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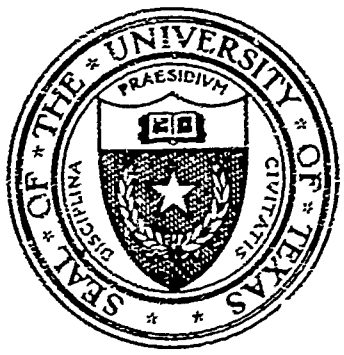
ABSTRACT

This instructional module for teacher education has two main goals: (a) participants will group objects or events and (b) participant will share his grouping with others, either verbally or with graphs. The graphing conventions used in the module are based on the materials developed by the Commission on Science Education of the American Association for the Advancement of Science in their program, Science - A Process Approach. The general pattern of instruction in this module is one of presenting the situation with as little instructor-direction as possible. After the participant has generated data, then the sequence provides illustrations of how the instructor could guide the discussion toward a meaningful description of the data gathered. The objectives of this instructional module are stated in performance terms. The format includes suggested time periods of each activity, materials for each activity, pre-appraisal for each performance objective, a description of the instructional activities, and post-appraisal. Because of the diagnostic data available in the pre-appraisal experience, it is possible to determine which instructional sequence appears to be most appropriate for which student. (BR)

DESCRIBING OBSERVATIONS

1st Experimental Edition

The Research & Development Center
For Teacher Education



THE UNIVERSITY OF TEXAS
AUSTIN

DESCRIBING OBSERVATIONS

1st Experimental Edition

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DESCRIBING OBSERVATIONS

David P. Butts

Science Education Center
and
The Research and Development Center for Teacher Education
The University of Texas at Austin

I. PERFORMANCE OBJECTIVES:

At the end of this session the participant should be able to:

1. Identify and name two dimensional and three dimensional shapes as parts of objects in the environment.

2. Name the minimal observable properties of an object or an event necessary to distinguish it from similar objects or events in a set.

3. Construct a two or more stage classification of a set of objects, based on observable properties.

4. Construct a graph for pairs of observations.

II. RATIONALE:

While it is recognized that the basis of all empirical knowledge is the experience of the individual, experience by itself is not equal to knowledge. We learn not by experience but by using our experiences. Being able to select parts of our experiences to share with others represents a task of no small magnitude. The ability to communicate to another is as important to a scientist as it is to any other educated person. Scientific studies which are not disseminated or available to other individuals lose much, if not most, of their value to science. The most important requirements of any scientific communication are accuracy, completeness and conciseness. Free associations and impressions have little place in such communication. Accuracy in detail, and completeness without embroidered elaboration must be such that the receiver of the communication has no doubt as to the purpose, method, and results of the study being reported. Producing scientific communication requires

skill and practice. For this reason the basic principles of communication are essential to children as well as adults.

There are three types of communication which are important to science: oral, written, and pictorial. At the earliest level in science instruction, oral communication is stressed. Then illustrations are introduced, and later, written communications are incorporated. These three types of communication are used to supplement each other.

The final test of any communication is whether the information is actually received by the reader or hearer. Scientific communication may be evaluated by determining whether the recipient of the information can locate or reproduce the results communicated. For example, can the individual locate among many similar objects the one to which the communicator is referring.

In addition to communication, another dimension of describing observations is that of classification. A classification is, in a sense, an extension of an observation. Careful observations are essential before classifications can be made. In each classification activity, it is necessary for the individual to make his observations even more explicitly than he did in those situations in which he was merely communicating observations.

Classification is a powerful tool for the scientist. In using this tool to describe observations, there is the opportunity to specify variety and complexity; there is an opportunity to differentiate using a systematic key and to generate a scheme for coding. Classification initially is based on properties which are directly observable. Recognizing similarities and differences among objects or events becomes of primary importance in establishing a classification scheme. This is followed, then, by skills in finding similarities and differences in a variety of things and establishing inclusive groups which are based on these similarities and more exclusive groups that are based on differences. All classification systems are arbitrary. Different ways of classifying the same set of objects may be more or less useful, depending upon the specific function the scheme is to serve.

In this instructional module, there are two main goals. The first is that the participant will group objects or events and will be able to share his grouping with others. The second goal involves the manner of sharing. It may be verbally or with graphs. The emphasis on the latter emerges since graphing is an extremely useful and powerful means by which one can communicate a relationship between objects and events. The graphing conventions used in this module are

based on the materials developed by the Commission on Science Education of the American Association for the Advancement of Science in their program, Science - A Process Approach.

The population for which this instructional program has been found to be effective includes pre-service and in-service elementary teachers who teach science.

The instructional activities of this module are based on the sequence in Figure 1.

The general pattern of instruction in this module is one of presenting the situation with as little instructor-direction as possible. After the participant has generated data, then the sequence provides illustrations of how the instructor could guide the discussion toward a meaningful description of the data gathered.

Because of the diagnostic data available in the pre-appraisal experience, it is possible to determine which instructional sequence appears to be most appropriate for which student. Experience indicates that if 80 percent of a group performs well on an appraisal task, the related instruction activities should be omitted. For this instructional module, this is illustrated as:

Objective	Appraisal Task	Instructional Activity
1	I, II	1
2	III	2
3	IV	3
4	V	4

Evaluation Data:

The results of students involved in the instructional experience as described in this module are as follows:

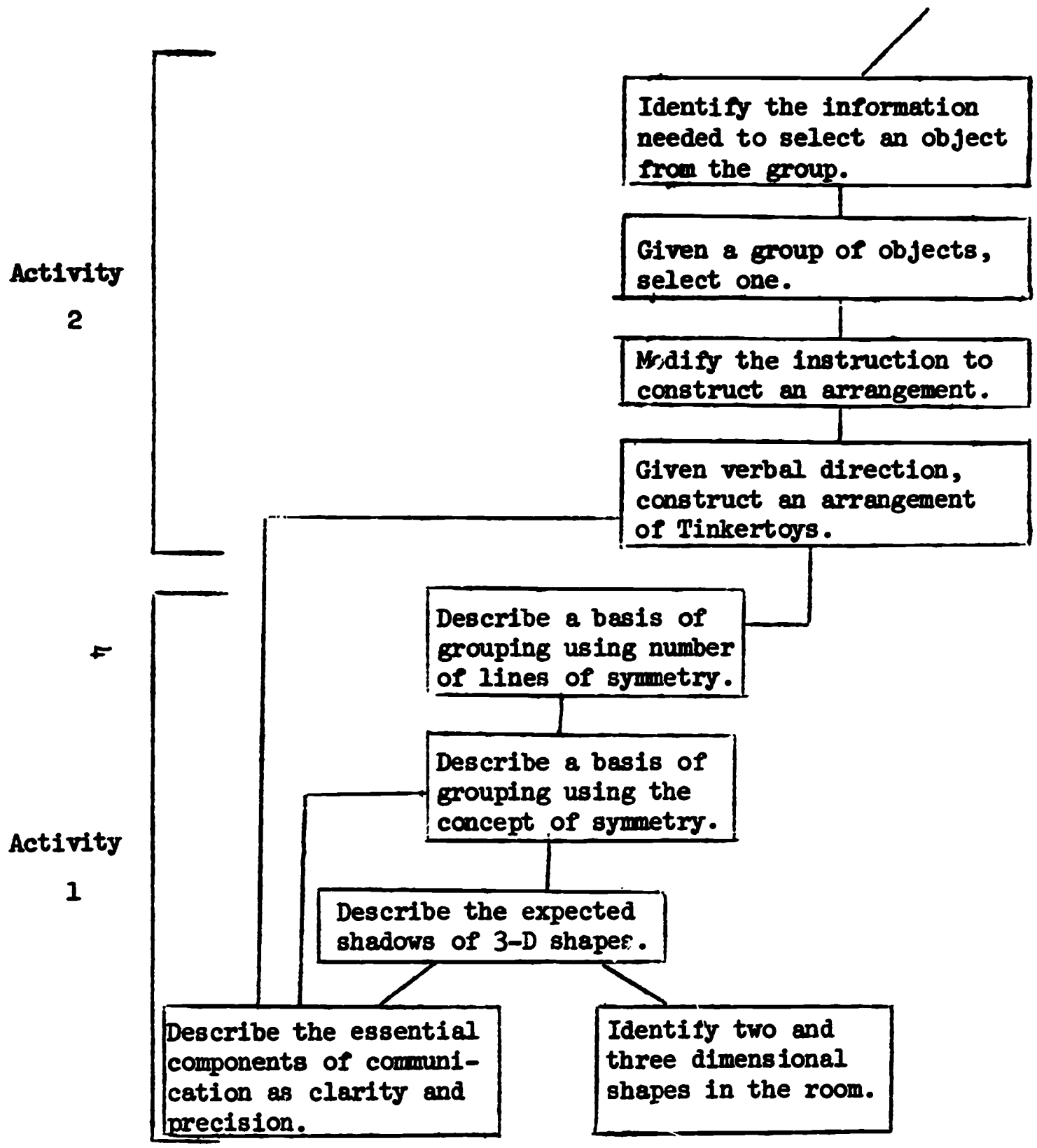
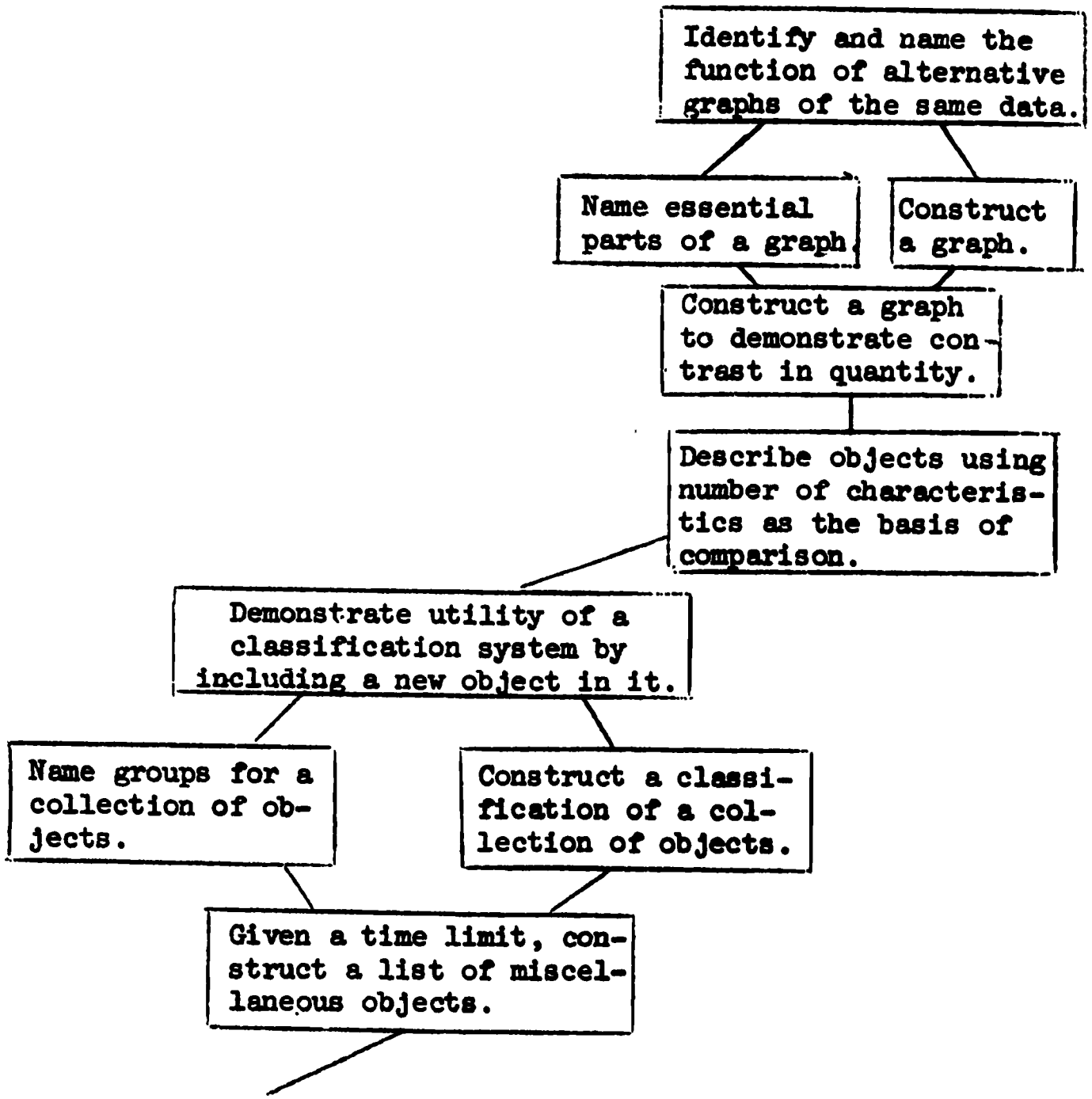

Activity 2
Identify the information needed to select an object from the group.
Given a group of objects, select one.
Modify the instruction to construct an arrangement.
Given verbal direction, construct an arrangement of Tinkertoys.
Activity 1
Describe a basis of grouping using number of lines of symmetry.
Describe a basis of grouping using the concept of symmetry.
Describe the expected shadows of 3-D shapes.
Describe the essential components of communication as clarity and precision.
Identify two and three dimensional shapes in the room.
Pre-Appraisal
I, II
III
IV

FIGURE 1.

Objectives	Identify and name two dimensional and three dimensional shapes as parts of objects in the environment.	Name the minimal observable properties of an object or an event necessary to distinguish it from similar objects or events in a set.	Construct a two or more stage classification of a set of objects, based on observable properties.	Construct a graph for pairs of observations.
Post-Appraisal	I, II	III	IV	V

Activity 4



Activity 3

(Figure 1 continued)

With a group of pre-service teachers, N = 22.

	Pre	Post
Task I	3	20
Task II	1	18
Task III	18	17
Task IV	3	12
Task V	3	19

The time periods required for this instructional module included:

A. Planning for instruction: Avg. 5 hours (est.)
(Range: 2 to 10 hours)

B. Teaching: Avg. 125 minutes (est.)
(Range: 40 to 240 minutes)

Suggested time periods for the module are as follows:

A.	Pre-Appraisal	20 minutes
B.	Activity 1	30 minutes
C.	Activity 2	15 minutes
D.	Activity 3	20 minutes
E.	Activity 4	20 minutes
F.	Post-Appraisal	20 minutes
	Total	125 minutes

III. REFERENCES:

Commission on Science Education. Science - A Process Approach, Commentary for Teachers. AAAS Miscellaneous Publication, 65-22, 1968, pp. 59-77, 78-83, 109-119.

Jacobsen, Willard and Kondo, Allan. Science Curriculum Improvement Study. SCIS Elementary Science Sourcebook. University of California: Berkeley, California, 1968, pp. 99-103, 131.

IV. MATERIALS LIST

Pre-Appraisal	Dr. Pepper bottle	
	Transparency A	Group of fruit (apple, banana, orange, grapes, cherries)
	DO #1	(1 per participant)
Activity 1	SVE Farm Animal Pictures..... (1 set)	Any large pictures of farm animals, including a cow, horse, rooster, and others, will be adequate.
	Packet A ..... (1 per 4 or 5 participants)	Includes a set of felt, manila, or other paper cutouts of 2-D shapes: square, circle, rectangle, triangle, ellipse; a set of plastic, wooden, or styrofoam 3-D shapes: cube, sphere, cylinder, rectangular, parallelepiped, triangular or rectangular pyramid, ellipsoid, cone.
	Scissors (1 pair)	
	Construction paper (various colors, 12-20 sheets)	
	Packet B..... (1 per 4 or 5 participants)	Includes paper cut-outs of hexagon, ellipse, parallelogram, octagon, equilateral triangle, pumpkin, pear, house, doll, and letters (all items designed so as to be symmetrical).
Activity 2	Packet C ..... (1 per participant)	Includes 8 pieces of Tinkertoys which can be fitted together into a construction (restrict to 2 colors of toys).
	Packet A (from Activity 1)	
Activity 3	Packet D (1 per 4 or 5 participants)	15 objects such as a pencil, eraser, rubber band, paper clip, wooden cube, sugar cube, small ball, petri dish, and circular paper shape, penny, washer, etc., contained in a box.
	Large chart paper (1 per 4 or 5 participants)	
	Felt pen (1 per 4 or 5 participants)	

	Coin	
	Set of vegetables (1)	May be fresh, or plastic, or pictures of vegetables, such as Irish potato, sweet potato, radish, carrot, beet, green onion, white or purple onion, turnip, celery, and head lettuce (no tomato).
	DO #3	1 per participant
	Green pepper (1)	
	Orange (1)	(fresh, plastic, or picture)
Activity 4	Packet D (from Activity 3)	
	Plain or ruled paper (2 per participant)	
	DO #4	1 per participant
	Large chart paper (1 per 4 or 5 participants)	
	Transparencies B,C, and D	Series of graphs; refers to those used in item #59.
Appraisal	Round primary pencil, sharpened	
	DO #2	1 per participant
	Transparency E	Group of configurations
	DO #5	

V. INSTRUCTIONAL ACTIVITIES

Pre-Appraisal (Time: Approximately 20 minutes)

(Direction: Use transparency A, Dr. Pepper bottle, and distribute copies of DO #1.)

1. This activity will provide an opportunity for you to check on your describing behavior. Take 10 minutes to do the task. Do what you can do in 10 minutes. Your score will be the number of acceptable responses.

2. Here are the acceptable responses for the five tasks. If you have 4 of the 5 on Task I, circle Task I on your paper; 8 of 10 possible tasks for Task II, circle Task II on your paper; 5 of 5, circle Task III; 5 of 5, circle Task IV; 3 of 4, circle Task V.

Tally the number having acceptable responses for each task in the following way:

Objective	Task	Number Having Acceptable Responses
1	I	
1	II	
2	III	
3	IV	
4	V	

Activity 1 (Instruction time: approximately 30 minutes)

Objective 1: Identify and name two dimensional and three dimensional shapes as parts of objects in the environment.

(Direction: Display 4 or 5 of the SVE Farm Animal pictures, including cow, horse, and rooster.)

3. Please find the picture of the thing that has a gizmo on top of one of its ends.

Expect puzzlement from the participants, but accept all responses.

4. Point to the cone-shaped projection on the head of one of the animals.

There are several such projections that the participants could identify such as cow's horns, goose's beak, chicken beak, horse's ear.

(Direction: Refer to activities #4 & 4.)

5. What was the difference in the two tasks?

The chief contrast is the preciseness of the description and the clarity with which you know what was expected of you.

(Direction: Distribute Packet A to each of the groups of 4 or 5 participants. Packet A includes the two and three-dimensional shapes.)

6. Select one of the objects in your packet and find another object here in the room that has a shape similar to the

shape of your object. Name both the shape of your object and the object in the room that is shaped like it.

Continue this activity until the various participants have each had an opportunity to identify and name several of the two- or three-dimensional shapes and make sure that <u>each</u> of the shapes has been used.

(Direction: Use the cube-shaped object to demonstrate on the overhead projector, without allowing participants to see the cube on the stage.)

7. As I turn on the light, what is the shape of the shadow you see?

The group would observe a square-shaped shadow from both images of the overhead projector.

8. What do you think the object on the stage is?

(Direction: Hold up the sphere-shaped object.)

9. Draw the shape of the two shadows you expect to see from this object. Label them Shadow 1 and Shadow 2.

As you walk among the group, you should be able to identify any who are unable to visualize both shadows as being like a circle.

Continue this activity with the ellipsoid, pyramid, cone, and rectangular parallelepiped. Verify the shadows by demonstrating two positions on the overhead projector.

10. How was the task of "shadows" related to our subject of <u>Describing</u>?

(Direction: Use construction paper and scissors for this activity.)

11. As I cut out these pieces of paper, I am placing them into two groups. When you think you can identify the reason for the two groups, please share it with the rest of us.

Deliberately fold the construction paper before you cut shapes for one pile -- do not fold the paper for the shapes in the second pile. The participants may identify color, straight and curved sides, etc., as your basis. Someone may say that the basis of grouping is the fold. Accept all responses. If fold is mentioned, continue.

12. You think this pile belongs together because they are all folded, and these belong together because they are not folded. That's a good idea, but it is not the basis that I'm using.

Then proceed to fold all the paper objects in the second pile.

(Direction: After you have 12-15 paper objects in each pile, you may need to help the group focus their attention on the similarities and differences in the paper objects.)

13. In what way are all the paper objects alike in this group, and different from the paper objects in the second group?

Several suggestions may be made by the participants. The specific reason which is appropriate is the relationship between the timing of folding the piece of paper (before or after cuting), resulting in some of the paper objects having matching sides.

(Direction: When suggestions of this type are made, scramble all of the paper objects into one pile.)

14. _____, please group these objects using the basis that _____ has just described.

When this can be successfully done, you may want to introduce the word, symmetry. (One way to do this is to ask:)

15. When the two sides of an object match, what is the label or name we give to that characteristic?

If no one answers, give them the word symmetry and its opposite, asymmetry.

(Direction: Distribute Packet B which includes a cut-out of a hexagon, parallelogram, ellipse, equilateral triangle, pumpkin, pear, house, and doll. Also a series of cut-out letters. These packets should be distributed to groups of 4 or 5 participants.)

16. Arrange the letters into two groups -- one that has symmetry and one group that is not symmetrical.

This task will give an opportunity for the participants to display their ability to use the concept of symmetry with a new set of objects.

17. Now look at the paper objects you have in your packet. How many of them are symmetrical?

The acceptable response to this is that they are all symmetrical.

18. Separate the eight paper objects into two groups -- those that are symmetrical in only one way and those that are symmetrical in more than one way.

Note that the triangle, hexagon, ellipse, octagon, and rectangle are symmetrical in more than one way. You may wish to have the various participants demonstrate their conclusion.

19. What is the relationship between this "symmetry" activity and Describing Observations?

Activity 2 (Instruction time: about 15 minutes)

Objective 2: Name the minimal observable properties of an object or an event necessary to distinguish it from similar objects or events in a set.

(Direction: Distribute Packet C (Tinkertoys). Select one of the participants to go out of view of the other participants and assemble all or part of the Tinkertoys into some configuration. The other groups will have the contents of Packet C laid on the table.)

20. We have been describing objects and their grouping to each other. _____, will you take the objects. I'd like for you to assemble all of the objects and as you do it to describe for us what to do so that we can construct the same arrangement of our Tinkertoys.

Because of sound problems, you may need to stand near the door and repeat the directions from the participants. Caution: Do not let the other participants ask questions about the directions. If they are not clear, the results will be observable. Do not allow the one giving directions to see what the other participants are doing.

When the directions are complete, have the participant who gave the directions walk around the room and silently observe the results.

21. As you observe the results, what directions, if any, would you change? For what reason would you change these directions?

The changes in direction will probably result from ambiguities as to what part of the set of Tinker toys should be placed where.

22. As you followed the directions for assembling the Tinkertoys, what specifically helped you?

Here you have the opportunity to assist the participants in identifying conciseness and preciseness as the two key features of functional communication.

(Direction: Use the two and three dimensional shapes in Packet A of Activity 1.)

23. My set of objects is just like yours. I will describe one of them. If you think you have enough information to select the object from your group, say "May I." If you do not have enough information, say "More information please."

These are the ground rules which are similar to the fun activities in the exercise, "Identifying an Object."

(Direction: Select the cube and a participant to respond.)

24. Show me the object which has a point on it.

The participant will not be able to show you the object, for that description, "a point on it" applies to the pyramid, cone, rectangular parallelepiped, as well as the cube. Thus, the participant should say "More information please."

25. Why do you need more information?

Here you are helping the participant focus on the reason that your first communication was inadequate.

26. Show me the object that has straight lines.

This response should also be "more information please."

27. Show me the object that has a square or 90° corners.

Again, the response should be "more information, please," for the objects with points, straight edges, and 90° corners applies equally well to the cube or parallelepiped or the square-based pyramid.

28. Show me the object that has a square shaped surface.

Note that the parallelepiped, the cube, and the square-based pyramid fit this description as well.

29. Show me the object that has only square shaped surfaces.

At this point the participants should be able to respond with "May I."

(Direction: After identifying one or two of the objects, have one of the participants be the describor and continue the activity with the group

OR

As an alternative, group the participants in teams of two and continue to practice in this precision of communication.)

30. With what specific skill have we been working?

Precision in communication.

Activity 3 (Instruction time: About 20 minutes)

Objective 3: Construct a two or more stage classification of a set of objects, based on observable properties.

(Direction: Distribute Packet D for each group of 4-5 participants which is an assortment of 15 objects, such as a pencil, eraser, rubber band, paper clip, wooden cube, sugar cube, small ball, petri dish, and circular paper shape. For Steps 31-34 use the transparency that pictures the objects.)

31. Observe this transparency for 15 seconds (or open the box, look, and close -- after 15 seconds).

At the end of 15 seconds, turn off the projector.

32. Now list as many of the objects on the transparency as you can.

Check the results of the group to see how many objects were listed.

33. You may now look at the transparency again for 15 seconds and then list the items again.

When they have completed the listing, identify how many more objects were listed after the second effort than after the first.

34. For what reasons did you improve your list the second time?

Some of the reasons may be that they remembered their first list and looked only for those items that they had not remembered.

35. Take the objects out of the packet and group them in this way -- those that all of your group listed the first time, and those that you all did not list the first time. In what way are the objects alike in the first group and different from those in the second group?

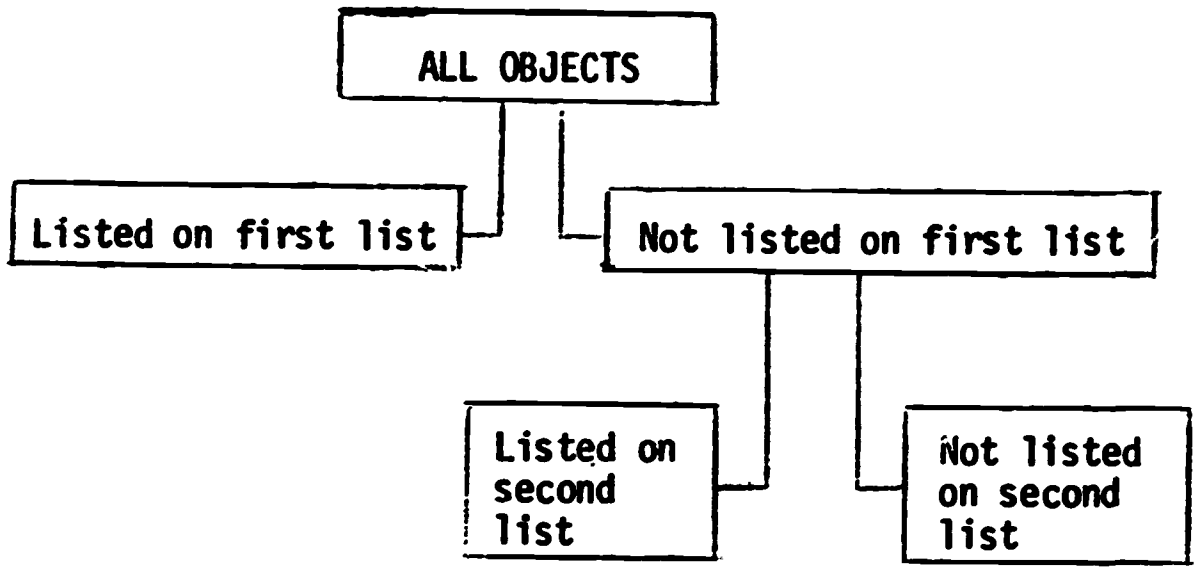
Note here they may start looking for physical characteristics or uses of objects. You may find it necessary to remind them of the basis of the grouping, that is, those they listed the first time and those they did not list the first time.

36. Name each of the two groups based on the way in which you grouped them.

They may choose names such as "first list," "not first list," or "saw" and "did not see," etc. It will be helpful if you redirect their labels so that in each case one label is a positive description and the other label is the same description with not added. For example, "first list" - "not first list." Select one table's groupings and use their second list.

37. I have taken this table's "not" group and regrouped it. What should be the name for the new groups?

Accept various responses. One acceptable response is that your new grouping is based on the objects that were listed the second time and those that were not listed the second time. Therefore, you end up with something like this:



(Direction: Distribute large sheets of chart paper and felt pens to each group. Display one with a large circle at the top.)

38. Each of your tables has a set of objects and a large sheet. Place the objects in the large circle at the top of the page. What name will you give that circle? Now continue to regroup the objects as we did based on listing, until there is only one object in each circle. Caution: We will be sharing the results with the others in our group, so please be explicit.

As the groups work, you may wish to note who at each table seems to be the leader. When they are finished, have the charts displayed around the room.

(Direction: Select a participant and a chart he did not prepare.)

39. _____, will you show me where the pencil belongs on one of these charts?

If the participant is not able to find the proper place on the chart, have him or the group decide what the difficulty is. You may want to continue the practice if the task is not clear.

(Direction: Use an object not a part of the set of objects, such as a chalkboard eraser or thumb tack or coin -- something not originally in the box.)

40. Show me where this would be placed on the chart.

41. What are some guides, useful for classifying?

1. Select a characteristic that is shared by 1/2 of the group, so that the original group is divided into 2 groups.

2. Make the 2 group categories mutually exclusive, as: BLUE and NOT-BLUE and use as titles.

3. Continue dividing groups until each item is isolated.

HINT: In each category, identify each item included in that category.

(Direction: Display a set of vegetables. Pictures or plastic vegetables will do if you don't want the mess and the fun of the real thing. A suggested set of vegetables would be a white potato, sweet potato,

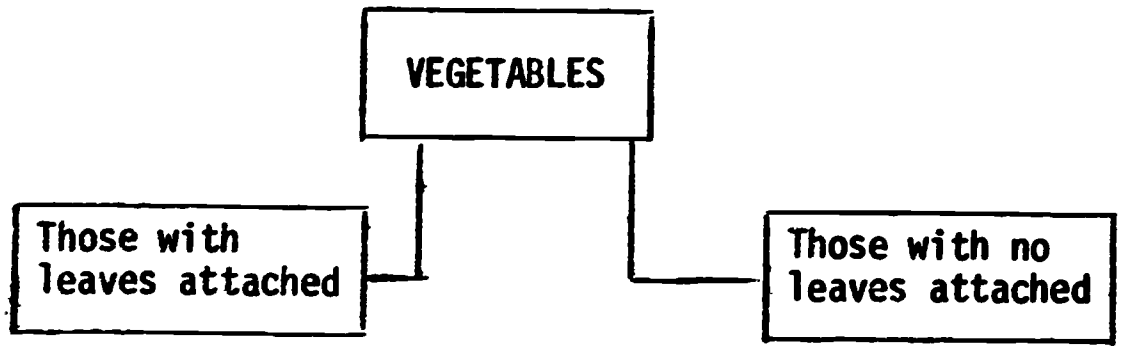
radish, carrot, beet, green onion, white or purple onion, turnip, celery, and head lettuce.

42. If we limit ourselves to only those properties that are observable, make two groups of these vegetables.

You may wish to note that it is usually most helpful to seek a property that divides the group into two sub-groups of about the same number.

43. What are the names of the three groups on our chart?

The first stage of all the objects might be labeled "Vegetables," and the second stage labeled "Those with leaves attached" and "Those with no leaves attached."



(Direction: Distribute DO #3 to each participant.)

44. Continue to group the vegetables until you have only one in a box and name the property you used for grouping at each level. Please note there are three ground rules.
   1. You may not name the vegetables as a property.
   2. You may use only observable properties -- not where it comes from or how it grows.
   3. You do not have to use the boxes as drawn on the sheet; some may be empty when you are finished, or you may need to add some.

As the participants work individually you will have the opportunity to assist those to whom the task of classifying is

still not clear. When most of the participants have completed this task, suggest that everyone finish within the next minute or two.

45. Let's make a list of the various properties we used.

As the participants name the properties they used, others may challenge some if they are not fully observable.

(Direction: Display the green pepper and orange.)

46. Here are two new objects. Show me where they would fit on your chart.

The green pepper's location may vary depending upon the organization of the chart. The important thing is that it can be placed somewhere.

The orange has really only one location. It is not a vegetable, which means that the whole chart will have to be changed to include at the top, "Fruit and Vegetable." The sub-categories under that would be "vegetable" and "not vegetable."

47. Around your table you have been working with five other people. Each of you is a distinct person with a name, as was the green pepper a distinct object with a name. Using the differences in your clothes, construct a classification scheme so that each person can be identified.

This is both a fun activity and a delightful opportunity for you to see how well classification and its communication comes through.

48. In what way does classifying parts of a system help you to describe it?

Activity 4 (Instruction time: about 20 minutes)

Objective 4: Construct a graph for pairs of observations.

49. Let's return to the box of objects. How many objects had a shape like a circle? like a square? like a triangle? like a rectangle? like an ellipse? Suppose you wanted to communicate this but could not use words, how might you do this?

You are continuing to emphasize the task of describing, but now the shift in focus is to the ways in which one can communicate without using words. Accept various responses from the participants such as drawing pictures, bar graphs, etc.

50. Suppose we wanted to draw a bar graph to communicate the shapes we see in a set of objects. Show how you could do this.

Use blank page after DO #3. You may want to give the participants plain or ruled paper. After a few minutes at the task, review their progress.

51. _____, tell me what your partner's paper tells you.

Doing this provides an opportunity for the participants to see how well their graph communicates.

52. Just to review -- as I construct a graph of this data in which we had 2 rectangles, 3 circles, 2 squares, 2 ellipses, and 0 triangles, what should I put along the base line?

You can put either names of shapes or numbers of shapes. The choice is arbitrary, but convention holds that we put the categories we choose or name along the base line and those we count or measure along the verticla axis.

53. If I put the number along the side, how far do I need to count?

The range of our data is from 0 to 3.

54. Do I number the lines or spaces?

Here again the choice may seem arbitrary, but if one thinks about it, one quart of ice cream is not really a quart until it is up to the top! Hence, we number lines, not spaces.

55. Should the labels on the base line be on spaces or lines?

For making a bar graph, it really doesn't matter, but we do know that the fewer rules we have the simpler life is; hence, it is helpful to always label lines and never spaces.

Now complete the graph.

56. Write the name of:
    1. your governor
    2. one U.S. senator from your state
    3. the mayor of your town
    4. Secretary of Defense
    5. Chief Justice of the Supreme Court
    6. the mayor of New York City

Review the correct names of these people and then tabulate how many of the participants had the correct response for each task. For example,
out of a class of 26, 24 named the governor, 25 the senator, 26 the mayor, 11 the Secretary of Defense, 4 the Chief Justice, and 18 the mayor of New York City.

57. Construct a graph using the conventions we have discussed.

Observe those who appear to have difficulty. Have them tell you what their problem is and in this way, assist them toward its solution.

(Direction: Hand out DO #4 and large chart paper.)

58. Here is a set of data showing the results of student achievement scores in spelling between the first test and the last test in which a teacher used a new approach to spelling. As a group, construct a graph you think best communicates how effective the teacher's new approach to spelling was.

After the group has completed the task, display the chart paper around the room. Review the graphs for adequacy of detail: are they labeled? are the lines named and numbered and not the spaces? and are the points correctly plotted?

59. Which graph communicates the best answer to the question, "How effective was the program?"

There are various possibilities for the graphs: (see the following pages)

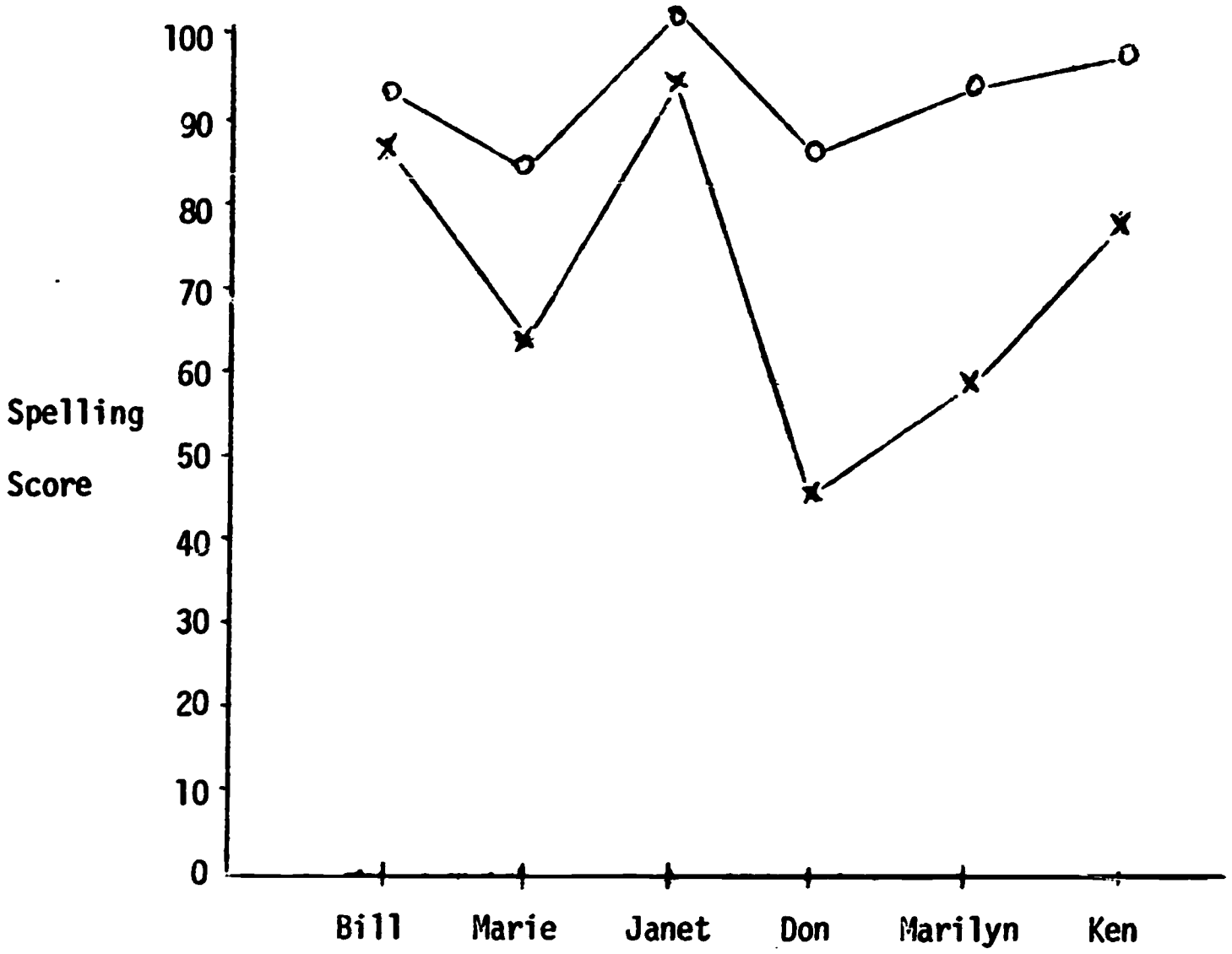
You may wish to have transparencies C, D, and E of each of these graphs and have the group select the one that most clearly answers their questions.

60. Let's review the conventions of graphing.

1. Place categories named along the base line.

2. Place categories counted or measured along the vertical axis.

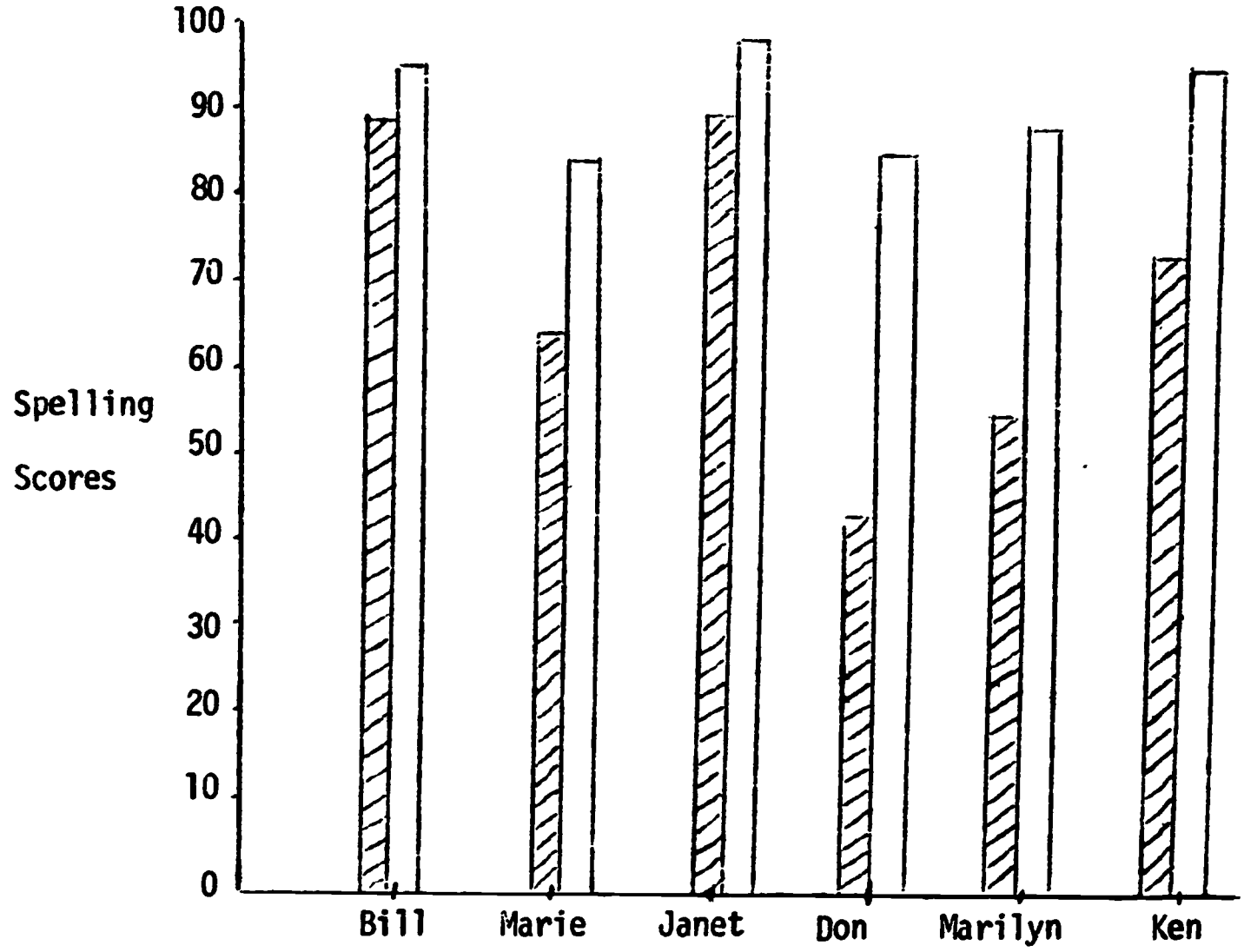
3. Label lines and never spaces.



January and March Spelling Scores

X = January score

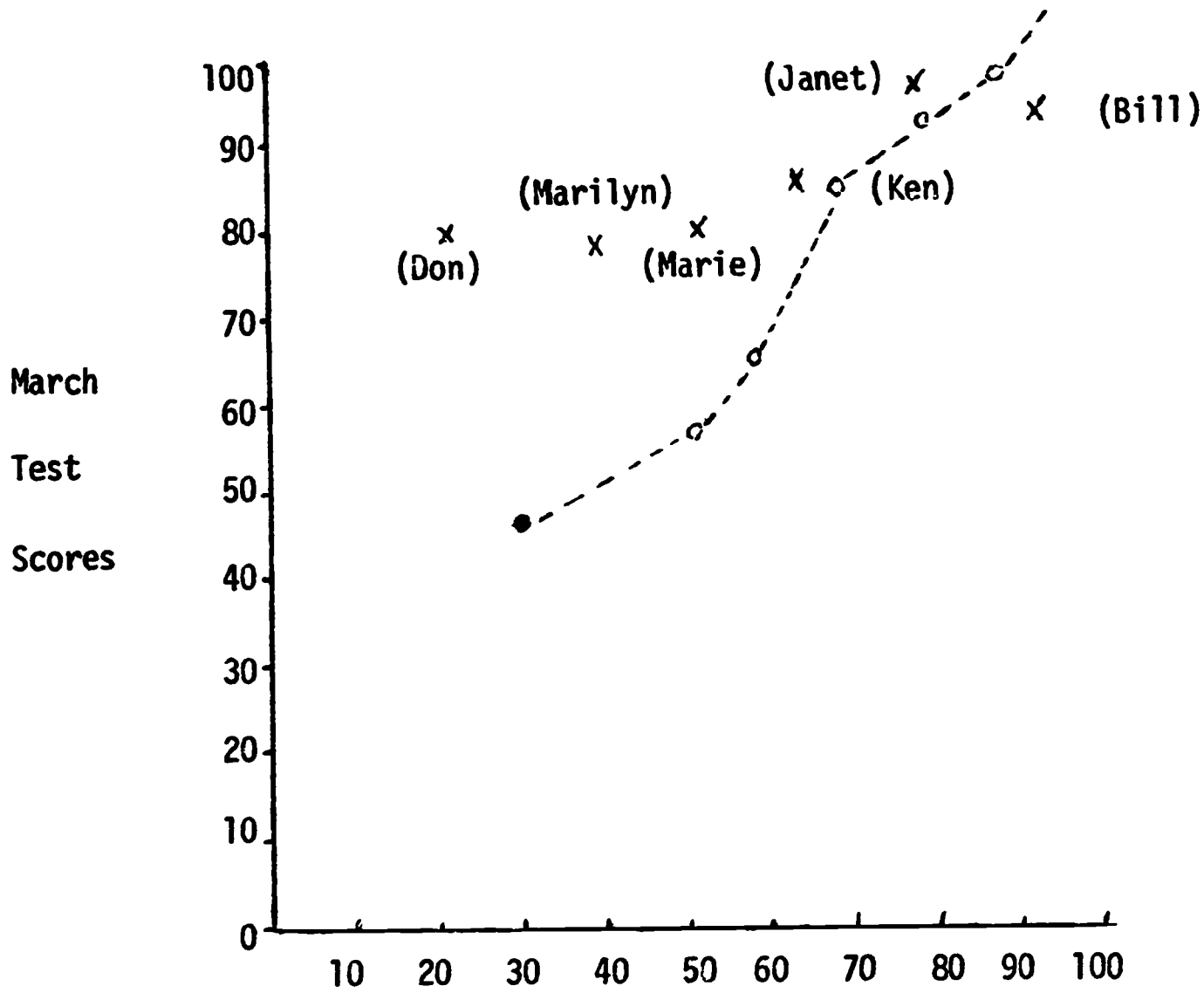
O = March score



January and March Spelling Scores

= January score

= March score



o = what was expected if all students were helped the same by the new spelling approach.

x = what was observed.

Appraisal (Time: about 20 minutes)

(Direction: Use DO #2, round primary pencil, sharpened, and transparency F.)

61. To check up on how well you have done, here is a learning diagnosis sheet. You will have a few minutes in which to respond. At the end of this time we will review the responses.

When the task is completed, give immediate feedback to the participants by providing acceptable responses. Tally the results of the group, as for the pre-appraisal. You may wish to have participants compare their own pre- and post-appraisals. If additional help is needed, individuals may be referred to supplementary material in the Commentary for Teachers, (Science - A Process Approach), 1968.

You may wish to use the Overview of Describing Observations, DO #5, as a basis for discussing how the task of describing observations can be approached in working with young children.

Duplicated Materials -- Without Answers

DESCRIBING OBSERVATIONS

TASK I

Name the two-dimensional and three-dimensional shapes which are part of the Dr. Pepper bottle.

Shapes: Two-dimensional _____

_____

Three-dimensional _____

_____

TASK II

By checking the appropriate column, identify the shape of the shadows cast by these objects:

	□	○	△	▯	0
a. cylindrical pill bottle					
b. base ball					
c. child's alphabet play block					
d. egg					
e. dunce cap					
f. cigar box					

TASK III

Examine the drawings of fruit. List only those characteristics of each sketch necessary to distinguish it from the others.

A. _____

B. _____

C. _____

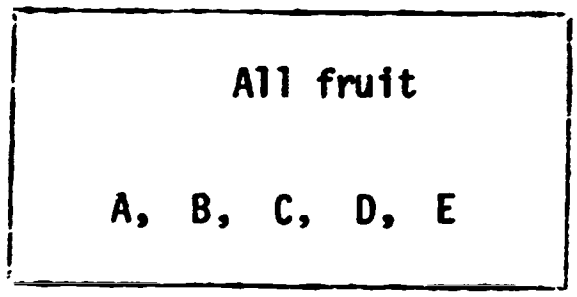
D. _____

E. _____

TASK IV

Construct a classification system based on your descriptions in Task III.

The classification scheme you construct should be such that another person could use it to identify and name each of the fruits by using just the key you constructed and the transparency. At each stage in your system, name both the property used to separate the fruit and the name of the fruit that has the property.



TASK V

In two classes, the children were listing their pets. The results were as follows:

Mrs. G's second-grade class

Pet	Number of Children Having One
Dog	11
Cat	9
Monkey	1
Parakeet	3
Gold Fish	4
Guinea Pig	1

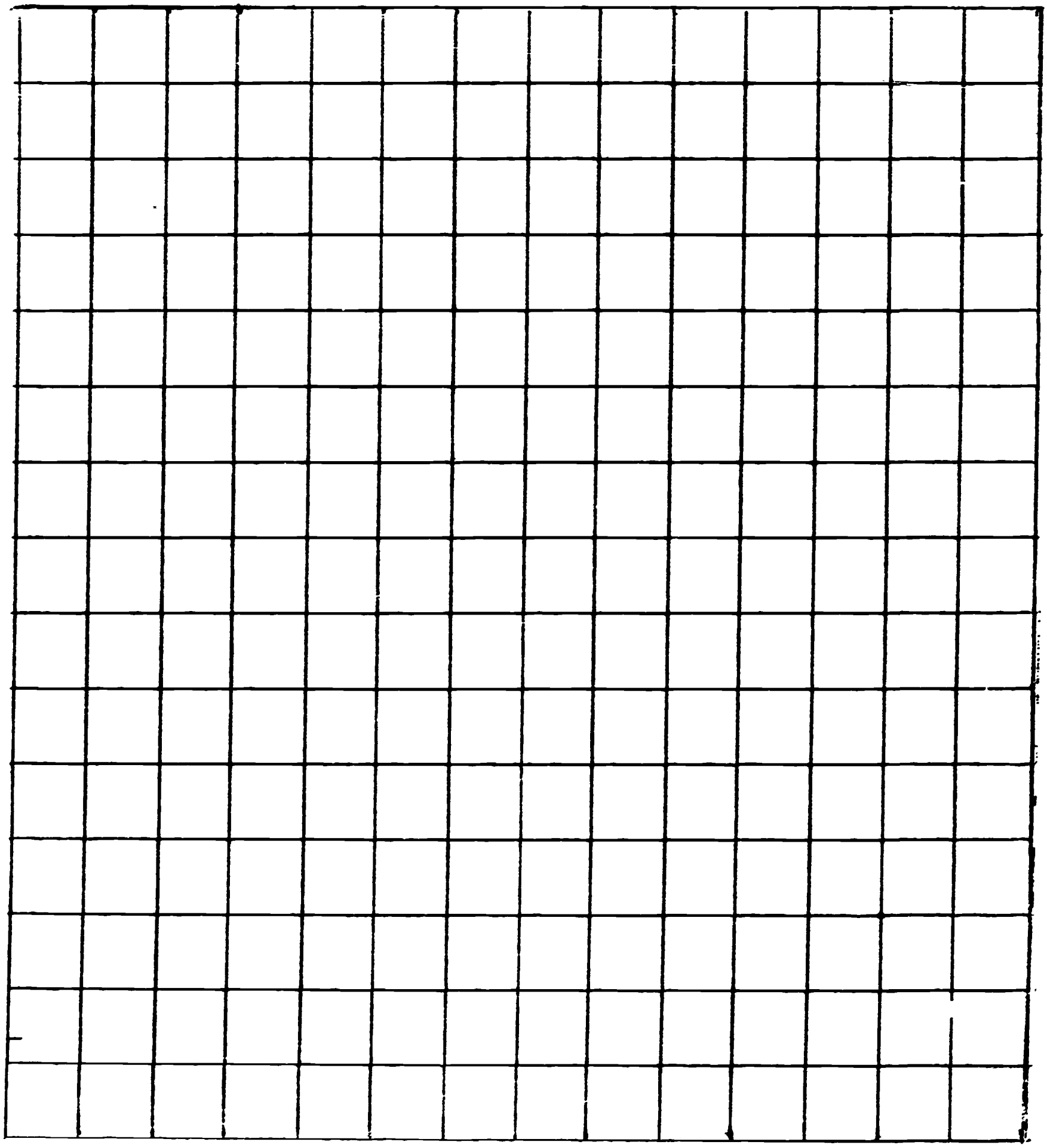
Mrs. H's second-grade class

Dog	16
Cat	11
Parakeet	2
Monkey	3
Gold Fish	4
Guinea Pig	1

Construct a graph that shows the comparison of the results of the survey of pets in both classes.

Which pet was the most popular? _____

Which pet was the least popular? _____



DESCRIBING OBSERVATIONS

TASK I

Name the two-dimensional and three-dimensional shapes which are parts of a sharpened primary pupil's round pencil.

Shapes: Two-dimensional _____

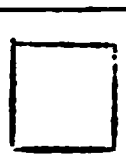
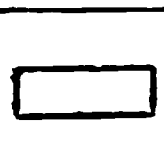
_____

Three-dimensional _____

_____

TASK II

Identify, by checking the appropriate column, the two-dimensional shapes which are parts of the following three-dimensional figures:

					
a. cylinder					
b. sphere					
c. cube					
d. ellipsoid					
e. cone					
f. rectangular parallelepiped					

TASK III

Examine the drawings. List only those characteristics of each sketch necessary to distinguish it from the others.

3. _____

10. _____

15. _____

34. _____

20. _____

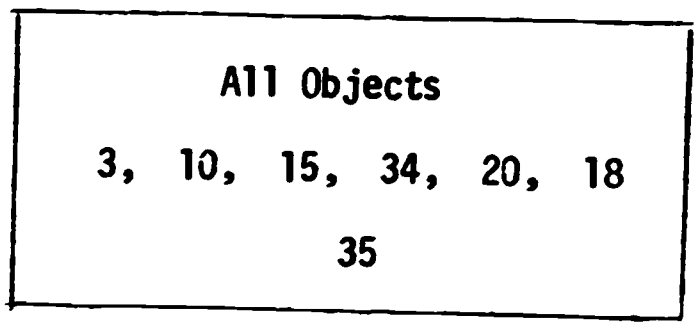
18. _____

35. _____

TASK IV

Construct a classification system based on your descriptions in Task III.

The classification scheme you construct should be such that another person could use it to identify and name each of the objects by using just the key you constructed and the transparency. At each stage in your system, name both the property used to separate the objects and the number of the object that has the property.



TASK V

The teacher in two fourth-grade classes made a survey of the students' opinion of the cafeteria menu. The results were as follows:

Mrs. M's Class

Menu	Number of Students Who Approved
Hamburger	29
Meat Loaf	26
Coney Sticks	18
Chicken Legs	21
Fish Sticks	8

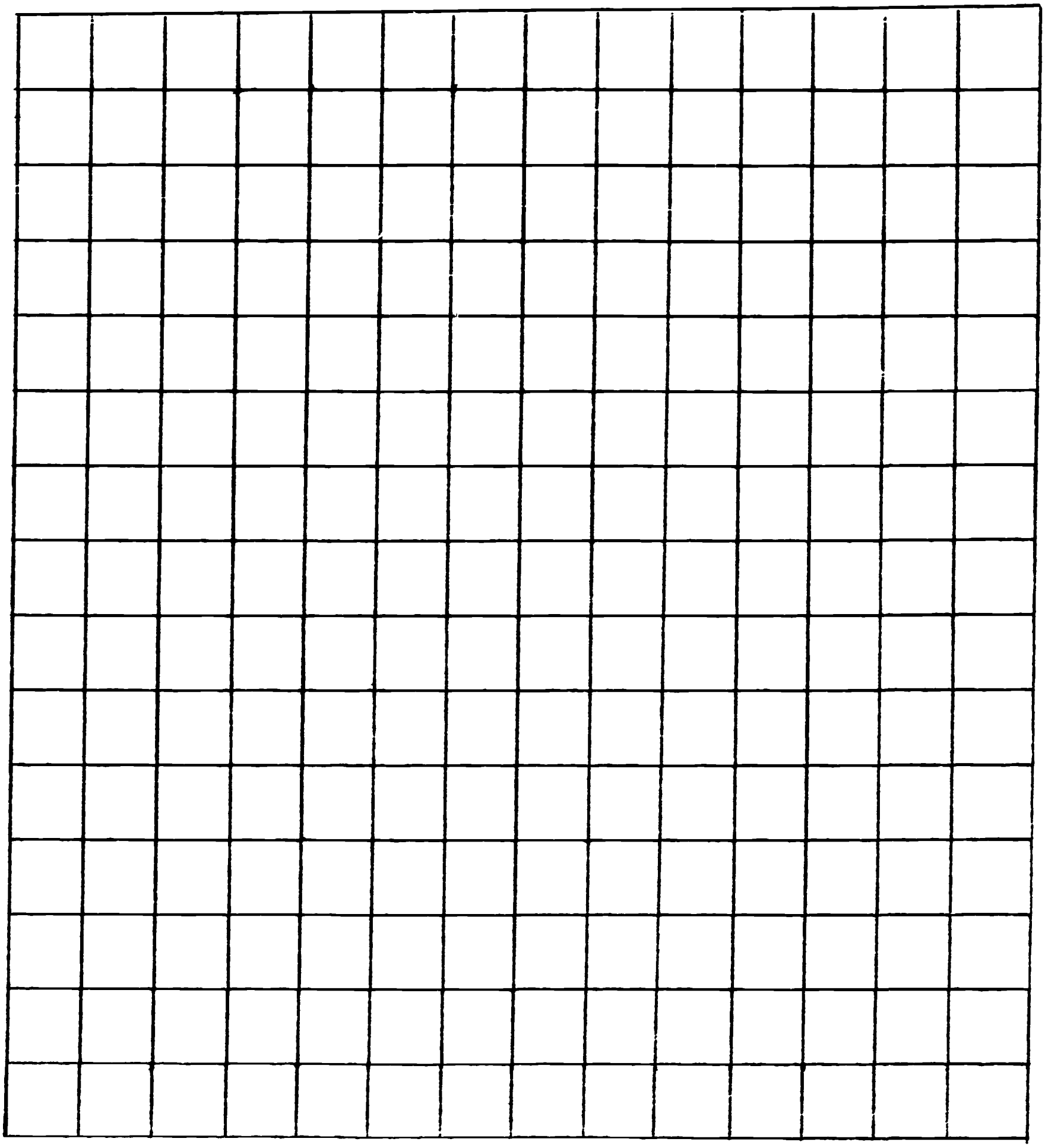
Mrs. W's Class

Hamburger	28
Meat Loaf	24
Coney Sticks	30
Chicken Legs	18
Fish Sticks	4

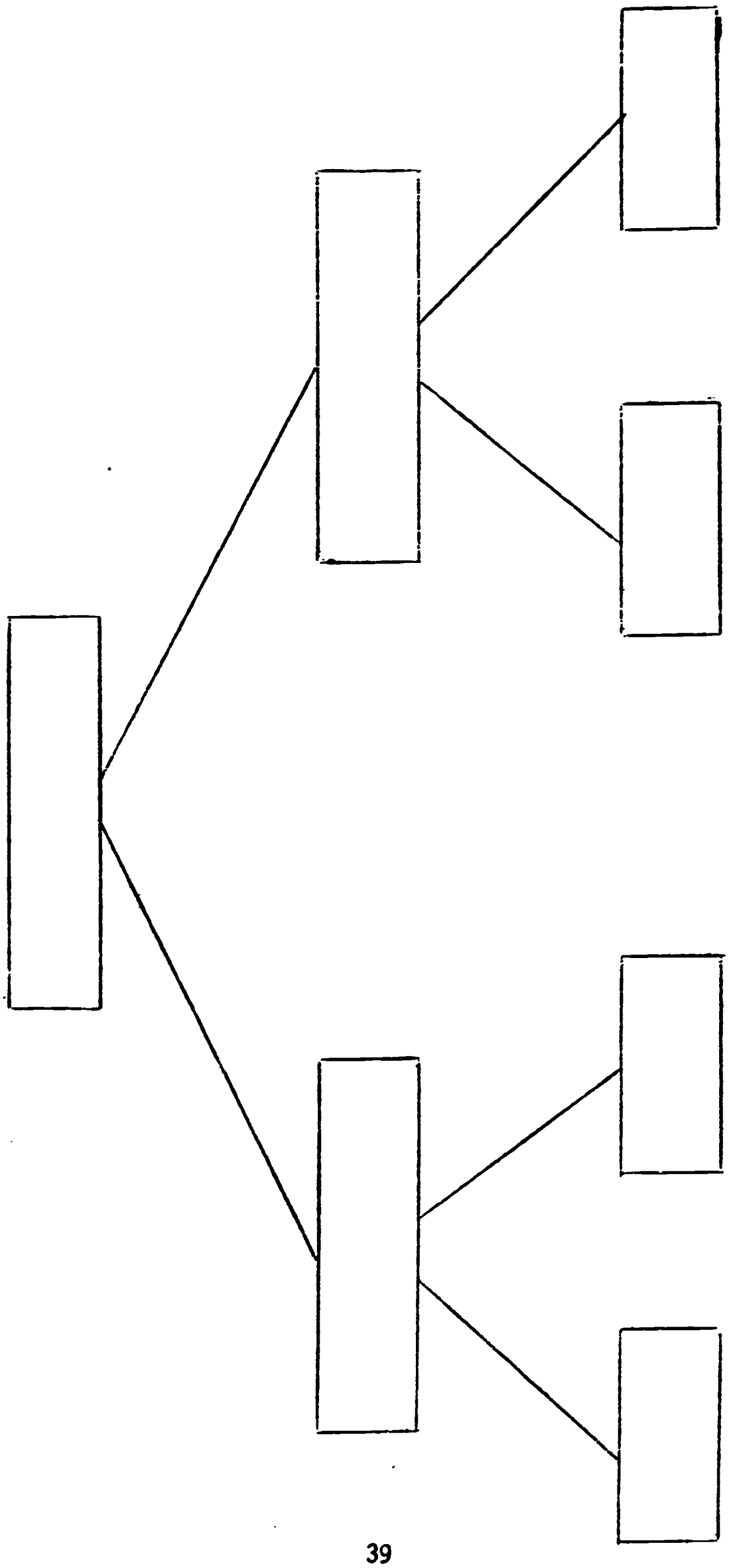
Construct a graph that shows the comparison of the results of the survey in both classes.

Which food did the children prefer? _____

Which food was preferred the least? _____



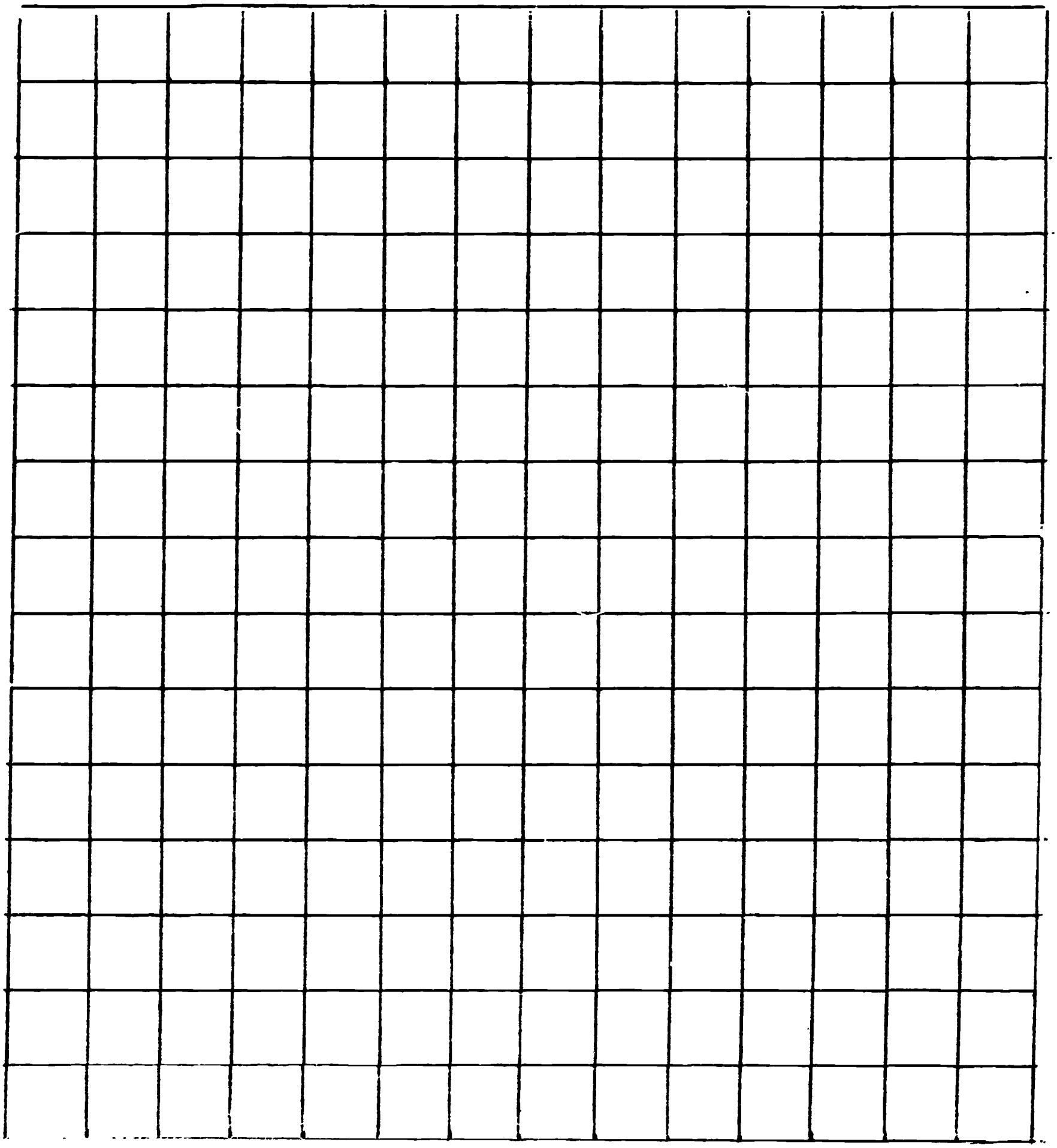
DO #3



DO #4

Miss Ima Genius's Class Spelling Achievement

Child	January	March
Bill	89	91
Marie	61	82
Janet	86	93
Don	40	81
Marilyn	50	84
Ken	72	88



Overview of Process of Describing Observations

(Parts A, B, C, D are taken from 1967 Xerox)

PART A (K, 1)

Classifying 1 - CLASSIFYING LEAVES, NUTS, OR SHELLS

Objectives:

At the end of this exercise, when a child is shown a collection of specimens (or of pictures) of well-known objects, he should be able to

1. CONSTRUCT and DEMONSTRATE the use of a classification of the objects according to variations in a single characteristic which has been specified by someone else.

2. CONSTRUCT and DEMONSTRATE the use of a classification of the objects according to variations in a single characteristic which he has chosen.

3. DESCRIBE to others the characteristic he chose for his method of classification.

4. IDENTIFY and NAME words which are used in the construction of a classification system which is based on a single characteristic.

Context:

Child cite characteristics of leaves, nuts, or shells, to be used as bases for grouping.

Vocabulary:

Arrange, classify, divide, differ, oval, pointed, flat, texture, group, match

Classifying 2 - A PURPOSE OF CLASSIFICATION

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT a classification of a set of objects into two or more groups depending on whether the objects can or cannot be used in a stated way.

2. CONSTRUCT and DEMONSTRATE the use of another classification of the same set of objects into new groups to serve a different stated purpose.

Context:

Pupils classify classmate's shoes, and group a variety of objects using bases given by the teacher and those generated by the class.

Vocabulary:

Classify, classification

Classifying 3 - CLASSIFYING ANIMALS

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH one animal from another, using his senses as the only source of information.

2. IDENTIFY and NAME how some common animals are similar and how they are different.

3. CONSTRUCT and DEMONSTRATE the use of a classification of animals, or pictures of animals, on the basis of gross physical or behavioral characteristics.

Context:

Children discuss and describe characteristics of cat, mouse, grasshopper, rabbit, chicken, butterfly in order to classify

them. Pictures of other animals are added to the classification system.

Vocabulary:

Names of animals and groups of animals used.

PART B (1, 2)

Classifying 4 - OBSERVING LIVING AND NONLIVING THINGS

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME at least one characteristic of living objects.

2. CONSTRUCT and DEMONSTRATE the use of a grouping into living and nonliving objects on the basis of observable characteristics.

Context:

An aquarium is used for observing living and nonliving things and describing their characteristics and needs.

Vocabulary:

Aquarium, guppies, snails, clams, water plants, alive, not alive, living, nonliving

Classifying 5 - VARIATION IN OBJECTS OF THE SAME KIND

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME variations among objects or organisms which have many features in common.

2. DESCRIBE features which are common for each member of a group.

Context:

Children discuss the differences in dogs and examine peanuts, balls, flowers, and paper to discover the variations within each group.

Vocabulary:

Member, common, feature, family, variation

PART C (2, 3)

Classifying 6 - KINDS OF LIVING THINGS IN AN AQUARIUM

Objectives:

At the end of this exercise the child should be able to

1. DEMONSTRATE a separation of living organisms commonly found in an aquarium into sets and sub-sets.

2. CONSTRUCT and DEMONSTRATE the use of a simple classification system (a key).

3. DEMONSTRATE the place of new organisms in the appropriate categories and sub-categories of an establish classification system.

Context:

Pupils organize items in an aquarium into a classification scheme, using the classifying conventions.

Vocabulary:

Floating, nonfloating, swimming, nonswimming, oxygen, cell, lung, gills, subdivide, aquarium, characteristic, reptile, amphibian.

Classifying 7 - THE SOLID, LIQUID, AND GASEOUS STATES OF MATTER

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME a substance as being a solid, a liquid, or a gas.

2. DEMONSTRATE whether a substance is a solid, a liquid, or a gas by using the following physical characteristics: it has a shape of its own; it has a top surface that can be felt or seen; and it takes the shape of the container.

Context:

The characteristics of water, stones, marbles, drinking glass and blowing through a straw serve to generate definitions of solids, liquids, gases.

Vocabulary:

Liquid, solid, gas, gaseous, matter, substance, state, visible, particle, solid state, liquid state, gaseous state, vial, compressed

Classifying 8 - THE COLOR WHEEL - AN ORDER ARRANGEMENT

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY the principal colors by name.

2. CONSTRUCT an ordered arrangement of hues.

3. DISTINGUISH between two hues on the basis of purity and STATE A RULE that brilliant and dull colors of a specific hue differ in purity (saturation).

Context:

Crayons, paints, colored paper are used for organizing colors in a wheel.

Vocabulary:

Hue, tint, shade, gray, complementary, purity, saturation, dull, brilliant, separated, adjacent

Classifying 9 - SEPARATING MATERIALS FROM MIXTURES

Objectives:

At the end of this exercise the child should be able to

1. DEMONSTRATE a method for separating (classifying) the components in a particular mixture according to their size.

2. ORDER the components of the mixture according to size.

3. DEMONSTRATE that the amount of each component in a mixture can be found by comparing the weights or volumes of the components of that mixture.

Context:

Mixtures of different size marbles, of gravel and coarse and fine sand, of different kinds of dry cereals are used for developing separating techniques.

Vocabulary:

Sieve, filter, component, mixture

PART D (3, 4)

Classifying 10 - USING PUNCH CARDS TO RECORD A CLASSIFICATION

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT a classification of objects by using at least one series of subsets.

2. CONSTRUCT a punch-card system to record simple data.

3. DEMONSTRATE the use of a punch-card system.

Context:

Cards are used in a multitude of ways to indicate characteristics used for classifying.

Vocabulary:

Punch card

PART B (1, 2)

Communicating 1 - IDENTIFYING AN OBJECT

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH between collections of information that are sufficient to identify an object and those that are not.

2. DESCRIBE a sufficient number of properties of an object (such as color, length, shape, texture, or smell) so that a second person can identify the object.

Context:

Stories, cubes, paper shapes are used to generate the need for precise descriptions.

Vocabulary:

Information, greenhouse

Communicating 2 - INTRODUCTION TO GRAPHING

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT a bar graph.

2. IDENTIFY and NAME the number of items represented by the bars of such a graph.

3. NAME the number of items represented by different bars and DISTINGUISH among such expressions as more than, fewer than, the same number as, most, and fewest.

Context:

Colored cubes, felt pieces, disks, stones serve as the bases for developing graphs.

Vocabulary:

Graph, grid, base line, key, bar

Communicating 3 - DESCRIBING PHYSICAL CHANGES

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE the physical changes in an object in terms of such characteristics as color, shape, texture, sound, volume, length, and surface area.

2. DESCRIBE any characteristic which remains unchanged while the object itself is changing.

Context:

Pupils describe an increasingly expanding balloon.

Vocabulary:

Expanding, lighter, completely, predict, deflate, heavier, exactly, straight line, firmness, inflate

Communicating 4 - OBSERVING COLLISIONS

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE the heavier object as the one which exerts the greater force when two objects move at the same speed.

2. DESCRIBE the lighter object as the one which will move farther, given two objects of different weights and the same force exerted on each.

3. DEMONSTRATE a procedure for measuring and recording changes in the position of various objects.

Context:

Rolling balls supply data for producing graphs.

Vocabulary:

Speed, incline, collision, force

Communicating 5 - DESCRIBING CHANGES IN PLANTS

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME observed changes in a plant.

2. DESCRIBE what was done to produce the observed changes.

3. DESCRIBE the order in which the observed changes occurred.

4. DESCRIBE the direction of motion and the rate of change of the motion of the parts of the plant which responded to the stimulus.

Context:

Venus's-Flytrap and other plants are examined and described.

Vocabulary:

Leaf, leaflet, stem, fold, curl, wilt, Mimosa pudica, Dionaea muscipula, stimulus, response

PART C (2, 3)

Communicating 6 - STAGES IN LIFE CYCLES

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE orally a living or nonliving object according to several of its characteristics.

2. DESCRIBE orally the characteristics of a living object as it grows and changes from one stage to another.

Context:

Children observe chickens, ducks, mice, frogs, earthworm, caterpillars, brine shrimp to develop precise terminology for describing.

Vocabulary:

Cocoon, egg cases, orally, organism

Communicating 7 - GRAPHING DATA

Objectives:

At the end of this exercise the child should be able to

1. NAME the units along the vertical and horizontal axes of a bar graph.
2. CONSTRUCT a bar graph, given a frequency distribution.
3. DISTINGUISH between quantities shown on a bar graph in terms such as "greater than," "less than," "greatest," and "least."

Context:

Desks, children, rubber balls, and a variety of objects provide data which is recorded on graphs.

Vocabulary:

Origin, record, data, vertical, horizontal, graph, grid, axis.

Communicating 8 - DESCRIBING GROWTH FROM PARTS OF PLANTS

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH between new plant growth and the part of the plant it is growing from.
2. DESCRIBE vegetative growth qualitatively.
3. DESCRIBE the techniques used to produce new plant growth from plant parts other than seeds in terms precise enough that other people will be able to follow the procedure.

Context:

Carrots, sweet potatoes, white potato, onion, coleus, geranium, philodendron, and ivy "planted" in water so that plants are produced, provide opportunities for observing and describing growth.

Vocabulary:

Cutting, tuber, bulb

Communicating 9 - USING A SUNDIAL TO DESCRIBE SHADOW CHANGES

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY the length and compass direction of the shadow of a given object at regular time intervals during the day by drawing line segments to represent them.

2. IDENTIFY and NAME the pattern of changes that occur in both the length and the direction of the shadow.

Context:

A stick, piece of paper, and pencil are used to record shadows of sun at hourly intervals; tables of data are charted.

Vocabulary:

Sundial, interpolate (optional), gnomon (optional)

PART D (3, 4)

Communicating 10 - USING MAPS

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME distances on a map, given a key.

2. IDENTIFY and NAME locations on a map, using a key.

3. CONSTRUCT a map on a larger or smaller scale than the area or object the map represents.

Context:

Blueprints, and scale drawings of the classroom which include letter-numeral coordinates, give map skills practice.

Vocabulary:

Map, architect, scale, blueprint, code, key

Communicating 11 - DESCRIBING LOCATION

Objectives:

At the end of this exercise the child should be able to

1. NAME the ordered number pair that locates a position on a graph or a grid.

2. IDENTIFY the position of a number pair on a graph or a grid.

Context:

Pupils' birthdays are used as data for a bar graph and as locations on a grid, which includes developing positive and negative coordinates.

Vocabulary:

Axis, parallel, coordinates, number pair, quadrant, negative number, intersect, grid, origin

Communicating 12 - REPORTING AN INVESTIGATION (IN WRITING)

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE in writing all parts of an investigation that he has just observed or conducted, including the purpose, method, materials, procedure, and results.

Context:

Sand and gravel mixed with water provide materials for an investigation and a report of the investigation.

Vocabulary:

Gravel, sand

PART A (K, 1)

Using Space/Time Relationships 1 - RECOGNIZING AND USING SHAPES

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME common two-dimensional shapes.

2. IDENTIFY the common two-dimensional shapes in objects in his environment.

Context:

Colored paper, felt, wire, cardboard introduce names of shapes.

Vocabulary:

Circle, rectangle, square, triangle, ellipse, edge, side, shape, alike, different, large, big, small, wide, narrow, long, short

Using Space/Time Relationships 2 - RECOGNIZING DIRECTION

Objectives:

At the end of this exercise the child should be able to

1. DEMONSTRATE movements up, down, forward, and back.
2. IDENTIFY the direction associated with each of these terms with respect to himself: up, down, forward, and back.
3. IDENTIFY the right and left parts of his body.
4. DEMONSTRATE movement in the direction of his right or left.
5. IDENTIFY the direction associated with his right and left.

Context:

Pupils move themselves directionally.

Vocabulary:

Up, down, back, forward, left, right, arrow, direction

Using Space/Time Relationships 3 - OBSERVING MOVEMENT

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY objects which are moving or not moving.
2. NAME the direction in which the objects or animals are moving--that is, up, down, forward, back, right, or left.
3. IDENTIFY body movements other than those of locomotion--moving the eyelid, moving the lower jaw, wrinkling the nose, turning the head to the left and right.

Context:

Paper streamers, flying flags, tree branches, swimming fish, moving turtles are observed in order to describe their directional movement.

Vocabulary:

Direction, streamer

Using Space/Time Relationships 4 - SPACING ARRANGEMENTS

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT an arrangement of himself and his classmates, as well as objects, in the forms of familiar two-dimensional shapes.

2. CONSTRUCT the two-dimensional shapes formed by a given arrangement of objects.

Context:

Following a diagram drawn on the chalkboard, children place themselves at specified locations on a rectangle, circle, triangle, or line segment drawn on the classroom floor.

Vocabulary:

Arrange, arrangement, diagram

Using Space/Time Relationships 5 - SHAPES AND THEIR COMPONENTS

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT and NAME the following plane, or two-dimensional, shapes: triangle, circle, square, rectangle, and ellipse.

2. IDENTIFY the following three-dimensional shapes: sphere, cube, cylinder, pyramid, and cone.

3. IDENTIFY and NAME the two-dimensional shapes that are components of regular three-dimensional shapes.

Context:

Pipe cleaners are used by children to copy paper two-dimensional shapes which are introduced as components of solid three-dimensional objects (made of wood, plastic, or styrofoam).

Vocabulary:

Sphere, cube, cone, cylinder, pyramid, ellipsoid, trace, base, two-dimensional, three-dimensional, line segment

Using Space/Time Relationships 5 - RECOGNIZING TIME INTERVALS

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH between time intervals by making statements like this: "The period for reading was longer than the rest period."

2. IDENTIFY and NAME the day of the week and DISTINGUISH the appropriate numeral on a calendar for a given day.

3. IDENTIFY and NAME the time on the hour, given a clock and the position of the hour hand, by saying: "It is 9 o'clock."

Context:

The calendar and a paper clock face are used along with extensive discussions with children concerning intervals of time.

Vocabulary:

Year, month, week, day, hour, minute, January, February, etc., Sunday, Monday, etc., sector, minute hand, hour hand

PART B (1, 2)

Using Space/Time Relationships 7 - SYMMETRY

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY objects which have line or plane symmetry.
2. DEMONSTRATE the symmetry of objects by matching their parts.
3. DEMONSTRATE that some objects can be folded or cut in more than one way to produce matching halves.

Context:

Paper two-dimensional shapes, cutouts of letters, and other figures, an orange and clay models of three-dimensional shapes are used for developing concepts of symmetry.

Vocabulary:

Symmetry, not symmetrical, symmetrical, line of symmetry, plane of symmetry

Using Space/Time Relationships 8 - THE SHAPES OF ANIMALS

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE common environmental objects such as animals in terms of two- and three-dimensional shapes.
2. IDENTIFY and DEMONSTRATE bilateral symmetry in animals.

Context:

Pictures and models of animals are used so that children may identify and reproduce two- and three-dimensional shapes.

Vocabulary:

Names of animals, bilateral symmetry, plane of symmetry

Using Space/Time Relationships 9 - SHADOWS

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY a three-dimensional object from its two-dimensional projections.
2. IDENTIFY the two-dimensional projections of a given three-dimensional object.

Context:

The different two-dimensional shaped shadows cast by three-dimensional figures are used by children to identify the unknown three-dimensional figure.

Vocabulary:

Shadow, hemisphere, rectangular prism

Using Space/Time Relationships 10 - RECOGNIZING AND USING ANGLES, DIRECTIONS, AND DISTANCE

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME angles.
2. DISTINGUISH a right angle from other angles.
3. IDENTIFY á "square corner" as an example of a right angle.
4. STATE and DEMONSTRATE which of two angles is larger by superimposing one angle upon another.

5. DEMONSTRATE how to walk or mark off a designated number of "steps" in a specified direction.

Context:

Pupils observe the angles of street intersections, wire squares and rectangles, and reproduce angles with pipe cleaners, straws and grid paper.

Vocabulary:

Angle, right angle, right triangle, square corner, congruent (optional)

Using Space/Time Relationships 11 - TIME INTERVALS

Objectives:

At the end of this exercise the child should be able to

1. DISTINGUISH short time intervals involving minutes or seconds by counting, or by using a time-measuring device such as a metronome, pendulum, water clock, or sandglass timer.

2. DISTINGUISH between observed differences in time intervals.

Context:

What to use for timing when a clock is not available to children: verbal counting, sand timer, water timer, a pendulum made of a suspended sponge rubber ball with a pencil through it, or a burning candle with scale attached.

Vocabulary:

Timer, metronome, pendulum, uniform, second

PART C (2, 3)

Using Space/Time Relationships 12 - TELLING TIME

Objectives:

At the end of this exercise the child should be able to

1. NAME the time orally to the nearest five minutes, given the position of the hour and minute hands on a clock.

2. NAME the time orally to the nearest five minutes, given the time as written numerals, such as 8:25.

3. NAME in writing the time using numerals, given a clock face.

4. NAME in writing the time using numerals, given the time orally.

5. NAME the number of days before or after a particular event, and IDENTIFY the particular day on a calendar, for example, in the following way: "It is eight days after Valentine's Day," or "It is five days before the class goes to the zoo."

6. NAME the number of hours before and after a particular time, and IDENTIFY on a clock face what the time was or will be, for example: "Three hours ago it was nine o'clock," or "Six hours from now it will be four o'clock."

Context:

Pupils use paper-plate clocks, sheets of clock faces for marking, "clock bingo" and, of course, a clock.

Vocabulary:

Half, half-past, after, colon, clockwise, minute, o'clock (of the clock)

Using Space/Time Relationships 13 - STRAIGHT LINES, CURVED LINES, AND SURFACES

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY and NAME straight and curved paths on a flat surface.

2. IDENTIFY a straight-line path on a flat surface as the shortest distance between two points.

3. DISTINGUISH between closed and open (or not-closed) paths on a plane surface.

4. DEMONSTRATE that a path drawn on the surface of a sphere must be curved; and that a line on the surface of a cylinder or cone may be a curved or straight path, depending on its position.

5. DEMONSTRATE how to decide whether a surface is flat or not.

6. IDENTIFY a straight path, a curved path, flat surfaces, curved surfaces, and curved surfaces that are spherical surfaces, by pointing to representations of them in the classroom.

Context:

Pencil, chalk, string, yarn are used on paper and a large ball to show paths.

Vocabulary:

Curved line, curved surface, flat surface, closed path, open path, spherical surface, great circle

PART D (3, 4)

Using Space/Time Relationships 14 - RATE OF CHANGE OF POSITION

Objectives:

At the end of this exercise the child should be able to

1. IDENTIFY objects according to their speeds, using terms such as "faster than" and "slower than."

2. STATE and APPLY A RULE that the speed of an object is the distance moved per unit of time.

3. DISTINGUISH between speed, time taken to change position, and distance moved.

Context:

Racing toy cars, hopping children, and walking children are timed and (distance) measured so that rate of change can be determined.

Vocabulary:

Rate of change, position, length of time of change, fast, faster, fastest

Using Space/Time Relationships 15 - TWO-DIMENSIONAL REPRESENTATION OF SPATIAL FIGURES

Objectives:

At the end of this exercise the child should be able to

1. CONSTRUCT pictures of a circle, a square, and a triangle as they appear when viewed at an angle rather than perpendicular to their surfaces.

2. CONSTRUCT pictures of a cube, a rectangular prism, a triangular pyramid, and a cylinder, first showing all edges and then only those that are visible simultaneously.

Context:

Using paper boxes, bricks, building toys, and shadows cast by squares, wire-frame cubes, rectangular prisms, and other three-dimensional shapes, children learn to construct pictures of three-dimensional objects.

Vocabulary:

Rectangular prism, edge, dimension, plane

Using Space/Time Relationships 16 - RELATIVE POSITION AND MOTION

Objectives:

At the end of this exercise the child should be able to

1. DESCRIBE observed changes in the position of objects relative to his own position.

2. DESCRIBE observed changes in the position of objects relative to the position of another observer.

Context:

A block on a board in a moving wagon, children passing a ball in a moving wagon are used to develop the objectives.

Vocabulary:

Relative to, observer

Duplicated Materials - With Answers

Performance criteria for acceptable response:

Task I	4 of 5
Task II	8 of 10 possible checks
Task III	5 of 5 7 of 7 (DO #2)
Task IV	5 of 5
Task V	3 of 4 (title, 2 labels, bars or points)

DO #1

DESCRIBING OBSERVATIONS

TASK I

Name the two dimensional and three dimensional shapes which are part of the Dr. Pepper bottle.

Shapes: Two-dimensional CIRCLE, TRIANGLE, RECTANGLE

Three-dimensional CONE, CYLINDER

TASK II

By checking the appropriate column, identify the shape of the shadows cast by these objects:

	□	○	△	▯	⬭
a. cylindrical pill bottle		✓		✓	
b. base ball		✓			
c. child's alphabet play block	✓				
d. egg		✓			✓
e. dunce cap		✓	✓		
f. cigar box	✓			✓	

TASK III

Examine the drawings of fruit on the transparency. List only those characteristics necessary to be able to distinguish it from the others.

A. RED SINGLE FRUIT, SPHERICAL IN SHAPE, SMOOTH APPEARING SKIN

B. SPHERICAL IN SHAPE, IN CLUSTERS, RED

C. ELLIPTICAL SHAPE, IN CLUSTERS, GREEN

D. SURFACE APPEARS ROUGH, ORANGE

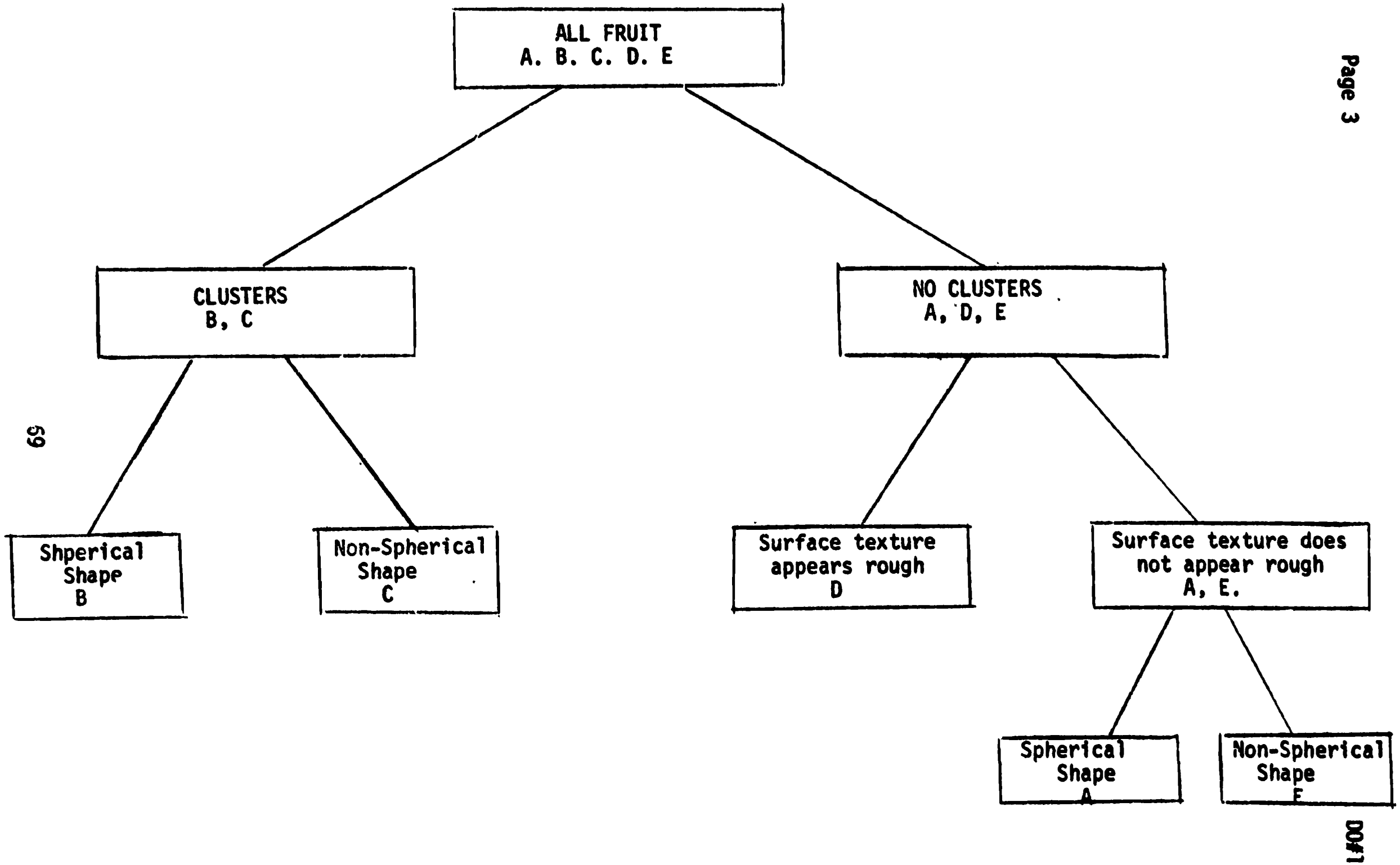
E. ELLIPTICAL SHAPE, SINGLE FRUIT, YELLOW

TASK IV

Construct a classification system based on your descriptions in Task III.

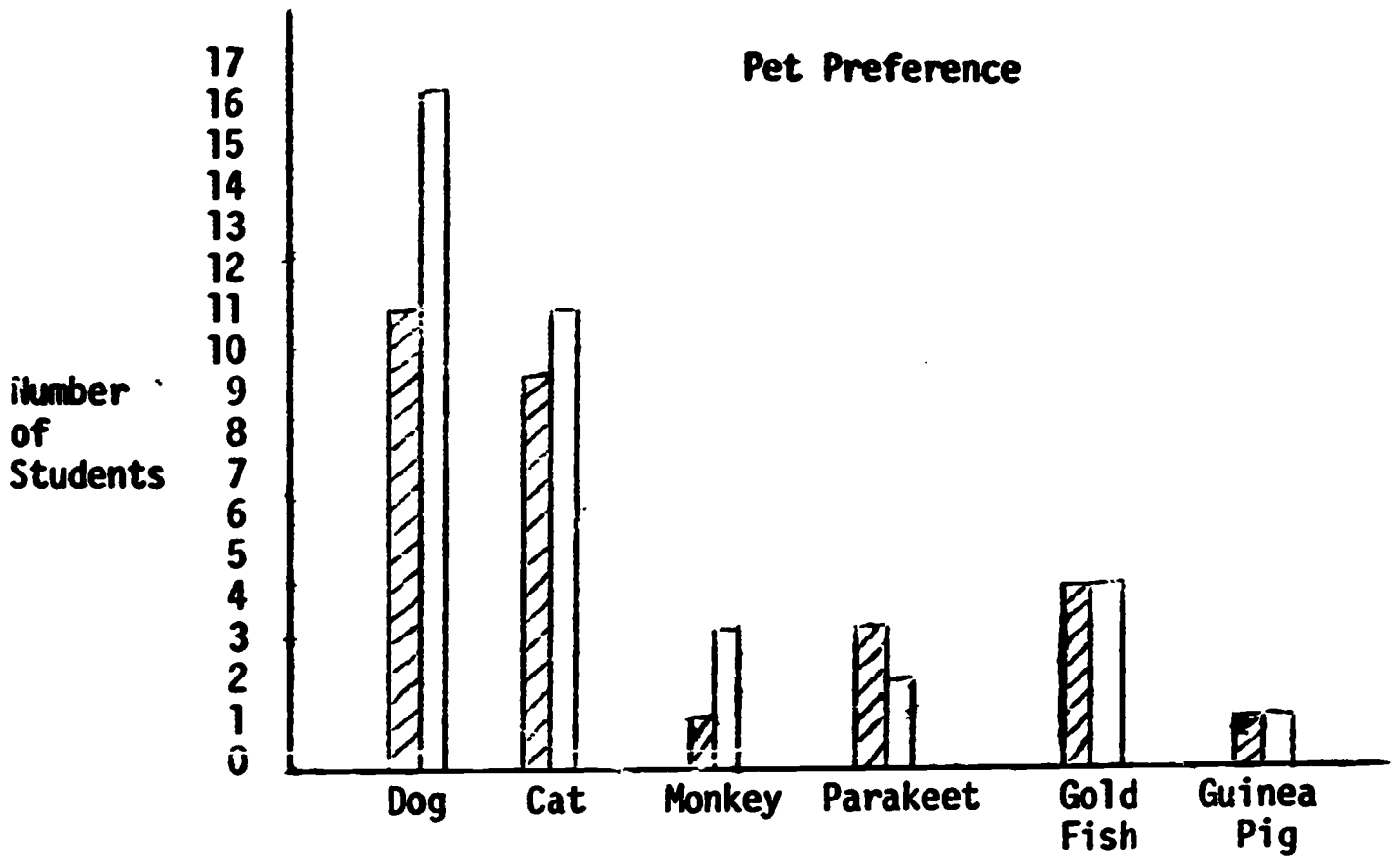
The classification scheme you construct should be such that another person could use it to identify and name each of the fruits by using just the key you constructed and the transparency. At each stage in your system, name both the property used to separate the fruit and the letter of the fruit that has the property.

All fruit
A, B, C, D, E


ALL FRUIT
A. B. C. D. E
CLUSTERS
B, C
NO CLUSTERS
A, D, E
Shperical
Shape
B
Non-Spherical
Shape
C
Surface texture
appears rough
D
Surface texture does
not appear rough
A, E.
Spherical
Shape
A
Non-Spherical
Shape
E

TASK V

Construct a graph that shows the comparison of the results of the survey of pets in both classes.



▨ = Mrs. G's second grade class

▯ = Mrs. H's second grade class

Which pet was the most popular? DOG

Which pet was the least popular? GUINEA PIG

DO #2

DESCRIBING OBSERVATIONS

TASK I

Name the two-dimensional and three-dimensional shapes which are parts of a sharpened pencil.

Shapes: Two-dimensional TRIANGLE, RECTANGLE, CIRCLE

Three-dimensional CONE, CYLINDER

TASK II

Identify, by checking the appropriate column, the two-dimensional shapes which are parts of the following three-dimensional figures:

	□	○	△	▯	⬭
a. cylinder		✓		✓	
b. sphere		✓			
c. cube	✓				
d. ellipsoid		✓			✓
e. cone		✓	✓		
f. rectangular parallelepiped	✓			✓	

TASK III

Examine the drawings. List the minimum characteristics of each sketch necessary to distinguish it from the others.

3. circular shaped

10. no straight sides, not colored

15. yellow

34. 4 sides equal in length

20. rectangular shape

18. 4 sides equal in length (larger than 2 cm)

35. triangular shape

TASK IV

Construct a classification system based on your descriptions in Task III.

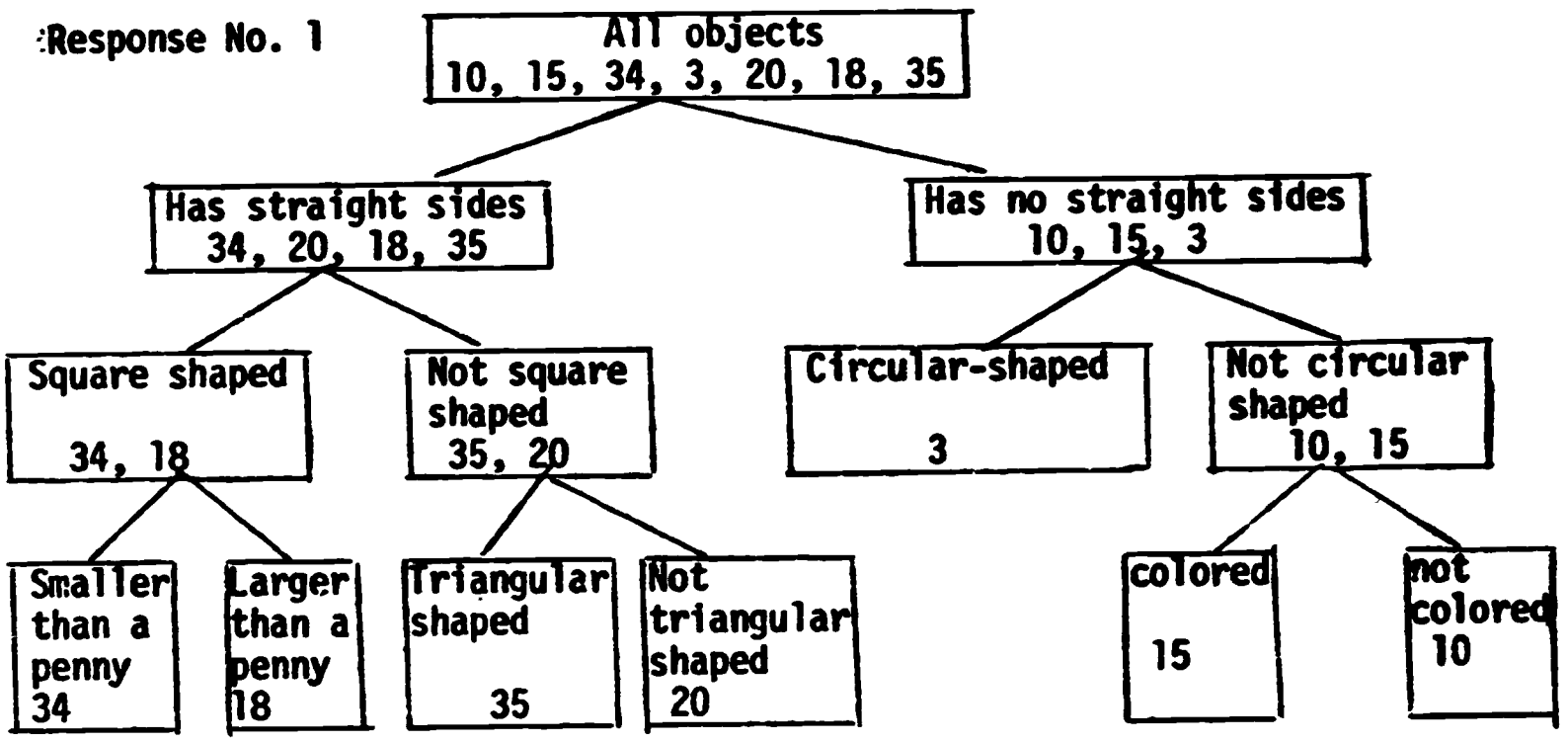
The classification scheme you construct should be such that another person could use it to identify and name each of the objects by using just the key you constructed and the transparency. At each stage in your system, name both the property used to separate the objects and the number of the object that has the property.

ALL OBJECTS
3, 10, 15, 34, 20, 18, 35

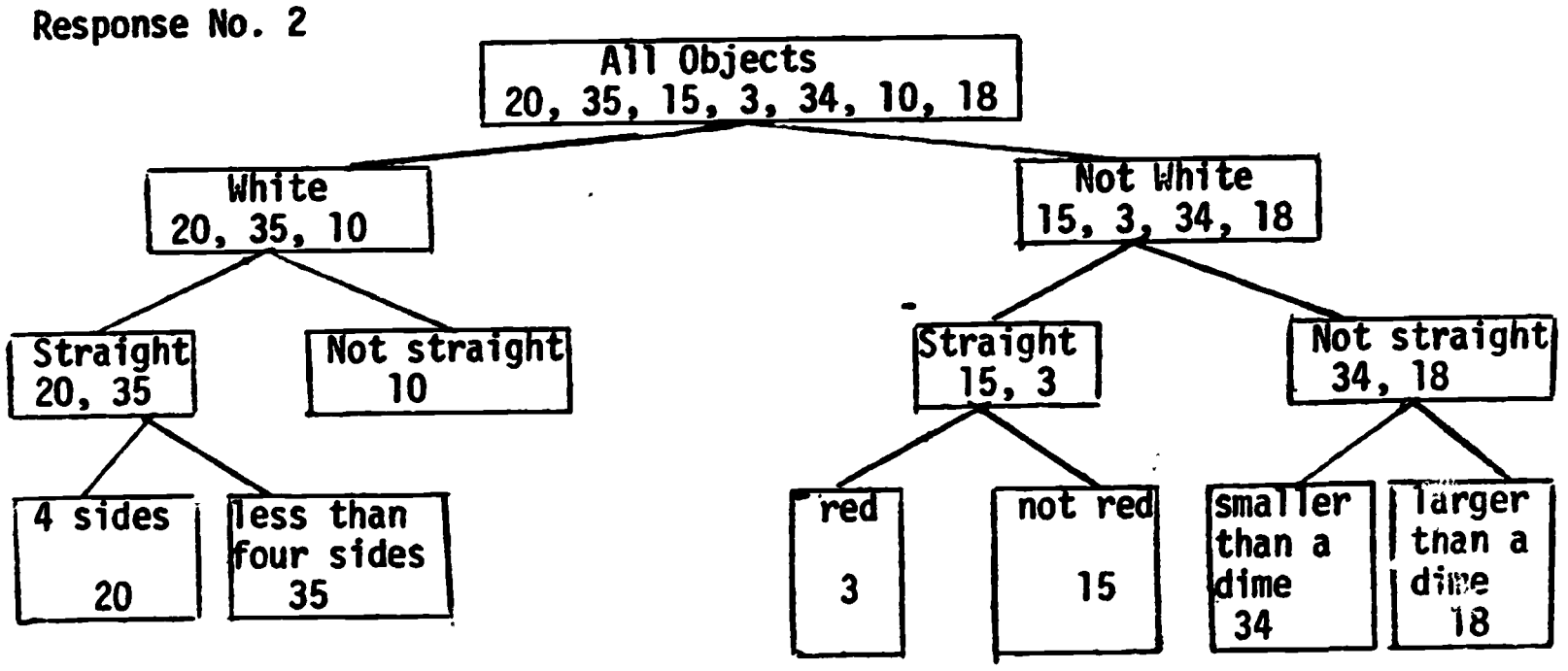
TWO ACCEPTABLE RESPONSES

DO # 2

Response No. 1

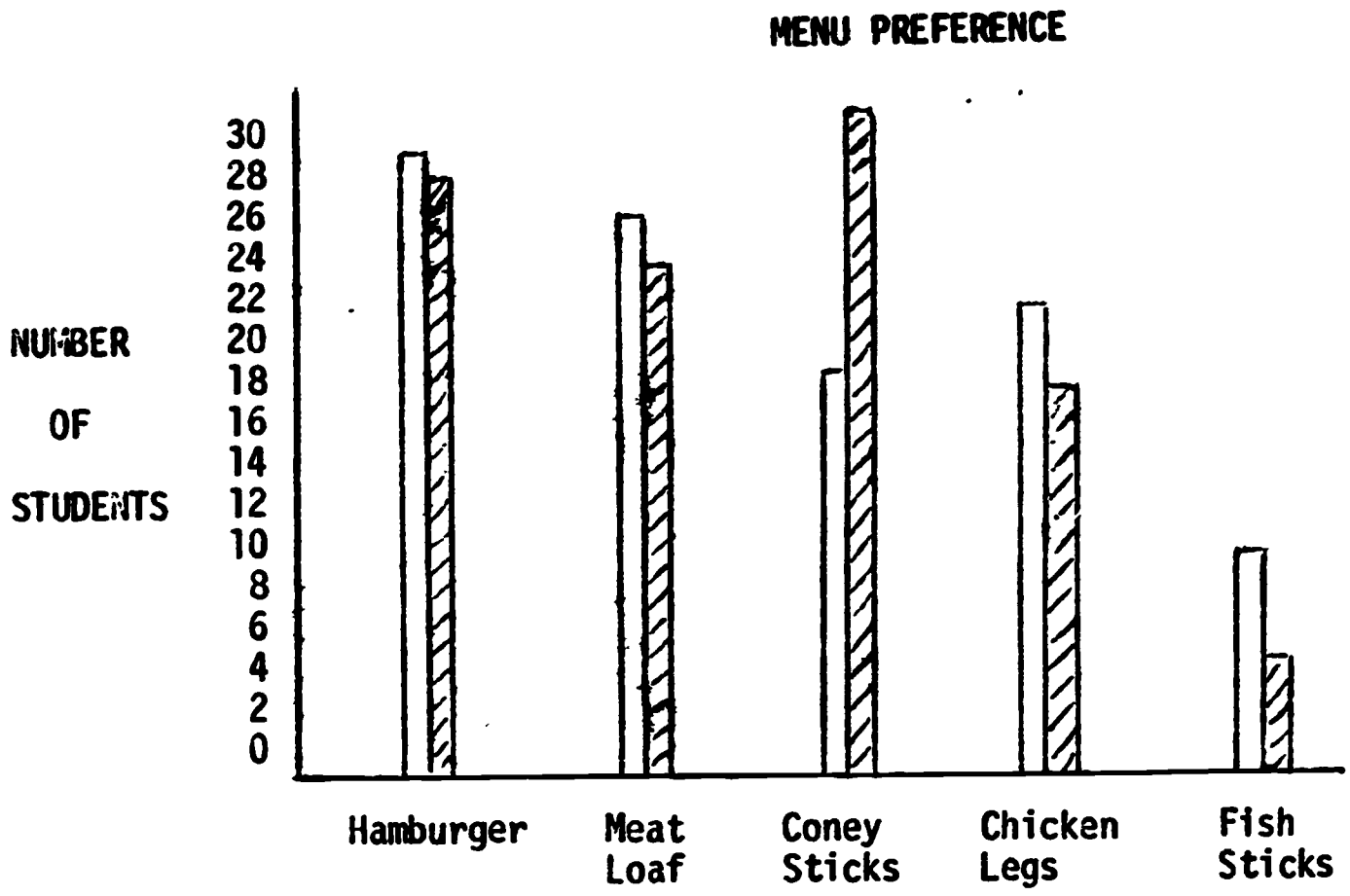


Response No. 2



TASK V

Construct a graph that shows the comparison of the results of the survey in both classes.



 = Mrs. M's class

 = Mrs. W's class

Which food did the children prefer? HAMBURGER

Which food was preferred the least? FISH STICKS