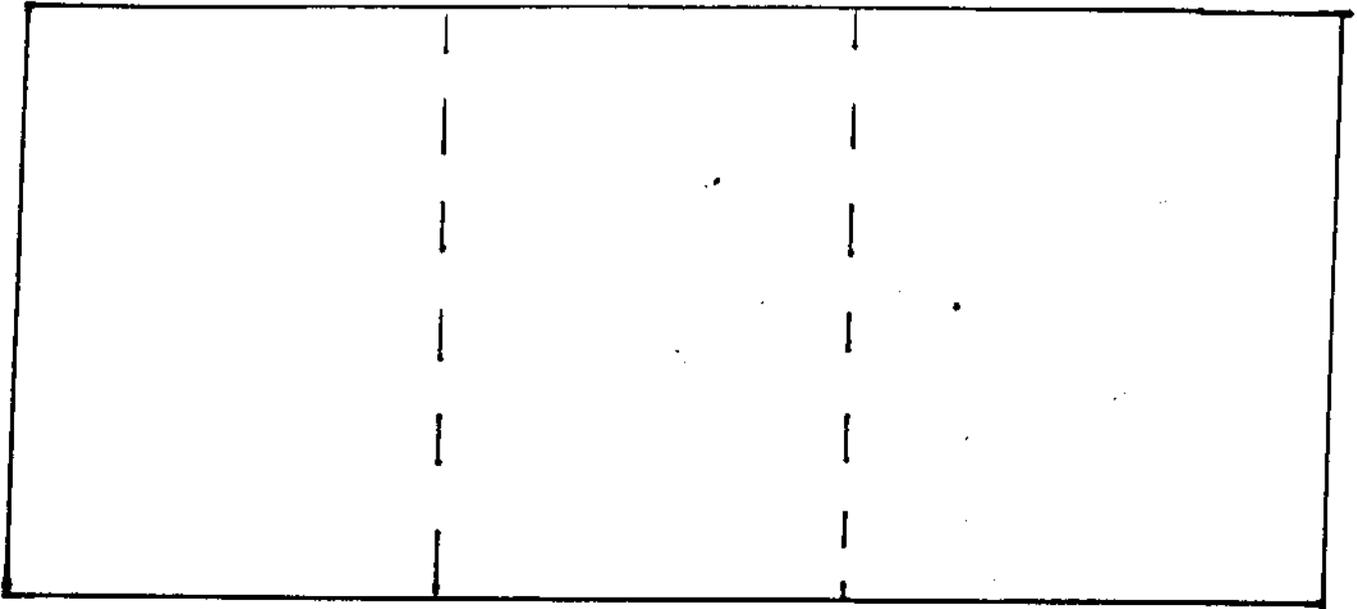
APPENDIX A
FLANNEL BOARD PATTERNS



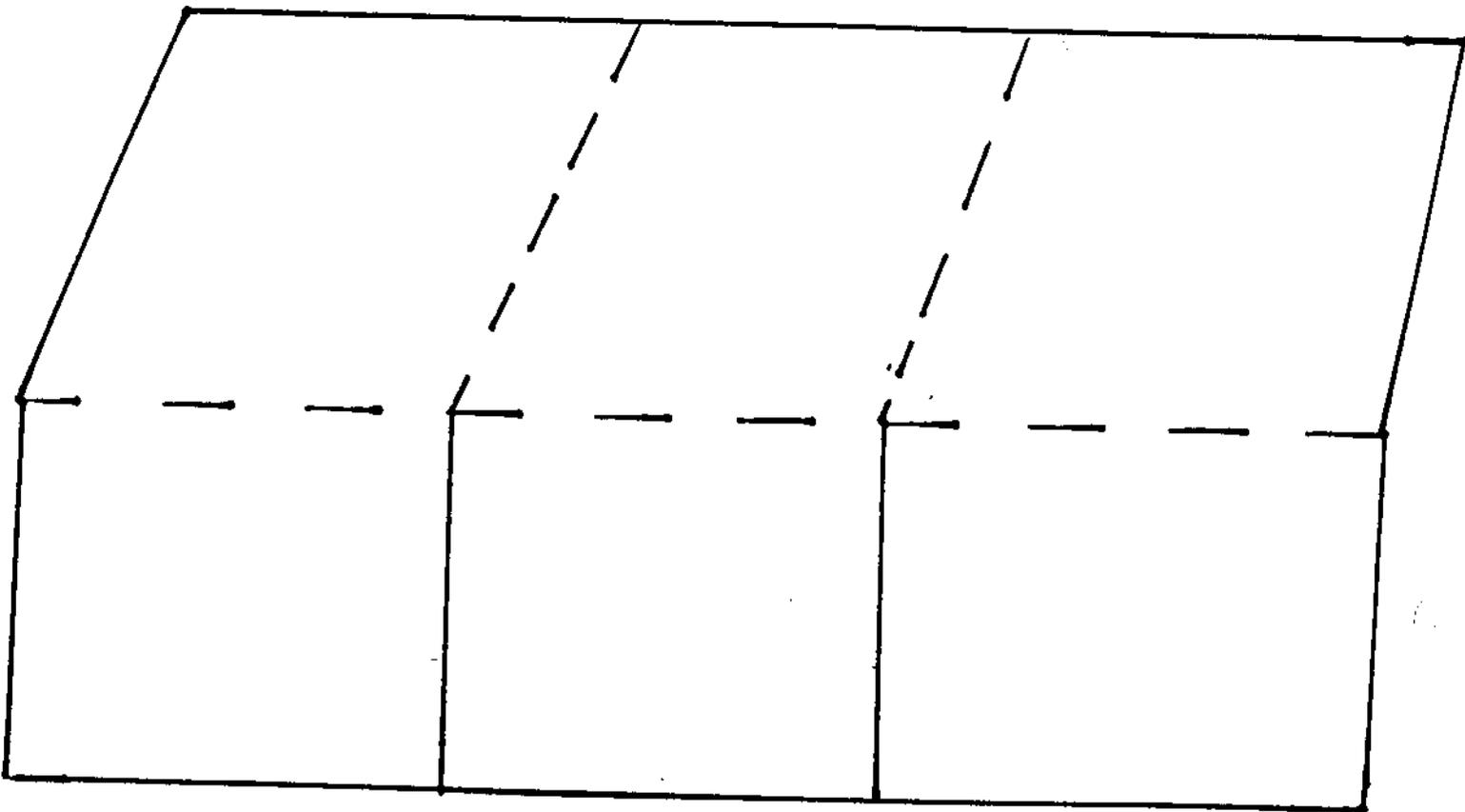
ENLARGE AND USE FOR FLANNEL BOARD PIECES.

APPENDIX B
FLAP BOOK EXAMPLE

FRONT



INSIDE



APPENDIX B
FLAP BOOK WORDS

solid

liquid

gas

ice

water

steam

Appendix F
Matter Chant

Hop on board the Science Train
And you will exercise your brain
Head on down the winding track.
Don't waste time looking back.

Solids, liquids, gases, too
I know about them, How about you?
Listen to me, you'll learn a lot.
Like what happens to a liquid when it gets hot.

Solids you can really see,
Like all the tables and the trees.
Solids keep their size and shape,
Like books and pens and rolls of tape.

A liquid's shape depends on what it's in,
Like glasses, bottles, pans, or tins.
Make a liquid very hot
And a gas is what you've got.

Gas is matter you cannot see.
The air is good for you and me.
Helium, oxygen, hydrogen, too.
I can name them and so can you.

We learned a lot upon this train.
We really exercised our brain.
Now our ride has come to an end.
We hope to sing to you again.

APPENDIX E

BINGO

APPENDIX E
BINGO CARD VOCABULARY

Solid

Liquid

Gas

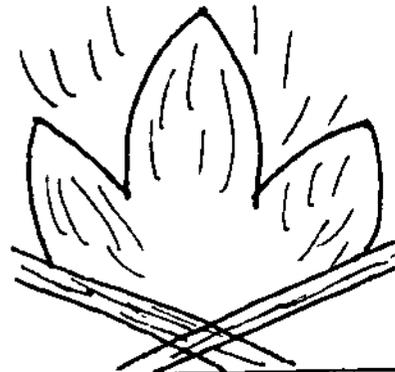
Visible

Temperature

Matter

Heat

Freeze



APPENDIX D
TASK CARDS

PERFORMER

PERFORMER

MATERIALS HANDLER

MATERIALS HANDLER

SPEAKER

SPEAKER

APPENDIX C
WORD BANK FOR STORY FRAME

frozen

gas

heat

liquid

matter

solid

temperature

Appendix C
Story Frame
Willy the Waterdrop

Brrr! Willy was so cold being the tip of an icicle. He was _____ solid. That night, he dreamed he was a liquid instead of a _____.

The next morning when the sun came out, the _____ warmed Willy. Willy started to change. His dream was coming true. He was turning into a _____.

Down, down, down Willy fell into the river with a plop. Willy was happy being a liquid. He splashed and played with the other water drops. But he was still cold.

Suddenly, he was scooped up into a shiny pan and placed with the other water drops. But he was still cold.

Suddenly, he was scooped up into a shiny pan and placed over a hot fire. The _____ felt so good to Willy.

Slowly, he began to change from a liquid to a _____. "Wow!" said Willy, this is the best state of _____.