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A systematic approach to number readiness in grade one

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Boston University

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Do Not Take From This Room
A SYSTEMATIC APPROACH TO NUMBER READINESS
IN GRADE ONE

Submitted by

Jeanne H. Lockhart
(B.S. in Ed., Boston University, 1947)

In partial fulfillment of the requirements for the degree of
Master of Education

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Second Reader: Mark Murfin, Associate Professor of Education
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To Dr. J. Fred Weaver I wish to express my sincere appreciation for his guidance and time which has been invaluable during the entire study.
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INTRODUCTION

Purpose and Scope of the Study

It was the purpose of this study to construct and organize instructional materials which form the basis of a systematic approach to number readiness in grade one.

Instructional devices, aids, and sample daily lesson materials are presented in this study as a systematic approach to number readiness in grade one.

This study uses the number six as an example to be applicable to all numbers (1-10) in a number readiness program.

The writer has used the following objectives for building a systematic approach to number readiness in grade one:

1. Begin where children are and help them use what they already know as means of discovering something new.

2. Build a program conducive to adequate number concepts.

3. Emphasize the social and the mathematical phases of arithmetic.

4. Provide for the three distinct steps in number learning:
   a. readiness
   b. understanding
   c. skill

5. Guide learning so it will be continuous and that each stage develops readiness for the next stage.

6. Obtain a clear understanding to protect the child from forgetting—so it is understanding that must be done over and over again rather than more drill with abstract facts.
7. Provide drill after understanding is clear.

In addition to these objectives, significant points of view and results of research reported in professional books, periodicals, bulletins, workbooks, and pamphlets were considered as a basis for the development of this study.

In order to formulate a definite approach to the problem, a careful analysis of the development of number readiness was made in the following areas:

1. Arrangement of patterns
2. Cardinal and ordinal numbers
3. Charts
4. Comparisons
5. Concrete materials
6. Counting: rote and rational
7. Development of concepts
8. Doubles
9. Drill
10. Enumeration
11. Evaluation
12. Flash cards
13. Grouping
14. Identification
15. Individual differences
16. Levels of maturity
17. Meaning
18. Meaning of the number system
19. Measurement
20. Money
21. Number abilities
22. Number names and symbols
23. Order of teaching facts
24. Picture drawings to illustrate
25. Place value
26. Practice exercises
27. Processes
28. Readiness for learning
29. Reading and writing of numbers
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CHAPTER I

SIGNIFICANT LITERATURE AND RESEARCH IN NUMBER READINESS

This study is designed to present concisely the gist of number readiness, but not all research and thought on the learning and teaching of arithmetic. Rather, the following statements summarize literature and research in number readiness which identify some areas of research in order to present suggestions and findings pertinent to the problem of number readiness in grade one. They are classified as follows:

The Meaningful Approach to Number Readiness
When to Begin Teaching Arithmetic
The Systematic Approach to Number Readiness
Grouping in Number Readiness
Practice in Number Readiness

The Meaningful Approach to Number Readiness

Though full agreement on essential meanings is still lacking, sufficient knowledge exists to guide selection. Sources of meanings range from isolated lists and to children's and professional textbooks of varied thoroughness, to the present most definitive source.

The literature places increasing emphasis upon outcomes beyond mere rote learning of facts and principles. It also indicates that the evaluation of mathematical understandings should receive heavy emphasis.
Junge\textsuperscript{1} states that children taught meaningfully retain the learning longer, are able to transfer this learning more effectively to solving new problems and develop the ability to think quantitatively better than do those taught under a drill method.

Many writings have stressed the need of teaching for meaning. They indicate that arithmetic should be made intelligible and useful to the learner and that the purpose of instruction in arithmetic is to help children grow in the ability to think quantitatively.

McConnell\textsuperscript{2} has listed as one of the guiding principles derived from research and logical inference: "Understanding the number system and the methods of operation it makes possible, facilitates both quantitative thinking and, ultimately, rapid and accurate computation."

Brownell\textsuperscript{3} summarizes the answer to the question, Why is it important to develop meanings in arithmetic?

\textsuperscript{1}Charlotte W. Junge. "Good Teachers of Arithmetic Teach for Meaning." \textit{N.E.A. Journal} 42, No. 3: 167; March 1953.


1. Meanings facilitate learning.... Through meanings we secure insights and note relationships which, without meanings, we should not be likely to hit upon. The insights in turn enable us to foresee connections and to tie together various aspects of the learning task which, without understanding, would have to be mastered separately, one at a time.

2. Meanings increase the chances of transfer.... It is because meanings do transfer that they facilitate learning. Whatever extra time may be required at the outset to teach meanings is more than regained later on, through quicker and more intelligent learning. The effects of meanings are cumulative. Their contributions to learning increase in amount as they enable the learner to gain new insights, to discover short cuts, and to apply in new ways what he has learned.

3. Meaningful arithmetic is better retained and is more easily rehabilitated than is mechanically learned arithmetic.... Meanings strengthen skills by supplying a structure to support them. When the skills themselves no longer function, the structure remains, and on this basis the skills can be renewed.

The teacher of arithmetic can feel very confident a readiness program of mathematically meaningful experiences will facilitate subsequent learning.

When to Begin Teaching Arithmetic

It is evident that the time for beginning arithmetic depends on the kind of program that is envisioned.

Many of the writers on this question believe that arithmetic instruction should begin as soon as the pupil enters school, and the program of instruction should be planned, systematic, and sequential.
The study by Robinson\(^1\) shows that pupils in the lower primary grades make considerable use of number in activities both in and out of school.

Studies by Gunderson\(^2\) and Brownell\(^3\) supply evidence that pupils in Grade I and Grade II can and do learn arithmetic in a program which provides systematic and sequential work with numbers.

Buckingham and MacLatchy\(^4\) found that many children entering first grade have the following knowledge of number:

1. Many can count to 100 and majority can count to 20-30.

2. Many can enumerate groups of objects through 10.

3. Many recognize groups of 3 and 4 without counting.

4. Many have had contacts with money. They have watched the making of change.

5. Many recognize common coins and are beginning to learn value.

6. Many have knowledge of measure in the home without clear concepts of their meaning.

---


Clark, Otis, and Hatton\textsuperscript{1} state "that the first grade child has some definite immediate needs for number.... He should be taught the meanings, information, and skills involved in meeting these needs in such a way that they will make a maximum contribution to his later number requirements."

Evidence has been given to show that many pupils enter school with a considerable knowledge of number, that they frequently use number in their experiences in and out of school, and that they can and do learn number when it is taught in a planned, systematic program in which there are concrete experiences and meaningful applications of number.

The Systematic Approach to Number Readiness

In the previous section there is considerable evidence in the literature of arithmetic to indicate general agreement on the need for a planned arithmetic curriculum. Perhaps typical is the statement of Brueckner and Grossnickle.\textsuperscript{2}

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

\textsuperscript{1}Clark, Otis and Hatton. First Steps in Teaching Number. World Book Company, Chapter I, 1930. p. 5.

be so conducted that the mathematical and the social phases of arithmetic are both fully developed.

Even though much arithmetic is learned incidentally through contact with number in social experiences, such learning is neither systematic nor comprehensive. It is clear that direct instruction is necessary for mastery of the basic skills, efficient work methods, and for social experiences in number readiness.

Caswell and Foshay\(^1\) say "the 'planless' curriculum, as commonly described by those who oppose it, is accepted by nobody."

McConnell\(^2\) has summarized the significant facts that are known concerning the growth process as:

Abstract ideas of number develop out of a great amount of concrete meaningful experience, mature apprehension of number relationship can be attained in no other way. Furthermore, the adequate development of number idea calls for systematic teaching and learning.

Woody\(^3\) also states his definition of educational readiness as "the preparation which the teacher consciously makes in getting the child ready to learn the things to be taught."

---


Many activity units, games and daily classroom experiences require the use of numbers, and most of these learnings are developed orally.

There is need to organize these oral experiences with visual systematic devices, aids, and seatwork in relation to classroom presentation.

The teacher can feel confident that, since children enter school with some knowledge of arithmetic, a systematic (not formal) program of socially significant and mathematically meaningful experiences is a desirable aspect of the elementary school program in Grades I and II.

Grouping in Number Readiness

The ability to group has not received the consideration that it deserves.

Carper⁠¹ found that pupils who used a grouping process in concrete number situations also were successful in obtaining correct solutions for verbal problems and for the abstract number situations. Pupils who could not count by grouping and who had to depend upon one to one relationships in concrete settings could not deal effectively with abstract situations. Inability to group is a symptom of immaturity.

Rosenquist\(^1\) writes "as children learn the meanings of numbers associated with various smaller groupings within the numbers, they are developing readiness for multiplication and division by distinguishing between equal groupings and unequal groupings."

A comprehension of various smaller groupings within the numbers is the foundation for understanding the four fundamental processes, and sufficient time should be spent in making such relationships clear."

Since grouping seems to be closely related to success in abstract number, the teacher should see to it that her pupils learn how to group and identify the number in a group by having a variety of grouping experiences.

**Practice in Number Readiness**

In a systematic program which emphasizes meaning, the pupil has many concrete experiences with numbers to develop their meanings. He learns to use concrete materials to objectify the work before he deals with abstract facts and processes.

Repeated use of a fact or process in many varied experiences while learning gives them social significance. This meaningful practice takes the place of repetitive drill.

---

Spitzer\(^1\) also states "To be effective, drill should follow understanding."

McConnell and Spitzer\(^2\) have listed the following guiding principles derived from research and logical inference.

McConnell lists:

1. Drill does not guarantee that children will be able immediately to recall combinations as such.

2. Habituation of number combinations is a final stage in learning which is preceded by progressively more mature ways of handling number relationships.

3. Repeating the final form of a response from the very beginning may actually encourage the habituation of immature procedures and seriously impede necessary growth.

4. Drill as such makes little if any contribution to growth in quantitative thinking by supplying maturer ways of dealing with number.

The acquisition of many skills needed in the solution of appropriate problems in arithmetic for first graders require a large amount of extended practice. This is not highly formalized practice, emphasizing mere repetition. Rather, it is motivated by a variety of significant experiences with emphasis on preceding understanding.

---


Skills depend one upon another and readiness is an essential requisite for each step in a number program.

The simple and fundamental skills are developed first and then the more complicated ones. In order that innumerable uses of arithmetic in the first grade can be made to contribute to and prepare for the acquisition of the more complicated skills to be developed later, the organization of a readiness program for the first grade will help obtain a firm foundation for later arithmetic need.

On the basis of these findings, the teacher can feel very confident that desirable classroom practice in the teaching of arithmetic necessitates guiding children to acquire understanding before drill.

Buswell\(^1\) states

Practice should follow, not precede understanding. The old method of drilling on abstract number facts without a careful and concrete development of the facts is gone from the modern program of arithmetic.

The function of practice is to increase efficiency of performance in operations which are already clearly understood. Such practice has an important place in teaching arithmetic with primary emphasis on meanings, reduces the amount of practice needed.

Summary

Trends in teaching arithmetic, as revealed by literature and research are:

1. Marked increases in attention given to concept-building programs.

2. Begin arithmetical instruction early, but delay abstract work until understanding is attained.

3. Emphasis on teaching a systematic program.

4. Recognition of the importance of grouping.

5. Realization that use of a wide variety of instructional material results in better learning.

CHAPTER II

A SYSTEMATIC APPROACH TO NUMBER READINESS
IN GRADE ONE

A. Presentation for Six

Materials of Instruction

The following materials and suggestions are presented for the study of six, as an example of organized systematic materials to be applied to all numbers (1-10) in a number readiness program.

These materials and suggestions are of three main types:

1. Reproduced instructional sheets.
2. Suggested concrete materials.
3. Suggestions for incorporating the systematic study of six in the incidental uses which children have of number.

These materials and suggestions do not exhaust the possibilities of number activities, but are indicative to the more important experiences that children may have in a systematic number readiness program.
Chart on Symbols, Vocabulary, and Value

The chart on symbols, vocabulary, and value is built along with each step in the readiness program and is referred to in connection with daily number lessons.

The chart is always there in sight for study and reference work. It serves to help the child to help himself.
<table>
<thead>
<tr>
<th></th>
<th>one</th>
<th>two</th>
<th>three</th>
<th>four</th>
<th>five</th>
<th>six</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<td>2</td>
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<tr>
<td>6</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Charts on Meaning for Symbols and Number Names for Quantities to Six

The charts are 18" x 12" and are placed on the bulletin board at each stage of development in the number readiness program.

They are used by the children for comparing, matching, and evaluating. The charts serve as teaching aids as well as tools for the children to use by themselves.
Spot Patterns

Sets of flash cards showing spot patterns of numbers in several different arrangements are useful materials in teaching pupils to think of numbers as made up of groups of units and to recognize each number in different groupings.

These cards are made as oblongs on oak tag nine inches long and six inches wide.

Uses of Spot Patterns

1. Pupils reproduce with their number boxes on their desks what they see on the flash cards.
2. Speed in recognizing groups of numbers in increased through the use of patterns.
3. Reproductions can be made on the felt board with manipulative materials by the pupils.
4. A quick flash drill with oral responses show levels of maturity.
5. Pupils reproduce from memory with pencil and paper what they have seen on the spot pattern card when the card has been removed from sight.

Spot patterns are used throughout the readiness program at each number step (1-10).
Domino Spot Pattern
The Felt Board

The felt board is a useful device in showing number in a clear, concrete form.

The board is made by gluing a piece of felt 36" x 36" onto masonite.

Colorful, interesting cutouts with sandpaper glued to the backs are used on the board.

Children manipulate these cutouts to give meaning to daily number work.

All quantitative and seatwork ideas are worked out on the felt board.
**The Number Box**

The Number Box and its contents is placed under the felt board in one corner of the room.

Whenever a quantitative situation or question arises, articles are used from this box to explain and give meaning.

The children experiment with the articles.

Numbers (1 - 31) in an envelope and a card holder are used with the calendar of the month by individual pupils as extra activity.

Measuring with the cartons is done with the group as a whole due to limitations of the classroom.

The Number Box is helpful in daily situations and extra experimental work.
I

\[ \frac{1}{2} \]
Individual Devices

Each pupil has a card holder 12 inches x 6 inches made of oak tag, 20 strips of 4 inch x 1 inch construction paper, (10 blue - 10 red), and a small number box.

The number box contains 10 buttons, 10 pegs, 10 paper clips, 10 diamond shapes, and 10 squares.

These devices are used with spot patterns, the felt board, the calendar, and solving seatwork whenever the need arises.

Number groups are reproduced on the pupils' own desks.

The place value of ten in connection with the calendar takes on meaning through the use of the card holder.

One red strip of paper represents ten blue strips. It takes the tens place in the holder.

Checking work can be done quickly as these devices reach all the children and not just a few.
Number Box

Contents

10 10 10 10 10

Individual Holder

10 ones 10 blue

represents

red blue

red
The Calendar Charts

Pockets are cut into a large colored poster board to hold numbers (1 - 31). The numbers are easily removed by the children.

The days of the week are in order in pockets on another poster board.

A large poster board tells the present date.

The pupils manipulate these charts to give the correct date for each day. All cards are put back in place after they have been used.

Position of number is emphasized with the numbers, but the days of the week are used as ordinal. First, second, and last day of the month are introduced.

Meaning for the terms beginning, middle, and the end are formed.

Reading large numbers and the place value of tens are worked out with the number boxes and individual holders.

Example: 15 Pupils put 1 red strip and 5 blue strips of paper in their holders.

Oral questions concerning the calendar are given each day. Example: The last day of school last week was Friday.

Today is Monday. What days did you spend at home? How many days were you at home?

How long do we have to wait until Christmas?

The calendar charts are not used until the first of October so the children can start with low numbers.
<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 5, 1958</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chart on Money

The chart for money is built gradually with real coins from one cent through each step of the readiness program (1 - 10).

The coin chart is always on display in a convenient place in the room where the children can refer to it at any time.
nickel 5¢
five cents
Counting

Many children entering first grade have had some experiences in counting, but time is allotted in a readiness program for practice in counting.

Some of the following objects are very useful in learning to count:

- desks
- milk boxes
- windows
- books
- doors
- chairs
- plants
- hooks

Opportunities to touch objects while counting orally establishes a fundamental feeling for number.

Games are played to stimulate interest at this early stage of readiness.
be seen as the source from which these relations are
understood and developed. It is clear that if we choose to
consider the real world as alternative and complex,
we must also consider the human use of language.

Some questions include:

- How does language influence our perceptions of the
  world?
- What role does language play in shaping our
  understanding of reality?
- How do different languages reflect different
  cultural perspectives?

These questions highlight the complex role of
language in shaping our understanding of the
world.
Recognizing Symbols

Number symbols on 9" x 6" oak tag are useful as flash cards in helping children learn the names of the symbols.

A new symbol is introduced only when the preceding symbol is thoroughly learned and the quantitative idea for that symbol is firmly imbedded.

Quantitative pictures of spot pattern cards matched with the symbol fixes meaning to the symbols.

A quick drill with these flash cards show the level of maturity of the learner.
**Writing Symbols**

The correct reproduction of a symbol is taught after recognition and meaning has been established for the symbol.

Practice on reproducing a symbol is guided by the teacher to avoid reversals and poor form.
Writing Symbols

When a symbol has been satisfactorily reproduced, a review of previous learned symbols are practiced in relationship to the new symbol.

This exercise shows positional relationship.
Grouping of Six

Six objects are arranged on the felt board. A child manipulates these objects into two groups and relates his findings.

Pupils watching at their desks choose objects from their number boxes to make a similar pattern.

The final arrangement of 5 and 1 is left on the felt board to fix this grouping in the minds of the pupils.

The seatwork for the day is this same grouping for six.

(5 and 1)
Six

Color 5 birds blue.

Color 1 bird yellow.
Grouping of Six

Through the use of charts, number boxes, spot pattern cards, and the felt board, preparation for the grouping of (4 and 2) is carefully made.

The seatwork for the day is now meaningful.

(4 and 2)
Six

Color 4 fish orange.

Color 2 fish black.
Grouping of Six

Doubles are a very interesting experience in experimental number.

The discovery of equal groups can be brought about by the use of manipulative materials.

A formation of this generalization may generate from relationships of preceding lessons.

When coloring the duck paper, a child may see that it doesn't make any difference which group of ducks he colors yellow or brown.
6 six

3 ducks yellow
3 ducks brown

Color


and why it should be valued.

It is.

It is.

It is.
Grouping of Six

Seatwork for the grouping of (5 and 1) is presented in this exercise.

The lesson reveals, through coloring, parts of six. It also shows the reversal of the same combination (1 and 5).

Two threes can be seen in each of the banana and leaf papers. While coloring one banana in a group of three, the pupil can see two bananas left and another group of three left uncolored.

The child may visualize the following groups:

(1 and 5)
(1 and 2 and 3)

The following groups are found in coloring the leaves:

(5 and 1)
(3 and 2 and 1)
Color 1: banana yellow.

Color 5: leaves green.
Grouping of Six

Three groups of twos are visualized in this exercise.

By coloring two groups of dogs it will equal four dogs colored with one group or two dogs left not colored.

The following combinations are in the dog paper:

(4 and 2 are 6)
(2 and 2 are 4)
(2 and 2 and 2 are 6)

The airplane pictures are a reversal of the same grouping.

(2 and 4 are 6)
(2 and 2 are 4)
(2 and 2 and 2 are 6)

A foundation for multiplication and column addition is laid here.
Color 4 dogs black.

Color 2 airplanes red.
Grouping of Six

The squirrels show two groups of threes. (doubles)
The turtles show the same grouping.
The relationship is the same in both exercises.
The combinations are the following:

(3 and 3 are 6)
(2 3's are 6)
Color 6 squirrels brown.

Color 3 turtles green.

Six
Identification: Applying Number Meaning

Directions:

Circle the number that tells how many in each box.
The children can color the pictures.
The more matured learners can color the pictures by coloring two groups within a box using two colors.

This is a check on the meaning of symbols.

Most of the children at this stage of the program can recognize groups below four so the order of the numbers 4, 6, 5 was presented to avoid serial order.

The presentation of six is limited, but beyond this point in the readiness program the order can be varied.
null
Grouping of Six

The moon lesson gives combinations with number vocabulary.
(five and one are six)

The caps + (one and five are six)

Arrangement of (four and two) or (two and four) are within the combination of (one and five) in the cap exercise.

Some children may see a relationship of groups within a group.

Caps

(four and two are six)
(two and four are six)
(one and five are six)
(one and three and two are six)
Color five moons yellow.

Color one cap blue.
Grouping of Six

Number vocabulary combinations are included in this lesson.

Chinese boys:

(two and four are six)
(three two's are six)
(two and two and two are six)

The same grouping is included in the bear exercise as in the Chinese exercise except in reverse.

(four and two are six)
(two and two are four and two more are six)
(three two's are six)
Color two Chinese boys red.

Color four bears brown.
Grouping of Six

There are number vocabulary combinations in this lesson.

Elephants:

(three and three are six)
(two three's are six)

Feathers:

(three and three are six)
(two three's are six)

Each exercise has the same grouping of doubles.
six

Color three elephants black.

Color three feathers red.
Identification: Applying Number Vocabulary

Directions:

Circle the number work that tells how many in each box.

The children color the pictures the same as they did with the number symbol paper. The more mature pupils can group their coloring by using two colors.

This is a check on the meaning of the symbol number vocabulary.

The beginning letters of four and five are alike and should be separated to prevent a visual error. Due to this factor the order four, six, five was selected and also to avoid serial order.

Later in the readiness program the choice of number words and their order can be arranged differently.
The text on this page is not legible due to the quality of the image.
Number Relationship

Blocks used by either a pupil or teacher are very useful in showing vertical relationship of numbers to six.

Directions:

Put your finger on the row that has six boxes in it.
Point to the row that has only one box in it.
Write the correct number of boxes in each row. Write
the number on the bottom box.
Color these boxes red.

Questions:

How many more boxes are needed in each row to make
six boxes?

Directions:

Build with your pencil boxes in each row to make
six boxes.
**Number Relationship**

This exercise is optional and may be alternated throughout the readiness program (1 - 10).

The procedure is the same as the preceding lesson. The difference is in position (vertical to horizontal).
Finding Six in Larger Groups

Directions:

Draw a ring around six circles in each box.
Color the circles in the ring.

Questions:

How many circles are in each box?
How many circles are outside the ring in each box?
Which box has the most circles?
Which box has the fewer circles?
May some of this, the bit here, not be read aloud.
Completion of Six

Questions:

How many circles are there in the first box?
How many circles are there in the second box?
How many circles are there in the third box?
How many circles are there in the fourth box?

Directions:

Color these circles red.
Make circles in each box with your pencil to make each box have six circles.
Color the circles you make blue.
Following Blackboard Instructions
Lesson 1
Directions:
- Make pictures for numbers (1 - 6)
- Color the pictures.
Relationship is shown. Each number is one larger than the preceding number. Six is the largest number presented.

Lesson II
Directions:
- Make color pictures for the numbers.
Quantity is shown in mixed form. Six is the largest number presented.

Lesson III
Directions:
- Make pictures for the story of six.
Through the use of their own picture number stories, the grouping of six can be emphasized.

Ability to plan a paper is important to the maturity growth of a first grader.
Blackboard

Make 5 green.
Make 6 orange.
Make 6 red.
Make 8 purple.
Make 2 brown.
Make 1 blue.

Make 6 Six.
Make 2 Six.
Make 3 Six.

Make pictures.
Check on Symbols and Number Vocabulary

Directions:

Draw a line from the number to the right number word.
Look at 4. A line is drawn from 4 to the word four.
Do the others the same way.

This check will reveal areas for remedial work.
6 5 3 2 1
Partial Counting

Directions:

Put your finger on the first box. There are five circles on one side. A 5 is written in the space under the five circles.

Look on the other side of the box.

How many circles do you see there?
One. Write 1 under the circle.

How many circles are there in all in the box?
Color the circles on one side of the box blue and on the other side red.

Do all the other boxes the same way.

Grouping of six is emphasized in this exercise.
Partial Completion

Directions:

Put your finger on the first box.
There are five circles on one side.
5 is written in the space under the five circles.
Look at the space beside it.
How many circles would you have to make in it to make six circles?
Make one circle in the space.
Write the number 1 in the space under the one circle you made.
Five circles and one circle are six circles.
Color one side of circles blue.
Color the other side of circles red.
Do the other boxes the same way.

The exercise can be alternated with the preceding exercise in the number readiness program (1 - 10).
Grouping of six is again emphasized.
Belonging

Garages and Cars:

Questions and Directions:

Are there enough garages for the cars?

How many garages would be empty if these cars were in the garages?

Make enough cars so there will be cars for all the garages.

Color the picture.

Children and Swings:

Questions and Directions:

How many swings are there in the park?

How many children are on the swings?

How many children are in the park?

Are there enough swings for all the children?

What will the children have to do?

Color the picture.
Serial Order

Before

Directions:
What number comes before six?
Write 5 in front of 6.
Do the others in the row the same way.

Between

Directions:
What number comes between one and three?
Write 2 on the line between 1 and 3.
Do the others in the row the same way.

After

Directions:
What number comes after two?
Write 3 after 2.
Do the others in the row the same way.
<table>
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<tr>
<th>Before</th>
<th>6</th>
<th>5</th>
<th>2</th>
<th>3</th>
<th>5</th>
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<tr>
<td>Between</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>5</td>
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<tr>
<td>After</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Ordinals

Directions: Oral

Color the first heart red.
Color the second star blue.
Color the third disk yellow.
Color the fourth jack black.
Color the fifth ball orange.

What comes after the fifth one?
Relationship to Ten

Directions:

How many boxes are there across in one row?
Put your finger on the number 1.
Color the first box beside 1 red.
How many boxes in this row are not colored?
Put your finger on the number 2.
Color the first two boxes blue.
How many boxes in this row are not colored?

3 - 4 - 5 - 6 - have the same directions.
ANDREW BRYANT

TRENDS

The trend is toward more open and honest conversations. This can
be achieved by encouraging team members to share their ideas and
feelings more openly. By fostering an environment where people
feel safe to express themselves, collaboration and creativity can
flourish. This leads to better problem-solving and innovation.

Additionally, we can see that the trend towards

integration of new technologies and automation continues to grow.

These changes require adaptability and a willingness to learn.

Thus, the future looks promising, but also challenging.
Measurement

The children practice measuring lines on the blackboard and objects around the room before attempting this paper.

The measuring is directed to even inches.

Directions:

Put your ruler on the pencil.

Make sure the beginning of the rule is on the eraser of the pencil.

Look to the right.

Read the number of inches long.

Write the number of inches long on the line beside the pencil.

Do the eraser, finger, scissors and box the same way.

Questions:

Which is the longest?

Which is the shortest?
Money

Directions:

Nickel
What is this coin?
What number of cents means the same as the nickel?
Circle with your pencil the right number of cents.

Penny
What is this coin?
What number of cents means the same as the penny?
Circle with your pencil the right number of cents?

Which is larger?
Which is larger, one cent or one nickel?
Circle with your pencil the words that say one nickel.
Do the others the same way.

Candy
How much do you think you would need to buy this candy?
Circle the number of cents you think would buy the candy.

Balloon and Apple
The procedure for the balloon and apple is the same as the candy.
Which is larger? One cent or one nickel.

Five cents or one cent.

One nickel or four cents.
Comparisons

Through the use of the felt board, books, number boxes, individual boxes, individual holders, pattern cards, charts, pictures, and seatwork, meaning for comparisons can be taught.

Terms can be emphasized at each stage of learning. Each day one of the following terms can be demonstrated:

Which is the larger?
" " " smaller?
" " " tallest?
" " " widest?
" " " wider?
" " " shorter?
" " " shortest?
" " " longer?
" " " longest?
" " " largest?
" " too short?
" " long?

A yardstick, pointer, ruler, sticks of various lengths will help to make clear understandings. These terms can be introduced:

Which is the top?
" " " bottom?
" " " left?
" " " right?
" " " next?
" " over?
" " under?
" " above?
<table>
<thead>
<tr>
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<td>Male</td>
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<td>$55K</td>
</tr>
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</table>

*Note: Income values are approximate.*
Oral Problems and Approximations

After each step in the readiness program oral problems within the interest of the children are presented. The problems are given orally by the teacher.

Examples:

1. There are six desks in David's row. One desk is empty. How many children are now in David's row? Who is absent?
2. How long do you think this toy airplane is?
3. There are two pairs of rubbers in the coat room. How many rubbers are in the coat room?
4. Five children came to the reading group. We have four books. Have we enough books for the children? How many more books do we need?

The children can answer these problems orally or the answers can be written on a small piece of paper.
B. Evaluation

Evaluation of a child's progress throughout the entire readiness program in arithmetic is essentialy to the whole study. Remedial work begins when difficulties first arise, not later in the program when the difficulties grow in quantity. When there are too many areas to re-teach, understanding is lacking.

Each child's progress in number readiness was determined by the use of the following forms of evaluation:

Forms of Evaluation

Observation: Through constant observation of the learner, the teacher knows when to encourage the child to advance to more mature methods of approach.

Interviews: Talking with a child alone reveals many interesting things about the child which never could have been discovered by the teacher without letting the child think out loud. It also brings about a closer relationship between the teacher and the child which is so necessary in every learning situation.

Oral Response: Oral problems reveal quickly, difficulties and levels of learning. Help and understandings can be administered immediately before wrong ideas are practiced and thus learned.
This document appears to be a page from a book or a report with text that is not clearly legible due to the image quality. The text is printed in a standard format, with paragraphs of text. Due to the blurriness, it is difficult to extract specific information or content from the page.
Instruction: Careful systematic presentation of number by the teacher is the foundation for successful arithmetic achievement. Devices and manipulative materials are instructional aids for making number presentations meaningful.

Written Response: This is the final stage of learning and is a check on the teacher's presentation. It also will indicate the need for remedial work. Generalizations are made by the pupil in the written response.

Throughout the study, observation, interviews, oral response, instruction, and written response are included at every level of the readiness program.
CHAPTER III

SUMMARY AND CONCLUSIONS

The purpose of this study was to construct and organize instructional materials as a systematic approach to number readiness in grade one.

The following results can be expected from a program such as presented in this study:

1. A meaningful number program in readiness saves valuable teaching time in teaching the processes.

2. The grouping method of number builds a foundation for transfer in other quantitative learning situations.

3. Concrete selected instructional materials aid and stimulate interest in arithmetic.

4. A systematic approach to number readiness in grade one provides for growth in the ability to apply arithmetic effectively in social affairs and increases sensitivity to the existence of, need for, and uses of number in everyday experiences.

5. After the completion of the readiness program many children know the addition facts (1 - 10) through just the explanation of the algorism.
**Suggestions for Further Study**

1. An experimental study could be set up to determine the value of this readiness program in comparison with others.

2. A similar program and materials could be made for the teaching of the number facts 1 – 10, in addition and subtraction as an additional step to the systematic approach to number readiness in grade one.

3. Another study could be made to give systematic readiness for other processes of arithmetic, such as multiplication and division.
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