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An arithmetic program for grade one.

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AN ARITHMETIC PROGRAM FOR GRADE ONE

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AN ARITHMETIC PROGRAM

FOR GRADE ONE

by

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INTRODUCTION

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INTRODUCTION

Background of the study. Beginning school children come to first grade with a varied background in their number concepts. Some have had a rich experience in the social use of numbers and are aware of a purposeful need for arithmetic. Others have had little contact with number experiences and will require a well-planned number readiness program. For children without, it will take a great deal of time to explore situations involving numbers and to make number discoveries. They must be given ample opportunities to work in a schoolroom environment which will foster growth in the development of number concepts.

The author of this study has been keenly concerned with the varying degree of readiness that the pupils bring to school. The writer believes that it is the responsibility of the teacher to note each child's number needs and build an arithmetic program. The author further is convinced that it is the responsibility of the teacher to provide educational experiences for the class that will result in sound learnings and bring satisfaction to both the student and the teacher.

There must be a well planned program, emphasizing the systematic and sequential relationships among numbers. These number experiences must not be left to chance. However, it is important to remember that curriculum guides and devices are but tools of learning, each dependent upon the other, and both dependent upon the teacher. For it is the teacher that must spark the program with enthusiasm and instill in pupils a curiosity for numbers. The children must see the need of numbers in

real life situations, and each child must be met at his own level of number understanding. For if a child is not ready for a more advanced activity in numbers, all the drill and rote memory work are a waste of time and will not help him gain understanding.

As a result of this concern, the writer established an arithmetic program for grade one which takes into consideration the backgrounds, abilities, and needs of first grade children. This program has specific objectives, the attainment of which comes through the use of carefully planned number experiences in a classroom which emphasizes the need for concrete experiences.

The purpose of this problem. It was the major purpose of this problem to formulate an arithmetic program for grade one which could be used in the following ways:

1. As a curriculum guide to indicate the common arithmetic learnings recommended for grade one

2. As a source of suggested manipulative devices intended to incorporate meaning into the number experiences

3. As a recommended time schedule for the teaching of specific words needed in an arithmetic vocabulary

4. As a bibliography of stories which could be used to enrich the understanding of number concepts.

Definition of terms. For the purpose of clarification, the following terms are defined according to their meaning in this study. They are:

A manipulative device is taken to mean a sensory aid which the pupil can manipulate and arrange in various ways to enable him to

discover facts.

A commercial device is interpreted to mean an aid which may be purchased for use as a manipulative device.

A teacher-made device is taken to mean a manipulative device which can be constructed by the teacher from easily obtainable materials.

A curriculum guide is interpreted to mean a systematic course of study which indicates the major common learnings at a specific grade level.

A number corner is taken to mean an area in the room which has been arranged by the teacher to supply materials which children may use to build quantitative understandings and relationships.

CHAPTER II

RESEARCH DATA

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RESEARCH DATA

The author in reviewing the research related to this study, An Arithmetic Program for Grade One, covered the following topics:

I Readiness for Numbers

II Readiness Tests

III Principles Underlying the Number Program

IV Concrete Experiences and Aids

Readiness for Numbers

In all educational experiences today the term readiness appears. The teacher is advised to incorporate into the planning a readiness program which will appraise and evaluate the chances for success that pupils may have in meeting new work. Although as early as 1930 the need for readiness was first stressed in connection with a reading program, many authorities in the field of arithmetic are concerned with the problem of readiness for number. Brownell made an extensive survey concerning the pupil's readiness for numbers. He states that:

> School entrants already know much about number; the inference is that they can learn more; nothing is gained, and much may be lost, if the school delays to later grades the discharging of its obligations.[1]

Morton, too, is in agreement with this point of view, for he states that, "Most children pick up ideas about numbers before they enter

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[1]Leo J. Brueckner & Foster E. Grossnickle, Making Arithmetic Meaningful. Philadelphia, Pennsylvania: The John C. Winston Company, 1953, p. 63.

school."[2] He further says that:

> By the time they are ready to enter the first grade, most children have become acquainted with the number to ten or beyond. Various studies have shown that, on the average, entering first-grade pupils can count to 20. Not all can count to 10, but it is rare indeed that the first-grade teacher finds a pupil who cannot count at all.[3]

In the text by Hollister and Gunderson we find a brief overview of several investigations made in this area. They state that:

> The child's understanding of arithmetical values probably begins with his recognition of terms in quantitative comparison. One of the first words in his vocabulary is likely to be "more," as he learns to express his desire for additional drink or food. He understands and uses many terms such as big, many, more, and up before he has an idea of number values.[4]

Mitchell made a survey to discover the child's understanding of certain quantitative terms. She found that:

> The meaning of "most" was apparently easy to understand, since ninety-six percent of the group were able to identify in several piles of blocks the pile having the "most" blocks in it. On the other hand, only forty-six percent of the children interviewed understood the meaning of "least."[5]

Continuing in the area of quantitative understanding we find:

> Russell tested children from four to eight years of age and concluded that the child of four and a half to five understood most, both, and biggest, while same and equal were not comprehended. He further reported that children of this age could compare groups of as many as ten blocks with remarkable accuracy, although they had a visual notion of only three or four. When studying quantitative terms used by beginning first

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[2]Robert Lee Morton, Teaching Children Arithmetic. Athens, Ohio: Silver Burdett Company, 1953, p. 67.

[3]Ibid. p. 68.

[4]George E. Hollister & Agnes Gunderson, Teaching Arithmetic in Grades I and II. Boston, Massachusetts: D. C. Heath & Company, 1954, p. 51.

[5]Ibid.

grade children, Reid found that all, little, and big were used most often.[6]

Additional evidence concerning this appears in Young Children Learn to Use Arithmetic by Lucy Rosenquist. She states that:

> It is evident that most children have done much thinking about number relationships before they come to school. Their achievements vary because of differences in the kinds of experiences and their individual reactions to them, rather than from differences in innate abilities.[7]

Stokes states that, "If a child is not ready for a new learning, the best teaching in the world cannot benefit him."[8] He further says that:

> A true readiness program is much more than a review of previous work. It is a check on retention, understanding of old relationships, and the pupil's ability to see new uses for the old learnings in the problem situation.[9]

John Clark and Laura Eads express the same theory in their text, Guiding Arithmetic Learning. They state that:

> If parents or teachers try to hurry a child's learning before he is ready or mature enough for it, his struggle with insurmountable tasks may impede or retard his learning later when he might otherwise be ready for the learning. For example, instead of learning to "think" mathematically, a child who has been pressed to do computation before he is ready to do so thoughtfully may continue throughout his life to make an effort to remember rules and formulas for solving mathematical problems. Moreover, a child's efforts to learn what he cannot yet learn properly may prevent his growing along lines for which he is ready. Thus a child's efforts to memorize and to write meaningless number facts may prevent his

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[6]Hollister & Gunderson, op. cit. p. 52.

[7]Lucy Lynde Rosenquist, Young Children Learn to Use Arithmetic. New York: Ginn & Company, 1949, p. 19.

[8]C. Newton Stokes, "How to Insure Readiness for Learning a New Concept," Tips on Teaching Arithmetic, III. Boston, Massachusetts: Allyn & Bacon, Inc.

[9]Ibid.

developing real number sense.[10]

Hollister and Gunderson sum up their research in this area as follows:

> From the foregoing survey it is evident that the typical pre-school child has acquired a considerable background of number experiences. The child's mental capacities and maturity as well as his home environment have affected his development in using and understanding numbers. As a result the teacher may find a great deal of variation in the arithmetic background of the pupils in the typical first grade.[11]

They continue with:

> Every child comes to school with a concept of one-to-one correspondence. While some children may not be able to get three books from a table, every normal five-year-old will be able to get a book for Judy, a book for Tom, and a book for himself. . . . During pre-school years the child learns to recognize many numerical terms and quantities and to a limited degree he becomes familiar with number words and ideas, money, measurements, and time-telling devices.[12]

And finally in this area we find Rosenquist defines readiness as:

> Readiness for learning arithmetical skill includes an understanding of the number relationships on which the skill is based, and the ability to perform the prerequisite skills with facility by mature methods.[13]

From this research we may conclude that readiness is a vital part of the first grade number program. Research shows that the majority of children have acquired some arithmetical knowledge before they enter school. These concepts will need to be clarified and strengthened in the beginning program. New and interesting experiences thoughtfully planned

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[10] John R. Clark and Laura K. Eads, Guiding Arithmetic Learning. Yonkers-on-Hudson, New York: World Book Company, 1954, p. 243.

[11] Hollister & Gunderson, op. cit. p. 54.

[12] Ibid. p. 55.

[13] Rosenquist, op. cit. p. 20.

and carried out by the teacher will strengthen understandings and develop new concepts. The teacher must not sit back and wait for this readiness to develop. This is what the teacher plans for and helps to develop in the pupils.

Readiness Tests

The importance of evaluating the pupil's readiness for numbers cannot be overestimated. Daily observation of the children's successes in the class routine should be noted as well as their failures. These observations should be recorded and are often more valid than the written test, yet it is still a true test of the pupil's readiness for numbers. The first grade teacher should begin her number program with a survey of what the child already knows about numbers. Morton stresses this when he says:

> It is important that the first-grade teacher soon learn just how far each pupil has already gone in developing an acquaintance with, and an understanding of, numbers. With this knowledge in hand, she can better use the day-by-day experiences of each pupil to enlarge his acquaintance with numbers and increase his understanding of them.[14]

Rosenquist has prepared a list of the skills and understandings which pupils should have before they are prepared to begin learning the addition and subtraction facts. The list follows:

1. Skills and understandings relative to the serial order:
   a. to count to ten by rote
   b. to enumerate objects in groups of ten or less
   c. to read and write the numbers through ten
   d. to understand that each number in the series is one more than the number before it, and one less than the one following it.

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[14] Morton, op. cit. p. 68.

2. Skills and understandings relative to the quantitative meaning of numbers:

   a. to apprehend on a mature level groups of objects of ten or less
   b. to understand that the number name of a group of objects is the number of objects in a group
   c. to reproduce groups of objects of ten or less, working with numbers on a mature level
   d. to recognize the number name of groups of spots of ten or less when arranged in familiar patterns (at least three different patterns)
   e. to recognize and state exact relationships of more or less between two groups of objects, each of them ten or less.

3. Skills and meanings relative to the expression of ideas of numbers:

   a. to tell simply and accurately about personal number experiences and ideas of number relationships
   b. to state simple problems which arise in activities, and to explain the solution of those problems through the use of representative materials.[15]

The readiness test is essential in establishing a number program that will suit the needs of the students. Concerning this Morton states:

> Extreme differences in background experiences are seldom as great or as influential as are extreme differences in intelligence, but they are great enough to constitute a very important factor conditioning a pupil's readiness for a new phase of the arithmetic program.[16]

Brueckner and Grossnickle reaffirm this when they state:

> Teachers of Grades I and II will find the test valuable as a means of studying the arithmetic background of their pupils. The test should be administered individually to eliminate reading difficulty. An analysis of responses will reveal the strengths and weaknesses of the pupils.[17]

They continue in this vein with:

> . . . the results of readiness tests administered early in the

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[15]Rosenquist, op. cit. p. 98.

[16]Morton, op. cit. p. 6.

[17]Brueckner & Grossnickle, op. cit. p. 169.

first grade show an astonishing range in the readiness of pupils for arithmetic. Steps should be taken to raise the level of readiness of pupils with low ratings in such tests by well planned number experiences which stress the meanings and uses of numbers.[18]

They again stress this when they state:

In addition to using the results of readiness tests such as those described above to establish the learner's readiness for new work, the teacher should also consider such factors as the child's mental maturity, his previous experience, his work habits, his motor control, his interests and attitudes. The underlying factors are complex and interrelated. Readiness for arithmetic in the primary grades can to some extent be assured by providing a systematic series of experiences at that level in which number functions. Through this systematic series of experiences suitable for his level the learner should become more number conscious.[19]

In measuring the child's readiness for numbers, Morton believes that:

It becomes the teacher's responsibility to get well-acquainted with each of the pupils in a group. This acquaintance should include intelligence level, previous school accomplishment, home life, community life, health and disease history, and special interests as to recreation, hobbies, and other phases of living. Only in the light of such a broad and thorough acquaintance can the day-by-day arithmetic experiences be wisely planned.[20]

The teacher may construct her own readiness test, or she may take advantage of the commercially prepared readiness tests. Leo J. Brueckner has developed a readiness test for primary arithmetic which predicts very accurately how well the youngster will succeed in arithmetic.[21] This test is divided into two parts. Part one deals with the mathematical phase of numbers and part two with the social phase. This is a completely

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[18] Brueckner & Grossnickle, op. cit. pp. 67-68.

[19] Ibid. p. 170.

[20] Morton, op. cit. p. 6.

[21] Brueckner & Grossnickle, op. cit., pp. 168-169.

oral test. The range of items in each part is from the very easy to the very difficult. Tentative norms for this test for September are fifteen items correct for pupils in grade one.

The World Book Company also presents a suggested oral number readiness test for grade one.[22] This test will give the teacher a good representative picture of the pupil's background in number experiences.

There are group tests available that require a written response. One that the author has used and found to represent an accurate picture of the number readiness of the class is the New York Test of Arithmetical Meanings.[23] This is a standardized test with norms established that the teacher may use to rate the abilities of her group. The John C. Winston Company also publishes a group readiness test entitled Seeing Numbers.[24]

We may conclude from this research that the determination of readiness is a primary factor in setting up an organized program of study. By charting the success of each child the teacher will have a general picture of the arithmetical ability of each child and of the class as a whole. Recognition of these immediate number needs of the children through the readiness test provides the opening for a vital and functional first grade number program. From this established beginning

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[22]Caroline Hatton Clark and Charlotte W. Junge, "Testing Readiness for Arithmetic Instruction in First Grade," Notes for the Arithmetic Teacher. Yonkers-on-Hudson, New York: World Book Company, 1954, No. 13.

[23]J. Wayne Wrightstone, Joseph Justman, Morris Pincus & Ruth H. Lowe, New York Test of Arithmetical Meanings. Yonkers-on-Hudson, New York: World Book Company, 1956.

[24] Elda L. Merton and Leo J. Brueckner, Seeing Numbers. Philadelphia, Pennsylvania: The John C. Winston Company, 1952.

point the teacher can build basic number meanings, essential number vocabulary, and desirable attitudes toward number.

Philosophy Underlying the Number Program

A satisfactory arithmetic program in grade one aims at building basic number meanings, essential vocabulary, and desirable attitudes toward number. The child must feel that arithmetic is useful and a part of everyday life. Number experiences must not be left to chance. There must be a well-planned program, emphasizing the systematic and sequential relationships among numbers. The teacher must build understandings gradually as the child goes from the related earlier learning to the new in a carefully organized program. To substantiate this the author presents the following findings from research.

Morton stresses the following in formulating an arithmetic program:

> An arithmetic program, if it is properly constructed and properly implemented, is a constantly evolving program. The topics and parts of topics are sequential. They fit together, and one phase leads to another to an extent which is characteristic of no other area of elementary school experience. Each teacher should be able to take a long view of the program and to see his part in that program. Then the program will be consistent and the individual pupil's growth will be assured.[25]

He continues with:

> The arithmetic program, therefore, must be organized so as to permit the operation of the principle of going from earlier related learning to the new. In this way the pupil can see relationships that lead to new connections: the transfer of learning is made possible.[26]

In Rosenquist's text we find:

> The child learns numbers through the interplay between a number

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[25] Morton, op. cit. p. 16.

[26] Ibid. p. 36.

system invented and used by society, and taught to the child and his own activities with quantitative situations. Each of these supplements and enriches his understanding of the other.[27]

She further believes that:

Children should be taught:

a. The simple scientific meanings of:
   (1) the numbers
   (2) the number system
   (3) the fundamental processes
b. The meanings of words used to express arithmetical ideas.[28]

She also stands firm in her belief that:

Systematic instruction in number should begin when pupils enter school whether that be in the kindergarten or the first grade. The term systematic instruction does not imply that there will be a certain period set aside each day in which numbers are specifically taught. It means that the teacher has in mind certain skills and understandings to be taught to the pupils and that the instructional activities are planned to teach these ideas.[29]

Morton stresses three criteria as being fundamental to determining the arithmetic program. They are as follows:

1. The logical criterion . . . reference to the structure and organization of arithmetic as a science.
2. The social criterion . . . indicates a concern with usefulness of arithmetic in life's affairs.
3. The psychological criterion . . . is concerned with how well the children learn.[30]

Concerning the principles underlying the number program, Clark and Eads state:

Arithmetic is not taught in a haphazard fashion. The teacher knows what arithmetic topic she has chosen to present and the steps she

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[27]Rosenquist, op. cit. p. 19.

[28]Ibid. p. 20.

[29]Ibid. p. 33.

[30]Morton, op. cit. p. 21.

will probably use in the development of that topic.[31]

The task of the teacher is emphasized when they state that:

> Not only does she set up conditions for learning; she urges her children to proceed to higher levels of learning, to more abstract aspects of mathematics, to more difficult phases of arithmetic.[32]

Morton reaffirms this when he states:

> The teacher personalizes the arithmetic program. She makes it a living and vital experience for the pupil. She adapts it to his previous experiences and to his level of maturation.[33]

We see this same belief expressed by Clark and Eads when they state:

> The teacher revises and reconstructs her plans for pupil growth as she listens to her children and as she observes them at work and at play . . . . She makes plans before the school year begins, at the beginning of the year, before daily lessons, during daily lessons, after daily lessons. As she plans for arithmetic growth, the teacher thinks also about other areas of the curriculum; as she plans for growth in other areas, she thinks also about arithmetic.[34]

Again we find the teacher's role expressed by Hollister and Gunderson when they state:

> An understanding of numbers is not a single concept; it is a composite of many related and interacting ideas. The children learn more and more about each separate number and about numbers in general as they learn more arithmetic. Accordingly, the teacher must analyze the aspects of number concepts which children in her class need at their particular level of maturity, and plan an intensive study of each number idea which contributes to building the requisite skills and understandings.[35]

Discussing the organization of the program we find Hollister and Gunderson list six immediate objectives. They are as follows:

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[31] Clark and Eads, op. cit. p. 8.

[32] Ibid. p. 3.

[33] Morton, op. cit. p. 4.

[34] Clark and Eads, op. cit. p. 3.

[35] Hollister and Gunderson, op. cit. p. 66.

1. to have the children work and play together
2. to develop the children's confidence in their ability to do school work
3. to teach the children to listen
4. to teach the children to follow directions
5. to provide an enriched program of experiences
6. to broaden their understandings through building vocabulary and enriching word meanings.[36]

Brueckner and Grossnickle stress the need for a planned arithmetic program and the school's obligation to provide it. They state:

> Arithmetic instruction in the primary grades should proceed on a systematic, planned basis. From the beginning, the children should participate under teacher guidance in well-selected activities which will show them how arithmetic functions in their daily lives. In these experiences the work should be so conducted that the mathematical and the social phases of arithmetic are both fully developed. . . . Emphasis should be placed on meanings and understanding rather than on the development of skill through formal systematic drill.[37]

They list five specific principles as being basic to the arithmetic curriculum. They are:

I. The systematic study of number and number processes
II. The consideration of related problems and information in the arithmetic textbook
III. Direct guidance in use of arithmetic in all curriculum areas
IV. Participation in arithmetic experience units which enrich instruction
V. Use of arithmetic in real problem situations that arise from time to time.[38]

From this research we may conclude that teaching arithmetic by drill and rote memorization has proved erroneous. Mathematical reasoning requires an understanding of mathematical concepts and meanings. The teacher must skillfully guide the child by giving him opportunities to

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[36]Hollister and Gunderson, op. cit. p. 62.

[37]Brueckner and Grossnickle, op. cit. p. 70.

[38]Ibid. p. 63.

explore numbers, to reason things out, and to come to a correct solution. Number experiences must not be left to chance. The teacher must have a well planned program, emphasizing the systematic and sequential relationships among numbers. This organized program need not be formal, nor without provision for the individual child. It should contain enough in content to give the program substance, and to give the pupils a real understanding of the meaning of numbers. Certain meanings and skills in which growth should take place are constantly in the mind of the teacher who plans for child participation in the activity program.

Concrete Experiences and Aids

In the first grade we attempt to show the child through experience how numbers are linked with everyday needs, and to guide him in his understandings through purposeful activities. A rich background of concrete experiences leads naturally to the further desirable activities of other grades. By providing first-hand contacts with manipulative devices we help the child to build a rich background of number concepts before beginning abstract number work. Through the use of these aids the pupils are encouraged to discover number facts for themselves under teacher guidance. The author has included several citations concerning this phase of the problem, An Arithmetic Program for Grade One.

Rosenquist states that:

> In the first school years the media used by the teachers to build meanings for abstract mathematical ideas are instructional activities with concrete and representative materials.[39]

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[39]Rosenquist, op. cit. p. 20.

She further feels that:

> Watching pupils work with representative materials is an effective way for an observing teacher to acquire an insight into the pupils' thinking about numbers, and their methods of working. Pupils who otherwise would make no attempt to do so, will attempt to explain their methods of working out an idea when given materials.[40]

Morton substantiates this when he states that:

> In the development of most topics, the first experiences should be concrete. That is, they should be sensory in character; they should deal with objects which can be seen and handled.[41]

He reiterates when he says that, "The use of concrete and semi-concrete materials is very important. Indeed, experience with such materials is indispensable."[42] This phase of the curriculum is the teacher's responsibility. For as Morton says, ". . . the concrete level must be supplied by the teacher if it is to be supplied at all."[43]

Further research reveals that Stokes also stresses the need of learning through sensory aids. He states that:

> If arithmetic is to be made vital and practical to children, sensory aids should be used as frequently as possible in the classroom. A sensory aid helps the child visualize the relationships involved in a problem situation, and aids his learning by appealing to as many as possible. By manipulating counters, or small objects, the child can show how things are related, how these relationships can change, and how they can be interpreted.
>
> Sensory aids can be purchased by the school as teaching aids, supplied (often free) by industry, made by the classroom teacher, and made by the students.
>
> The key to effective learning is to make the learner active; he must learn by doing. Therefore, the classroom should be a kind of laboratory in which the children have an opportunity to work with the materials helpful to arithmetical understandings. Materials

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[40] Rosenquist, op. cit. p. 67.

[41] Morton, op. cit. p. 4.

[42] Ibid. p. 10.

[43] Ibid., p. 5

in the arithmetic corner of the classroom should be checked frequently to make sure that they correspond to current number activities.[44]

However, we must remember that these devices must not become a crutch to the child's thinking. Caroline Hatton Clark tells us that:

> Important as things are in the learning of arithmetic, the teacher should always remember that she is using them only as a preparation for a higher level of maturity in thinking with numbers - abstraction or number symbolism. If it is true that the pupil cannot learn arithmetic without things, it is equally true that he must eventually free himself from the necessity of thinking with things. Only then has he really acquired the ability to do quantitative thinking.[45]

Catherine Stern has established a number program based on the use of concrete materials. She says that:

> A balanced, well-integrated treatment of both the social and mathematical phases of arithmetic is essential. Arithmetic should be both mathematically meaningful and socially significant.[46]

However, she qualifies this statement with the following:

> The manipulative materials are laid aside as soon as he has understood a new principle. If he falls short the teacher should present the principles in another way. The child begins to use the manipulative materials as reference tools. However, they fill their purpose only when he can visualize them without their being present.[47]

A summary of her findings tells us that:

We must not use so many devices that we lose the basic sense of

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[44]C. Newton Stokes, "Learning Through Sensory Aids," Tips on Teaching Arithmetic, VI. Boston, Massachusetts: Allyn and Bacon, Inc.

[45]Caroline Hatton Clark, "Improvised Aids in Teaching Arithmetic," Notes for the Arithmetic Teacher. Yonkers-on-Hudson, New York: World Book Company, 1956.

[46]Catherine Stern, Children Discover Arithmetic. New York: Harper Brothers, 1949, p. 289.

[47]Ibid. p. 289.

> mathematics - that the child doesn't fail to "see" the numbers and to "think" in numbers. You want him to see the wholeness of numbers, but also the different parts that make up the whole . . . . Children need the proper tools to work with. Don't smother him with gadgets.[48]

From this data we may conclude that the pupil should have many concrete number experiences, leading to sound understandings and providing an excellent background for later work in arithmetic. The child best remembers whatever he personally handles or experiences, and the use of concrete manipulative materials can be a valuable aid. However, the teacher should guide the use of the devices carefully so that they do not become a disguised form of drill, nor should they be allowed to become a crutch to the child's thinking and reasoning. These manipulative experiences should arouse a curiosity about numbers in the children and build a firm foundation which will assure them of success as they advance forward in their arithmetical ability. This feeling of success is most important to the child for it gives him his sense of security which is as important in numbers as in all else.

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[48]Stern, op. cit. p. 289.

CHAPTER III

OUTLINE OF PROCEDURE

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The problem stated. It was the purpose of this problem to formulate a course of study which could be used as an arithmetic program for grade one in the following ways:

1. As a curriculum guide to indicate the common arithmetical learnings recommended for grade one

2. As a source of suggested manipulative devices intended to incorporate meaning into the number experiences

3. As a recommended time schedule for the teaching of specific words needed in an arithmetic vocabulary

4. As a bibliography of stories which could be used to enrich the understanding of number concepts.

General procedure. The method of procedure used for this study, An Arithmetic Program for Grade One, consisted of the following major steps:

1. The study of eight well-known number workbooks to determine the common learnings in arithmetic for grade one.

2. The formulation of a check list with criteria based on the selected common learnings discovered through the research and study of the number workbooks.

3. The construction of a curriculum guide with the incorporation of the following features:

A. Areas of growth

B. First grade activities

C. Suggested manipulative devices that implement the program

D. A vocabulary of number relationships

4. The listing of a bibliography of stories to read to the children that involve number experiences.

Materials used for this study. The materials used for this study included number workbooks from eight well-known series in arithmetic for grade one. They were:

1. Growth in Arithmetic. Clark, Jung & Clark; World Book Company: 1952.

2. Happy Ways to Numbers & Ready for Numbers. Merton & Brueckner; The John C. Winston Company; 1955.

3. Jolly Numbers. Buswell, Brownell & John; Ginn & Company; 1944.

4. Learning to Use Arithmetic. Gunderson & Hollister; D. C. Heath & Company; 1953.

5. Making Sure of Arithmetic: Book One. Morton & Gray; Silver Burdett Company; 1953.

6. Our Number Workshop. Studebaker, Findley, Knight & Gray; Scott, Foresman Company; 1946.

7. Workbook for Arithmetic in my World. Adams & Bauer; Allyn & Bacon, Incorporated; 1958.

8. Workbook - Primer. Wheat, Kauffman, Wheat, Douglass & Larsen; Row-Peterson Company; 1954.

Workbook I. Wheat, Kauffman, Wheat, Douglass & Larsen; Row-Peterson Company; 1955.

CHAPTER IV

A CURRICULUM GUIDE FOR GRADE ONE

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A CURRICULUM GUIDE FOR GRADE ONE

A resume of the problem. The writer was concerned with the establishment of an arithmetic program for grade one. This included an analysis of eight well-known number workbooks published for grade one. From this analysis and the findings of research, the author formulated a curriculum guide which stated the areas of common learnings, suggested commercial and teacher-made devices which would help to build understanding, included a vocabulary of number relationships, and listed a bibliography of stories involving number experiences to read to the pupils.

A curriculum guide. The course of study in arithmetic for grade one is presented in Table 1, An Overview Chart of the Common Learnings in Arithmetic for Grade One. This represents the scope of first grade number work. This table is divided into four sections:

1. Section one includes the areas of growth.
2. Section two lists the grade one activities.
3. Section three lists the suggested devices.
4. Section four includes the vocabulary of number relationships.

TABLE 1

AN OVERVIEW CHART OF THE COMMON LEARNINGS IN ARITHMETIC FOR GRADE ONE

SECTION I	SECTION II	SECTION III*	SECTION IV
Areas of Growth	Grade One Arithmetic	Suggested Devices	Vocabulary of Number Relations
Understanding Number Concepts	Counting: Provision through experience for rational and rote counting	1. Tens-tens bead frame (1) 2. Primary number cutouts with cohere-o-graph (2) 3. Number table (8) 4. Flannel board (15) 5. Film strips (7)	color count number write
Reading and Writing Numbers	Reading and writing numbers to 100 Studying relationships of numbers in a tens system Recognizing the numbers of objects in structured groups	1. Tens-tens bead frame (1) 2. Primary spool number board (3) 3. Number grouping disks (4) 4. Number table (8) 5. Number cards for writing (9)	tens ones circle between

Areas of Growth	Grade One Activities	Suggested Devices	Vocabulary of Number Relations
Reading and Writing Numbers Continued	Numbering objects serially	6. Clothespin bead frame (11)	next last
	Learning ordinals through sixth	7. Number line (12)	first second third fourth fifth sixth
	Reading dates with months, days, years	8. 1-100 number chart (14)	Sunday Monday Tuesday Wednesday Thursday Friday Saturday day today week year tomorrow
		9. Flannel board (15)	yesterday January February March April May June July August
		10. Number fact cards (16)	September October November December month
	Reading their own street and telephone numbers	11. Number name cards (17)	road route street
	Reading number words, one - ten	12. Number symbol cards (18)	one two three four five six seven eight nine ten
		13. Film strips (7)	
Adding Whole Numbers	Counting and handling of objects in the experience program	1. Tens -tens bead frame (1)	all altogether
		2. Number fact cards (16)	and are add

Areas of Growth	Grade One Activities	Suggested Devices	Vocabulary of Number Relations
Adding Whole Numbers Continued	Grouping and regrouping using objects and pictures Adding sums through six - optional through ten Deriving, reading, writing addition facts in vertical form - sums through six, optional through ten Solving easy problems with the aid of representative materials and pictures Estimating, generalizing, and reasoning Finding how many things there are altogether in two or more like groups Putting together to make one larger group	3. Primary number cutouts with cohere-o-graph (2) 4. Flannel board (15) 5. Primary spool number board (3) 6. Number grouping disks (4) 7. Number table (8) 8. Combination spinner (10) 9. Clothespin bead frame (11) 10. Place value sticks (5)	come group see find see draw many is how it much each enough is it has have

Areas of Growth	Grade One Activities	Suggested Devices	Vocabulary of Number Relations
Subtracting Whole Numbers	Subtracting means to take from a group Breaking up a single group into two smaller groups Meaning through grouping and re-grouping objects and pictures - minuends through six, through ten optional Deriving, reading, writing, subtraction facts in vertical form, minuends through six - through ten optional Solving easy problems with the aid of representative materials and pictures Estimating, generalizing, and reasoning	1. Tens-tens bead frame (1) 2. Number fact cards (16) 3. Primary number cutouts with cohere-o-graph (2) 4. Primary spool number board (3) 5. Number grouping disks (4) 6. Number table (8) 7. Combination spinner (10) 8. Clothespin bead frame (11) 9. Flannel board (15) 10. Place value sticks (5)	take away from go leave left less need

Areas of Growth	Grade One Activities	Suggested Devices	Vocabulary of Number Relations
Multiplying Whole Numbers	Studying collections of objects (to 6) by combining equal groups, to build readiness for multiplication	1. Primary number cutouts with cohere-o-graph (2) 2. Number table (8) 3. Flannel board (15) 4. Place value sticks (5)	of times
Dividing Whole Numbers	Studying collections of objects (to 6) by separating into equal groups, to build readiness for division	1. Primary number cutouts with cohere-o-graph (2) 2. Number table (8) 3. Flannel board (15) 4. Place value sticks (5)	both share
Using Fractions	Telling when an object or group is in two equal parts, each part being called a half Telling when an object or group is in two equal parts - showing halves Dividing a whole into two equal parts, each part being called a half	1. Primary number cutouts with cohere-o-graph (2) 2. Number table (8) 3. Flannel board (15)	parts half equal same whole

Areas of Growth	Grade One Activities	Suggested Devices	Vocabulary of Number Relations
Understanding Measurements	Using the ruler - the inch Understanding dozen, half dozen and pair Understanding liquid measurement - pint and quart Understanding time - clock (to even hours) and calendar Developing a useful vocabulary of measurement and comparison	1. Primary number cutouts with cohere-o-graph (2) 2. Primary spool number board (3) 3. Tick-tock primary clock (6) 4. Number table (8) 5. Mr. Tell-Time (13) 6. Flannel board (15)	foot inch ruler long longer longest short shortest pair dozen half dozen pint quart more most on past o'clock time before after clock big bigger biggest little last middle over square tall taller tallest top under up old young
Learning the Values of U.S. money	Knowing the value of the: penny quarter nickel half-dollar dime dollar Knowing how much each is in cents		buy money quarter cent nickel sale cost penny spend dime price dollar half-dollar

Areas of Growth	Grade One Activities	Suggested Devices	Vocabulary of Number Relations		
Solving Problems	Solving easy problems with the aid of manipulative materials and visual aids Analyzing and solving problems arising in classroom situations requiring children to find out how many and how much	1. Primary number cutouts with cohere-o-graph (2) 2. Primary spool number board (3) 3. Number grouping disks (4) 4. Film strips (7) 5. Number table (8) 6. Clothespin bead frame (11) 7. Flannel board (15) 8. Place value sticks (5)	another	I	row
			as	in	story
			back	left	than
			begin	lunch	the
			behind	made	there
			bring	name	to
			by	none	we
			count	other	what
			dot	picture	when
			every	put	which
			here	right	why

*The number in parenthesis indicates the description of the device as it appears in detail in the following pages.

Devices

Manipulative devices. The following devices are those that the author has found successful in implementing the first grade number program. These include:

1. Commercial devices - These products are listed by name and catalogue number. This number is to be used when ordering from the supply house. The address of the supply house is in the appendix.

2. Teacher-made devices - These devices are ones that the author has constructed and found helpful in presenting first grade numbers.

Commercial Devices that Implement the Program

1. The Classroom Counting Frame 9370

The tens-tens bead frame aids in the understanding of place value and that our system is a tens system. The children are able to visualize quantities and to develop the meaning of numbers 1 to 100. They are able to note patterns for the addition and subtraction of numbers. The number frame that is illustrated is the Classroom Counting Frame available from Milton Bradley Company at a cost of $16.00. Note Figure 1.

Figure 1

2. Primary Number Cutouts with Cohere-o-graph

The cohere-o-graph is similar to a flannel board. It includes cutouts of 24 rabbits, 24 ducks, 30 stars, and 33 disks. They have a cohesive quality that causes them to stick to the display surface. This device may be used for teacher-pupil demonstrations, for the children to discover number concepts, and for the children to develop understanding of addition and subtraction. It may be purchased from the John C. Winston Company at a cost of $7.45.

3. Primary Spool Number Board 31.

This spool board is 16" x 16", and it has 100 pegs placed in ten rows of ten each. There are 100 accompanying spools, 25 red spools, 25 green spools, 25 white spools, and 25 blue spools. This is used to help teach the number combinations by arranging the spools in the various patterns and to help the pupils understand the related addition facts and subtraction facts. It is an aid in counting, and in teaching ordinal concepts. It is also an aid in teaching size, shape, and location. It may be obtained from the John C. Winston Company at a cost of $5.50. It is illustrated in Figure 2.

Figure 2

4. Number Grouping Disks 751

These red cardboard disks come ready to punch out. They aid the child in discovery of number facts, in grouping and the discovery of related addition and subtraction facts. There are 500 disks in each envelope. They may be purchased from Ideal at a cost of $1.00. They are illustrated in Figure 3.

Figure 3

5. New Enlarged Place Value Sticks 767

These come with 100 red lacquered sticks in a box. They aid in teaching the ten-ness of numbers and place value. The child may group the sticks to show 37 as three groups of tens and seven ones. They may be purchased from Ideal at a cost of $3.00 per box.

6. Tick-Tock Primary Clock 9380

This clock is 20" square. Color is used as an aid in teaching time. The 'past' side of the clock is blue, while the 'of' side is gray. The minute hand and minute marks are red, while the hour hand and

hour marks are black. This may be purchased from the Milton Bradley Company at a cost of $3.00

7. Film Strips

Audio-visual materials must be tied in with the concepts being taught. They are helpful in that they give concrete forms to simple number experiences. However, there should always be a careful follow-up in which the teacher evaluates the experiences the children have had by asking questions like these:

1. Did the children get answers to their questions?

2. Will they retain the information they have gained?

Eye Gate House Incorporated has two number film strips that are available. They are:

1. "Work and Play with Numbers"

2. "Seeing the Use of Numbers."

Encyclopaedia Britannica Films has one available. It is:

1. "Using Numbers."

Teacher-Made Devices that the Author Has Found Helpful In Presenting Arithmetic in Grade One

8. A Number Corner

A number corner is a helpful addition to a primary classroom, for through participation in this experience the children are able to manipulate various objects which aid them in finding their own solutions to number problems. Such a corner is illustrated in Figures 4 and 5. The following is a list of suggested materials the teacher might supply for the number corner.

disks	pencils	buttons	paper plates
pegs	spools	paper cups	tongue depressors
blocks	erasers	toy money	colored art paper
rulers	crayons	paper clips	paste sticks
milk bottle tops		clothespins	dominoes
Tinker Toy parts		toy telephone	old catalogues
toy cash register		half pint bottle	egg cartons
wooden beads		pint bottle	nest of tin cans
measuring cups		quart bottle	sheets of stamps
globe		tape measure	soda straws
paper punch		thermometer	

Figure 4

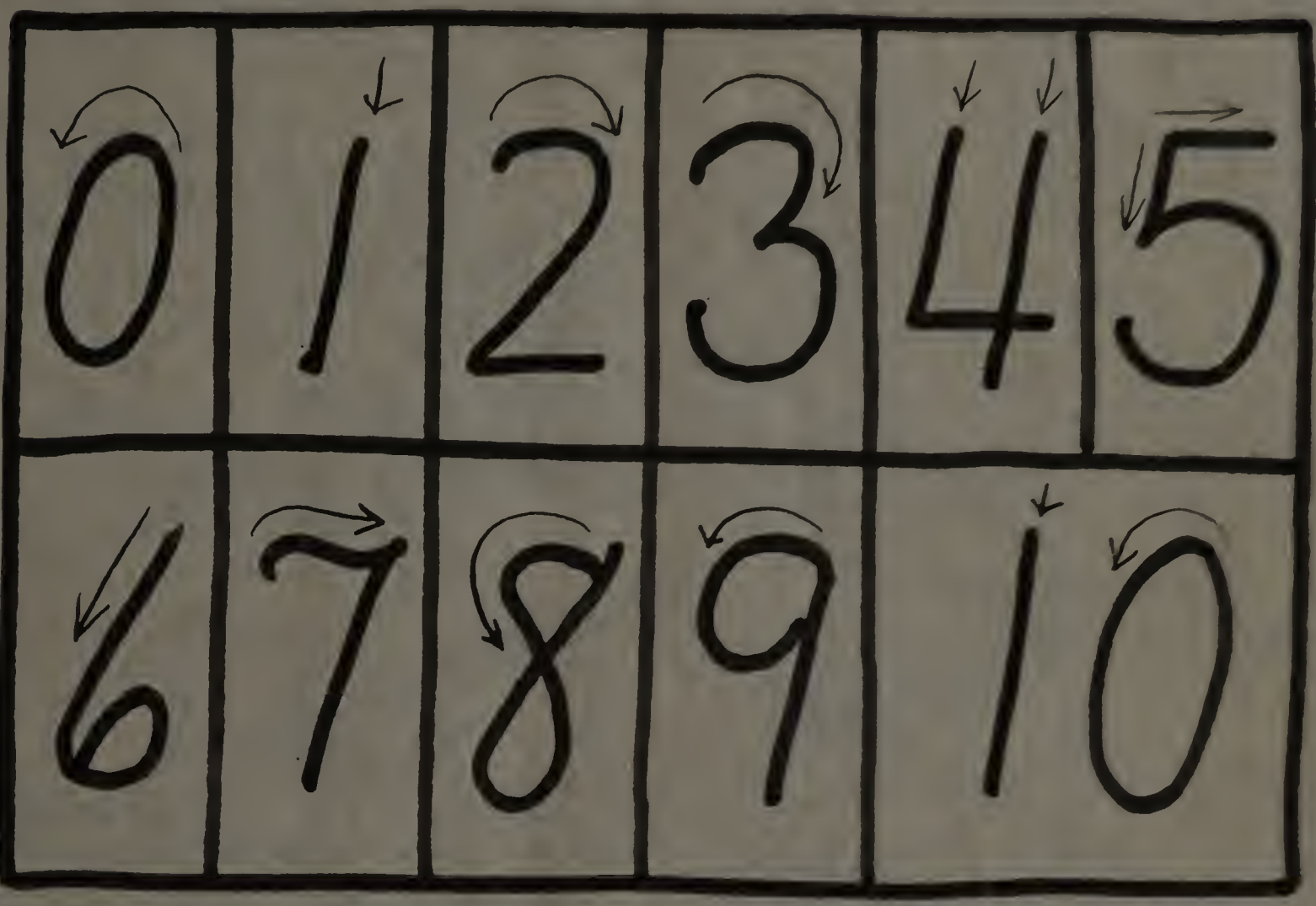
Figure 5

9. Number Cards Used to Teach the Correct Formation of the Numbers

It is important that the children learn to write the numbers correctly, and the teacher must remember that she must always present a good example when doing board work. Number cards must also be available. These number cards may be made on oak tag or construction paper 9" x 11"

and drawn with a felt pen. Or, they may be cut from sandpaper and mounted on oak tag or construction paper. Figure 6 merely shows how the numbers should look.

Figure 6



10. Combination Spinner

Take a 9" square of oak tag or poster board and number it from 0 - 9. Cut a hand 2" long and point one end. Punch a hole in the opposite end and fasten to the center of square with a round head paper fastener. The child will spin the hand and tell or write all the combinations that will make the number found with the spinner. This is illustrated in Figure 7.

11. A Clothespin Bead Frame

This is an adaption of the tens bead frame and may be made from a

simple wire coat hanger. In working the number concepts to ten, simply clip on ten clothespins. If you like, you may use the plastic variety and use two different colors--one color representing each number. Keeping extra pins on hand, the child may discover the number facts by grouping and regrouping the pins. This is illustrated in Figure 8.

Figure 7

Figure 8

12. Construction of a Number Line

A number line is helpful in teaching the order of the numbers 1 - 10, and for the teacher to make a check of the pupil's ability to place the numbers in the proper order. Take a piece of pine 1" x 3" x 24". Have a groove placed in the center of the board $\frac{1}{2}$" deep and 1/16" wide. Make number cards of poster board 2" x 5" and draw the numbers 1 - 10 on them with a felt pen or marking pencil. This is illustrated in Figure 9.

Another adaptation of this is the Indian Princess made of poster board and construction paper. Her head-band is made of oak tag, and roundhead paper fasteners hold it on and separate the numbers. The

numbers are drawn on poster board feathers. This is illustrated in Figure 10.

Figure 9

Figure 10

13. Mr. Tell - Time, the Clock

A large circle 20" in diameter is drawn on poster board 22" x 30" to represent the clock face. This circle is covered with saran wrap. Cut two poster board clock hands--the hour hand is 2 1/2" x 3/4" and the minute hand is 3 1/2" x 3/4". They are placed in the center of the large saran covered circle with a round head paper fastener. Using a smooth plastic material, such as you use to cover kitchen chairs, cut out the numbers for the clock. They will cling to the saran wrap, and can be placed on the clock face by the children. The clock hands may then be set at various times by the children, or it may be used for class demonstration by the teacher. This is illustrated in Figure 11.

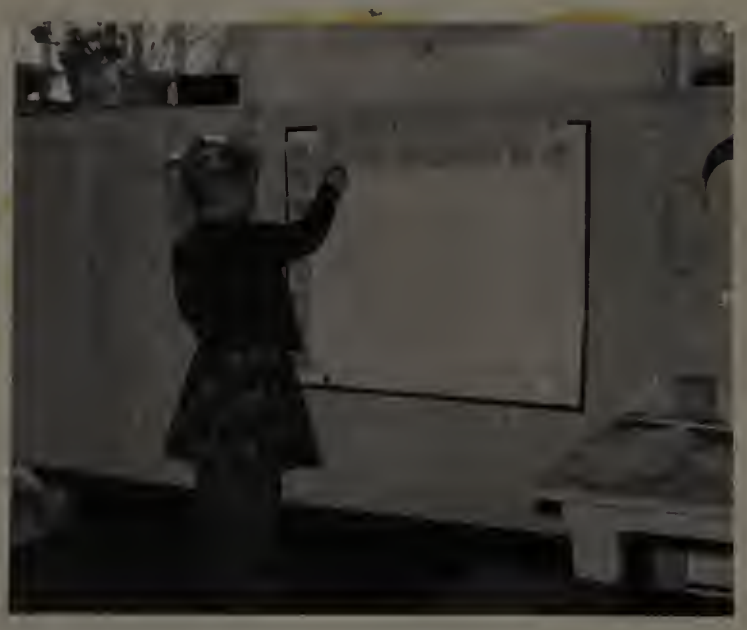
14. A 1 - 100 Number Chart

This chart is made of a discarded word holder. The only addition is one small pocket on the bottom of the chart to hold number 100. The

cards are 2" x 3" and cut from oak tag. The numbers, 1 - 100, are placed on the cards with a felt pen or marking pencil. The children may place the numbers in the chart, or it may be used by the teacher for class demonstrations. This is illustrated in Figure 12.

Figure 11

Figure 12



15. Flannel Board

The flannel board is used as a visual aid in teaching for developing concepts like the following:

a. comparison of sizes, shapes, direction

b. number grouping - names and identification

c. visualizing addition and subtraction by using symbols and numbers

d. clarification of simple fraction concepts.

The flannel board may be constructed of plywood or masonite. A good size for class demonstration is one thirty inches wide by six inches long. Outing flannel is needed to cover the board. Blue or gray are good background colors. Spread Elmer's Glue liberally over the board and pull the flannel tight over the board. Keep it smooth and press it

to help it adhere. Turn over the board and fasten the edges of the flannel with tape, tacks, or staples.

Accessories may be made by the teacher with:

a. felt cutouts

b. construction paper with a small piece of sandpaper pasted on the back to help it cling to the flannel board.

16. Number Fact Cards

Dominoes are used to discover that a number has a group meaning and that it is the total of the groups within it. They are also used to discover related addition and subtraction facts and group patterns. They are constructed of oak tag cut into 9" x 12" pieces. Fold the card in half and draw a dotted line on the fold. On each card draw or mount circles about the size of a half dollar. The nine cards needed for grade one in the John C. Winston grade one workbooks are shown in Figure 13.

Another domino card might be made by cutting oak tag into pieces 6" x 12". On the one side the number combinations are placed using number symbols. On the other side the number combinations are shown with dots drawn or pasted on about the size of a half dollar. The children might like to keep a collection of these in their individual folder with a pocket for those they know, and a pocket for those they need to practice. These are illustrated in Figure 14.

17. Number Name Cards

These cards are used to teach number names. You may use construction paper or oak tag 6" x 12". The number word is clearly

Figure 13

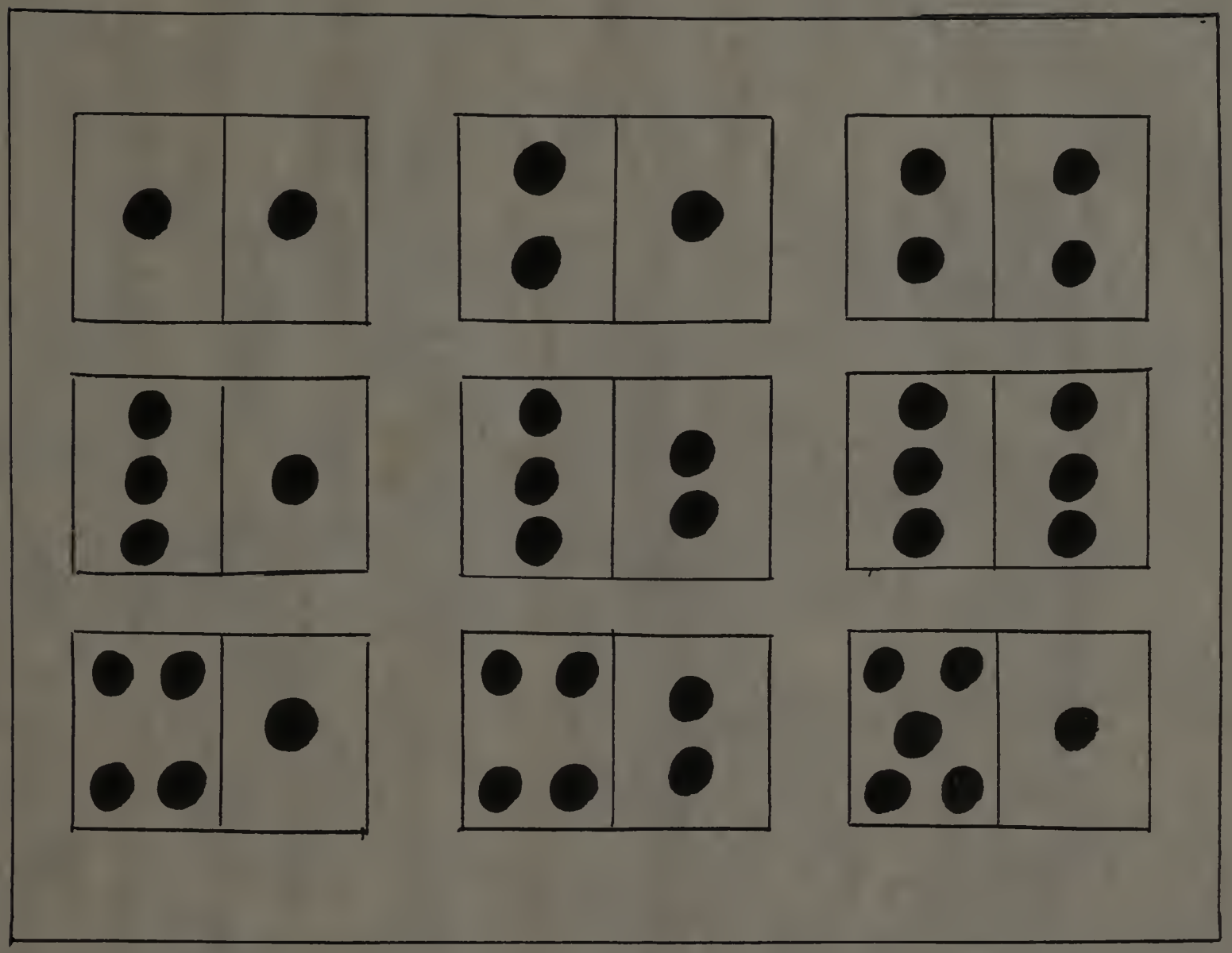
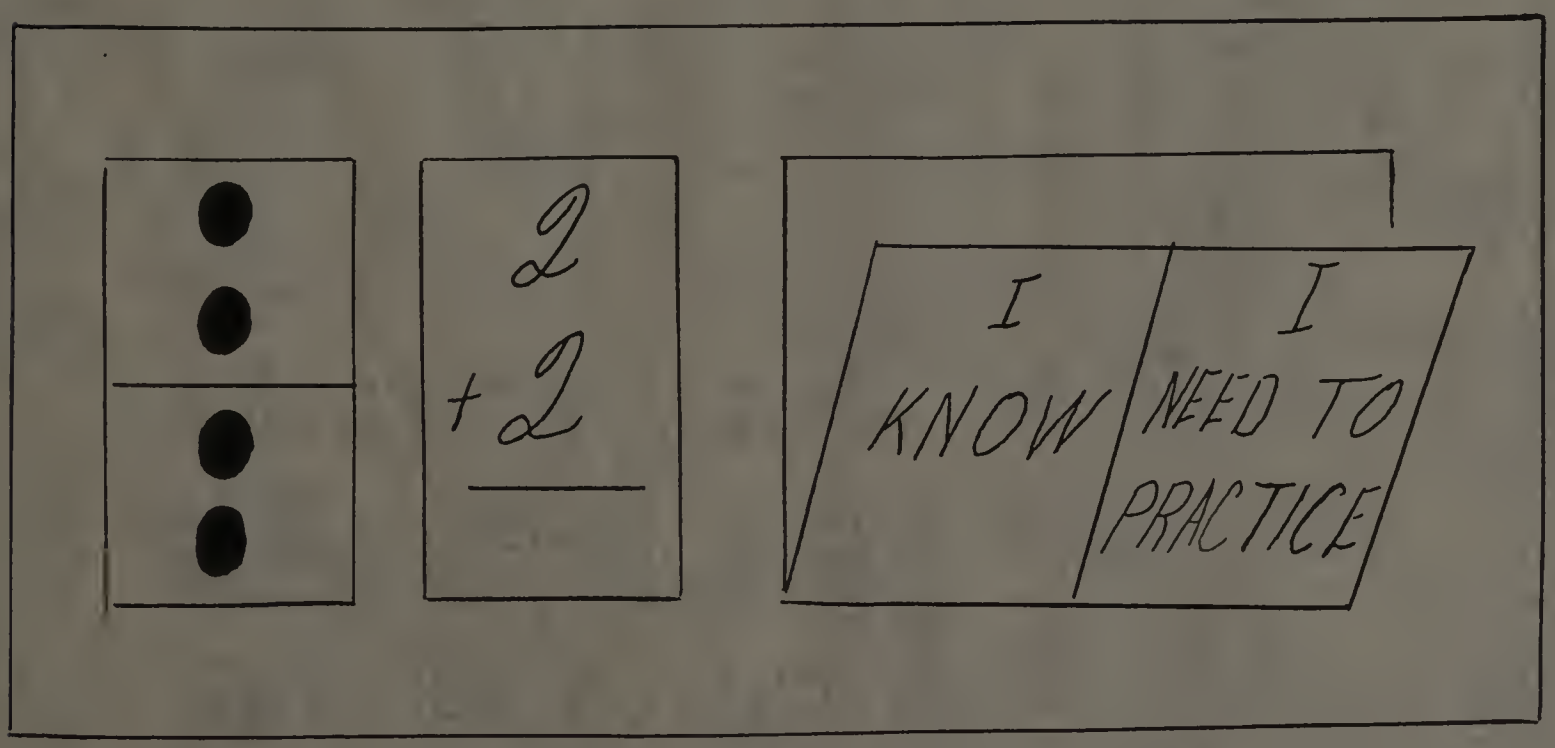


Figure 14



lettered with a felt pen or marking pencil; on the reverse side are the number disks, about the size of a half dollar, that the number represents. A set of these for the number names one through ten is needed. This is illustrated in Figure 15.

18. Number Symbol Cards

These cards are used to help the child bridge the gap from the pictures of objects to the use of symbols. The number symbol is placed in the upper corner of a card 9" x 12", made of oak tag or construction paper. Disks or pictures of objects may be used to represent the numbers. A set of one through ten is needed. This is illustrated in Figure 16.

Figure 15

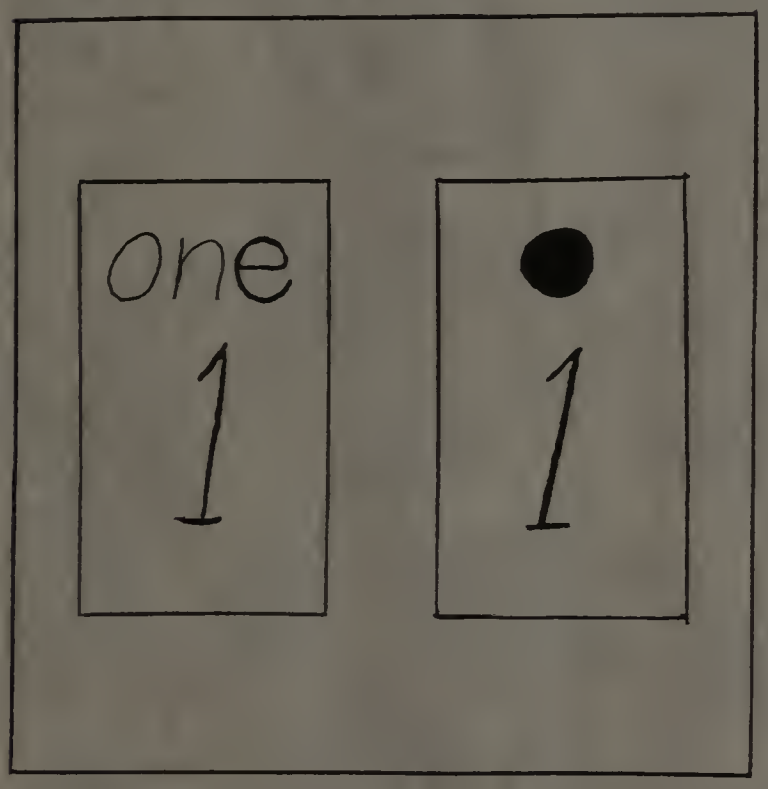
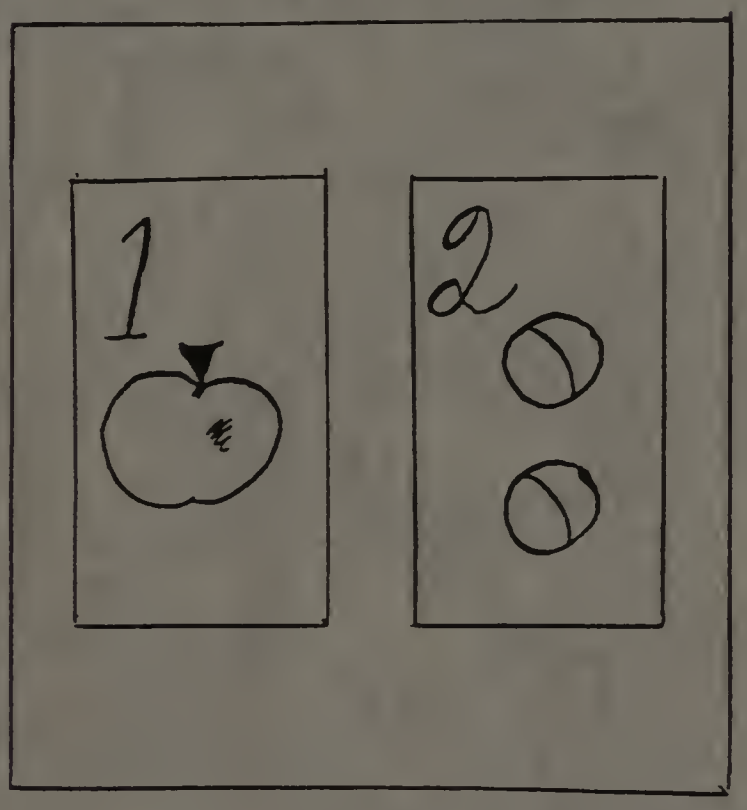


Figure 16



19. Charts for Teaching Number Vocabulary

A picture chart is a useful aid in teaching number vocabulary. The charts are made on construction paper 18" x 22" or on oak tag. The

vocabulary word is clearly lettered with a felt pen or marking pencil. Examples of these charts are shown in Figures 17 through 21.

Figure 17

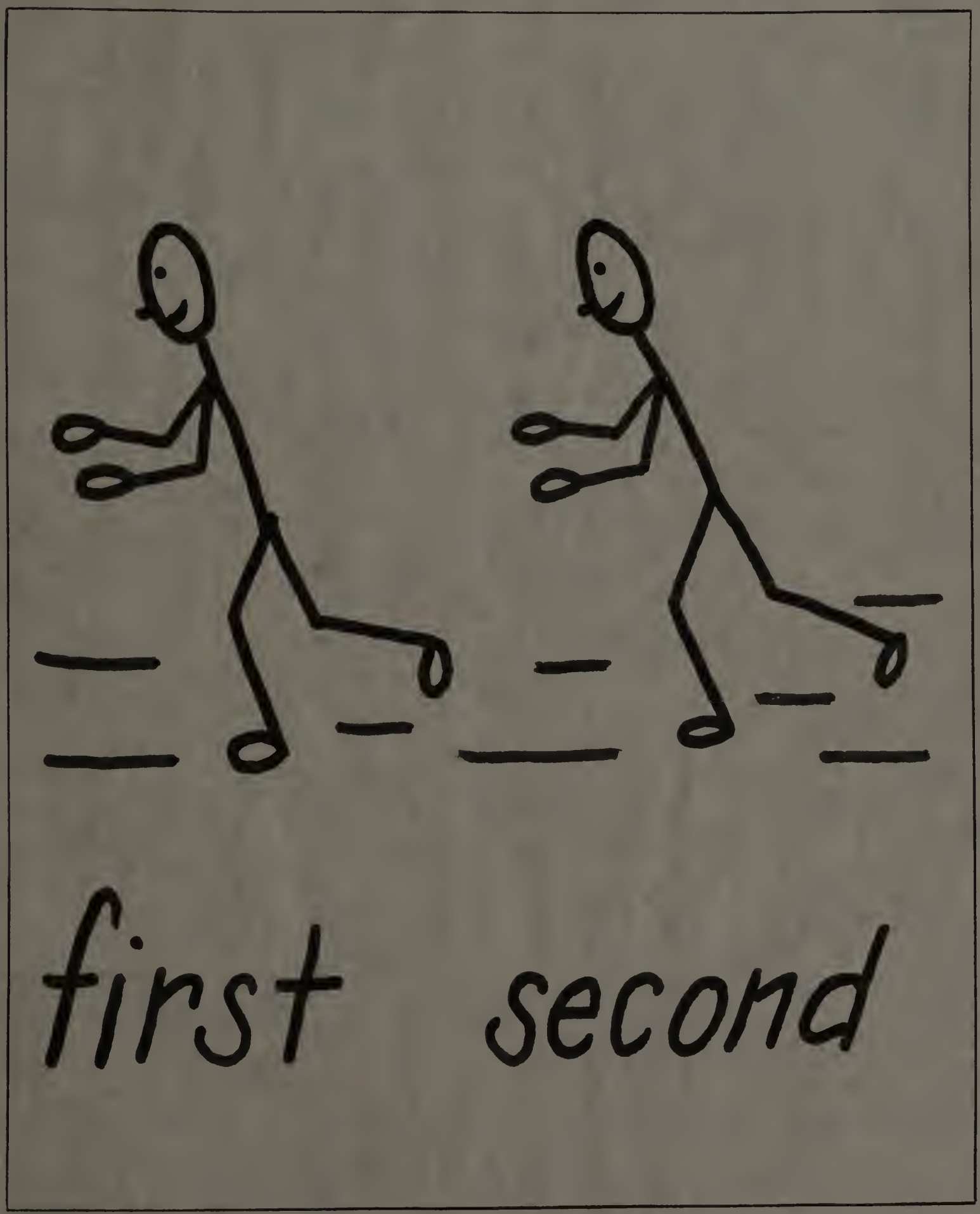


Figure 18

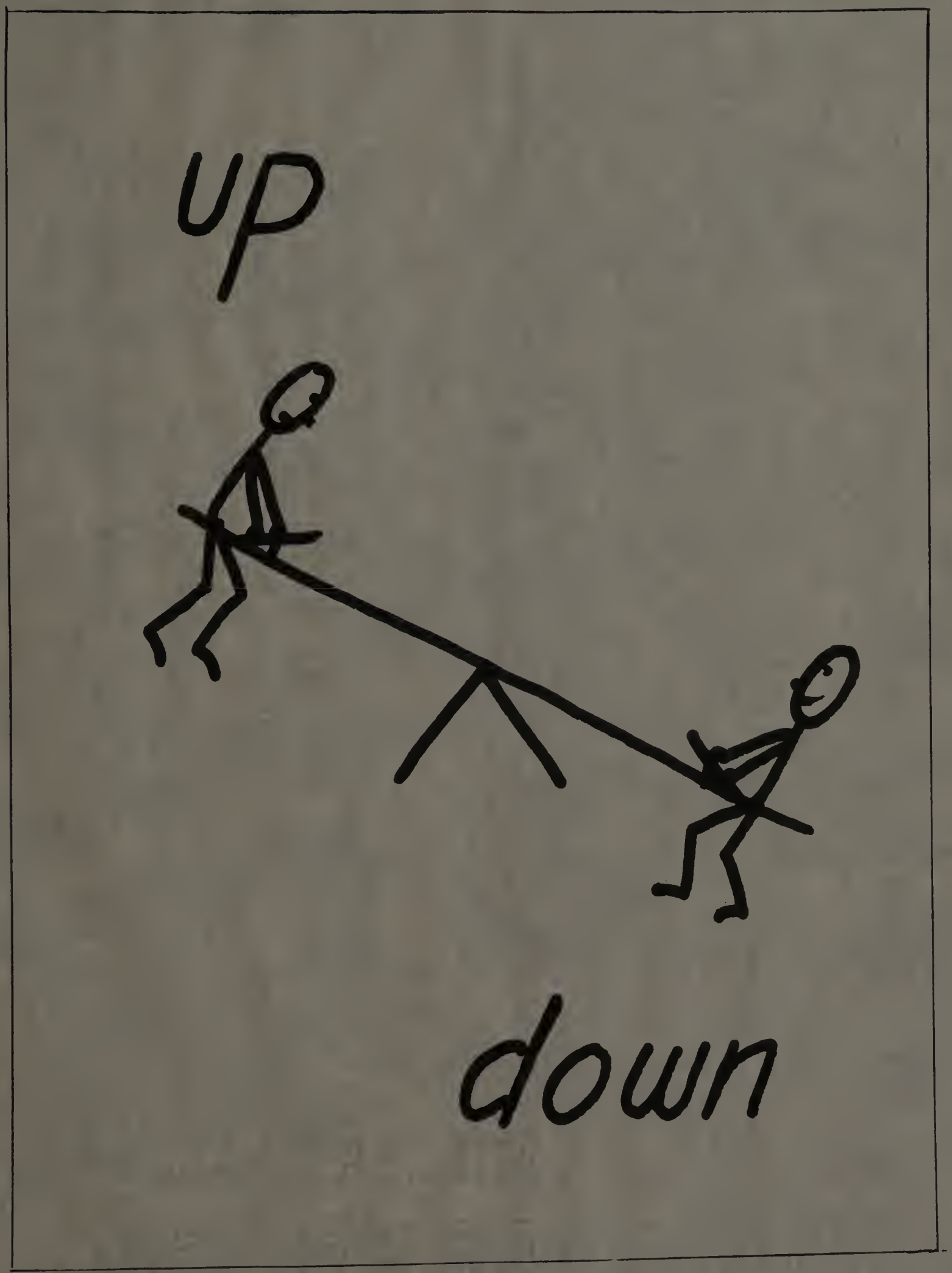


Figure 19

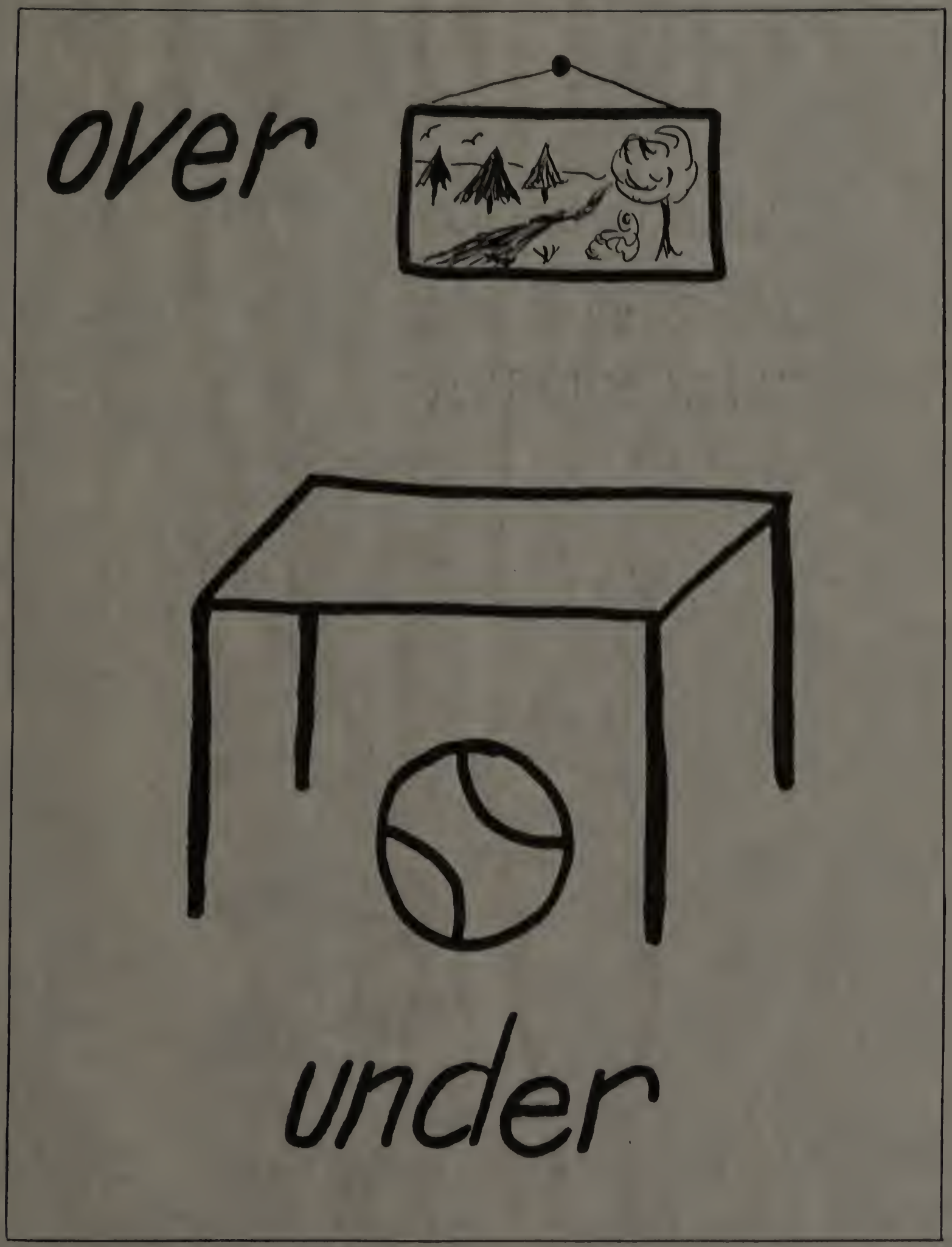


Figure 20

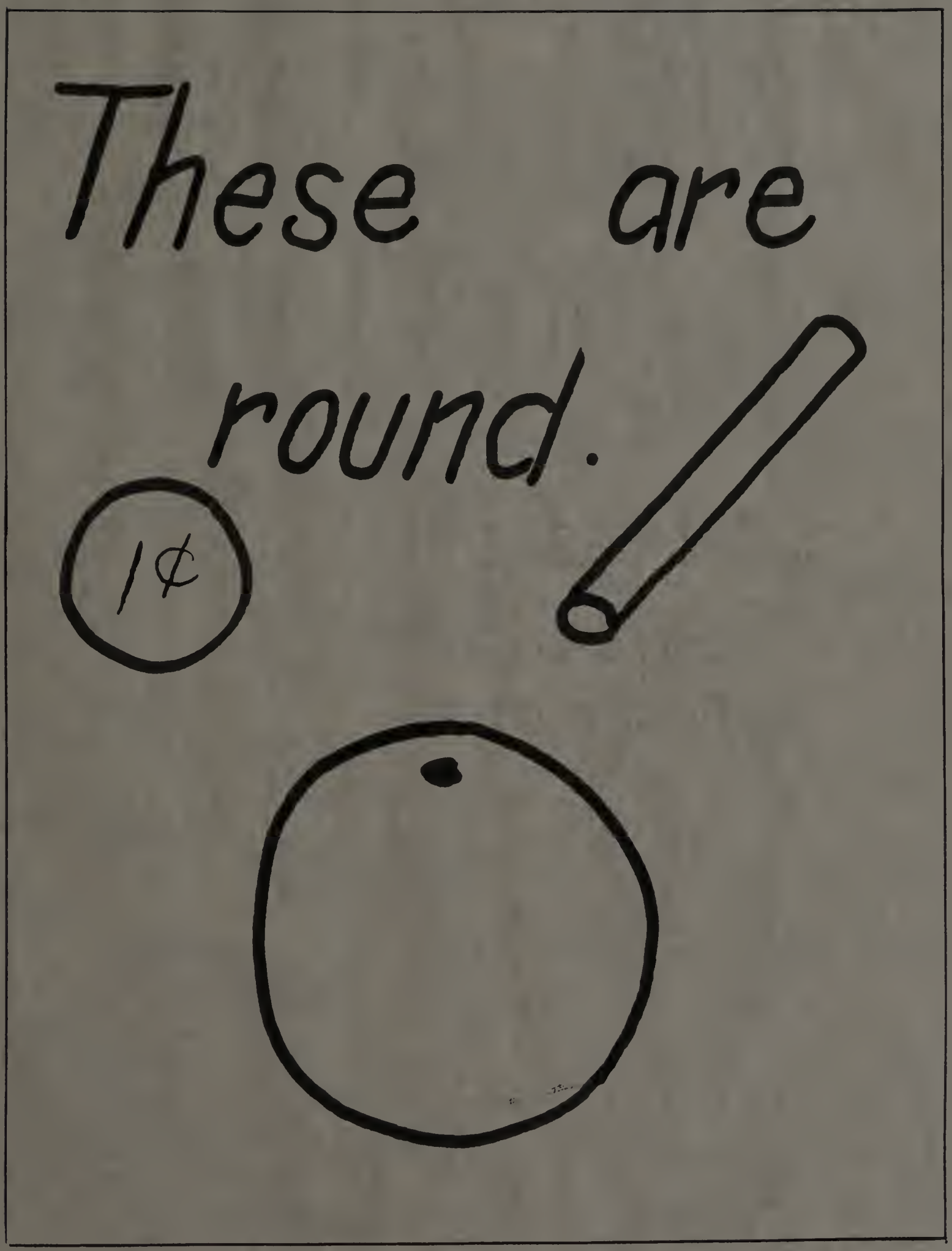
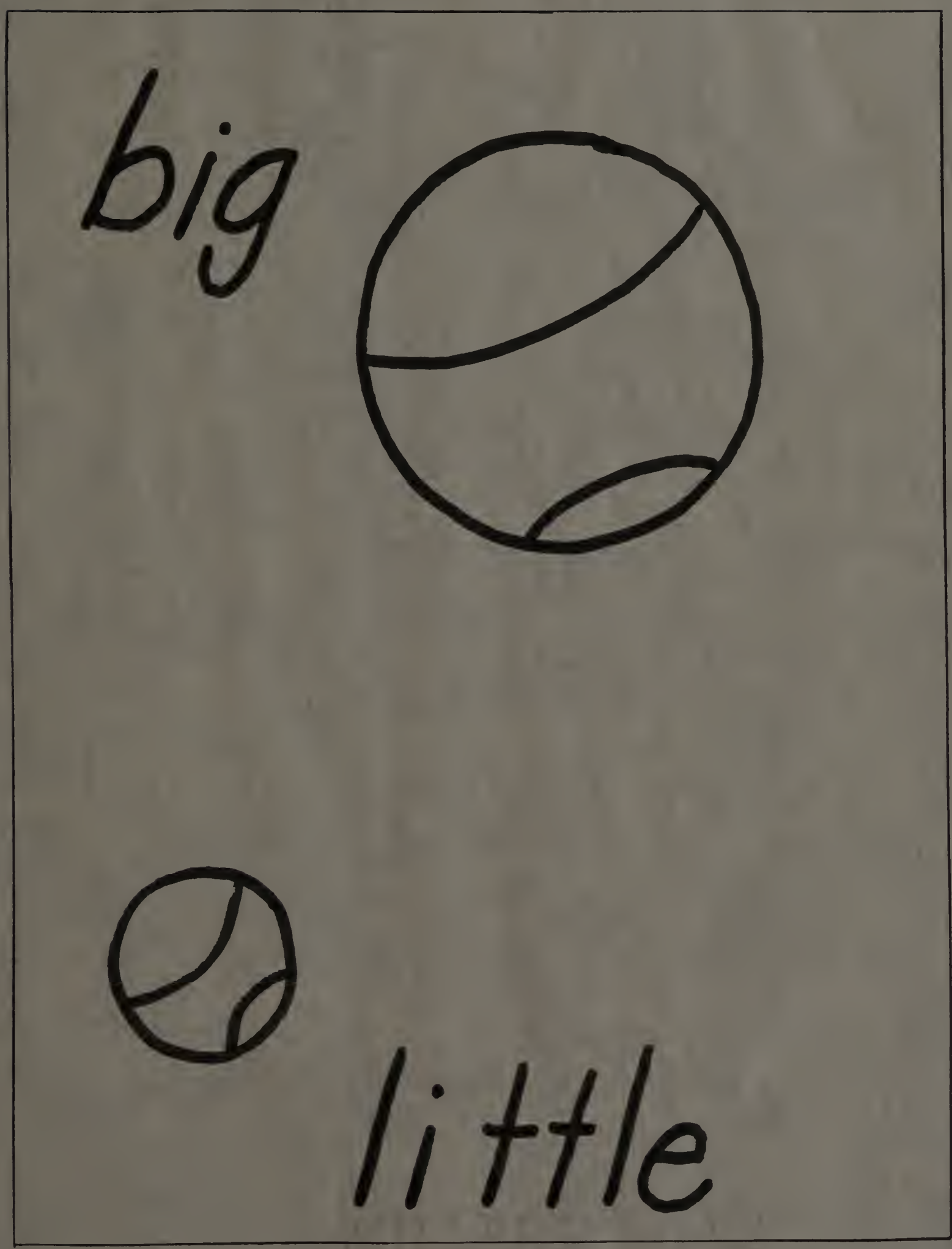


Figure 21



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

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CONCLUSIONS AND RECOMMENDATIONS

Conclusions. In this study the author established a number program for grade one. The program was based on data compiled from research and from an analysis of eight well-known number workbooks published for grade one. This program was an organized course of study with stated aims and suggested devices to implement the program. A vocabulary of number relationships was also included. The author further listed a bibliography of stories that involve number experiences.

This paper presented the writer's ideas concerning a sound arithmetic program. It would be erroneous to state that this program would be correct for all students, for each child must be met at his own level of readiness. Furthermore, this program holds meaning for the class only if it is understood by the teacher. The author does not aim for speed through the use of drill and rote memorization, but for the pupils' understanding of numbers and their ability to use numbers intelligently in a problem solving situation.

Summary. From this study we may conclude that a satisfactory arithmetic readiness program in grade one aims at building basic number meanings, essential number vocabulary, and desirable attitudes toward number. The child must feel that arithmetic is useful and a part of everyday life. The classroom must become a learning laboratory where the children make the discoveries of the basic number concepts. The program requires a skillful, imaginative teacher to lead the children to the discovery of numbers, for it is her ability, imagination, and enthusiasm

that sparks the program.

Beginning success in arithmetic is important to the child, and to gain this success the teacher must select her methods and materials most carefully. This material must be well organized and must lend itself to the systematic course of instruction. As each child progresses at his own speed, there must be provision for continuous growth from year to year. Only the teacher can utilize the experiences at hand and discover the special interests and abilities of the pupils. Only the teacher can appraise the individual learners and their levels of progress, and go, if necessary, beyond the basic instructional material to satisfy them. If the teacher is resourceful and provides the right setting, many new facts can be discovered by the pupils. These discoveries by the pupils will be lasting and develop their independence and self-reliance. Care must be taken to allow children to appraise their own work and experiment to find other ways of reaching the same conclusions.

Number is abstract, rather than concrete, and it is the thoughtful progression of the concrete to the abstract that the first grade teacher must teach effectively to the class of children. There are four distinct steps in this progression. They are:

1. Seeing and handling objects
2. Using pictures of objects
3. Using semi-concrete objects such as dots and disks
4. Understanding the abstract use of numbers . . . number symbols.

The foundation of experience through activity with manipulative devices will lead to the second step using pictures of objects. This may be presented through the use of a workbook and carefully constructed

ditto sheets. The material in the workbook should be well organized and carry out a systematic course of instruction. This tool of learning should encourage good work habits and accuracy, providing the child with the practice that will fix what has been learned. The vocabulary used in the workbook should be less difficult than that used in the reading program and should be taught as the need arises.

The well-planned workbook will cary the child through the transition steps also. As the child steps up the ladder of learning, he progresses to the semi-concrete . . . the use of dots and disks to represent numbers. This leads him on to the final stage--the substitution of number symbols. The practice pages will differ in amount from topic to topic and from pupil to pupil.

We are teaching the pupils to think about the number of things--about quantities and amounts and sizes. It is taught through reasoning based on previously acquired facts. We are teaching the pupil to think in an orderly way, to work it out for himself. The teacher is merely the way shower.

However, our attitudes toward numbers will do much to influence the child's feelings about arithmetic. The teacher must provide the child with a firm background of knowledge and experience to assure success in later years.

Suggestions for research. Further research in this area might include a study of an experimental group of first graders, measuring the results of their achievement through various approaches to the course of study. This might be termed as action research for it involves the following techniques:

1. Solving a real problem

2. Trying new and different approaches and methods

3. Measuring its success.

The different methods used to approach this number experiment might include the following:

1. Formal approach of drill and rote memorization

2. Incidental approach

3. Social approach

4. A method incorporating the incidental and social approach, with the children having an opportunity to manipulate devices and explore numbers.

APPENDICES

APPENDIX

TABLES

TABLE 2

AN ANALYSIS OF NUMBER WORKBOOKS

AREAS OF LEARNING	WORKBOOKS							
	A	B	C	D	E	F	G	H
1. Number Concepts	3	2	3	1	2	3	2	1
2. Reading and Writing Numbers	3	2	3	0	2	3	3	1
3. Addition of Whole Numbers	3	2	3	0	2	2	3	1
4. Subtraction of Whole Numbers	3	2	3	0	2	2	3	1
5. Multiplication of Whole Numbers	2	0	1	0	1	0	2	0
6. Division of Whole Numbers	2	0	1	0	1	0	2	0
7. Fractions	3	1	0	0	1	2	2	0
8. Measurements	3	1	0	0	1	1	2	0
9. U. S. Money	3	0	2	0	0	2	3	0
10. Problem Solving	3	0	0	0	0	0	3	0
11. Simple Vocabulary of Number Relations	3	1	2	0	1	2	3	0
TOTAL SCORE	31	11	18	1	13	17	28	4

Key for Table 2 -- Numerical Values: 3 - excellent 1 - fair
2 - good 0 - poor

Workbooks are identified by the letters A - H.

The following is a number check list that the writer has found helpful.

TABLE 3

A NUMBER CHECK LIST

NAME _____ DATE _____

	YES OR NO	COMMENT
1. Counting by 1's to 20 (rote)		
2. Counting by 1's to 20 (objects)		
3. Counting beyond 20 (objects) How far?		
4. Counting by 2's - How far?		
5. Counting by 5's - How far?		
6. Counting by 10's - How far?		
7. Can recognize numbers to 10		
8. Can recognize numbers from 11 - 20		
9. Can count beyond 20 (rote) How far?		
10. Can tell number of objects in small groups to 10		
11. Can write numbers to 10		
12. Can write numbers from 1 - 20		
13. Can recognize number words one - ten		

	YES OR NO	COMMENT
14. Can tell simple number stories from personal experience		
15. Understands the ordinals - first, second, etc.		
16. Recognizes common shapes as: circles, rectangles, squares		
17. Knows which number comes before and after a number		
18. Finding which number is left out		
19. Can read the numbers on the clock		
20. Can tell time - on the hour and half-hour		
21. Can use the calendar		
22. Can use common measures in school activities		
23. Can recognize size: larger, smaller, etc.		
24. Knows meaning of half		
25. Knows value of penny, nickel, dime		
26. Counting money in simple problems		
27. Concept of addition		
28. Concept of subtraction		

APPENDIX

BIBLIOGRAPHY OF STORIES TO READ TO CHILDREN

BIBLIOGRAPHY OF STORIES TO READ TO CHILDREN

The following list of stories to read to the first grade class is composed of suggestions included in the teachers' editions of the workbooks the writer has investigated.

---

1. Baruch, D. W. and Montgomery, E. R. Sally Does It. New York: Appleton-Century-Crofts, Incorporated, 1940.

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6. Berkowitz, Ethel S. Ups and Downs. New York: W. R. Scott, 1951.

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8. Bianco, P. The Doll in the Window. New York: Oxford, 1953.

9. Brann, Esther. Five Puppies for Sale. New York: Macmillan, 1948.

10. Brown, M. W. Two Little Trains. New York: W. R. Scott, 1959.

11. Chalmers, Audrey. I Had A Penny. New York: The Viking Press, 1945.

12. Eichenberg, Frits. Dancing in the Moon, Counting Rhymes. New York: Harcourt, 1955.

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APPENDIX

ADDRESSES OF SUPPLIERS

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1. Encyclopaedia Britannica Films, Inc., Wilmette, Illinois.

2. Eye Gate House, Inc., 330 W. 42nd. St., New York 18, New York.

3. Ideal School Supply Company, 8324 South Birkhoff Avenue, Chicago 20, Illinois.

4. Milton Bradley Company, 43 Cross Street, Springfield, Massachusetts.

5. The John C. Winston Company, 1010 Arch Street, Philadelphia 7, Pennsylvania.

APPENDIX

AN ALPHABETICAL LISTING OF A NUMBER VOCABULARY

AN ALPHABETICAL LISTING OF A NUMBER VOCABULARY

The first grade child should be taught the meanings of words used to express arithmetical ideas. Growth in the number vocabulary must correlate with the development of the number concepts. The following is a list of words necessary for the oral expression of arithmetical ideas and necessary also in the required reading of the number workbooks for grade one.

a	between	dime	fourth	inch	lunch	number
above	big	dollar	Friday	is	made	o'clock
add	bigger	dot	from	it	many	October
after	biggest	down	front	January	March	of
all	both	dozen	go	June	May	old
altogether	bottom	draw	group	July	middle	on
and	bring	each	half	large	Monday	one
another	buy	eight	half-dollar	larger	money	ones
April	by	enough	has	largest	month	other
are	cent	every	have	last	more	over
as	circle	February	heavy	leave	most	pair
August	clock	few	here	left	much	part
away	color	fewer	high	less	name	past
back	come	fifth	higher	light	need	penny
before	cost	find	highest	little	next	picture
begin	count	first	hour	long	nickel	pint
behind	cup	five	how	longer	nine	pound
below	day	foot	I	longest	none	price
beside	December	four	in	low	November	put

quart	small	today
quarter	smaller	tomorrow
right	smallest	top
road	spend	Tuesday
route	square	two
rwo	story	under
ruler	straight	up
sale	street	we
same	Sunday	Wednesday
Saturday	take	week
second	tall	weigh
see	taller	weight
September	tallest	what
seven	ten	when
shape	tens	which
share	the	why
short	then	wide
shorter	there	write
shortest	third	yard
six	three	year
sixth	Thursday	yesterday
slow	time	young
slower	times	
slowest	to	

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PROBLEM APPROVED BY:

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(Problem Committee)

DATE _____