Calkins's New Object Lessons.

PRIMARY

OBJECT LESSONS,

FOR

TRAINING THE SENSES AND DEVELOPING THE FACULTIES OF CHILDREN.

A MANUAL OF ELEMENTARY INSTRUCTION FOR PARENTS AND TEACHERS.

By N. A. CALKINS,

Author of "Phonic Charts," and "School and Family Charts."

"Present to children things before words, ideas before names. Train them to observe, to do, and to tell."

EIGHTEENTH EDITION.—REWRITTEN AND ENLARGED.

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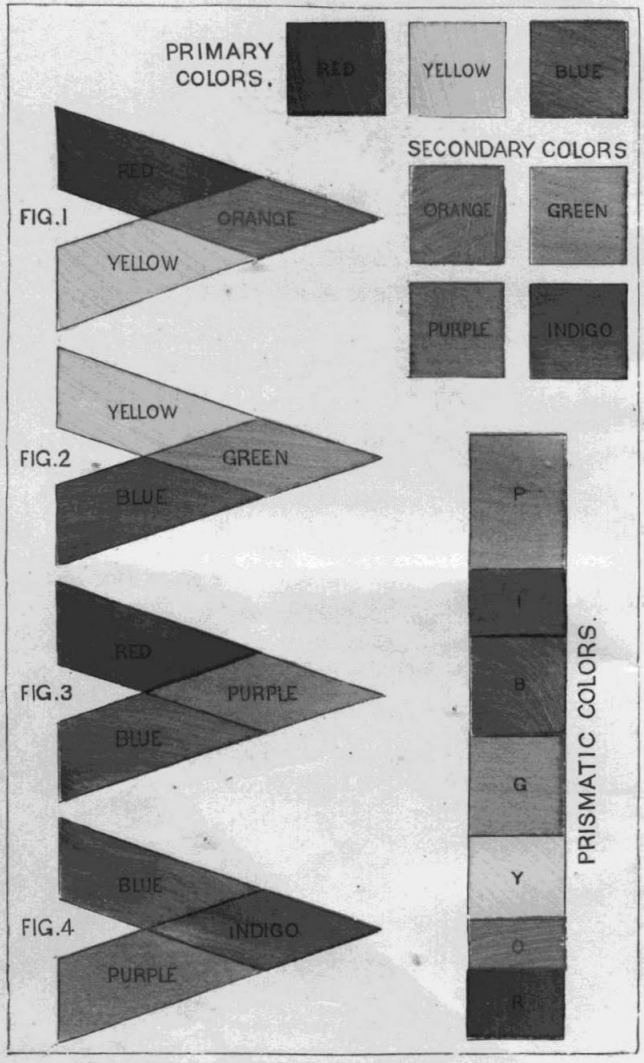

See pages 147, 181, 182, 183.

PREFACE

TO THE FIFTEENTH EDITION.

"ENTIRELY rewritten, reillustrated, and enlarged," briefly describes the relation of this work to the former editions of my Primary Object Lessons. This is essentially a new work, although it treats chiefly upon the same subjects that were presented in the former editions. While these lessons are nearly all new in form, they are intended to maintain and illustrate more clearly the principles of true *objective teaching*, and the relation of this system of education to the common branches of school instruction.

The lessons of this work embody, in the subjects treated, the results of an experience of nearly eight years as a Superintendent of the Primary Schools in the city of New York; also as Lecturer in the Saturday Normal School on Principles and Methods of Teaching. Some idea of the nature and extent of this experience may be obtained from the fact that there are employed in these Primary Schools alone more than twelve hundred teachers, and that these teachers have under their instruction a hundred thousand children.

Three subjects which were included in former editions—"Weight," "Place," and "Physical Training"—have been omitted in this work, and *five new subjects have been added to it*—"Home Training of the Senses;" "Exercises for Training in Habits of Thinking and Speaking promptly, and a correct Use of Language;" "Time;" "How to Teach the Sounds of Language;" and "Lessons on Qualities." Besides, "Form," "Color," "Number," and "Reading" have been much extended by a variety of illustrative exercises, and the lessons on the various subjects introduced have been arranged in graded steps, with a view to adapt the work to the wants of teachers under all circumstances.

The difference between the lessons of this work and those of the former editions, in the subjects which are included in both, consists chiefly in the methods of giving them; the *principles of the system* on

ral plan—one in accordance with the philosophy of mind and its laws of development—the author commenced the following pages.

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In the preparation of a work upon a subject of such importance as one claiming to be a guide in the early education of the young, he felt it his duty to avail himself of the best sources of information by which he could add to his own the observation and experience of the most successful educators. He has accordingly examined the various systems of infant education of Europe, and especially those by Wilderspin, Stow, and Currie, and that practiced by the "Home and Colonial School Society" of London, as presented by Elizabeth Mayo in her "Model Lessons" and "Manual of Elementary Instruction."

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The work differs from others prepared for teachers in this important feature: it illustrates how the teacher should proceed at each successive step in developing the minds of children. *In telling what ought to be done, it proceeds to show how to do it by illustrative examples.*

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In preparing this work, the aim of the author has not been to produce a faultless composition, but rather a book adapted to the wants of teachers in presenting a natural, simple, and philosophical system of primary education so clearly and minutely that no teacher can fail of gaining from it not only its principles, but a knowledge of how to apply them under the varying circumstances in which he may be placed. With the hope that he has not failed in this respect, this volume is earnestly commended to the kind consideration of teachers, parents, and all friends of education. N. A. CALKINS.

New York, June, 1861.

PREFACE

TO THE FIRST EDITION.

"INSTRUCTION must begin with actual inspection, not with verbal descriptions of things. From such inspection it is that certain knowledge comes. What is actually seen remains faster in the memory than description or enumeration a hundred times as often repeated."

Thus wrote John Amos Comenius, an exiled teacher of Austria, about the middle of the seventeenth century. And to the introduction of his works Germany is largely indebted for the great progress in her schools which commenced during that century.

Said the great Swiss educator Pestalozzi at the close of the eighteenth century,

"Observation is the absolute basis of all knowledge. The first object, then, in education, must be to lead a child to observe with accuracy; the second, to express with correctness the result of his observations."

On the philosophical principles taught by those two great educators, and confirmed by the experiences of subsequent observers, is based the system of mental development illustrated in the present work. In the application of these principles, however, there have been successive changes resulting in the various forms of the inductive methods of education now practiced in this country and in Europe. Not to those noble educators belongs all the credit of the present system of teaching from objects, the unknown from the known; they developed *principles* only; the *systems* have grown out of the study and application of those principles by succeeding educators.

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With an earnest desire to contribute something toward a general radical change in the system of primary education in this country—a change from the plan of exercising the memory chiefly to that of developing the observing powers—a change from an artificial to a natu-

which they are founded remain unchanged. *A principle of teaching is a law based upon conditions of the minds of those to be taught. A method of teaching is simply the form or manner of presenting the subjects of instruction.* A true principle remains the same always; while there may be many methods of presenting a subject, each in conformity to the same principle.

Between a child from six to nine years of age, and a youth from twelve to fifteen, there is a greater difference in development than between the youth and the man. There should be a corresponding difference in the subjects and modes of instruction for these periods. During childhood, the attention must be largely occupied with the accumulation of facts through the exercise of the several senses. By means of a proper training of its various faculties, the child attains the power of systematic effort in learning, and thus the youth is enabled to acquire a suitable knowledge for commencing the duties of the man. Unless the child attains this power, the youth can not procure the necessary knowledge. How to properly educate the child, and prepare it for the studies of youth, that it may gain the knowledge requisite for the duties of manhood, is the most difficult problem in education.

Granting that such a knowledge of our language as will enable one to speak, read, and write it readily, and such an acquaintance with arithmetic as will prepare one to engage in the business affairs of life, are the indispensable subjects of school instruction for *youth*, yet the demands of education for the period of *childhood* can not be met by elementary instruction in these branches alone. Language itself can not be learned until the mind has been brought in contact, through its several senses, with the qualities and characteristics of things around us. It is only by attention to objects, animals, plants, occupations—in other words, by the observation of whatever may be the surroundings of itself, that the child's mind undergoes that developing process which gives it the power of subsequently acquiring any branch of knowledge.

Since the period of childhood is most profitably spent in attending to those things which will train the mind in power and in facility of mental acquisition, the necessity for that varied character of school instruction which is afforded by means of *Object Lessons* must be apparent to all educators, and the importance of this system of education

be acknowledged by every teacher who will give the subject a careful and candid consideration.

It is well known that the majority of those who engage in school teaching commence its duties with little or no professional training. Their preparation for this work usually consists in learning the several branches which are generally taught in school, without attention to methods of instruction, or to exercises specially adapted to train the mental powers of children; consequently, these teachers enter upon their duties with but little knowledge of the philosophy or the principles which should guide them in their work. In view of these facts, books giving practical suggestions relative to methods of elementary instruction in accordance with right principles of education become almost indispensable to those who engage in teaching. To meet this necessity in the department of primary education, and lead teachers to take proper steps toward success in their work, is the design of this book.

I have deemed it best to devote this work almost entirely to *methods of teaching*, at the same time aiming, by means of the series of graded lessons in the subjects treated upon, to lead teachers to an understanding of the principles which underlie correct methods of instruction. In a portion of another work now in preparation—"A Manual of Object Teaching"—I shall endeavor to give enough of mental science, in its relations to education, to enable me to present more clearly the philosophy on which the principles of correct teaching are based.

With grateful remembrances of the kind manner in which the former editions of this work were received, and hoping that in its new form this may become still more useful in the cause of Primary Instruction, it is once more intrusted to the generous friends of education.

NEW YORK, *June*, 1870.

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PRIMARY OBJECT LESSONS.

PRINCIPLES ON WHICH OBJECT TEACHING IS FOUNDED.

THE first step toward a preparation for the educational training of children should be to ascertain the nature of the mind, its condition in childhood, its natural modes of development, and the processes best adapted to secure a proper discipline of their faculties. When this is understood, it will be an easy matter to adapt instruction to them. As an introduction to this step, a few important facts may be stated as a basis for this educational training.

1. Our knowledge of the material world is derived through the senses. Objects, and the various phenomena of the external world, are the subjects upon which the faculties are first exercised.

2. Perception is the first stage of intelligence. Primary education naturally begins with the culture of the perceptive faculties. This culture chiefly consists in affording occasions and stimulants for their development, and in fixing perceptions in the mind by means of the representations furnished by language.

3. The existence of knowledge in the mind begins when resemblances and differences in objects are perceived. Knowledge increases in proportion to the increased ability for distinguishing resemblances and dif-

ferences, and the capacity to classify and associate objects, experiences, and facts that resemble each other.

4. All the faculties are developed and invigorated by proper exercise; they may be enfeebled by being overtasked, or by being exercised on subjects which do not come within their proper sphere.

5. Some of the mental powers are as active and nearly as vigorous in the child as they are in the man. Among these are sensation, perception, observation, comparison, simple memory, and imagination. Other powers of the mind do not attain their full development until the child has arrived at the period of maturity. Among these are reason, philosophical memory, and generalization.

6. The natural and most healthful incentive to attention and the acquisition of knowledge, with children, is the association of pleasure with instruction. Curiosity, or the desire of knowledge, and the love of the wonderful, are great actuating principles of early childhood, and their gratification is always accompanied by pleasurable emotions. Children possess a natural craving for knowledge as well as for occupation. Success affords them pleasure. Self-dependence is another powerful agent of culture.

7. Instruction should give pleasure to children, and where it does not there is something wrong, either in the mode of presenting it or in the subject-matter selected for instruction.

8. Habits of attention are permanent mainsprings of education. Habits are formed by the repetition of the same act. The great secret of securing the attention of children consists in arousing their *curiosity*, and gratifying their *love of activity;* in mingling delightful associations with learning, and never overtaxing their powers by keeping them too long directed upon the same object.

9. The natural process of education is from the simple to the complex; from the known to the kindred unknown; from facts to causes—things before names; ideas before words; principles before rules.

A brief glance at the order and processes by which the mind gains knowledge, and at the steps to be taken in training the mental powers, may aid in making this subject of primary education more clearly understood. But I shall only attempt to present some of the leading mental powers which are employed by children in gaining knowledge, and to indicate the order in which these act.

The *senses* furnish to the mind its means of contact with the external world. Through *sensations* the mind gains *perceptions* from the objects around it. *Perceptions* lead to *conceptions*, or ideas, which are retained or recalled by *memory*.

Imagination takes up the ideas formed through the perceptions, combines and presents them in new forms.

Reason proceeds to investigate these ideas by more definite modes, and *judgment* is the result.

Again, *sensations give perceptions; attention to perceptions* leads to *observation. By means of observation*, comparison, and classification of experiences and facts, *knowledge is attained.*

It follows, then, that the first aim of the teacher, and of the parent, in primary instruction, should be *to cultivate in the child habits of accurate observation*, and grouping together of like things. Such habits—clear perceptions, fixed attention, and careful observation and

ready classification—become a guaranty for the acquisition of knowledge in after years.

Nature suggests the true plan for accomplishing this desirable end in the course which the child itself pursues in the examination of the various objects which surround it. The instructor should fall in with the child's desire to know, and allow it to exercise its senses upon each new object presented to it, by seeing, feeling, hearing, tasting, or smelling it, as the case may be. This is Nature's method of teaching, and man never has been able to improve it. By the use of its perceptive faculties on the objects around it, the child acquires a large stock of ideas before it goes to school.

The teacher should begin instruction at the point at which the child has arrived when school-life begins, and lead the mind gradually forward from one degree of knowledge to another. She should begin with things that are familiar to the child, and lead it to use the knowledge already acquired in obtaining new ideas. Words and their uses will naturally succeed a knowledge of things, because language will be needed to express the ideas derived from them. Here Nature's method may be perceived to be *things before words*. If, then, we would improve the language of a child, we must first give it ideas, then words to enable it to express those ideas.

Sometimes children employ original terms to express their thoughts; these should be accepted, and, if faulty, let errors be pointed out and right words substituted. Whenever a new word or term is to be taught, the thing or idea of which the term is a sign should be taught first, and be understood by the pupil before the word is presented. In all cases let the teacher present

first a clear mental picture or idea of the object to her pupils, then its name will have a meaning which it would not otherwise possess, and, when used, it will call up a distinct conception before the mind. The opposite method—that of giving first the *sign* of the idea, and, as in many instances, only the sign or word—is opposed to the first principles of education, and its results may be witnessed every day in the mere word knowledge of many schools.

All our ideas are primarily derived from nature; books merely represent the knowledge thus obtained; therefore it must be evident that books instruct us only so far as we are able to connect the words contained in them with the ideas which those words represent. Since ideas are not derived primarily from words, but from things, it follows that our teaching should begin with things and ideas, and lead to principles.

No man becomes a good farmer, or carpenter, or painter, or engineer, or surgeon from books alone; he must have *observation* and *practice*—in other words, *experience*, to make what he reads in books a living reality, so that words shall be to him as pictures representing those realities.

If habits of accurate observation are ever attained, the foundation must be laid in childhood. Since children delight in natural knowledge—a knowledge of things—and since a constant impulse to know seems to urge them to acquire ideas of the objects about them, a little encouragement will lead them to employ this useful and divinely-implanted desire so that observation shall become a most valuable habit. Thousands of evidences exist around us proving that this noble impulse, if neglected or checked in childhood, becomes greatly

diminished in activity, even so far as almost to cease to take notice of the beauty and wonders of the world.

From the lack of habits of observing the properties of common things, and deriving therefrom those lessons to which such observation leads, the most lamentable errors are committed. Without this habit nature is a sealed book; the varieties of animal and vegetable life appear but a mass of confusion; the stars tell no wonders, mark no seasons. To remedy this, habits of observation must be commenced in infancy, carried forward in youth, and confirmed in manhood.

If we would take for our guide in education those laws which God has prescribed for the development of mind, and follow them, we must begin with *things*, and go from them to *words*, teaching words as representative symbols, or signs, of the things themselves. This course would render the path of the learner pleasant, as God intended the acquisition of knowledge should be.

The most important period in education is that spent in the primary school. Hence those who undertake the charge of training children during this period should be especially qualified for it; they should understand the cultivation of the senses, and know how to teach *real things*, *real forms*, *real colors*, *real sounds*, and words to represent them, and how to lead the mind to correct conceptions. Before teaching the word *cube* as the name of an object, they should see that the child is familiar with and can readily distinguish the form of a cube. Before teaching the word *green* as the name of a color, they should know that the child has a distinct idea of the color itself. Instead of teaching first the words *rough* and *smooth*, and then their definitions, the mind should be made acquainted with the sensations of

rough and smooth, and the words taught to enable it to express those sensations. If teachers will learn to carry out this idea in all their primary instructions, *words* and *books* will come to have a significance to the young which they seldom or never attain under other methods of education.

Observation teaches that the full use of our senses is to be acquired by suitable training. Their cultivation is one of the important duties of both the parent and the primary teacher. On this subject Miss Edgeworth justly remarks:

"Rousseau has judiciously advised that the senses of children should be cultivated with the utmost care. In proportion to the distinctness of their perceptions will be the accuracy of their memory, and probably, also, the precision of their judgment. A child who sees imperfectly can not reason justly about the objects of sight, because it has not sufficient data. A child who does not hear distinctly can not judge well of sound; and if we could suppose the sense of touch to be twice as accurate in one child as in another, we might conclude that the judgment of these children must differ in a similar proportion.

"The defects in organization are not within the power of the instructor. We may observe that inattention and want of exercise are frequently the causes of what are mistaken for natural defects; and, on the contrary, increased attention and cultivation sometimes produce that quickness of eye and ear, and that consequent readiness of judgment, which we are apt to attribute to natural superiority of organization or capacity."

The more we spread and enlarge these roots of knowledge by such practical means, the more rapidly the future

tree will grow, and the more abundant and perfect will be the fruits thereof.

"A little child has sensations which we ourselves had, but which we now forget. It walks in the world as we might do in a new country; the sky, the changing lights, every class of natural objects, give rise to new sensations, for each of which it seeks a name, and, long before it has words to characterize them, it is acquainted with many qualities and circumstances relating to them. But its faculties are chiefly employed upon those things most closely allied to its own nature. Every thing that lives has a special interest; motion invariably attracts as a sign of life, but it is human society and all its relations that come home most fully to its sympathies."*

Whatever the child sees done he wants to know about, and to do; and so great is his love of the knowledge of actions, that he will gladly throw aside the playthings which delight him to watch his papa or mamma in operations where tools are employed. He wants to know about the food he eats; the uses of each article of furniture; the uses of tools which he sees; about his clothes —how they are made; and about every thing relative to man, animals, and plants. In fact, his curiosity is insatiable, because a knowledge of these things is necessary to existence and well-being. Now it is evident that by taking advantage of this propensity to know, while gratifying a natural desire, *habits of observation* may be established, a great amount of *knowledge imparted*, and, at the same time, the *conception*, *comparison*, *imagination*, *reason*, and *judgment* cultivated, the ability for classifying and associating strengthened, and the foundation laid for a thoroughly practical education.

* Young's Teacher's Manual.

Books will never accomplish this; such training should precede books; *it is the work of the parent and of the primary teacher.* To aid both in their endeavors to properly develop the minds of the children intrusted to their care is the design of this book. It is not expected that these lessons will be followed literally; but it is hoped that they will serve to suggest methods adapted to the wants of teachers and parents under the varying circumstances in which they may be placed, and lead them to instruct by system, in accordance with nature's laws for the acquisition of knowledge, rather than by mere experiments, unguided by system or law.

No one is a master of the science of teaching until such skill has been attained as will give the ability to quickly ascertain not only what the child knows upon any subject, and what portion of this knowledge is clearly known, what part is faintly known, but what steps should be taken, and their order, that the subject may be properly known. Furthermore, the instructor must be able to determine what was defective in the methods of teaching from their results alone, and to suggest readily methods adapted to correct the defects.

When a teacher has become practically acquainted with a correct system and laws of instruction, all difficulties relative to what methods should be used in any given case will rapidly disappear.

The laws of mental development are just as certain, and may be as clearly understood, as the laws of physical growth. A person is no better qualified to enter upon the duties of a teacher without knowing these mental laws, and understanding a system of teaching in accordance with them, than one would be to undertake the duties of a physician who knew nothing of the laws of health and the philosophy of medicine.

HOME TRAINING OF THE SENSES.

The importance of a proper cultivation of the senses by means of home training can not be over-estimated. The mind of the child has access to the material world only through its senses. It is through these doors and windows that all knowledge of the world can be acquired. These senses need cultivation by suitable exercise to enable the mind to act through them with readiness and clearness.

When no attention is given to the training of the senses, it often happens that some of them receive so little exercise that they fail to attain their full power of activity. Sometimes it is found that for want of suitable attention the sense of hearing is very imperfect, and, in consequence, the child is called stupid, when the difficulty exists in its not having been trained to perceive sounds readily and clearly. This condition may exist with other senses, and the child be considered dull, and slow to learn, simply in consequence of not having been trained to use its senses properly.

During the period of home training all the senses should receive due attention — smelling, tasting, and feeling, as well as seeing and hearing. It is especially important that the senses of smelling, tasting, and feeling should be carefully trained at home, since the opportunities are very limited for their cultivation in school, where the exercises chiefly pertain to seeing and hearing.

The prominent characteristics of early childhood should be carefully observed, and plans adapted for home training in accordance with them. Among these characteristics will be found activity, a fondness for handling things, and a desire to try to do what older persons do. No better training can be given to the child, before it is old enough to go to school, than to furnish the means to enable it to exercise these characteristics in such a manner as to lead to a proper training of the several senses.

The opportunities for such home training are of daily occurrence. Favorable circumstances for such exercises should be seized whenever and wherever they arise, in the kitchen, dining-room, parlor, garden, field, or the street. Wherever they go, children might thus be trained to observe, and to acquire knowledge, and find entertainment.

Where there are two or three children in the family, it will be often found desirable to arrange exercises by which they can join in these sense-training lessons.

The following lessons are presented to suggest methods for arranging exercises for home training of the senses. Other plans may be devised by the parent that would be equally useful, should the end to be attained be kept properly in view.

EXERCISES FOR TRAINING THE SENSE OF SIGHT.

The sense of sight may be cultivated by distinguishing shapes of objects, or their size, length, width, color, etc. Any plans by which shapes, sizes, lengths, widths, or colors may be compared by children will aid in the training of this sense.

Rapid Vision.—Let a child be led through a room, and then requested to tell what it saw in the room. Repeat this, and let it tell what other objects it saw.

Let children stand before a shop window for a minute, and afterward tell what they saw.

EXERCISES FOR TRAINING THE SENSE OF HEARING.

To distinguish Objects by their Sound.—Let a bell, a tumbler, and a bowl be struck lightly with a table-knife, and the child led to notice the difference in their sounds. Then let the child turn its back toward these objects while each is struck again as before, and then tell which object is struck by its sound alone. Other objects may be used in the same manner, and the child trained to distinguish them by sounds also.

To distinguish the Location of Objects by Sound.—Let a small bell be struck in different parts of a room, and children be requested to tell where the bell was sounded each time. It might be struck under a table, under a chair, near the floor, behind a child, then near the ceiling, in a box, in a closet, in a distant corner of the room.

A child might be blindfolded, and a bell rung near it on one side, then far away on the same side; then near behind it, then far away behind it; then near and far on the other side; then near and far in front, and the child required to tell in what position the bell was each time it was rung.

To distinguish high, low, loud, and soft Sounds.—Three tumblers, each having a marked difference in tone, may be struck lightly, and the children required

to notice the sound belonging to each. Then, while the eyes of the children are closed, let each tumbler be struck, and each child requested to tell which tumbler was sounded.

In a similar manner children may be led to distinguish high and low sounds.

To distinguish loud, soft, and faint sounds, let loud, soft, and faint raps be made on a door, on a table, on a tumbler, on the wall. Each might be struck with the same object, then all with different objects. Finally, let the children distinguish which object is used for striking by the sound produced.

Children should also be led to imitate high and low, loud and soft sounds, with their voices.

To distinguish Persons by Voice and by Footsteps.—Let children be trained to distinguish different members of the family by their voice, when they speak but a single word. They may also be led to distinguish the footsteps of each member of the family.

EXERCISES FOR TRAINING THE SENSE OF TASTE.

To distinguish common Objects by their Taste.—Let children taste very small portions of the following articles of food without seeing them, and tell what each is, viz.: Bread, cake, cheese, butter, meat, potato, turnip, apple, peach, grape, plum, pear, salt, sugar, tea, coffee, milk, water, vinegar, etc. Let them also learn to distinguish fruits, nuts, berries, etc., by their taste.

To distinguish Sour Substances.—Let the children

learn the taste of vinegar, lemon, sour apple, currants, pie-plant, etc., and then by taste alone distinguish each of these, and other sour substances.

To distinguish Pungent Substances.—Let the children learn the taste of common pepper, spice, cloves, horse-radish, cinnamon, peppermint, etc., and then to distinguish them by taste, without seeing them.

To distinguish Astringent Substances.—Let children taste of alum, a choke-cherry, an unripe persimmon, a piece of oak bark, and, when they clearly distinguish the puckery taste, tell them that all things that taste like these are said to be *astringent.* Then let them distinguish a few substances by their astringent taste, and this quality will be understood, and never forgotten.

To distinguish Bitter Substances.—Children may acquire a knowledge of a bitter quality by tasting of gentian, myrrh, Peruvian bark, wormwood, rue, quassia, aloes, hops, tansy, or other bitter substances.

To distinguish Salt and Sugar.—Place a little dry white sugar in one paper, and in another a little salt. Let the child smell of each, then feel of each, then taste of each. Then ask it, Do these taste alike? Do they feel alike? Do they smell alike? Has the salt any smell? Are both of the same color? Which do you like better, salt or sugar? Would you like to eat as much salt as you do of sugar? How can you tell which is sugar?

EXERCISES FOR TRAINING THE SENSE OF SMELL.

1. Place successively before the child several objects, and let it tell what they are without seeing or feeling them, as cheese, coffee, onion, turnip, a rose, a pink, a ripe apple, an orange, vinegar, leather, sugar, etc.

2. A variety of flowers may thus be placed successively before the nose of a child, and it requested to tell the name of each.

3. The children should be led to notice objects that they can not smell, as salt, glass, alum, iron, etc.

4. Arrange substances possessing strong odors, as camphor, peppermint, cinnamon, cologne, onion, and let the children tell their names without seeing them.

EXERCISES FOR TRAINING THE SENSE OF TOUCH.

To distinguish Objects by Touch.—Place in a small bag several objects, as marbles, tops, knife, buttons, cents, pencils, key, pieces of cloth, and paper; then request a child to put its hand in the bag, take hold of one object, then tell what it is, without seeing it, and before removing it from the bag. When the name has been given by the child, the object may be taken out, and, if the right name was given, the child may keep the object, and draw another in the same manner. Should the wrong name be given, the object must be returned to the bag.

Where there are two or more children, they may take turns, each naming and drawing out one object. When a child makes a mistake in naming it, the object must be returned to the bag, and that child should wait until

each of the other children have guessed the name of an object and drawn it from the bag before it draws another. When all the articles have thus been drawn from the bag, each child may count them, and see which has drawn out the greatest number.

Lumps of sugar, salt, and pieces of stone and wood may be placed in the bag, and the children requested to distinguish each by feeling, as before.

Children may hold their hands behind them, and a small object be placed in one hand of each, and they be requested to tell the name of it.

Let a child be blindfolded, and try to tell the names of articles placed on a table before it by touching them.

To distinguish Persons by Touch.—When several children are together, one may be blindfolded, and then try to distinguish the others by feeling of their clothes and hands. Let a child try to distinguish the members of the family by feeling of their hands, then by feeling of their faces.

To distinguish Coins by Touch.—Place several coins in a small bag or in a pocket, as one-cent, two-cent, three-cent, and five-cent pieces, and let the child distinguish them by feeling. Each coin may be drawn from the bag or pocket after its name has been given, but it must be returned when the wrong name is given.

To distinguish Grains by Touch.—Several kinds of grain may be put into different bags, as wheat, oats, peas, corn, beans, etc., and the child requested to tell the name of each kind by feeling it.

To distinguish Rough and Smooth Objects.—Arrange several articles that differ in smoothness and roughness, as pieces of silk, cotton, and woolen cloth, brown paper, writing-paper, rough and smooth pieces of wood, pieces of stone, metals, etc., and request the children to select the smooth articles, and place them in one group, and the rough articles, and place them in another group.

To distinguish Hard and Soft Substances.—Arrange on a table several substances, as cork, pine, oak, lead, copper, iron, stone, glass, leather, rubber, and let the children select, by feeling, the three softest articles, also the three hardest.

Let them select all that are softer than lead, and place them on the left side of it; then all that are harder than lead, and place those on the right side of it.

Place several substances before the children, and let them ascertain, by scratching each with a piece of copper, which are harder than copper, and which are softer than copper.

To distinguish Warm and Cold Substances.—Arrange several substances on a table, as cotton, linen, and woolen cloth, different kinds of wood, stone, lead, iron, glass, and let the children touch each, and say which they think feel cold, and which warm.

To distinguish Size of Objects by Touch.—Place three objects, differing but little in size, in the hands of a blindfolded child, and request it to select the largest one.

Place objects of the same shape and size, and objects of the same shape but of different size, in a bag, and let

children select and draw out two of the same size, then two of a different size.

Objects of different shapes, but of nearly the same size, may be placed in the same bag with the last lot, and the child led to select like sizes, then like shapes, then like shape and size.

The sense of touch may also be improved by allowing children to compare the thickness of objects by feeling, as a thick and a thin book, a thick and a thin piece of paper or piece of cloth, a thick and a thin stick, a large and a small string.

To distinguish Leaves by Touch.—Encourage children to learn the feeling of different kinds of leaves, and of the blades of grass and grains. They may be requested to distinguish these by touch alone.

The exercises already mentioned will suggest a variety of methods for training the sense of touch. And, in addition to those now given, children should be trained to distinguish substances that are slippery, sticky, light, heavy, etc. On all suitable occasions they should be allowed to touch different objects, and to tell how they feel. But care should also be taken to secure a *proper training in discriminating what and when they should not touch.*

HOME EXERCISES FOR TRAINING THE HAND.

Let the children open and shut their hands; shut all the fingers of the right hand except the forefinger and thumb; then the same of the left hand; then all except a little finger on each hand; then all but the little finger and the forefinger, etc.

Balancing.—Let children try to balance small objects on the tip of a finger, as a cent, a pencil, a pocket-knife, sticks, etc.

Tying Knots.—Let children learn to tie a simple knot in a single string; then a simple knot with two strings side by side; then to join two strings together by a square knot; then two strings may be united by a loop-knot. Children should also be taught to tie single and double bow-knots, such as are used in tying their shoe-strings, also their neck-ties.

Doing up Parcels.—Children may be taught to tie up small parcels neatly, as books, pieces of cloth, a few pebbles or beans; also sand, peas, or small grains, in parcels of a conical shape, such as grocers use.

Cutting and Folding Paper.—Let children be shown how to cut and fold papers to form small boxes, boats, hats, baskets, garments, houses, etc.; also folding slips of paper for lighting candles or gas.

Cat's Cradle is a good game for exercising the fingers of children.

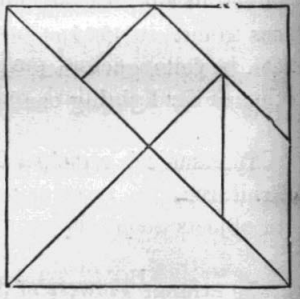
HOME TRAINING IN FORM.

Ideas of form may be developed by means of the toys furnished for the child's amusement at home. For this purpose a box of cubes and a box of brick-shaped blocks should be supplied. The brick-shaped blocks should be made of some hard wood, as cherry or maple, and be about four inches long by two inches wide, and one

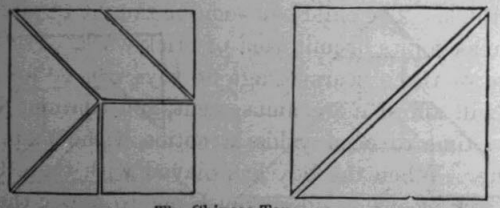
inch thick. The child can soon be taught to pile them up, break joints in imitation of brick-work. For a boy of two or three years of age no toys can be furnished that will afford more amusement, and continue for so long a time to occupy his attention without apparent fatigue. When the boy has played with these blocks for a few weeks, it will astonish one to notice the variety of square and oblong structures, towers, pyramids, bridges, arches, gateways, walls, forts, chimneys, etc., that he will construct with them.

Crandall's building blocks also serve a similar purpose of amusement and observation in shape. These are made so that the different pieces may be joined together at the ends, and the structure may be carried about without falling to pieces.

A toy known as a Chinese puzzle, or tangram, represented below, will also be found useful in this home training in form. The tangram may be made of pasteboard, or wood, or metal. It consists of seven pieces, as seen in the accompanying illustration representing it in the form of a large square. On the opposite page may be seen two squares formed with the same pieces.



With the seven pieces that constitute the tangram many hundred figures may be constructed. First the child should be directed to form the two small squares; afterward the large one. When it can form these readily, various outlines of figures may be given to be imitated by arranging the several pieces. In addition, other forms may be arranged according to the child's fancy. It is said that the tangram was one of the amusements of Napoleon.



The Chinese Tangram.

On the following page are a few of the figures that may be arranged from the tangram.

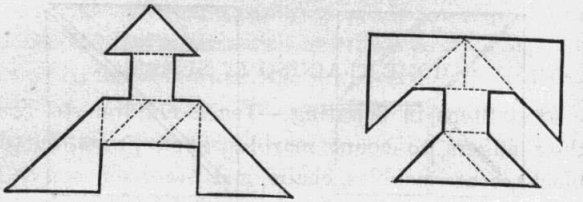
HOME TRAINING IN COLOR.

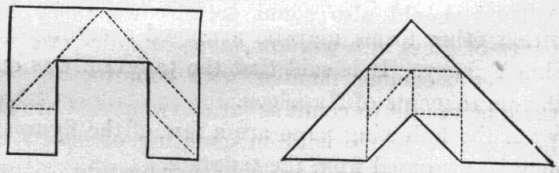
To distinguish Colors. — Let the children arrange pieces of silk, ribbon, cloth, paper, or worsteds, of various colors, in groups of red colors, blue colors, green colors, yellow colors, purple colors, without any distinction of light and dark reds, blues, etc.

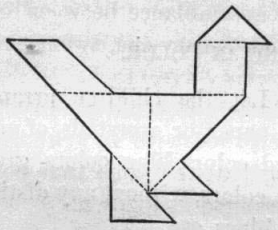
To name the principal Color of Objects.—Let the children name the principal colors in their articles of dress, in objects about the room, as carpets, mats, etc.

To arrange Flowers of like Colors.—In the summer encourage children to notice the colors of flowers; also to arrange together flowers of like colors.

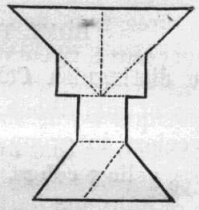
To arrange Colors in Order.—Place colors in order, as red, orange, yellow, blue, green; or green, red, orange, blue, and let children arrange colors in the same order.



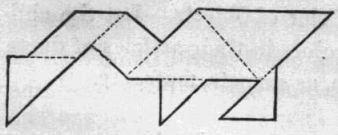




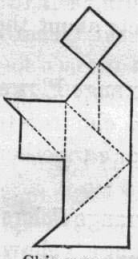
Chicken.



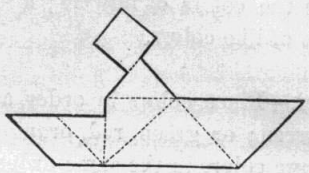
Fruit-dish.



Goose.



Chinaman.



Man in a Boat.

HOME TRAINING IN NUMBER.

First Steps in Counting.—Teach children to count their fingers, to count marbles, apples, nuts, buttons, blocks, cents, pebbles, chairs, and other objects, as far as ten, in order. Let them walk and count their steps. They should also count trees, cows, sheep, horses, panes of glass in a window, steps in stairs, etc.

After becoming familiar with counting to ten, let them be taught to count as far as twenty. Care should be taken to teach children counting of *objects* before they are allowed to learn counting by rote.

Lead them to notice the resemblance between one, two, three, four, five, etc., and twenty-one, twenty-two, twenty-three, twenty-four, twenty-five, etc.

One evening, when my little girl could read only a few simple words, she came to me with an arithmetic, and asked, "What are these?" at the same time pointing to a group of figures arranged as follows:

1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10

Requesting her to hold up one finger, I pointed to the 1, and said, "That is the *figure one.*" Then asking her to hold up two fingers, I pointed at 2, and said, "That is *figure two.*" After proceeding in this manner as far as the 4, I began at 1 again, pointing at the figures, and saying, "Figure 1, figure 2, figure 3, etc. See, this is the way you count; and the names of these figures are what you say when you count *one, two, three, four,* etc." As I came to the 4 this time, she comprehended the relation between the figures and counting, and at once

pointed out and named 5, 6, 7, 8, 9, 10. In less than fifteen minutes she could name either of these figures in any order. This was her first lesson. In a few days I requested her to place in groups as many pieces of money as each figure represented.

OTHER HOME EXERCISES.

Children should be supplied with a variety of attractive and instructive games and puzzles for home amusement, as "fox and geese," "garrison game," "solitaire," "checkers," "Jack-straws," etc. And for out-of-door sports, top, kite, bat and ball, hoops, croquet, sleds, skates, etc. Such games, puzzles, and amusements as lead children to habits of quick perception, or give skill to the eye, ear, or hand, when properly participated in, tend to develop the powers of both mind and body.

SUGGESTIONS FOR TEACHERS.

Teachers will find many children in school who have had no home training of the senses, and who seem to have made but little progress toward a ready use of these powers which God gave them, that they might learn what is in this world into which they have come to dwell.

To prepare such children for a proper introduction to the lessons of school, the teacher will need to perform much of the work of training which ought to have been done by the parent, and in such cases many of the foregoing exercises for home training will suggest methods that may be used for similar work in school. Language can not be understood until pupils have been taught to observe their sensations.

INTRODUCTORY SCHOOL LESSONS

FOR CULTIVATING OBSERVATION AND THE USE OF LANGUAGE.

CONVERSATIONAL EXERCISES.

The child's first school lessons should be conversational, and imparted in the simplest manner, with an aim to awaken the mind, develop habits of observation, and train pupils in the use of language. This work should be preparatory to a more definite knowledge of form, color, number, and of printed words.

That subject in which the child manifests the greatest interest is the one about which the conversations should commence, and indicates the point where that child's instruction should begin. As the lessons proceed, the interest in that particular subject may be made the key-note for drawing attention to other subjects having a kindred interest.

Conversations about things at home — every-day things—will usually prove interesting. These lessons should be conducted without formality. The children may be led to talk about the things which they daily see, and use, or wear, and to ask and answer questions concerning them. Those subjects should be chosen at first that are very simple, and with which both children and teacher are familiar.

1. Suppose the teacher's first conversation with the children be about a cat: let her ask how many feet a

cat has; how many ears; what a cat does; what a cat is good for. Encourage them to talk about *their* cat. Similar inquiries may be made about a dog. Care should be taken to encourage children to *tell* about whatever thing may form the topic for conversation.

2. They may be led to talk about their playthings, and tell what they have, and what they do with them, and who gave them their playthings.

3. As children are fond of telling what they have seen, let them tell what they saw on their way to school; what birds they have seen; what animals they have seen, and where they saw them.

4. After a few familiar conversations of this kind, which win confidence and remove restraints upon the expression of their thoughts, let them be led a little farther, and asked to name some objects that have a common use; as, what things are used to sit upon? "Chair, sofa, stool, bench," probably would be the reply. Ask where they sit upon sofas, where on chairs, where on stools, where on benches.

5. What things are worn on the hands? "Mitts, gloves, mittens, rings, muffs." Who wear mitts? Who wear gloves? When are mittens worn? How are rings worn? When are muffs used?

6. What things are worn on the feet? "Stockings, slippers, shoes, boots, overshoes." Why are stockings worn? When are slippers worn? Who wear shoes? Who wear boots? When are overshoes worn? What else is worn on the feet?

7. What things are worn on the head? "Cap, hat, bonnet." Who wear hats? Who wear bonnets? Do girls wear caps?

8. What things can you see in the schoolroom that

are made of wood? "Chair, bench, table, desk, floor." For what is the table used? For what are the desks used? Do you think the scholars could walk in the schoolroom without a floor? What, then, is its use?

9. What things are seen in the sky? "Sun, moon, stars, clouds, rainbow." When may you see the sun? Point where the sun is in the morning. Point where the sun is at sunset. When do you see the moon? Can you see the moon every night? Can you see more than one moon? Can you see more than one star at one time? Do you see the stars in the daytime? When can you see clouds? Did you ever see a rainbow?

10. Tell me the names of some articles of dress. "Coat, vest, pantaloons, gown, apron." Do girls wear coats and vests? Who wear pantaloons? Who wear aprons? Who wear gowns? Of what are coats made? Of what are gowns made? Are vests made of calico? Are aprons made of cloth like that used for coats?

In conducting these *Conversational Exercises*, care should be taken to select at first those things with which the children are familiar, and not to lead them to observe things which are beyond their comprehension. The course may be pursued for some time, gradually taking up subjects which require a wider range of observation, as the pupils become more capable of telling what they have seen, and thus they may be led to a more thorough and definite knowledge of all the ordinary objects around them.

Exercises of this character are especially adapted to children that have not learned to read; and they may be introduced with profit in immediate connection with their reading lessons. They are also appropriate to introduce as *occasional exercises*, for variety, or to fill up

the time usually devoted to a lesson, which, from some cause, has not occupied the full time assigned to it.

The following notes of conversations will suggest some of the methods that may be used in this class of lessons.

CONVERSATION ABOUT A KNIFE.

Teacher (holding a pocket-knife before a class, says). What is this?

Children. "A knife."

T. What can I do with it?

C. "Cut with it; whittle; make things."

T. I have now closed the knife; can I cut with it now?

C. "No; you must open it."

T. How do people carry a knife of this kind?

C. "In a pocket."

T. Did you ever see any other kind of knife?

C. "Yes; a dinner-knife, a table-knife, a tea-knife."

T. Which is longer, the dinner-knife or the pocket-knife?

C. "The dinner-knife."

T. What do we do with a dinner-knife?

C. "Eat with it."

T. Is the dinner-knife good to use in whittling?

C. "No; it is not sharp."

CONVERSATION ABOUT A CAP.

Teacher (showing a boy's cap to the class). What is this?

Children. "A cap."

T. What is it good for?

C. "To wear on the head."

T. Who wear caps?

C. "Boys wear them; and sometimes men wear them."

T. When do men and boys wear caps?

C. "When they go out of doors."

T. Why do they wear caps when they go out of doors?

C. "To keep the head warm."

T. Do all boys wear caps?

C. "No; some wear hats."

T. What is this cap made of?

CONVERSATION ABOUT A BALL.

Teacher (showing the children a rubber ball, a ball of wood, a ball of yarn, marbles, etc.). Which of these is larger—the rubber ball, or the marble?

Children. "The rubber ball."

T. What is a ball good for?

C. "To play with."

T. What can a boy do with a ball?

C. "Throw it; knock it; bounce it."

T. Which had you rather have, this ball of wood, or the rubber ball?

CONVERSATION ABOUT A STOVE.

Teacher (pointing to a stove in the room, says). What is this?

Children. "A stove."

T. What is it used for?
C. "To make a fire in."
T. Why do we make a fire in it?
C. "To keep us warm."
T. What do we put in the stove to make a fire?
C.
T. Will the stove burn up?
C. "No; it is iron."
T. Did you ever see a stove in any other place?
C. "Yes; at home."
T. What is the use of the stove at home?
C. "To cook with, and warm the room."

Conversations somewhat like the foregoing might be had upon the following and similar subjects:

Bread.	Apple.	Snow.
Cake.	Orange.	Ice.
Pie.	Peach.	Rain.
Cheese.	Pear.	Slate.
Butter.	Cherry.	Chair.
Milk.	Plum.	Table.
Sugar.	Grape.	Bell.
Fork.	Spoon.	Shoe.
Horse.	Cat.	Cow.
Dog.	Sheep.	Cart.

The children should also be taught to tell their names; the name of the street in which they live; the names of their parents and of their brothers and sisters; the days of the week; to know their right and left hands; in what city or town they live.

It will be observed that these simple conversational exercises might be extended almost without a limit; also that the interest of the pupils can be awakened

and kept alive by such variations as will readily suggest themselves to the ingenious teacher. Sometimes it might add interest to these exercises to tell the children beforehand what object will be talked about for the next lesson; but this should be done only where it affords the class additional pleasure, and with subjects for which the children show great interest.

Children possess active minds; they are constantly changing from one thing to another, and it must not be expected that they can consider a subject for a considerable length of time, as older persons do, or that they would think much about a lesson, should they be told what it will be, before they are called upon to talk about it, especially if they do not manifest more than ordinary interest in it. It requires skill on the part of the teacher to keep up a lively interest, even during a class exercise, when the subject has all the attraction of novelty.

The teachers who possess *tact*, and an enthusiastic love of their work, will succeed. Such teachers will derive most benefit from these suggestions, and upon them must chief reliance be placed for a successful introduction into our schools of methods for cultivating habits of accurate observation, and more thorough training of the mental powers through the processes of acquiring knowledge.

The importance of cultivating such habits in childhood, and the consequent love for nature, are beautifully expressed in the following words from an article on the "Cultivation of the Perceptive Faculties," by Prof. William Russell, published in *Barnard's Journal of Education:*

"The 'pliant hour' must be taken for all processes of *mental* budding, grafting, or pruning, as well as in those

of the orchard. An early dip into the study of nature will serve to saturate the whole soul with a love for it so strong as to insure the prosecution of such subjects for life. The season is auspicious; the senses are fresh and susceptible; the mind is awake; the heart is alive; the memory is retentive; nature is yet a scene of novelty and delight; and application is a pleasure. The twig may now be bent in the direction in which the tree is to be inclined."

EXERCISES FOR TRAINING IN

HABITS OF THINKING AND SPEAKING PROMPTLY,

AND A CORRECT USE OF LANGUAGE.

It is of great importance to have children trained to think quickly, and speak promptly, and use language correctly. Exercises suitable for pupils during their first and second years of school attendance ought to be introduced into every primary school, for the attainment of these habits. Such training might properly succeed the "Conversational Exercises."

The following descriptions of methods will suggest means by which skillful teachers may accomplish this desirable object, and also lead children to notice their *sensations.*

What I can See.—Request each child, in turn, to stand up quickly and tell the name of something that it can see in the class-room, as: "I can see the blackboard;" "I can see the table;" "I can see a chair;" "I can see a piece of chalk;" "I can see a book;" "I can see my teacher."

The pupils should be so trained that no time will be lost between the sitting down of one child and the getting up of the next. Each child should be trained to speak instantly after rising, or sit down, and the next pupil take the turn.

After a few days the pupils may be allowed to mention the names of things that they have seen out of

school, as: "I saw a horse;" "I saw a wagon;" "I saw a cow;" "I saw a car;" "I saw a bird." This exercise should teach pupils *not* to say "I seen."

What I can Hear.—"I can hear my teacher speak;" "I can hear the bell;" "I can hear a piano;" "I can hear a wagon;" "I can hear a car;" "I can hear Lucy speak."

Subsequently the pupils may be requested to tell what they have heard, as: "I heard a bird sing;" "I heard a fire-bell;" "I heard a mouse nibbling;" "I heard a lady singing," etc.

What I can Taste.—"I can taste an apple;" "I can taste an orange;" "I can taste a peach;" "I can taste candy;" "I can taste pie;" "I can taste a banana;" "I can taste bread," etc.

This exercise may be changed, and the pupils required to tell what they can eat, as: "I can eat meat;" "I can eat cheese;" "I can eat cake;" "I can eat pie;" "I can eat an apple," etc.

What I can Smell.—"I can smell an orange;" "I can smell cheese;" "I can smell an apple;" "I can smell an onion;" "I can smell wintergreens;" "I can smell peppermint;" "I can smell camphor;" "I can smell cinnamon," etc.

What I can Feel.—"I can feel my book;" "I can feel my slate;" "I can feel my pencil;" "I can feel my finger;" "I can feel my hair;" "I can feel a chair;" "I can feel ice;" "I can feel water;" "I can feel the wind," etc.

What I can Do.—"I can talk;" "I can read;" "I can play;" "I can walk;" "I can run;" "I can jump;" "I can sing;" "I can spell;" "I can jump the rope;" "I can play ball;" "I can skate;" "I can ride on a horse;" "I can ride in a wagon;" "I can sweep;" "I can sew;" "I can wash dishes;" "I can wash my face and hands;" "I can comb my hair," etc.

Where I can Go.—"I can go to school;" "I can go to church;" "I can go home;" "I can go to the grocery store;" "I can go to the baker's;" "I can go to market;" "I can go to the park;" "I can go to a shoe store;" "I can go to my cousin's;" "I can go to my uncle's;" "I can go to my grandmother's;" "I can go in the country," etc.

How I can Go.—"I can walk to church;" "I can walk to school;" "I can run to the store;" "I can ride in a stage to my cousin's;" "I can ride in a horse-car to my uncle's;" "I can ride in a steam-boat to my grandmother's."

What I would like to Have.—"I would like to have a new book;" "I would like to have a pair of new shoes;" "I would like to have a new dress;" "I would like to have some candy;" "I would like to have my dinner;" "I would like to have a watch;" "I would like to have a new knife," etc.

What I can Wear.—"I can wear a hat;" "I can wear a cap;" "I can wear a coat;" "I can wear shoes;" "I can wear boots;" "I can wear a dress;" "I can wear a shawl;" "I can wear an apron;" "I can wear a cloak," etc.

The teacher may arrange similar exercises, by which the pupils will tell what they do not like to see; what they do not like to hear; what they do not like to taste; what they do not like to smell; what they do not like to feel; what they do not like to do; where they do not like to go, etc.

It would also be well for the teacher to ask the children to tell the names of some things that they can not see; of some that they can not hear; of some that they can not taste; of those they can not smell; of those they can not feel; also to tell what they can not do, and where they can not go.

These or similar exercises might be used occasionally with profit during the first two years of school attendance.

FORM.

Form and *Color* are the two properties of objects which are the most distinctive to children. Both appeal to the sight, and are early and generally recognized. Both appear in great variety every where, and therefore afford ample scope for training children in observation. These properties should receive an important place in the course of primary instruction.

Children learn to group objects of like shapes accurately more readily than they do those of like colors. The young child learns to distinguish objects chiefly by their *forms*. It is this property, in its simplest conceptions, which attracts the attention of very young children to the things about them. By means of the resemblances and differences in the *shape* of those objects that are repeatedly brought before the eyes of a young child, it learns to distinguish the spoon from the cup, the knife from the fork, the plate from the bowl, the chair from the table, the cap from the hat, the glove from the muff, the boot from the shoe, the book from the slate, the cat from the dog, the horse from the cow, the sheep from the pig, long before it has acquired a knowledge of the other properties of these objects.

Form is the most suitable quality with which to commence lessons for training children to observe with careful attention and accuracy the distinguishing properties of objects. Ideas of shape may be represented by clear and simple descriptions and definitions, consequently these ideas may be easily made subjects of

early instruction, as well as a means of discipline in habits of accurate observation.

Experience shows us that it is better to commence lessons on objects by teaching each conspicuous property separately, so that a distinct impression shall be made, and the idea of the given property understood, before the child is required to recognize several properties in combination.

Among the early perceptions of children are those of form, color, sound, number, size, motion, taste, cold, and heat. Each of these should receive due attention, but none of them is so well adapted for training young pupils to notice every thing which they see outside of the schoolroom as form. Perhaps the next in order of adaptation are color, sound, number, size, and motion.

To teach the names of forms may be deemed somewhat arbitrary, yet it is far less so than to teach children the letters before teaching them words. By exercising a little skill in illustrating each shape with a variety of objects, diagrams on cards and on the blackboard, and teaching its name after its form is clearly recognized, these lessons will prove attractive and interesting even to young children.

In all the lessons on form several objects should be associated with each shape taught, by requiring the children to recognize the shape in objects about the room, and to mention others that they have seen which resemble the given form.

It does not produce a proper development of the powers of mind to show an object, and point out and name its shape; the child must be trained to distinguish the form, and taught to use its name. Herein lie the principal differences between modes of teaching in

common use. By one mode the teacher continually *tells* the pupils, simply pouring words into their ears, without considering whether this is the best avenue to the mind, or whether the children understand the meaning of the words which are thus communicated. By another method the teacher trains the pupils to use their own powers of mind in obtaining knowledge, thus making their school education practically available through life.

The mode of teaching employed by those whose main object seems to be telling their pupils, and expecting them to remember, makes the mind a passive recipient of words, like a bag being filled; and it leaves the mind almost as incapable of adding more knowledge to its stores, as the bag of increasing its own contents. The other method of teaching trains all the powers of the mind to greater activity, and thus accustoms children to observe more carefully every thing around them, and leads them to acquire knowledge in such a manner that it becomes most practically useful to them in after life.

Methods of teaching the lessons on *Form* properly will lead unconsciously to the use of better modes of instruction in other subjects. The teacher who carefully observes the spirit of these lessons on *form*, and acquires skill in presenting them, will teach reading and writing, arithmetic and geography, better, because of the influence of these lessons on both teacher and pupils.

Very little importance should be placed on repeating the names of forms, but a *great deal* upon the actual selection and classification of the objects by their different shapes. It is the *seeing*, *comparing*, and *grouping*

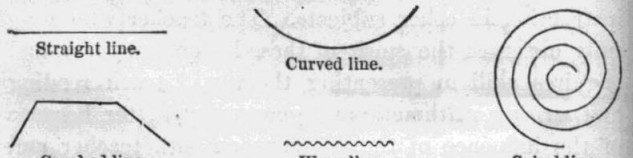
that perfects knowledge in this department of education; not the repetition of names merely. All of these should be combined; the child should be led *to see*, taught *to compare*, trained *to do*, and required *to tell* what it sees and does.

APPARATUS FOR ILLUSTRATING FORM.

Whenever the lessons are commenced for teaching the *names of forms*, there should be provided a box* containing plane forms, as triangles, squares, polygons; and solids, as sphere, spheroid, cone, conoid, ovoid, cylinder, cube, pyramids, etc., etc. There should also be Charts† to illustrate the lines and forms. In the absence of any better apparatus for illustrating form, the *plane figures* may be cut from pasteboard, and the *solids* from potatoes or turnips; and the *lines* might be drawn on the blackboard. But models of the regular *Forms* and *Solids* are indispensable in teaching children correct ideas of their respective shapes.

The following diagrams are intended to illustrate, in their appropriate groups, such shapes of *lines*, *plane forms*, and *solids* as the teacher will have occasion to use in the course of lessons on *Form* given in the succeeding pages.

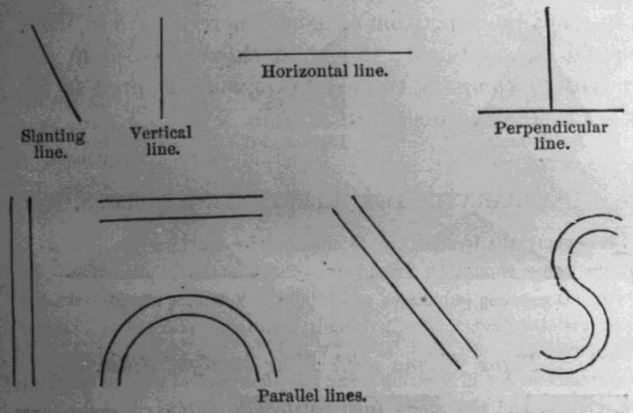
Shapes of Lines.



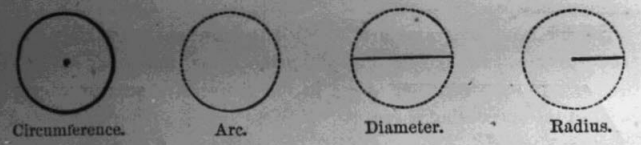
* A box of "New Forms for Object Teaching" has been manufactured expressly for this new edition by Messrs. J. W. Schermerhorn & Co., New York.

† "Charts of Lines and Forms" have been prepared for illustrating the lessons on this subject by Mr. Calkins, and published by Harper & Brothers.

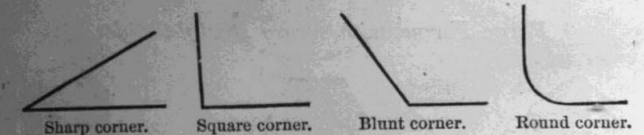
Position of Lines.



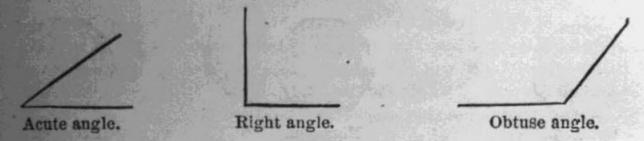
Names of Lines in other Positions.



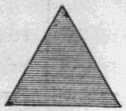
Shapes of Corners.

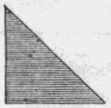


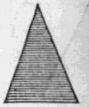
Names of Angles.



Plane Forms with Three straight Sides.


Equilateral triangle.

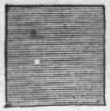

Right-angled triangle.

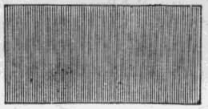

Isosceles triangle.

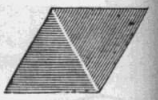

Obtuse-angled triangle.


Scalene triangle.

Plane Forms with Four straight Sides.


Square.


Oblong.


Rhomb.


Rhomboid.

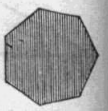

Trapezium.


Trapezoid.

Plane Forms with many straight Sides.


Pentagon.


Hexagon.


Heptagon.

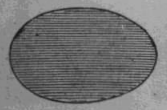

Octagon.


Nonagon.


Decagon.

Plane Forms with curved Sides.

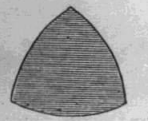

Circle.


Ellipse.


Oval.


Ring.


Crescent.


Curved triangle.

Parts of Plane curved Forms.


Semicircle.

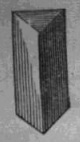

Quadrant.


Segment.

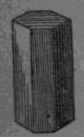

Sector.

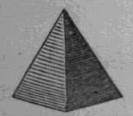
Solids.


Cube.

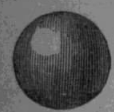

Triangular prism.


Square prism.


Hexagonal prism.


Square pyramid.

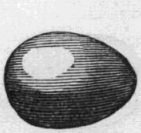

Triangular pyramid.


Sphere.

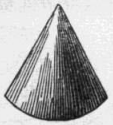

Hemisphere.


Prolate Spheroid.


Oblate Spheroid.


Ovoid.


Cylinder.

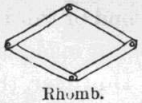

Cone.


Conoid.

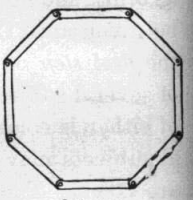
GONIGRAPH.

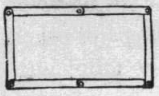
The gonigraph is a small instrument resembling somewhat a jointed carpenter's rule, but made so as to bend in only two directions. It is made with several short rulers, or joints of iron or brass, fastened together by pivots. With it may be formed all the geometrical figures that consist of straight lines and angles, some of which are illustrated by the accompanying engravings:

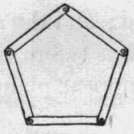

Square.


Rhomb.


Triangle.


Octagon.


Parallelogram.


Pentagon.

LESSONS ON FORM:

WHEN TO TEACH THEM.—WHICH FIRST.

To know *what* to teach, *how* to teach, and *when* to teach are the chief wants of the instructor. Especially is this the condition when "object lessons" are to be given. With a view of showing *what* should be taught *first*, and *what should follow* this in order, thus indicating when to teach a given fact or lesson, the following exercises on *Form* have been arranged in *Steps*.

In all cases, *each step of a subject should be taken in its order*, and no exercise of a second or third step should be given until the pupils have been made familiar with the *first step* of that subject. However, the *first steps* of several subjects may be taken before the *second step* of either is commenced; and the second steps of several subjects may be taken before the *first steps* of others are taken. This will appear plainer by the following

ORDER OF LESSONS FOR CITY SCHOOLS.

For the guidance of teachers in graded city schools, the following suggestions are given relative to the order of presenting the subjects and steps, and an appropriate time for taking up each series of lessons on Form.

During the period from the time that the children enter school until they have read through the Primer, and are ready to commence reading in a First Reader,

the First, Second, and Third Series of Lessons should be taken up and completed.

The Fourth Series of Lessons should be taught while the pupils are reading in a First Reader.

The Fifth Series of Lessons should be completed by the time that the pupils have read half through a Second Reader.

The Sixth Series of Lessons may be given while the pupils are reading the last half of a Second Reader, or in an easy Third Reader.

First Series of Lessons on Form.

The First and Second Steps of Resemblances and Differences in Shape, pages 62, 63, 64.

Second Series.

First Step in Shape of Lines, pages 65, 66, 67.
First Step in Corners, pages 80, 81, 82,
First Step in Solids—Ball Shape, page 119.

Third Series.

Second Step in Shape of Lines, pages 68, 69.
First and Second Step in Position of Lines, pages 73, 74, 75.
First and Second Step in Plane Forms, pages 89, 90, 91.
First step of a Cylinder, page 123.

Fourth Series.

Third Step in Shape of Lines, pages 70, 71, 72.
Third Step in Position of Lines, pages 76, 77, 78, 79.
Second Step, Angles, pages 82, 83, 84, 85, 86.
Third Step in Plane Forms, page 92.
First Step in Triangles, page 93.
First Step in Four-sided Forms, pages 97, 98, 99, 100.
First Step in Circular Forms, pages 106, 107, 108, 109.
First Step in Plane and Curved Surfaces, pages 115, 116.

Second Step in Solid Figures, pages 119, 120, 121.
Second Step of Cylinder and Cone, pages 124, 125.
First and Second Steps in Cube and Cubical Forms, pages 127, 128.
First Step in Prisms, pages 129, 130.

Fifth Series.

Third Step in Angles, pages 87, 88.
Second Step in Triangles, pages 94, 95.
Second Step in Four-sided Forms, pages 100, 101.
Second Step in Circular Forms, pages 109, 110.
Second Step in Surfaces and Faces, pages 116, 117.
Third Step in Solid Figures, page 122.
Third Step of Cylinder and Cone, page 126.
Second Step of Prisms, pages 130, 131, 132.
First Step of Pyramids, pages 133, 134.

Sixth Series.

First and Second Steps of Many-sided Forms, pages 103, 104, 105.
Third Step of Circular Forms, pages 111, 112, 113.
Third Step of Surfaces and Faces, pages 117, 118.
Second Step of Pyramids, pages 134, 135.
Third Step of Four-sided Forms, pages 101, 102.
Third Step of Triangles, pages 95, 96.
Fourth Step, Radius, Quadrant, etc., pages 113, 114.

LESSONS TO DEVELOP THE IDEA OF

RESEMBLANCE AND DIFFERENCE IN SHAPE.

BEFORE entering school, children acquire some idea of shape; but, in most cases, their knowledge of it is so imperfect that they can scarcely arrange common objects that resemble each other in form into groups. It is therefore desirable that lessons should be given for training children to distinguish prominent resemblances and differences in the shape of objects, and to classify them by means of these distinctions. Such distinction and classification constitute the beginning of knowledge in *Form*.

For these lessons the teacher should provide a variety of suitable objects, taking care to have several that resemble each other in shape, as balls of wood, rubber, marbles, an orange, and apple; cylinder, lead-pencil, stick of candy, crayon, slate-pencil; cube, box, pieces of an apple or other substance cut into cubes; squares of wood, pasteboard, paper, soda-cracker; oblong books, slates, sheet of paper; cent, button, ring, candy, crackers or cakes; long and narrow objects, as rule, slips of paper; top, cone, cornucopia; crescent, boy's cap, key, thimble, tumbler, etc.

FIRST STEP.—SHAPE.

The teacher might commence this lesson by holding before the pupils different objects, and asking the name

of each, as: ball, orange, marble, ring, book, slate, crayon, stick of candy, button, lead-pencil, cent, knife, etc.

Next the teacher may hold up two objects that have the same form, and ask the children if these are alike in shape, as a ball and marble; lead-pencil and crayon, or stick of candy; the cent and the button; the book and slate, and so on.

Afterward show the children objects that are not alike in form, and ask them if these are of the same shape, as a ball and crayon; a stick of candy and a top; a cent and a marble; a cube and an apple.

Then objects that are alike and those that are unlike may be shown, as a ball, a stick of candy, and a marble, and the children requested to tell which are alike. A ball, a cube, and a cubical box may be shown in the same manner; then a cube, a square, and a soda-cracker; then a cone, a cylinder, and a top. Thus various objects may be compared, and from these simple exercises the children be led to discriminate differences in their form.

Subsequently the teacher might talk with the children about the shape of various familiar objects, as the table, chair, door, stove, cap, hat, shoe, broom-handle, stove-pipe, etc., and request the pupils to tell which resemble each other, and which are unlike in shape.

SECOND STEP.—SHAPE.

The teacher may request the children to tell which objects are ball shape, which box shape, which door shape, which cent shape, and each may be placed in a group according to its shape, or the answers given by the pupils.

Next the pupils may be requested to mention the names of all the objects that they have seen that are shaped like a ball; shaped like a lead-pencil; shaped like a cent; shaped like a soda-cracker; shaped like a tea-chest or box, etc.

SUGGESTIONS FOR THE TEACHER.

These introductory lessons on *Form* may be commenced with children that are beginning the first step in reading, as early as the fourth or fifth year of their age. When the size of the class, and other circumstances will permit, the children should be allowed to take the objects and arrange them into groups of similar shape.

The exercises in each of the steps of *Shape* may be divided into several lessons. In the *first step* two or three lessons may be given in comparing objects that *resemble* each other in shape; then two or three lessons in comparing objects that *differ* in shape; then four or five lessons in distinguishing objects of *like shape* when placed with others that differ in form; then two or three lessons in comparing familiar objects.

In the exercises of the second step of shape from five to ten lessons may be given, according to the age and progress of the children.

During these exercises, *the shape as a whole* should be presented to the children, and no attempt made to analyze or describe the elementary features of the shape.

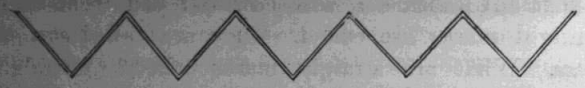
In Nature's school, children first learn to know things as wholes; they learn to know the parts afterward. The teacher who would be successful must follow Nature's plan of instruction.

LESSONS TO DEVELOP THE IDEA OF SHAPE OF LINES.

FIRST STEP.—STRAIGHT, CROOKED, AND CURVED LINES.

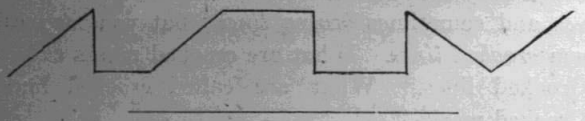
The teacher, holding a string, says, What have I in my hand? "A string." Holding it straight between both hands, she asks, How am I holding the string? "Straight." Bringing the hands nearer each other so that the string hangs loosely, the teacher asks, Now what can you say of the string? "It is crooked—it bends."

Then, holding a gonigraph, or a rule with joints, so that all the joints are bent, the teacher asks, What is the shape of this?



"Crooked." After making all the joints straight, she asks, What shape has it now? "Straight."

Now the teacher may draw a crooked mark and a straight mark on the blackboard, thus:



Then, taking the rule or a gonigraph, request the pupils to tell which mark is like the shape of the rule, as she holds it before them, first straight, then crooked.

Several straight marks and crooked marks may now be made on the blackboard, and the pupils required to tell the shape of each as the teacher points to them successively.

Then pupils may be requested to go singly to the blackboard, and point to straight marks and crooked marks.

Taking a slate, the teacher says, I hold a slate in my hand: does any part of its frame resemble the shape of a straight mark? "Yes, the edges of the frame do."

Taking up a numeral frame, she says, Does any part of this numeral frame resemble the straight marks? "Yes, the wires, and the edges of the frame."

Do you see any thing else in this room that has the same shape as the straight mark? "The edge of the table"—"The top of the blackboard"—"The sides of the door."

Straight Lines.—I will now tell you what these straight marks are called. They are called *straight lines.* What are straight marks called? "Straight lines." What are called straight lines? "Straight marks." Now repeat, "Straight marks are called straight lines."

Crooked Lines.—Crooked marks are called *crooked lines*, and sometimes *broken lines;* but you may call them *crooked lines.* What are crooked marks called? "Crooked lines." What are called crooked lines? "Crooked marks."

The teacher now points to the lines on the blackboard, and the pupils tell their names, as "straight line," "crooked line," etc.

Next the pupils may be called to the blackboard to point to straight lines, crooked lines, etc.

Curved Lines.—The teacher, holding the string so that it bends in the form of a curve, says, I am now holding this string so that it bends like a bow—alike in all parts. How does it bend? "Alike in all parts."

I will now make a mark on the blackboard that shall  bend alike in all parts. The name for this mark is *a curved line.* What do we call a mark that bends alike in all parts?

"A curved line?"

How does the curved line bend? "Like a bow—alike in all parts."

The teacher may now make several straight, crooked, and curved lines on the blackboard, and as each is pointed at, the pupils may tell its name, as "Curved line," "Straight line," "Crooked line," etc.

Then single pupils may be called upon to point to straight, crooked, and curved lines. The pupils may also be requested to find these shapes in objects about the room.

Suppose I should pass this string around a hat, would it represent a straight line? What line would it represent? "A curved line."

SUGGESTIONS FOR THE TEACHER.

It will be observed that the answers supposed to be given by the children in these lessons are quoted. This plan is adopted to make the descriptions of these exercises as short as possible, and yet maintain a prominent distinction between the remarks and questions of the teacher and the replies of the children. It is not presumed that teachers will always ask the questions in these lessons, nor that all children

will give these answers. It is simply intended that these questions and answers may serve *to illustrate how the teacher should proceed*, rather than what questions should be asked and what answers given. Each lesson ought to be so presented that the pupils shall understand it, and the questions should be such as to lead them to give answers showing that they do understand the subject.

Where the children are quite young, it will be well for the teacher to give two or three lessons, each five or ten minutes long, on straight, and crooked, and curved marks, before introducing the term *lines*.

To illustrate the terms *straight*, *crooked*, and *curved*, various objects should be used, as strings, pencil, rule or pointer, whalebone, ratan, wire, etc., and these shapes should be pointed out in the sides or edges of objects around the room. Use the terms "straight line," "crooked line," etc., only when speaking of lines; and the single term "straight," "crooked," and "curved" when speaking of the shape of objects. Do not attempt to teach *lines*, as you might teach them to a class of older pupils in geometry, in an abstract manner.

Request the children to mention other objects than those in the room in which these shapes may be seen.

SECOND STEP.—WAVE AND SPIRAL LINES.

Wave Line.—The teacher, after drawing a line on the blackboard of this shape,

asks the children if they ever saw water when it was uneven, like this line. What do we call the ridges of water when it is uneven? "Waves." Very good; now, because this line is uneven, like the waves on water, we will call it a *wave line*. What kind of a line may we call this? "A wave line."

The teacher may now draw straight, crooked, curved, and wave lines on the blackboard, and, after the children can name each as it is pointed at, they may be requested to point to each of these kinds of lines as their several names are called.

In a small class the pupils might represent this line with a string, on a table.

Spiral Lines.—After drawing a line on the blackboard

of this shape, the teacher asks the children if they ever saw any thing of this shape? Some will answer, "A watch-spring;" some, "The wire on which the bell hangs;" others, "A sofa-spring;" some, "A spider's web." The teacher may then tell them that when a line winds about a point, like this, it is called a *spiral line*.

What is the shape of a watch-spring? "Spiral." What is the shape of the wire that holds the bell? "Spiral." What is the shape of some springs? "Spiral."

What objects have you seen that resemble this spiral line? "A string coiled up;" "Some spiders' webs;" "Springs for bells;" "Watch-springs;" "Some shells."

To represent the shape of the other spiral line, the teacher may take a long lead-pencil, or a pointer, and wind a ribbon or a string around it, leaving spaces between the ribbon or string. Showing this string wound around the pencil, the teacher may say, This string around the pencil represents another form of spiral lines. She may then ask them what they have seen of this shape. Some may answer, "Stripes on a barber's pole;" some, "Vines growing around strings;" others may say, "Springs made of wire for sofas."

SUGGESTIONS FOR THE TEACHER.

Thus far the attention of the children has been called only to the *simple idea of shape* of objects and lines. Now it will be proper to give lessons requiring attention to more minute differences in shape, which will enable the pupils *to describe the shape* of these lines. Methods for giving such lessons may be found under the "Third Step," on this and the following pages.

THIRD STEP.—DESCRIPTIONS OF LINES, AND DRAWING LINES.

Straight Line.—The teacher makes two dots or points on the blackboard, and connects them by a straight line, thus: •——————•. She then remarks, Now I will make two more points the same distance apart, and connect them by a curved line, thus:

Now I will measure each of these lines with this string, and ascertain which is longer—the straight or the curved line. I will tie a knot in my string, to show the length of the curved line; now I will place this string on the straight line, and you may tell me which is longer. "The curved line." Right.

I will now make two more points the same distance apart, and connect them by a crooked line, then measure its length. I will measure this crooked line with the string, and you may tell me whether it is longer or shorter than the curved line. "Longer."

Which is the longest line on the board? "The crooked line." Which is the shortest line? "The straight line." Can you make a shorter line between these two points than the straight line?

What may you say of the straight line? "It is the shortest line between two points." Very well; but you may call the straight line *the shortest distance* between two points. What is a straight line?

"*A straight line is the shortest distance between two points.*"

Does a straight line change its direction?

Crooked Line.—You see that all crooked lines bend. Some of them bend more in some parts of the line than in other parts of it. Do crooked lines change direction?

What can you say about a crooked line? "It is longer than a straight line;" "It bends unevenly;" "It changes its direction."

Very well answered; you may say that a crooked line changes its direction and bends unevenly. What is a crooked line?

"*A crooked line is a line that changes its direction and bends unevenly.*"

Curved Line.—What can you now say about a curved line? "It bends evenly;" "It bends alike in all its parts;" "It changes its direction in all its parts."

Very good.

"*A curved line is a line that bends evenly, changing its direction at every part of it.*"

Spiral Lines.—Look at these spiral lines, and see how they bend. Do they change direction in all parts? Are both of these lines alike? What can you say

about them? "One bends around itself;" "The other winds around something else."

"*A spiral line is a line that bends around itself, or a line that winds around some other object.*"

Wave Line.—Can you tell me any thing about a wave line? "Its shape is like waves." How does it bend? "It bends in curves." Can you point to a wave line?

Drawing Lines.—You may now take your slates and represent three straight lines. Now three crooked lines. Now three curved lines.

You may draw a straight line entirely across your slate. Now draw a curved line across your slate Now draw a crooked line across your slate. Which is the shortest line? Which is the longest one?

Describe a straight line. Describe a curved line. Describe a crooked line. You may draw spiral lines.

Who would like to represent a straight line on the blackboard? James may do it.

Who will draw a crooked line? I see that all of you would like to draw crooked lines. William may make one.

Who can take this string and draw a curved line? Hiram may try to represent the curved line.

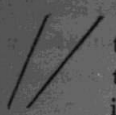
Henry may draw a wave line on the blackboard, and the rest of the class may draw this line on their slates.

LESSONS TO DEVELOP THE IDEA OF POSITION OF LINES.

FIRST STEP.—SLANTING AND VERTICAL LINES.

Slanting.—Taking a pointer, a ruler, or pencil, the teacher holds it before the class, first in an upright position, then in a *slanting* position, requesting the children to notice the difference in the positions. The pointer may also be placed upright on the table, then made to lean to the right, then to the left. Then the teacher may ask, holding the pointer in a *slanting position*, in what *position* is this pointer now? "Slanting;" "Leaning."

Placing the pointer in a leaning position, one end on the table, the teacher asks, In what *position* is the pointer now? "Leaning;" "Slanting."



I will now make marks on the blackboard to represent this position, and you may call these marks *slanting lines.* How many slanting lines have I made?

Vertical.—Taking the pointer again, the teacher holds it in a slanting position, then in an upright position; then holds it upright with one end standing on the table. Now the question is asked, In what position is the pointer? "Standing;" "Up and down;" "Upright."

Very good. Now I will give you another name for this position; it is *Vertical.* What did I call this position? "Vertical." Then vertical means the same as "Standing;" "Upright;" "Up and down."

I will make marks on the blackboard to represent this position, and you may call these marks *vertical lines*. How many vertical lines did I make? How many slanting lines do you see on the blackboard?

As I point at a line on the blackboard, you may tell me its name. "Slanting line." "Vertical line." "Vertical line." "Slanting line."

Now you may point to a slanting line; now to a vertical line.

Can you stand in a vertical position? Let me see you try it. [All in the class stand erect.] That is well done; you may sit down.

SECOND STEP.—HORIZONTAL AND OBLIQUE LINES.

Horizontal.—Again taking the pointer, the teacher holds it in a slanting position, then in an upright position, then in a lying-down position. Placing it on the table in an upright position, it is first made to lean far over, then to lie on the table. Then the children are asked, In what position is the pointer now?

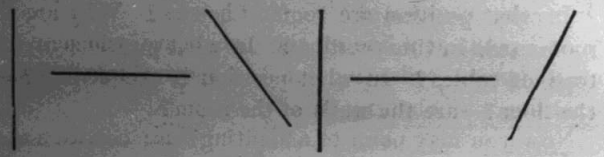
"Lying down."

Taking the pointer up, the teacher holds it in various positions, then horizontal, and asks, In what position is the pointer now? "Lying down;" "Level;" "Even." Yes, the pointer is level, like the ice on a pond, or the surface of water in a basin, or like the floor. You may call this the *horizontal* position.

If you were out in a field, with the land level as far as you could see, the place where the sky and the earth seem to meet all around you would be called the *horizon*. Because this pointer is now in such a position

that its ends point to the *horizon*, we call it the *horizontal* position.

I will now make marks on the blackboard, and you may tell me in what position they are in as I point at



them. "Vertical;" "Horizontal;" "Slanting;" "Horizontal;" "Slanting;" "Horizontal."

In how many positions have I placed these lines? "Three." What are the names of these positions? "Slanting, vertical, and horizontal."

Now you may point to a vertical line; to a horizontal line; to a slanting line; to a horizontal line; vertical; slanting.

Oblique.—The slanting line is sometimes called by another name, which means the same as slanting; that name is *oblique*. So you may say the line is *oblique*, or the line is *slanting*. If you place one end of the pointer on the floor, a few inches from the wall, and place the top of it against the wall, you would say the pointer is *leaning*. So, if you should see a tree standing so that its trunk is not in a vertical position, you would say *the tree leans*, or the *tree is leaning;* but when you speak of the position of lines, call them *slanting* or *oblique* lines.

Now you may hold your right arm in a horizontal position; now in a slanting position; now in an oblique position; now in a vertical position; now in a horizontal position; in an oblique position. Let books and slates be held in these same positions.

In what position are you when standing erect? In what position are you when lying down? In what position do little boys often get when trying to learn to skate?

In what position are roofs of houses? Why are the roofs made in this position? In what positions are the tops of tables? In what position is the ceiling?—is the floor?—are the walls of the room?

THIRD STEP.—PARALLEL AND PERPENDICULAR LINES.

Parallel.—Let the teacher take two pointers, or two pen-holders, or two lead-pencils, and hold them before the children so that two ends shall be near each other and the two opposite ends wide apart, as in Fig. 1; then hold them so that the other ends shall be wide apart, as in Fig. 2; then hold them so that both ends shall be the same distance apart, as in Fig. 3, requesting the pupils to observe each position.

Now the teacher may draw lines on the blackboard to represent each of these positions, thus:

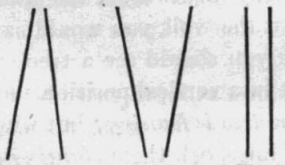


Fig. 1. Fig. 2. Fig. 3.

Then pointing to the lines as in Fig. 1, the teacher asks, Are these lines the same distance apart at each end? Pointing to the lines as in Fig. 2, the same question is again put. Then pointing to the lines as in Fig. 3, the teacher asks, Are these lines the same distance apart at both ends?

Now look at the cracks in the floor, and tell me whether two of those are the same distance apart. "They are."

Then drawing lines on the blackboard in a horizontal position, thus:

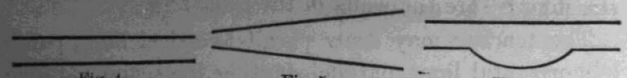


Fig. 4. Fig. 5. Fig. 6.

the teacher points to lines as represented by Fig. 4, and asks, Are these lines the same distance apart? Then at the other lines as represented by Figs. 5 and 6, and asks the same question.

Now the teacher may say, When two lines are side by side, and the same distance apart, like these (pointing to those represented by Figs. 3 and 4), they are called *parallel lines.* The word *parallel* means *by the side of each other.*

Now look at these lines again, and see if each two of them are by the side of each other. You may tell me how the parallel lines differ from the other lines. "They are the same distance apart, and the others are not."

Pointing at lines as represented by Fig. 6, the teacher says, These lines are the same distance apart at both ends; are they parallel?

"No; they are not the same distance apart in the middle." Very good; I will now tell you when lines are parallel.

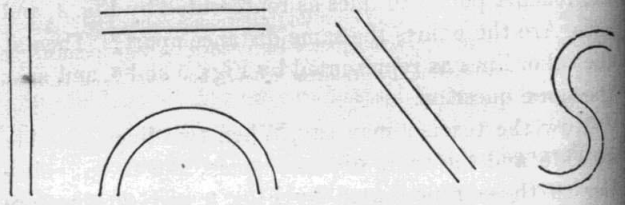
When lines are *side by side, and equally distant in all parts, they are parallel.*

Again pointing at lines as in Figs. 3 and 4, the teacher asks, Why do you say these lines are parallel?

"Because *they are side by side, and equally distant in all parts.*"

Do parallel lines have the same direction? What can you see in this room that you may say are parallel? Did you ever see any thing in a parallel position in the street? "The car tracks."

The teacher may draw parallel-vertical lines, parallel-horizontal lines, parallel-slanting lines, and parallel-curved lines on the blackboard, thus:



What can you tell me about the *shape* of these lines? "Some are straight, and some are curved."

What can you say of their *position?* "Some are vertical, some are horizontal, some are oblique, and all are parallel."

Are the curved lines parallel? "Yes."

Why do you say these curved lines are parallel? "Because they are side by side, and equally distant in all parts." Very well.

Now could you show me parallel lines in a writing-book? "Yes; the ruled lines are parallel."

What lines are parallel on the slate-frame? "The two sides and the two ends." What lines are parallel in the door?

You may draw parallel lines on your slates.

How can you ascertain whether two lines are parallel or not? "By measuring the distance between them."

SUGGESTIONS FOR TEACHERS.

It is of great importance that the two conditions in parallel lines—*side by side*, and *equally distant in all parts*—be fully illustrated, and the pupils led to perceive these points. It is a common error for teachers to require their pupils to repeat the definitions found in text-books on Geometry somewhat as follows: "Parallel lines never meet, how far soever they may be produced." By this means they fail to notice the two indispensable conditions mentioned above, and fail also to determine by observation what lines are parallel.

These facts, that parallel lines lie in the same plane, and "can not intersect each other, how far soever both ends may be extended," belong to the instruction for grammar schools, and should not be introduced into the primary school.

Perpendicular.—Sometimes another name is given to the *vertical line.* When I hold this pointer in a vertical position, with one end resting on the table, we may say, "The pointer is in a *perpendicular* position." Now, if I draw a horizontal line on the blackboard, thus, ————, and then draw a vertical line so as to meet the horizontal one (see Fig. 7), the vertical line may be called a *perpendicular line.*

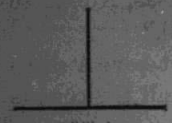


Fig. 7.

In what position is the floor? "Horizontal." In what position are the walls? "Vertical."

What other name may you give for the position of the walls? "Perpendicular."

The walls are perpendicular to the floor.

LESSONS TO DEVELOP IDEAS OF
CORNERS AND ANGLES.

First Step.—Corners.—The teacher may take a book, and square and oblong forms, and, showing them to the children, ask, How many corners has this book? "Four corners."

How many corners has this piece of wood? "Four." How many corners has this? "Four."

How many corners has the slate? "Four." How many corners has the table? "Four."

Showing forms with three and five corners, the teacher proceeds to ask, How many corners has this? "Three." How many has this? "Five." And this? "Three."

Now I wish you to look at this form with three corners, and tell me whether these are like the corners of the book? "They are not; these corners are smaller."

Taking the trapezium, the teacher asks, Are these corners all alike? "No; some are small."

You may call these small corners that have a sharp point *sharp corners*. What may you call the corners that have a sharp point?

"Sharp corners."

Now I will fold this piece of paper so that one corner will be like a sharp point. What may you call this corner? "A sharp corner."

Has the table sharp corners? "No; they are round." What shape are the corners of this slate? "Round corners."

Taking the trapezium, and showing the blunt end, the teacher may inquire, Has this corner a sharp point? "No."

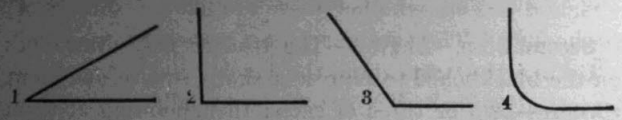
Can you think of a good name for it? "Large corner;" "Dull corner;" "Blunt corner."

Very well; you may call this corner with a wide point a *blunt corner*. What may we call a corner with a blunt point? "A blunt corner."

Here is a form with four corners alike: you call it a—"Square." Right. Then you may call all corners that are like the corners of a square, *square corners*. What may we call these corners, like those of a square? "Square corners."

What kind of corners has the book? "Square corners." What shape are the corners of this sheet of paper? "Square."

Now I will draw lines on the blackboard to represent these corners, and you may tell me the names of each as I make it.



What did you call the first corner? "Sharp." And the second? "Square." What did you call the third? "Blunt." And what the fourth? "Round corner."

Which is the smallest corner? "The sharp one." Which corner is like those of the table? "The round corner."

What figure did I place by the square corner? "Figure 2."

What figure stands by the blunt corner? "Figure 3."

What is the name of the corner by figure 1? "Sharp corner."

What is the shape of the corners of the blackboard? "Square." What kind of corners has the door? What is the shape of the corners of the panes of glass?

Drawing Corners.—You may now take your slates and draw lines to represent these corners. First draw two sharp corners. Next draw two square corners. Now draw three blunt corners. Next draw one sharp corner.

Now write a figure 1 at each sharp corner; a figure 2 at each square corner; and figure 3 at each blunt corner.

How many sharp corners have you drawn? "Three." How many square corners? "Two." How many blunt corners? "Three."

You may now turn your slates, and let me look at the corners. I wish to see who has drawn them neatly.

Second Step.—Angles.—The teacher may draw lines on the blackboard to represent sharp, square, and blunt corners—two or three of each; then, pointing at them separately, request the pupils to tell what kind of corner each represents.

I will now take this knife and open one blade a little way, so that the opening between the handle and the blade shall represent one of these sharp corners. Now I will open it further, and you may tell me which corner the opening between the handle and the blade is like. "The square corner."

Opening it still further, which is it like now? "The blunt corner."

Now which corner is it like? "The square corner."

Now which is it like? "The sharp corner."

Now look at the edge of this blade; now at the edge of the knife-handle. You see that these meet so that the opening between them forms a point at one end. Sometimes it is a small point, like the sharp corner; sometimes it is larger, like the square corner; and sometimes it is a blunt point, like the blunt corner.

Now I am going to give you a new name for these points, or the openings between the two lines that form a point. We will call them *angles* instead of corners. You may still say that the book has square corners, and the table round corners, and the door square corners, and that some things have sharp corners, but we will call the corners made by two lines *angles*. What shall we call the corners made by two lines?

"Angles."

Acute Angle.—We have names for the different kinds of corners, and we need names for the large and small angles. We will call the small angle, that is like the sharp corner, an *acute angle*, because the word *acute* means sharp.

Now you may tell me the name of the angle as I point to the lines on the blackboard. "Acute angle; acute angle; acute angle."

How many acute angles do you see on the blackboard? "Three."

Now you may make an acute angle with your two fore-fingers.

You may point to acute angles on the "Chart of Lines;" also on the blackboard.

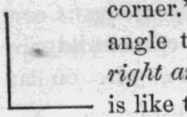
Right Angle.—I will now draw a horizontal line on the blackboard, and then a perpendicular line above it, so that it shall stand on the middle of the horizontal line. How many angles have I made with these two lines? "Two angles."

Are these acute angles? "No; they are both larger than acute angles."

Which of these two angles is larger? "Neither; both are of the same size."

Then you may call them *equal angles*. What may we call two angles of the same size? "Equal angles."

What corner are these angles like? "The square corner."—I will now give you a name for the angle that is like the square corner; it is a *right angle*. What may we call the angle that is like the square corner? "Right angle."



How did I make these equal angles? "By drawing a horizontal line, and a perpendicular line to meet it."

Very good; when two lines are drawn so as to form two equal angles, these angles are called *right angles*. Now make a right angle with your two fore-fingers.

I will now point to the angles on the blackboard, and you may tell their names. "Right angle; acute angle; acute angle; right angle; right angle; blunt angle."

No, we do not say blunt angle; we speak of blunt corners. But I will soon tell you a name for the angle that is like the blunt corner.

Obtuse Angle.—You remember that we have a word which means the same as sharp; what is that word? "Acute." Yes; and so we have another word which means the same as blunt; it is *obtuse*. Then we

may call the angle that is like a blunt corner an *obtuse angle*. What word means blunt? "Obtuse."

What, then, may we call the angle which is like the blunt corner? "Obtuse angle."

Now, how many kinds of angles have you learned? "Three."

What are their names? "Acute angle, right angle, obtuse angle."

Which angle is like the blunt corner? "The obtuse angle?"

Which is like the sharp corner? "The acute angle."

Which is like the square corner? "The right angle."

Now you may point to right angles on the "Chart of Lines," also on the blackboard. Another child may point to obtuse angles on the "Chart," also on the blackboard.

All of the children may now make an obtuse angle with the fore-fingers. Now make right angles. Now acute angles.

Drawing Angles.—The pupils may now take their slates and pencils, and (as the teacher dictates) draw angles.

Ready! Draw an acute angle. Draw another acute angle. Draw a right angle. Draw another right angle. Draw an obtuse angle; now another. Draw an acute angle. Draw an obtuse angle.

How many acute angles have you made? "Three."

How many right angles have you drawn? "Two."

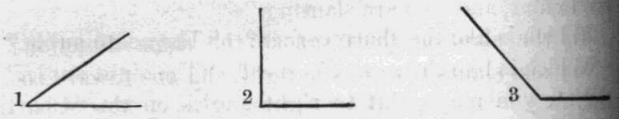
How many obtuse angles did you make? "Three."

Now turn your slates, that I may see how well you have drawn these angles.

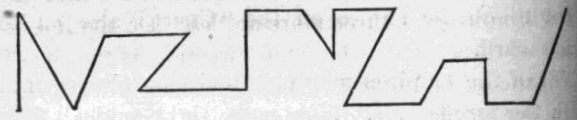
SUGGESTIONS FOR THE TEACHER.

In place of the knife, a pair of scissors might be used to illustrate the openings of different sizes, to prepare the children for the term *angle*. The gonigraph will also be found convenient for illustrating the lessons on angles.

When the names of the different kinds of angles have been taught, it might be well to draw the angles on the blackboard, numbering each thus:



Then draw several angles, joined together, similar to the following:



Now request the pupils to go singly and write a figure, representing one of the three kinds of angles, opposite an angle of the same kind in the group of angles. Then they may be required to tell how many angles there are of each kind in the group.

In small schools, where there are children in several grades of studies, as in the ungraded schools in the country, it would be well for the teacher to provide several small sticks, and give two to each of the younger pupils, after they have taken these lessons on angles, and request them to make angles with them. This might prove to be the most interesting part of the lesson, and be the means of saving the instruction that had just been given. Besides, teachers often find difficulty in keeping the younger pupils profitably occupied. This plan might furnish a profitable and interesting employment for a portion of the time usually wasted in playing or idleness, much to the annoyance of the teacher.

Care should be taken to make the children understand that the *size of the angle* does *not* depend upon the length of the lines, but upon the *difference in their direction.*

Third Step.—Angles.—Those who wish to teach their pupils that "an angle is the difference in the direction of two lines that meet in a point," may give exercises in this step.

The teacher draws three angles on the blackboard—acute, right, and obtuse—with one line in each in a horizontal position; then asks, How many of these lines are in a horizontal position? "Three."

In what position are the other lines? "One is perpendicular, and two are slanting."

Do the slanting lines run in the same direction? "No; one slants toward the right, and one toward the left."

What is the shape of these lines? "All are straight."

I will now draw three more angles. Do the lines of either of these run in the same direction as the lines in one of the other angles? "Yes; the lines in each right angle run in the same direction."

Look at the lines in the acute angles. "They run in the same direction also."

How is it with the lines of the obtuse angles? "The lines of each of these are alike."

What do you observe about the size of the two acute angles? "They are both of the same size." How about the obtuse angles? "They are alike in size."

Now, when angles are of the same size, their lines run in the same direction. Do the lines of angles that differ in size run in the same direction? "No."

Does the size of an angle depend upon the difference in the direction of its lines? "It does."

Is the difference in the direction of the lines of a right angle greater than the difference in the direction of the lines in an acute angle? "It is."

In which angle is the difference in the direction of the lines greatest? "In the obtuse angle."

Then we might say "an angle is the difference in the direction of two straight lines that meet in a point."

How many right angles may be drawn upon one horizontal line?

How many obtuse angles can be drawn upon one horizontal line?

Can more than two acute angles be made upon one horizontal line?

How many right angles can you make with two lines?

How many obtuse angles can you make with two lines?

How many acute angles can you make with two lines?

LESSONS TO DEVELOP IDEAS OF PLANE FORMS.

First Step.—Plane Forms.—Having provided pieces of paper, pasteboard, and cards of various sizes and shapes, as triangles, squares, oblongs, rhombs, circles, pentagons, half a sheet of paper (each form to be represented by *three* or more pieces, and *two* or more sizes, including those from the Box of Forms), the teacher may place all of these forms on a table before the children, and, showing two or three at a time, lead the pupils to observe which shapes resemble each other, to count the corners, and edges, and compare the size.

When the children are able readily to distinguish the differences in these forms by the number of corners and the number of edges, they may be required to classify them in groups with *three corners* and three edges; and *four corners* and four edges; and *five corners* and five edges; *six corners* and six edges; and groups *without corners*, as circles.

In a small class it would be best to allow the pupils to come to the table, one at a time, and make a selection, each of two shapes, and place them with their appropriate groups. But in large classes the teacher may hold the form before the class, and require the pupils *to tell* the number of corners and edges, and in which group to place it.

The teacher may now place the "Chart of Forms" before the class, and call upon pupils to point to the forms with three corners; then those with four corners; then

those without corners; then those with three edges; then with four edges.

Afterward the teacher may draw these forms on the blackboard, and call pupils to point them out, as before.

Subsequently the children may draw these forms on their slates.

Second Step.—Plane Forms.—Taking several squares and oblongs from the "Box of Forms for Object Teaching," or pieces of pasteboard representing these forms, the teacher may tell the pupils that the edges of these forms have another name; they are called *sides;* and when speaking of these edges we will call them *sides.*

Holding up the square, the teacher asks, How many corners has this? "Four."

How many sides has it? "Four."

Holding up the oblong, she asks, How many corners has this? "Four."

How many sides has it? "Four."

How many corners has this form? [Circle.]

"No corners."

Now I will point to these forms on the "Chart of Forms." How many sides has this figure? "Four."

How many has this? "Four."

How many has this? "Three."

How many corners has it? "Three."

How many corners has this form? "Four."

Square.—Taking a square from the Box of Forms,

the teacher asks, How many *sides* has this form? "Four."

Look at the sides, and then tell me which side is longest? "They are all alike."

Very good; the sides are equal. Now look at this. How many sides has it? "Four."

Are these sides equal? "No; two are longer than the other two."

Taking up two squares, the teacher asks, Are the sides of both of these alike? "They are."

What kind of corners has this figure? "Square corners."

How many square corners? "Four."

Now I will give you a name for this figure with four square corners and four equal sides; it is a *square.* What do we call a figure with four square corners and four equal sides? "A square."

You may point to a square on the Chart of Forms. You may point to a square on the blackboard.

What is the shape of this piece of wood? "Square."

What is the shape of this piece of paper? "Square."

What is the shape of this soda-cracker? "Square."

Why do you call it a square? "Because it has four square corners and four equal sides."

Oblong.—Holding up an oblong, the teacher asks,

How many corners has this figure? "Four."

How many sides has it? "Four."

Are these sides all equal? "No; two are longer than the other two."

This form has four square corners, and two equal long sides, and two equal short sides; we will call it an *oblong.* What shall we call this shape? "An oblong."

When shall we call a figure an oblong? "When it has four square corners, and two equal long sides, and two equal short sides."

You may point to oblongs on the Chart of Forms.

You may point to oblongs on the blackboard.

What is the shape of this book? "Oblong."

Why do you say the book is oblong? "Because it has four square corners, and two equal long sides, and two equal short sides."

Third Step.—Plane Forms.—I have several pieces of paper, and cards of the shape of squares, oblongs, and other forms, on this table. Some of the squares and oblongs are large, and some of the squares and oblongs are small. Here are also long and short strings. This is a long piece of paper, and it is narrow. Here is a long piece, but it is wider than the other. Do we say a string is long and wide?

We measure strings by *length* only. But when we wish to ascertain the size of squares, oblongs, and similar forms, we measure their *length* and their *width*. These measures are called *dimensions*.

Plane Forms.—Those flat objects which we measure in two directions, as squares, oblongs, and triangles, are called *plane forms*. *Plane* means *flat*, or even. Then plane forms are flat forms.

We find the size of these by measuring *two dimensions*—length and width.

How many measures would you make to find the size of a slate?

How many to find the length of a string?

How many to find the size of the top of this table?

How many dimensions have plane forms? How many dimensions has a line?

LESSONS TO DEVELOP IDEAS OF TRIANGLES.

SUGGESTIONS FOR THE TEACHER.

The lessons on triangles should not be introduced before the pupils have been made familiar with plane forms, and are able to distinguish them readily by the number of *corners* and *sides;* nor until they have learned the names of the *square* and *oblong;* also of the different *angles*, as right, obtuse, acute.

The first lessons on triangles should treat of them as a class of three-cornered figures, without giving attention to the kinds of triangles. Several lessons may be given on this class of forms before the second step is taken, and before attention is directed to the different shapes and names of the kinds of triangles.

The third step on triangles might be omitted in the Primary School; at least it should not be undertaken until the pupils have become familiar with all the other lessons on Form. These uncommon names of the triangles are more appropriate for older pupils in the more advanced schools.

First Step.—Triangles.—What name do we give to corners? "Angles."

Holding up a triangle, the teacher asks, How many angles has this figure? "Three."

How many sides has it? "Three."

I will give you a name for these forms with three sides and three angles; they are called *tri-angles*. *Tri* means *three*, and the word *tri-angles* means *three angles*. Then a figure with three angles may be called a *tri-angle*. What is the name of this figure with three sides and three corners? "A tri-angle."

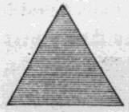
You may point to triangles on the Chart of Forms. Now you may point to triangles on the blackboard.

How many lines does it take to make a triangle? "Three."

What does each line represent? "One side."

Why do you call this figure a triangle? "Because it has three angles."

Second Step.—Equilateral Triangle.—What do you call this figure which I hold in my hand? "A triangle."



Look at the *sides* of this triangle; what can you say of them? "They are all equal."

Then it is an *equal-sided triangle.* What does equal-sided mean? "Having all sides equal."

Holding triangles of different shapes successively before the pupils, the teacher asks, Is this equal-sided? "Yes." Is this equal-sided? "No."

I will now give you another name for this shape, which means *equal-sided;* the name is *equi-lateral. Equi* means equal, and *lateral* means side; hence we may say *equi-lateral* when we mean *equal-sided.* This is a hard word, and if you can not think of it you may say *equal-sided.*

Now you may point to equilateral triangles on the chart; also on the blackboard.

Why do we call these equilateral triangles? "Because the sides are all equal."

You may now draw equilateral triangles on your slates.

How many acute angles has the equilateral triangle?

Right-angled Triangle.—Here is another triangle; are its sides equal? "No."

How many acute angles has it? "Two."

What do you call the other angle? "A right angle."

This is a triangle with one right angle; so we will call it a *right-angled triangle.*

What may we call triangles with one right angle? "Right-angled triangles."

You may show me right-angled triangles on the Chart of Lines; also on the blackboard. How many lines will it take for each triangle?

Third Step.—Isosceles Triangle.—Here is another triangle. Is it like either of the other two triangles? What kind of angles has this? "Acute angles."

What can you say of its sides? "It has two equal long sides, and one short side."

This triangle has a hard name, and you may not be able to remember it. I will write the name on the blackboard, and you may see how strange it looks—*Isosceles.* It is pronounced Ī-sŏs-se-lēz.

You may point to isosceles triangles on the Chart of Forms and on the blackboard. You may also draw this angle on your slates.

You need not try very hard to remember the name of this triangle. It will not matter if you wait until you are old enough to study Geometry in the Grammar or High School before you learn the name isosceles.

Obtuse-angled Triangle.—Here is a triangle with two acute angles and one obtuse angle; two of its sides are equal. This is called an *obtuse-angled triangle.*

Scalene Triangle.—Here is another triangle with two acute angles and one obtuse angle; but it has no two angles, nor any two sides equal. The other triangle, with *one obtuse angle*, as you may see, has *two equal sides*, while this one has *all its sides unequal*, and *all its angles unequal.*

Here is another triangle that has three unequal acute angles and three unequal sides. Both of these angles may be called *scalene triangles.* The word *scalene* means crooked or unequal. These triangles have unequal sides.

When may we call a triangle an *equilateral triangle?*

When may we call a triangle a *right-angled triangle?*

When may we call a triangle an *isosceles triangle?*

When may we call a triangle an *obtuse-angled triangle?*

When may we call a triangle a *scalene triangle?*

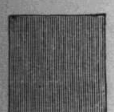
How many kinds of triangles can you draw on your slates?

LESSONS TO DEVELOP IDEAS OF FOUR-SIDED FORMS.

FIRST STEP.—SQUARE, OBLONG, RHOMB.

Square and Oblong.—I have here several forms with four sides. You have already learned the names of some of them, and, as I hold one of these up, you may speak its name; but when I hold up one that you do not know, you need not say any thing.

What is the name of this shape? "Square." Of this? "Square." Of this? "Oblong." Of this? "Square." Of this? ——— Of this? "Oblong." Of this? "Oblong." And of this? ———.



How many corners has this square? "Four."

What other name can you use for corners? "Angles."

Then how many angles has this square? "Four angles."

What kind of angles has the square? "Right angles."

How many right angles has it? "Four right angles."

How many angles has the oblong? "Four angles."

How many right angles has it? "Four right angles."

You told me that the square has four right angles also; now what is the difference between the square and the oblong? "The square has four equal sides,

and the oblong has two equal long sides and two equal short sides."

Very well. You see that *a square has four equal sides and four right angles;* and that *an oblong has two equal long sides, and two equal short sides, and four right angles.*

I will write these descriptions of a square and an oblong on the blackboard, and you may read them.

I will now take one of these forms in my hand, without allowing you to see it, and describe it, and then you may tell the name of it.

I hold in my hand a form with four equal sides and four right angles; what is it? "A square."

I now hold in my hand a form with four right angles and four equal sides; what is it? "A square."

I hold in my hand a form with four right angles, and two equal long sides and two equal short sides; what is it? "An oblong."

I hold in my hand a form with four right angles, and two short sides, and two more sides of the same length; what is it? "A square."

You may now tell me the names of things that you have seen of the shape of the square, and I will write them on the blackboard.

Things that are square:

Soda-crackers.
Stove door.
End of a box.
Some books.
A piece of paper.
Some windows.

Now I will write the names of things which you have seen that are oblong in shape.

Things that are oblong:

Slates.	Side of the stove.
Books.	Top of the table.
Doors.	Blackboard.
Glass.	Side of the room.

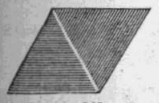
Why do you say these objects are oblong? "Because they have four right angles, and two equal long sides and two equal short sides."

Why do you say the soda-cracker is square? "Because it has four equal sides and four right angles."

FOR THE TEACHER.

This first step may be taken in one, two, or three exercises, as the age of the children and their progress seem to indicate best.

Rhomb.—I have here several forms which I wish you to observe, and tell me how they resemble each other. Holding up a square and a rhomb, the teacher asks, Are these forms alike? How many sides has this? "Four."



How many sides has this? "Four."

Then both have the same *number* of sides. Are all the sides of the square of the same length? "They are."

Are all the sides of this form of the same length? I will measure them with the side of the square. What do you now observe? "The sides are all equal."

Are they of the same sizes as those of the square? "They are."

Then both of these forms have the same number of sides, and all the sides are of the same length. Now why do you say these two forms are not alike? "Because their angles are not alike."

Very good. What kind of angles has the square? "Right angles."

What kind of angles has this form? "Two acute angles and two obtuse angles."

I will now give you a name for this figure with four equal sides, and two acute angles and two obtuse angles; it is a *rhomb*. I will write the name on the blackboard, and you may spell it.

As I hold up these forms, you may tell their names. "Square; rhomb; oblong; rhomb; oblong; square."

You may now point to a square on the Chart of Forms. The next boy may point to an oblong; the next to a rhomb.

Now you may tell me what you have seen of the shape of this rhomb, and I will write the name on the blackboard.

Things of rhomb shape:

Some cakes.
Some candies.
A piece of paper.
A lozenge.
Some panes of glass.

You may now draw rhombs, and squares, and oblongs on your slates. How many lines does it take to represent a rhomb? How many lines does it take for each of these forms?

SECOND STEP.—RHOMBOID.

The teacher may prepare several pieces of paper, pasteboard, etc., in the shape of rhombs and of rhomboids, and, holding one of each before the pupils, ask, Are the corners of these forms alike?

How many acute angles has each?

How many obtuse angles has each?

Are the sides alike? "No; one has two long sides and two short sides."

Rhomboid.—This form is *somewhat like* a rhomb, so

it is called a *rhomboid: oid* means *somewhat like*. You see that this differs from a rhomb only in the length of two of its sides.

Point to a rhomboid on the Chart of Forms.

You may describe a rhomboid. "A rhomboid has two equal long sides, two equal short sides, two acute angles, and two obtuse angles."

THIRD STEP.—TRAPEZIUM, TRAPEZOID.

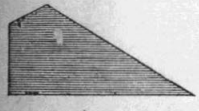
I have here forms of two shapes. You may tell me how many angles each has? "Four angles."

How many sides has each? "Four."

What kind of angles has this form? [Showing the trapezium.] "It has one acute angle, two obtuse angles, and one right angle."

Are two of its sides parallel? "No."

Trapezium.—Any form that has four sides and four



angles, and that has no two sides parallel, is called a *trapezium*. What may you call this figure? "A trapezium."

You may point to a trapezium on the Chart of Forms.

When do we call a four-sided figure a trapezium? "When no two of its sides are parallel."

Trapezoid.—Here is another four-sided form; what can you say of its sides? "Two of its sides are parallel."

A figure that has four sides, with only two of them parallel, is called a *trapezoid.* A trapezoid is somewhat like a trapezium.

How many parallel sides has a trapezoid?

How many parallel sides has a trapezium?

Quadrilateral.—All four-sided figures may be called *quadrilateral* forms. This word means *four-sided.*

Parallelogram.—A four-sided figure with *its opposite sides parallel* may be called a parallelogram. Then squares, oblongs, rhombs, and rhomboids may be called parallelograms.

SUGGESTIONS FOR THE TEACHER.

The *third step* in four-sided figures may be postponed until the *third steps* in the other divisions of *Form* have been taken, except the *third* of *Triangles.*

Or it may be omitted altogether in the Primary School. Whether it would be better to teach it, or to omit it, must depend upon the progress of the pupils and their ages.

LESSONS TO DEVELOP IDEAS OF MANY-SIDED FORMS.

FIRST STEP.—PENTAGON, HEXAGON.

HAVING provided pentagons and hexagons from the Box of Forms, also several pieces of pasteboard and paper of the same shape, the teacher may request the pupils to count the corners and sides as each is held up; and those with five sides may be placed in one group, and those with six sides in another group.

Pentagon.—How many angles has this form? "Five angles."

How many sides has it? "Five sides."

A flat figure with *five angles* and five sides is called a *pentagon. Penta* means five, and *gon* means angle; therefore the word *penta-gon* means *having five angles.* A plane form with five angles is called a *pentagon.*

How many sides has a pentagon? How many angles has it? What do you call a plane figure with five angles? A form with *five equal sides* is a *regular* pentagon.

Hexagon.—How many sides has this form? "Six."

How many angles has it? "Six."

The name of this form is *hexagon.* How many angles has it? "Six."

What part of the word means angle? "The last part —*gon.*"

Then what do you think *hexa* may mean? "Six."

Very well. So the word *hexagon* means *having six angles*. Then this is a good name for this form.

How many sides has a hexagon? How many angles has it? What do we call a plane figure with six angles?

SECOND STEP.—HEPTAGON, OCTAGON, NONAGON, DECAGON.

Heptagon.—We have already learned what figures with five angles and those with six angles are called. Now I hold another form in my hand; you may count the number of angles on this. "One, two, three, four, five, six, seven."

This is a figure with *seven* angles; its name is *heptagon*. Now you may tell me what part of this word means seven. I will write it on the blackboard. "Hepta." Very good.

Octagon.—Here is another figure. Count its angles. "One, two, three, four, five, six, seven, eight."

Then this form has *eight* angles. Its name is *octagon*. Now can you tell me what *octa* means? "Eight."

Then an octagon is a plane figure with eight angles. What does *gon* mean?

Nonagon.—You may count the angles in this figure. "One, two, three, four, five, six, seven, eight, nine."

It has nine angles, and it is called a *nonagon*. What does *nona* mean? "Nine."

Then *nonagon* is a plane figure having *nine angles*. A form with nine equal sides is a *regular nonagon*.

Decagon.—You may count the angles on this form. "One, two, three, four, five, six, seven, eight, nine, ten."

It has ten angles; and its name is *decagon*. Then *deca* means *ten*. Decagon is a plane figure having ten angles.

You may now point to each of these shapes on the Chart of Forms and on the blackboard as I name them. Decagon, pentagon, octagon, hexagon, nonagon, etc.

Polygons.—The teacher may show a piece of paper cut with many angles, and ask the children, Has this a few or many angles? Has it a few or many sides? This is a figure of *many angles*, so it may be called a *polygon: poly* means many.

Sometimes all of these forms that have more than four angles are called *polygons*. When all the sides of a polygon are equal, it is called a *regular polygon*.

Suggestions for the Teacher.—These lessons on the many-sided forms should not be taken up until the *third steps* of the preceding divisions of form, except those of triangles and four-sided figures, have been mastered, and not until the *first* and *second* steps of most of the succeeding divisions of form have been learned.

The most important *form* of the polygons is the *hexagon*. Besides being the shape commonly adopted for large nuts and bolt-heads, it is the shape of the cells in honeycomb. It is a wonderful fact that this from gives the largest space and greatest strength with the least amount of wax in the construction. No better shape could be devised for these cells than that which God taught the bee to use. Illustrate the perfect manner in which hexagons will fit together by using the ten small *hexagons* from the Box of Forms.

LESSONS TO DEVELOP IDEAS OF
CIRCULAR FORMS.

FIRST STEP.—CIRCLE, SEMICIRCLE, RING.

THE teacher may provide for this lesson several coins, flat buttons, circles and semicircles from the Box of Forms, circles and semicircles cut from pasteboard or paper, also a triangle, a square, and an oblong. Showing the square, she may ask, How many corners has this form? How many has this? "Three."

How many has this? "It has no corners."

Taking up the square, the teacher asks, What kind of lines are represented by the edges of this form? "Straight lines."

"How many straight lines are represented by this (triangle) form? "Three."

How many by the square? "Four straight lines."

How many straight lines has the oblong? "Four."

Circle.—How many lines are represented by the edge of this form? "Only one."

What is the shape of this edge? "Curved."

We sometimes say the line that forms the edge of a shape *bounds* that form; that is, it shows how far the figure extends. The walls of this room show how far the room extends, and they *bound* the room.

How many lines bound this triangle? "Three."

How many bound this square? "Four lines."

What is the shape of the lines that bound the triangle, square, and oblong? "They are all straight lines."

What is the shape of the line that *bounds* this figure? "Curved."

How many lines bound this figure? "Only one."

You may call this figure a *circle.* What is the name of this shape? "Circle."

Showing the various objects of a circular form, the teacher asks, What is the shape of this? "Circle." Of this? ——— Of this? "Circle."

What is the shape of this two-cent piece? "Like a circle."

What is the shape of the lid on the stove? "A circle."

A circle has one evenly curved edge.

Circular.—Sometimes you see an object that is almost round like this circle, but not so perfect in shape; then you may call its shape *circular.* You may also use this word when asked the shape of these objects, as, what is the shape of this five-cent piece? *Circular* would be a correct answer.

You may point to a circle on the Chart of Forms.

I will now take a string, and show you how to draw a circle on the blackboard.

You see that I place my finger on the string and hold it firmly against the board, and I hold the opposite end of the string and a piece of chalk with the fingers of the other hand, and then move them around on the board, thus, making a curved line with both ends meeting.

I will now make a mark to show the place where I held the string on the board with my finger.

Centre.—This dot is in the middle of the circle. This place is called the *centre.* If I should measure the distance from the centre to this boundary line, it would be exactly the same in every direction.

Suppose a boy should tie a string to a post so loosely that it would slip around it, and, taking hold of the other end, should walk around the post as far from it as the string would reach, what would be the shape of his path? "Circular."

In a small class, two boys might be called to form a circle on the floor, one being required to place himself at the centre and hold a string, while the other pupil holds the other end to a piece of chalk, and marks the floor as he passes around the centre.

You may now take these strings and draw circles on your slates, and make a dot in each to show the centre.

These practical illustrations greatly interest children, and fix the subjects in their minds; they should always, as much as is compatible with order, *be actors in their lessons.*

You may now tell me the names of objects that you have seen with a circular shape.

Semicircle.—I will now take one of the circles made of paper, and cut it through the middle, so as to make two equal parts. What would you call one of these parts? "Half a circle."

Very good. I will give you another name which means *half a circle;* it is *semicircle. Semi* means half, so that *semicircle* means— "Half a circle."

Here is a half circle among these forms; what do we call it? "A semicircle."

Now point to a semicircle on the Chart of Forms.

Did you ever see any thing of this shape in the sky? "Yes; the moon."

If you had a circular pie, how could you make a semicircle of it? "Cut it into two equal parts."

What part of the pie would one piece be? "One half."

Ring.—Here is a circle with its centre cut out; what would you call it? "A ring."

What kind of a line bounds the outside of the ring? "A curved line."

What kind of a line bounds the inside of the ring? "A curved line."

Then how many curved lines has a ring? "Two."

Look at this ring, and tell me whether these curved lines are both of the same length. "No; one is shorter than the other."

Where are these lines? "One is outside of the other."

What have you seen of this shape? "Finger-rings, rings on chains, hoops, etc."

SECOND STEP.—CRESCENT, ELLIPSE, OVAL.

For this step the teacher should provide from the Box of Forms the crescent, oval, ellipse, and circle and semicircles, also the same shapes cut from paper.

Crescent.—What is this figure called? "A circle."

And this? "A semicircle."

Now look at this figure, and tell me how it differs

from the semicircle. "It has two curved edges, and the semicircle has one straight edge."

You may call this form a *crescent*. I will write it on the blackboard, that you may see how the word looks. What is this word? "Crescent."

What have you seen of this shape? "The new moon; the front of a boy's cap; a rocker of a cradle; a piece of an apple."

Ellipse.—Is this figure a circle? "No; it is longer one way than the other."

Has it any corners? "No."

Has it ends? "Yes; it has two ends."

We call a form of this shape an *ellipse*. You may spell the word as I write it on the blackboard. What is the name of this form? "Ellipse."

Did you ever see any thing of this shape? "Yes; picture-frames."

There is another word which we may use for this shape; it is *elliptical*. This word means *having the form of an ellipse*. Sometimes this shape is called *oval*.

You may point to this form on the Chart.

Oval.—Here is another figure that is bounded by one curved line; is this a circle? "No; it is longer one way than it is the other."

What did we call the other form which was longer than it was wide? "An ellipse."

This is another ellipse, but it usually has a different name.

Did you ever see any thing that resembles this shape? "An egg."

Very good; its side resembles an egg in shape. An egg was called *ovum* by the Latin people. We call this shape *oval* because its side resembles the egg-shape. *Oval* is the name of a plane figure.

What have you seen of this shape? "Leaves of trees."

I hold in my hand a plane figure having one evenly curved line for its edge; what is it? "A circle."

I hold a plane figure having one curved edge and one straight edge; what is it? "A semicircle."

I hold a plane figure with a curved edge, with two equal ends; what is it? "An ellipse." "An oval."

I hold a plane figure with a curved edge, with one large end and one small end; what is it? "An oval."

THIRD STEP.—CIRCUMFERENCE, ARC, DIAMETER.

For the exercises of this step the teacher should have before her rings, circles, cylinders, spheres, and other objects of similar shape.

Circumference.—Here I have forms and objects that are *round like a ring, round like a circle, round like a cylinder, and round like a ball.* Now I will take this string and measure the distance around them. We call *the distance around an object its circumference.* Then what am I going to measure? "The circumference."

What is the curved line that bounds the circle called? "Its circumference."

Point to the circumference of the circles on the Chart and on the blackboard. Where is the circumference of

this ring? of this apple? of this cup? of this hat? of this button? etc.

Arc.—I will draw a circle on the blackboard, and then rub out a part of its *circumference.* The part of the circumference that is left is called an *arc.* What is a part of the circumference of a circle called? "An arc."

Point to an arc on the Chart—on the blackboard.

I hold in my hand a paper ring; now, if I cut out a piece of this ring, we might call the piece of it an *arc,* because it would be a part of the circumference of the ring.

FOR THE TEACHER.

The words *circumference, arc,* and *diameter* should each be written on the blackboard and spelled by the pupils during the exercise for each of these terms.

Diameter.—I will draw a circle on the blackboard, and place a dot in the centre, and I will take this straight stick and place it across the circle so that I can just see the dot in the centre. Now I will draw a line across this circle directly through its centre, and make the ends of the line touch the circumference on opposite sides. If I measure this line, it will show me *the distance through the centre* of the circle; this is called the *diameter.* What is the distance through the centre of a circle called? "The diameter."

You may point to the diameter of a circle on the Chart; also on the blackboard. What does diameter mean? "The distance through the centre."

Where does the line representing the diameter begin? "It begins in the circumference."

Where does it end? "It ends in the circumference on the opposite side."

Through what does it pass? "Through the centre."

What is the distance *around* a circle called?

What is the distance around a ball called?

What would you call the distance around a stove-pipe?

What is the distance *through* the centre of a circle called?

What would you call the distance through the centre of an orange?

What is a part of the circumference called?

Which is longer, the circumference or the diameter of any thing?

FOURTH STEP.—RADIUS, QUADRANT, SECTOR.

I will draw some circles on the blackboard, and place a dot in the centre of each. Now I will draw a straight line from the centre of one of these circles to its circumference. This is called the *radius* of the circle.

Radius. I will now draw two lines across the other circle, through its centre, and at right angle with each other. Now each of these lines, from the centre to the circumference, also may be called a *radius* of this circle. A radius, then, is one half of the diameter of a circle.

Quadrant.—This second circle, you observe, is divided into four equal parts. What do we call one fourth part of an apple? "A quarter."

These parts of the circle are called *quadrants*. *Quadrant* means *a quarter*, or one fourth part of a circle. What part of a circle is a quadrant? "A fourth part."

If you had a piece of pie of the shape of a *quadrant*, what part of the whole pie would you have? "One quarter of it."

Sector.—I will now draw three straight lines through the diameter of the other circle. Is each part of the circle now as large as a quadrant? "No."

Each of these small pieces of the circle may be called a *sector*.

Which had you rather have, a piece of pie of the shape of a quadrant or of the shape of a *sector?*

SUGGESTIONS FOR THE TEACHER.

The fourth step of "Circular Forms" may be omitted in the Primary Schools whenever the pupils are not prepared by training in other steps to easily understand the terms used here.

All of these lessons on *circular forms*, and the various parts of circles, should be fully illustrated by objects, pieces of paper, drawings on the blackboard, etc.

LESSONS TO DEVELOP THE IDEA OF SURFACE AND FACES.

FIRST STEP.—PLANE AND CURVED SURFACES.

TAKING the chalk and writing on the blackboard, the teacher says, I am writing; can you tell me where I am writing? "On the blackboard."

Am I writing on the *inside* of the board? "No; on the outside."

On what part of your slates do you make figures? "On the sides."

What am I holding in my hand? "An apple."

What part of the apple do you see? "The skin."

On what part of the apple is the skin? "On the outside."

When you take hold of an orange, what part of it do you touch? "The skin—the outside."

Surface.—I will now give you another word which means outside; it is *surface*. The color of an apple is on its *surface*. I write on the surface of the blackboard; you walk on the surface of the floor. On what part of your slates do you make figures? "On the surface."

On what part of a pane of glass in the window does the fly crawl?

When boys skate, on what part of the ice are they?

When a board floats on the water, on what part of the water is it?

Plane Surface.—When a surface is flat, like your slate, the top of this table, or the floor, we call it a *plane surface.*

What kind of a surface has the blackboard? "A plane surface."

What kind of a surface has the wall of the room? "A plane surface."

Tell me other objects which have plane surfaces. "The book-covers; the ceiling; the glass; the floor."

Curved Surface.—Now look at the surface of this ball and the surface of this slate, and tell me what difference you see in the *shape* of these surfaces. "The slate has a *plane* surface, and the ball has a *curved* surface."

What do you call the surface of an apple? "A curved surface."

What would you call the surface around your hat? "A curved surface."

Now tell me the names of things that have curved surfaces. "Pails; cups; oranges; stove-pipes; barrels."

Can you mention some object that has two *plane faces* and one *curved face?* "A drum; a barrel."

What kind of surface has a brick? What kinds of surfaces has half of an apple?

SECOND STEP.—FACES OF SOLIDS.

You told me the other day that a brick has a *plane surface;* now, has the brick more than one outside? "No."

Well, suppose a brick lies on the ground; could we not speak of the upper surface of the brick and of the lower surface of the brick?

I will try to help you out of this difficulty. How many surfaces has the orange? "Only one."

How many has this ball? "Only one."

Here is a block with square sides; how many surfaces has it?

Well, you may count the sides. "One, two, three, four, five, six." Now the outside of this block is divided into six parts, and each part is called *a face.* All of the *faces* make its *surface.*

Now you may tell me into how many faces the surface of a brick is divided. "Into six faces."

And all of the faces together make up the *surface.* How many faces has a bar of soap? How many faces has a tea-box?

How many faces has a pencil? How many faces has a marble?

THIRD STEP.—SURFACES.

You have already learned the names of two kinds of surfaces; what are these called? "Plane surfaces and curved surfaces."

Look at the surface of the outside of the glass in my watch, and tell me its shape. "It is curved."

Now look at the inside surface of this glass, and tell me its shape. "It is curved, but not like the outside."

You perceive, then, that curved surfaces are not all curved the same way. Sometimes you may wish to tell how a surface is curved; and that you may be able to do this readily, I will give you names for both kinds of curved surfaces.

Convex Surface.—When any surface is curved like the outside of a ball, or like this glass, it is called a *convex surface.*

Concave Surface.—When any surface is curved like the inside of this watch-glass, or the inside of an orange-peel, it is called a *concave surface.*

What kind of a curved surface has a ball?

What kind of curved surface has the bottom of an iron kettle, inside?

What kind of surface has the inside of a soup-plate?

What kind of surface has the inside of the bowl of a spoon?

What kind of surface has the outside of the bowl of the spoon?

When a mirror makes your face appear very large, the surface of the mirror is concave.

When a mirror makes your face appear very small, the surface of the mirror is convex.

LESSONS TO DEVELOP IDEAS OF

SOLID FIGURES—SPHERE, HEMISPHERE, SPHEROID.

FIRST STEP.—BALL SHAPE.

For the exercise of this step the teacher may provide balls of wood, rubber, lead, marbles, and an orange.

Ball.—Here is a piece of wood; what is its shape? "Round."

You may say *round like a ball.* What is the shape of this rubber? "Round like a ball."

What is the shape of this piece of lead? "Round like a ball."

What is the shape of this cent? "Round like a circle."

You may tell me the names of objects that are *round like a ball.*

"Marbles; oranges; grapes; currants; shot."

SECOND STEP.—SPHERE, HEMISPHERE.

You say the shape of the orange is "*round like a ball.*"

Sphere. I will give you one word that means *round like a ball;* it is *sphere.* When I ask you to tell me the shape of an orange, you may answer, *a sphere.* What is the shape of this rubber ball? "A sphere."

What is the shape of a marble?

Spherical.—There is another word which is sometimes used in place of the word *sphere;* it is *spherical,* and means *having the shape of a sphere.* Therefore you might say the grape is *spherical;* the globe is *spherical.*

Now look at this sphere, and tell me how many surfaces it has. "Only one surface."

What is the shape of the surface? "It is a curved surface."

How is the surface curved? "Alike in all its parts."

Then *a sphere is a solid figure with one evenly curved surface.*

Hemisphere.—If I should cut a sphere into two equal parts, what might you call one of those parts? "Half of a sphere."

Very good. How many halves of a sphere can I make from one sphere? "Only two."

I will now give you a new name for *half of a sphere;* it is *hemisphere. Hemi* means half; then *hemisphere* means *half of a sphere,* or half of a ball. What is the shape of half an orange? "Hemisphere."

How many hemispheres could I make from one orange? How many *faces* has a hemisphere? "Two faces?"

What is the shape of the faces of a hemisphere? "One is flat, the other is curved."

Then *a hemisphere has one plane circular face and one curved face.*

How many hemispheres would it take to equal a sphere?

Solids.—To illustrate the idea of solids, the teacher should provide a variety of objects, as a cube, a prism, an oblong, a rhomboid, a square, large and small books, some of them thick and some thin; a sheet of paper, and a string.

Suppose I wanted a string long enough to reach across the room, should I measure the width of the string to find whether it would be long enough or not? "No; you should measure its *length.*"

Could I ascertain whether the string is as long as I want it by measuring *one dimension,* its length. "Yes."

Suppose I wish to find how large a piece of paper or cloth it will take to cover the top of this table, could I find the size by measuring the length of the table only? "No; you must measure its width also."

Each measure of an object is called a *dimension.* Then how many *dimensions* must I measure to find the size of the top of this table? "Two dimensions."

How many dimensions must I measure to find the size of your slate? "Two."

What do we call those forms that have two dimensions, like the oblong, slate, etc.? "Plane forms."

Here are large and small books. Some are long, and wide, and thin; some are short, and narrow, and thin; some books of the same length are thin, and others are thick. How can I find which books are largest? "By measuring them."

How many dimensions must I measure? "Three; the length, the width, and the thickness."

How can I find the size of a box? "By measuring its length, its width, and its thickness."

Holding a cube, How can I find the size of this? "By measuring three dimensions."

Any object that has *three dimensions* -- length, breadth, and thickness, is called a *solid.* Now what may we call a stick of wood? "A solid."

What may we call a brick? "A solid."

THIRD STEP.—SPHEROIDS AND OVOID.

Sometimes we find objects that are not quite like a sphere in shape; they are nearly round like a ball; these are called *spheroids.*

Spheroid.—A lemon, a peach, and a watermelon are *spheroids.*

What is the shape of a plum? "Spheroid." Of a grape? "Some grapes are spheres and some are spheroids."

Some *spheroids* are long, like the lemon; some are flattened, like the onion, or a white turnip. When a spheroid is long, it is called a *prolate spheroid.* When a *spheroid* is flattened, it is called an *oblate spheroid.*

Pro-late Spheroid.

Oblate Spheroid.

Ovoid.—What have you seen of the shape of this solid? "An egg."

Very well. This shape was named *ovoid* because this word means egg-shaped. *Oval* is a flat or *plane figure,* the boundary of which resembles an egg-shape. *Ovoid* is a *solid figure* shaped like an egg.

Did you ever see any fruit of this shape?

LESSONS TO DEVELOP THE IDEA OF A CYLINDER AND CONE.

FIRST STEP.—CYLINDER.

For illustrating the forms of a cylinder and cone, several objects having these shapes should be provided; also a sphere.

What am I holding in my left hand? "A ball."

In how many ways is it round? "Every way."

In how many ways is the object in my right hand round? "Two ways."

In how many ways will the ball roll? "In every way."

In how many ways will this object roll? I will try it on the table. "In two ways."

What is the shape of this object? "It is round."

Cylinder.—Is it round like a ball? "No; it is round and long."

Can you say any thing more about it? "It has circular, flat ends."

What can you say of the surface of its sides? "Its sides have a curved surface."

Tell me of something that resembles this object. "A stove-pipe; a round ruler; a pencil."

This is called a *cylinder.* The shape of any thing that resembles this in form is *like a cylinder.*

Did you ever see any thing growing in the field or forest that resembled this form in any of its parts? "Yes, trees; stalks of wheat; oats; sugar-cane."

Which end of this cylinder is larger? "Both are of the same size."

SECOND STEP.—CYLINDER, CONE.

Place a sphere, a cylinder, a cone, and a cube on the table, and request a pupil to roll each across the table. Which of these solids will roll best? "The sphere."

Cylinder.—Suppose you wished to roll an object along the floor, which shape would you prefer, that of a *cube* or that of a *cylinder?* "The form of a cylinder."

Now will you describe a *cylinder?*

A cylinder has two equal, plane, circular ends, and one curved surface for its sides.

You may tell me what objects you have seen that are shaped like a cylinder. "Lead-pencil; stove-pipe; gas-pipe; a candle; stick of candy; broom-handle; pen-holder; the legs of some chairs."

Sometimes we use the word *cylindrical*, which means like a cylinder. We can say the stove-pipe is cylindrical; a lead-pencil is cylindrical.

Cone.—I wish you to look at this object, and tell me whether it is like the sphere or like a cylinder. "It is not like either."

Look at the bottom of this, then at one end of the cylinder; what can you say of the shape of each? "Both are circular."

Are the sides of this like those of a cylinder? "No; the sides of this go to a point."

You may say *the sides taper to a point.* This figure is called a *cone.*

Did you ever see the fruit or seed of a pine-tree? Well, can you tell me what that seed is called? "A cone."

Which of the objects does it most resemble, the cylinder or the other? "The other object."

Now if the shape of this object resembles the *cone* of a pine-tree, what would be a good name for it?

"A *cone.*"

Yes; all objects that are round like a cylinder at one end, but which taper to a point at the other end, may be called *cone-shaped.*

Base.—The bottom of the cone, or the part on which it stands, is called its *base.* The part on which any object rests or stands is called its *base.* Then what is the bottom of a cone called? "Its base."

I have placed the cylinder upon one of its ends; now what is the base of this cylinder? "The end upon which it stands."

I have placed the cylinder upon the other end; now what is its base? "The end upon which it stands."

What is the base of any object? "The part upon which it stands."

Apex.—The top of the cone is called its *apex.* The apex means the top, or the highest point. Here is a solid with four sides, which meet in a point at the top; what may we call this point? "The apex."

I will now write a description of a *cone* on the blackboard, and you may repeat it.

A cone is a solid having a flat, circular base, and a curved surface tapering regularly to a point at the top.

THIRD STEP.—CONICAL, CONOID.

Conical.—Instead of saying *cone-shaped*, we may use the word *conical*, which means *having a form like a cone.*

Conoid.—When the sides of a conical solid do not taper *regularly* to the apex, it may be called a *conoid.* The sides of the *cone* taper in *straight* lines, but the sides of a *conoid* taper in *curved* lines. The conoid is nearly like a cone, as may be seen in the illustration.

Conoid.

What have you seen of this shape? "A hay-stack; a Minie bullet; some tops; the small ends of some eggs; an acorn; a pine-apple; some cocoa-nuts; pine-apple cheese; some berries."

LESSONS TO DEVELOP THE IDEA OF A CUBE AND CUBICAL FORMS.

FIRST STEP.—CUBE.

I HAVE placed a solid figure on the table before you. What is the shape of each side that you can see? "Square."

Cube.—I will hold it, and you may count its sides as I touch each. "One, two, three, four, five, six."

How many sides has it? "Six."

What is the shape of each side? "Square."

The name of this figure is *cube.* Then how many sides has a cube? What other name may we give for side? "Face."

Then how many faces has a cube? "Six faces."

What is the shape of each face of the cube? "Square."

Are all the faces of a cube equal? "Yes."

A cube is a solid having six equal square faces.

I will write this on the blackboard, that you may remember it.

SECOND STEP.—CUBICAL FORMS.

How many faces has a cube? "Six faces."

What is the shape of each of the faces? "Square."

Is a bar of soap like a cube? How does it differ from a cube? "Only two of its faces are square; the others are oblong."

Sometimes we find objects that have six sides, some of which are square, and others nearly so; the shape of these may be called *cubical*, because they are *nearly like a cube.*

What objects have you seen that resemble a cube? "Lumps of sugar; pieces of cake; tea-chests; some boxes; pieces of soap."

When do you call a solid a cube? "*When it has six equal square faces.*"

How would you make a cube from a bar of soap? "Cut off a piece so that it would have six equal square faces."

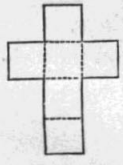
Which side of a cube is its base?

How many different bases may a cube have?

SUGGESTIONS FOR TEACHERS.

The teacher might farther illustrate the shape of the cube by taking the square and triangular prisms and the inch cube from the Box of Forms, and showing how cubes could be made by cutting the square prism into pieces having six equal square faces.

The triangular prism might be shown, and the pupils asked whether cubes could be cut from it. Why would not a piece cut from the triangular prism have the shape of a cube?



This figure represents the shape of a piece of pasteboard that may be folded so as to form a cube. The dotted lines indicate the places of the folds. To show children how to cut and fold a paper or pasteboard cube would both interest and instruct them, and furnish the means for profitable amusement and instruction at home.

LESSONS TO DEVELOP THE IDEA OF PRISMS.

FIRST STEP.—PRISMS.

BEFORE commencing these lessons the teacher should provide a cube, a triangular, a square, and a hexagonal prism, from the Box of Forms; also other objects having equal ends, but unequal sides; and some with unequal ends. All of these objects should be placed on a table in front of the teacher, or in a box conveniently near.

Holding up a cube, the teacher asks, What is this shape? "A cube."

Taking up a square prism, the teacher asks, Is the shape of this like a cube? "No; the sides are not all square."

What is the shape of its sides? "Oblong."

What is the shape of its ends? "Square."

Holding up a triangular prism, the teacher asks, What is the shape of the sides of this? "Oblong."

What is the shape of its ends? "Triangular."

Holding up an oblong solid having unequal sides, the teacher asks, What is the shape of the sides of this? "Oblong."

Now look at these oblong sides. Are all of them of the same size? "No."

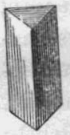
Look at the sides of this, which has triangular ends. Are its sides all equal? "They are."

What can you say of the sides of this solid, with square ends? "They are all equal."

How many of these objects have equal sides? "Two."

I will give you a name for solids having *equal oblong sides and equal ends.* They are called *prisms.* If the *sides* are not equal, we do not call them prisms. What do we call solids having *equal ends* and *equal oblong sides?* "Prisms."

Triangular Prism.—How many oblong sides has this prism? "Three."



What is the shape of its ends? "Triangles."

If its ends are triangles, how many sides has it? "Three sides."

Then we might call it a *three-sided prism;* but it has also another name, which means three-sided prism. The other name is *triangular prism.* It is called a triangular prism because its ends are triangles.

Square Prism.—How many oblong sides has this prism? "Four."

What is the shape of its ends? "Squares."

If its ends are squares, how many sides has it? "Four sides."

Then we might call it a *four-sided prism;* but this also has another name. Can you give me a good name for this prism? "Square prism."

SECOND STEP.—PRISMS.

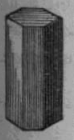
Taking a triangular prism, and holding it so that the pupils can not see its shape, the teacher says, I hold in my hand *a solid figure, having three equal oblong sides, and two equal triangular ends;* what is it? "A triangular prism."

Now I hold *a solid figure, having four equal oblong sides and two equal square ends;* what is it? "A square prism."

Placing the three-sided prism in the hands of a pupil, the teacher says, Tell me the name of this solid, and why it is called so. "It is a triangular prism, because it has three equal oblong sides and two equal triangular ends."

Placing a four-sided prism in the hands of another pupil, request the name of the solid, and the reason for calling it, thus: "This is a square prism, because it has four equal oblong sides and two equal square ends."

Hexagonal Prism.—How many sides has this solid? "Six."



What is the shape of each side? "Oblong."

Are the ends equal? "They are."

Are these oblong sides all equal? "They are."

Then what may we call this solid? "A *prism.*"

What is the shape of the ends of this prism? "Six-sided."

Then what may we call this prism? "A six-sided prism."

Very good. There is a name for a figure having six equal sides; can you tell me what it is? "A hexagon." Then we may call this solid a *hexagonal prism.* Why do we call this a hexagonal prism? "Because it has six equal oblong sides, and equal hexagonal ends."

How many kinds of prisms can you name? "Three."

What are they? "The triangular; the square; the hexagonal."

Why do you call one of them a triangular prism?

"Because it has three equal oblong sides and equal triangular ends."

Why do you call one of them hexagonal? "Because it has six equal oblong sides and equal hexagonal ends.

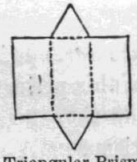
If a solid had equal ends and five equal oblong sides, what would you call it? "A five-sided prism."

Suppose a solid had eight equal oblong sides and equal ends, what would you call it? "An eight-sided prism."

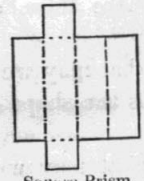
Did you ever see a glass prism? How many sides had it?

SUGGESTIONS FOR THE TEACHER.

The figures given here represent the shape in which pasteboard may be cut to fold into the form of a triangular prism; also for a square prism.



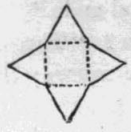
Triangular Prism.

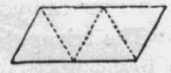


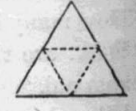
Square Prism.

The teacher can add much to the interest of these lessons by showing the pupils how they may cut out paper or pasteboard so that it may be folded into the forms of triangular and square prisms.

The following figures represent the shapes of pieces of pasteboard or paper that may be folded into triangular and square pyramids.







LESSONS TO DEVELOP THE IDEA OF PYRAMIDS.

FIRST STEP.—SHAPES OF PYRAMIDS.

Before commencing the lessons on pyramids, the teacher should provide prisms, cubes, cone, and square and triangular pyramids for the illustrations.

Taking up a square prism, the teacher might ask, How many sides has this solid? "Four."

What is the shape of its sides? "Oblong."

Taking up a square pyramid, the teacher may ask, How many sides has this solid? "Four."

What is the shape of its sides? "Triangles."

Holding up a triangular pyramid, the teacher might ask, How many sides has this solid? "Three."

What is the shape of its sides? "Triangles."

Placing the square prism, the square pyramid, the triangular pyramid, and a cone on the table, each standing upright, the teacher may ask, What do we call the part on which each of these objects stand? "The base."

What is the shape of the base of the pyramid? "Square."

What is the shape of the base of the cone? "Circular."

What is the shape of the bases of the other objects? "One is square, and the other is triangular."

Very good. Now observe the tops of these solids; are these alike?

"No; the top of the prism is square, the tops of the others are points."

How many of these solids have triangular sides that meet in a point at the top? "Two."

I will now tell you what we call all solids that have triangular sides which meet in a point at the top; they are called *pyramids. A pyramid is a solid body having a base, and triangular sides meeting in a point at the top.*

SECOND STEP.—PYRAMIDS.

Triangular Pyramid.—How many sides has this solid? "Three."

What is the shape of its sides? "Triangles."

What is the shape of its base? "Triangular."

What is the name of a solid having triangles for its sides which meet in a point at the top? "A pyramid."

Since this pyramid has only three sides, what name may we give it? "A triangular pyramid."

Why do you call this a triangular pyramid? "Because it has only three triangular sides."

You might say it is a triangular pyramid because *its base is triangular.*

Square Pyramid.—How many sides has this solid? "Four."

What is the name of a solid having triangular sides which meet in a point at the top? "A pyramid."

What is the shape of its base? "Square."

Since the base of this pyramid is square, what name may we give it? "A square pyramid."

Why do you call it a square pyramid? "Because it has a square base, and four triangular sides meeting in a point at the top."

Suppose I had a solid with a base, and five equal triangular sides meeting in a point at the top; what might we call it? "A five-sided pyramid."

I hold in my hand a solid having a triangular base, and three triangular sides meeting in a point at the top; what is its name? "A triangular pyramid."

I hold in my hands a solid having a square base, and four triangular sides meeting in a point at the top; what is its name? "A square pyramid."

SUGGESTIONS FOR THE TEACHER.

The teacher may add much interest to the lesson on the pyramids by telling the pupils about the Pyramids of Egypt. If the pupils are not familiar with the location of Egypt, it may be pointed out on the map of the world.

The children may be told that along the banks of the Nile, for a distance of seventy miles, may be seen a great number of pyramids built of stone and brick. The largest of these is nearly *eight hundred feet* square, covering a space of more than *twelve acres;* and the top is *four hundred and eighty feet* in height.

The base of such a pyramid would cover nearly all the space from Fourteenth to Eighteenth Street, between Fifth and Sixth Avenues, in New York City; and its top would reach *two hundred feet* above the steeple of Trinity Church.

It is said to have taken a thousand men twenty years to build this pyramid. The pyramids were built many thousand years ago, by kings of Egypt, as monumental tombs.

LESSONS TO SUGGEST

DESCRIPTIONS OF OBJECTS BY THEIR FORMS.

When children have become familiar with most of the forms of the preceding lessons, they should be trained to a practical application of this knowledge in describing the shape of objects. Such exercises will serve as a review of the lessons on Form, and make those lessons more useful to these children when they have left school to engage in the common affairs of life.

In giving these lessons, it should be remembered that the object in view is not to teach the children to tell "all about" the objects—the names of the parts, the colors, what they are made of, their uses, etc. In these lessons, all that should be required of the children is *to tell the shape of familiar* objects.

The following descriptions are given as suggestions for conducting this class of lessons.

A Broom.—The common *broom* is triangular in shape, and its handle is cylindrical. The handle usually tapers slightly toward the top.

A Pin.—A common *pin* has a head somewhat like an oblate spheroid, a cylindrical, straight body, and a conical point.

A Slate.—A *slate* has two plane oblong surfaces, surrounded by an oblong frame with square or round corners.

A Table.—A *table* has a flat oblong top, with narrow oblong sides and ends, and four cylindrical legs.

A Table-knife.—A *table-knife* has a narrow oblong blade, with a curved end, and a handle usually with four oblong sides.

A Spoon.—A *spoon* has an oval concave bowl, a narrow, flat handle, which widens toward the end opposite the bowl. Sometimes the part of the handle opposite the bowl has an oblong shape. The handle is usually curved at the end.

Blackboard Rubber.—A *blackboard rubber* is oblong. Some have curved handles on the back. The face is covered with wool.

A Numeral Frame.—A *numeral frame* is oblong, and has several parallel wires extending lengthwise through it. On the wires are movable balls of various colors. It has a handle fixed in the centre of one of the long sides.

A Chair.—A *chair* has four curved cylindrical legs; several cylindrical bars, or rounds; a seat somewhat in the form of a square, with curved corners and a curved side. It has a back of an oblong form, with curved sides and top. The back slants backward slightly.

A Wood Stove.—A *wood stove* has an oblong top and bottom, and sides, with ends nearly square. It has an oval hearth and a square door. It stands on four curved legs. The pipe is a hollow cylinder.

A Tin Cup.—A *tin cup* has a flat circular base, with a body like a hollow cylinder. It has a curved handle on its side.

A Wagon Wheel.—A *wagon wheel* is circular, with a barrel-shaped hub for its centre, from which spokes that are somewhat cylindrical radiate to the circular rim. An iron ring or hoop, called a tire, forms the circumference.

COLOR.

IMPORTANCE OF TRAINING THE EYE.

The eye is the organ of the most important of our senses. It is the window of the mind, through which all knowledge of colors, shape, size, position, reading, and many of the qualities of objects, must be obtained.

Sight is the most nearly perfect of all our senses; its conceptions of properties of objects are more vivid and complete than ideas of the same properties when conveyed to the mind by any one of the other senses. Horace understood the importance of this sense when he sang:

> "Sounds which address the ear are lost, and die
> In one short hour; but that which strikes the eye
> Lives long upon the mind; the faithful sight
> Engraves the knowledge with a beam of light."

This important fact should be heeded by instructors of the young, and greater attention paid to teaching the properties of objects by sight, and less to teaching mere words about these properties by the sense of hearing. The subject now under consideration—color—is emphatically one that must be learned through the sense of sight. Color can never be learned by means of words alone. No description will convey any idea of color to one who has always been blind.

A blind man once told me that the best idea of black which he ever received was from a remark made to him one day by his little sister. She was describing some object that was black. Her mother, hearing her, re-

marked, "Your brother can not understand you; he does not know what black is." "Don't you know how black looks, brother? It looks like the darkest night that you ever saw," said the little sister. Nothing could have been more simple and better adapted to convey the idea of black to a blind man, yet, as he did not know the difference between darkness and light, it gave him no definite conception of black.

Notwithstanding a knowledge of color is important in the various avocations of life, and a nice discrimination of it is a source of great pleasure to the mind, yet the subject is generally neglected in our schools.

Color Blindness. — It is a well-known fact that the power of distinguishing color is possessed in very different degrees by many individuals. Some can scarcely discriminate shades of the same color; others can not discern colors the most strikingly opposed to each other. Some persons have been known who could distinguish only black and white, all the intervening colors appearing as shades of gray. Many instances have been known where individuals could not distinguish red cherries from green leaves except by their shape.

It is said that a certain English naval officer chose a blue coat and red trowsers, believing that they were both of the same color. A story is told of one tailor who had no perception of color, that mended a black silk vest with a piece of crimson color; and of another tailor who put a collar of red cloth on a blue coat.

The celebrated chemist, Dr. Dalton, thought the red gown in which he was installed as Doctor of Civil Law at Oxford was a blue one. Some of his friends, in order to test this peculiarity of his vision, substituted red

stockings for those he usually wore. The doctor put them on without noticing any thing remarkable in their appearance, and when his attention was directed to them he only said they looked rather dirty. One day Dalton dropped a piece of red sealing-wax in the grass, and had great difficulty in finding it again.

During the last twenty years this subject has attracted the attention of scientific men, and many observations have been made, and numerous facts collected pertaining to this phenomenon, so puzzling to both philosophers and physiologists. It has been found that this condition of sight is much more common than was generally supposed. Many persons who are thus afflicted remain ignorant of this defect in their sight until mistakes or accidents in their business lead them to discover it.

Bartholomew, the sculptor, could not distinguish between a crimson curtain and a green one. Yet he began his artistic career as a portrait painter, and once gave the cheeks of a female sitter a hue of bright green. He put the two pigments upon his palette, and mistook the green for the red, and did not discover his mistake until it was pointed out to him. Yet, blind as he was to the differences of color, he had the most exquisite perception of the beauties of *form*.

Weavers of silk have been compelled to give up their trade because they could not distinguish colors. On one occasion a Swiss artist was called to paint a portrait by candle-light, and he used yellow for pink in laying on the flesh tints.

An English engineer ran his train into a freight train on which the usual red signal of danger had been placed. During his examination it was discovered that

he was color-blind, and could not distinguish *red* from *green*.

Out of forty boys that were examined in a school in Berlin, five were found who could not discriminate common colors. From calculations based on various examinations made in England and Scotland, it appeared that one person out of every fifteen was unable to distinguish all of the ordinary colors; one in fifty-five confounded red with green; one in sixty brown with green; one in forty-six blue with green.

Of the three primary colors, *red* appears to be the most difficult to be distinguished; it is the distracting color of the three. Some persons can not see it at all as a color, for it appears to them as black, but most commonly it is mistaken for green. Yellow is the color which least frequently escapes perception. There are but few persons, even among those who are called color-blind, that do not see yellow perfectly. A pure blue is in the next degree least likely to be mistaken, and with some it is the most vivid color of the three. Among the secondary colors, green is the most difficult to recognize. Thus it appears that *red* and *green* are the two colors which the color-blind most frequently fail to distinguish, yet it so happens that these are the two colors chiefly used as signals on railroads and ships. This fact renders it highly important that every person employed on railroads or ships, whose duties have any relation to signals by color, should be carefully examined in his ability to discriminate colors accurately. Without proper attention to this matter, a fearful catastrophe might occur from mistaking a signal implying danger for one denoting safety.

The cause of color-blindness is unknown. The most

careful observations have thus far failed to detect any difference between the eyes of those who can readily discriminate all colors, and the eyes of those who are color-blind. Possibly what appears to be a permanent physical defect may yet be found to exist, in many cases, in consequence of undeveloped dormant powers of the sense of sight. Who can say that special training of the eye, during early childhood, in distinguishing prominent colors, might not remove many of these defects in discerning color? Certainly the possibilities of the case, and the great importance of knowing whether such defects of vision do or do not exist in our children before their avocations for life have been chosen, makes attention to this matter one of much consequence.

How far this remarkable defect in distinguishing colors can be remedied by early training and careful education of the eye, it is impossible to answer from present experience; but we know that by cultivation the ear may be rendered much more capable of perceiving and distinguishing sounds. Judging then from analogy, we may reasonably suppose that the eye also, by proper training, might be greatly improved in its power of discriminating colors. At all events, it is of sufficient importance and probability to deserve greater attention, and to render it highly desirable that the subject of color should have a place in school training.

FACTS ABOUT COLOR.

FOR THE TEACHER.

ALL colors exist between the extremes of light and darkness. These extremes are represented by *white* on one side and *black* on the other. Light and darkness are opposite conditions. All colors appear different in sunlight. All colors appear alike in darkness. Without light there can be no color. Sunlight contains all colors, except those produced by combinations of *white* or *black* with other colors.

All the colors contained in sunlight may be seen in the rainbow. Sunlight can be separated by a glass prism into the colors of the rainbow—red, orange, yellow, green, blue, indigo, purple. This fact was discovered by Sir Isaac Newton. These seven colors are called *prismatic colors*. They furnish the true standards for artists and colorists, and a key to the whole science of colors and coloring.

Since the discovery made by Newton that sunlight can be separated into seven colors, it has been ascertained that four of these colors—*orange*, *green*, *purple*, and *indigo*—can be produced by mixing together two or more of the other three—*red*, *yellow*, *blue*. It has also been found that *red*, *yellow*, and *blue* can not be produced by any mixture of the other colors. Because of this fact, these three are called *primary colors*. The colors that can be produced by mixing two primary colors are called *secondary colors*.

If we could obtain perfectly pure red, yellow, and blue pigments, and mix the three completely in their proper proportions, they would produce a *white*. But a mixture of the best pigments which are known produce only a whitish gray.

Ultramarine is one of the purest representatives of a primary color known; its darkest shades and lightest tints are pure blue. No paint or coloring material of red or yellow has been produced without a slight mixture of one of the other colors. Even *carmine*, the purest type of the prismatic red that color-makers have produced, contains some yellow. The color obtained by purest *chrome yellow*, or by gamboge, may be taken as the best representative of the prismatic yellow. Yet so far do these materials for red and yellow fall short of being

perfect primary colors, that a mixture of the three representatives of the primary colors produces only a light gray. However, for practical purposes, *carmine*, *chrome yellow*, and *ultramarine* may be taken for the standards of *red*, *yellow*, and *blue*.

By mixing *black* with any color, it becomes darker, and is therefore called a *shade* of that color.

By mixing *white* with any color, it becomes lighter, and is therefore called a *tint* of that color.

Worsteds are dyed so perfectly that all shades and tints of each of the colors—red, yellow, blue, orange, green, purple—from nearly black to nearly white, may be obtained, in which no more trace of either of the other six colors can be found than appears in the color before the black or the white were added to it. By counting each shade and tint thus produced as a color, the number of reds that could be distinguished by a well-trained eye would be about twenty-four, and the number that could be perceived of each of the other colors would range from twenty to twenty-four.

The teacher may be asked, Why does grass appear green? Why are some apples red? Why are some flowers yellow and others blue? Probably the best reply would be the usual scientific answer—*all bodies absorb certain colors and reflect others:* thus, if a body is red, it absorbs the yellow and blue rays, and reflects the red; if yellow, it absorbs the red and blue rays, and reflects the *yellow;* if blue, it absorbs the red and yellow rays, and reflects the *blue;* if green, it absorbs the red rays, and reflects the *yellow* and *blue;* and so with the others: the colors which the body appears to possess are reflected, the other colors are absorbed.

CLASSIFICATION OF COLORS.

Primary Colors.—Red, yellow, blue.

The primary colors can not be produced by mixing any other colors.

Mixing two primary colors will produce a secondary color. Mixing red and yellow will produce an orange color; yellow and blue, a green; red and blue, a purple.

Secondary Colors.—Orange, green, purple.

Mixing two secondary colors, or three primary ones in the propor-

tion of two parts of one color and one part of each of the other two, produces a tertiary color.

Tertiary Colors.—Citrine, olive, russet.

The various combinations of the primary, secondary, and tertiary colors, together with black and white, produce the

Irregular Common Colors.—Browns, claret, chocolate, auburn, chestnut, snuff, drab, gray, slate, etc.

Shade.—Any gradation produced by mixing *black* with a color, so as to render it darker than the original color, is called a *shade* of that color. Some shades may be made by mixing a dark color with a light one, where a darker color can be produced without changing the character of the light color so much as to destroy its original color.

Tint.—A gradation produced by mixing *white* with a color, so as to render it much lighter than the original color, is called a *tint* of that color.

Hue.—A hue is produced by combining two colors in unequal proportions; as a little yellow mixed with pure red gives a scarlet, a *hue* of red. A little red mixed with yellow gives a *reddish hue* of yellow. A little red mixed with blue gives a *reddish hue* of blue, a color that inclines to a violet. A little yellow mixed with green gives a *yellowish hue* of green. This term may be applied to colors that are lighter, as well as to those that are darker than the original color. It will be observed that the color which appears most prominent after mixing two colors gives the name to the hue, as a *hue of red.* This may mean a *red* with a little yellow mixed with it, or a *red* with a little blue in it; but a *yellowish hue* of red indicates what color has been mixed with the red to make its hue.

Tinge.—A slight coloring or tincture, which may be perceived in addition to the principal color, is called a *tinge.* If a green has a slight coloring of yellow, it may be said the green has a tinge of yellow.

COMBINATIONS OF COLORS.

For illustrations showing how colors may be produced by mixing the primary ones, see the Plate of Colors fronting the title-page.

Primary.	*Secondary.*	*Secondary.*	*Tertiary.*
Red and Yellow	produce Orange.	Orange and Green	produce Citrine.
Yellow and Blue	produce Green.	Green and Purple	produce Olive.
Red and Blue	produce Purple.	Orange and Purple	produce Russet.

DESCRIPTIONS OF COLORS.

The following familiar descriptions of colors are intended to convey as definite knowledge of standards for the several colors, their shades, hues, and tints, and names for each, as it would be desirable to teach children. It is not claimed that these are entirely perfect, yet they are sufficiently accurate for all the purposes of training children to distinguish colors readily. It is nearly impossible to arrange the several names employed by artists, dyers, colorists, dealers in fancy goods, etc., to designate their various ideas of color, so that a single term shall represent the same idea to each class of persons. It is no less difficult to describe a color so that the description shall correspond entirely with the conceptions formed of it even by those who are familiar with colors as used in their own occupations.

But there are so many who never obtain any correct conceptions of colors, nor the ability to describe them with even a tolerable degree of accuracy, because they never were taught any standards for distinguishing colors, it becomes a matter of great importance that a foundation for a knowledge of color should be laid in childhood by fixing these starting-points. With a proper early training in distinguishing colors, it will become an easy matter to attain minute and definite knowledge of color in later life, in any department of business which may require it.

REDS.

Pure Red.—Carmine—the purest deep red; the standard primary red; the color of Chinese vermilion.

Shades of Red.—Morone, or Maroon—a dark crimson; the color of an unripe mulberry; a crimson darkened with black. It is sometimes classed with the browns.

Crimson—a pure red darkened with a deep blue, giving it a shade of red with a purplish tinge. This color may often be seen on red apples.

Garnet Color—a deep red, the color of the mineral known as the carbuncle of the ancients.

Magenta—a shade of red lighter than crimson; a bluish-red.

Damask Color—a rich dark red, darker than crimson; the color of a damask rose.

Venetian Red—a name commonly applied to a paint made of earth. It is a dark, dull red, approaching the red-browns.

Hues of Red.—Scarlet—a bright red, lighter than carmine; a pure red made lighter by a slight mixture of yellow.

Cherry—a bright red lighter than a scarlet.

Vermilion—a yellowish-red paint; it contains more yellow than scarlet, and may be called an orange-red. This is the color of common vermilion; the Chinese vermilion has the color of pure carmine.

Turkey Red—the deep red seen in calico and woolen goods when dyed with madder.

Copper Color—the color of copper; a pale red slightly tinged with yellow.

Tints of Red.—Pink—a tint of crimson; a crimson color made very light by mixing white with it.

Rose—a tint of carmine; a carmine color made very light by mixing white with it.

Flesh Color—a tint of scarlet.

YELLOWS.

Pure Yellow.—Chrome Yellow, or Chromine—a bright yellow color; a fair standard for primary yellow. The yellow produced by *gamboge*, a gum used for yellow in water-colors, is a good standard for a primary yellow.

Shades of Yellow.—Citrine—a dark greenish-yellow; the color of the fruit of the citron-tree.

Saffron—a deep dark yellow; the color of the saffron flowers.

Hues of Yellow.—Lemon—a yellow slightly tinged with green; the color of a lemon.

Sulphur—a yellow with a bluish tinge.

Golden Color—the color of gold; a bright yellow with a reddish tinge.

Canary—a light chrome yellow; the bright yellow of the canary-bird.

Ochre—a pale dusky yellow; a kind of earth used for paint.

Tints of Yellow.—Straw—a tint of pure yellow; chrome yellow made very light by mixing white with it.

Primrose—a tint of yellow lighter than straw.

Flaxen—a pale tint of yellow, resembling the color of flax.

BLUES.

Pure Blue.—Ultramarine—the purest blue. A very fine rich blue, formerly obtained from the mineral lapis lazuli.

Shades of Blue.—Indigo—a very dark shade of blue with a purplish tinge; a deep blue containing a little red, and made darker with black; a color obtained from the indigo plant.

Mazarine—a deep reddish-blue.

Prussian Blue—a dark blue with a slight greenish tinge.

Plum Color—a dark purplish-blue.

Hues of Blue.—COBALT BLUE—a pure blue, somewhat lighter than the ultramarine, and much lighter than the Prussian blue.

TURQUOIS—a beautiful blue, the color of this precious mineral. Sometimes it has a greenish tinge.

FRENCH BLUE—a bright blue with a violet hue.

Tints of Blue.—LIGHT BLUE—a tint of ultramarine. A pure blue made lighter with white.

AZURE, CERULEAN, or SKY BLUE—the clear blue of the sky. A light tint of pure blue.

ORANGE.

Pure Orange.—ORANGE—the color of a ripe orange; a reddish-yellow. Equal parts of pure red and yellow will produce a red-orange color. Three parts of red and five parts of yellow will give a good orange color.

Shades of Orange.—DARK AMBER, or AMBERINE—a very deep reddish-yellow; a deep orange made a little darker with black. Amber is a fossil gum, found on sea-coasts. It is obtained on the coast of the Baltic Sea. Some varieties of this gum are semi-transparent, and of a lighter reddish-yellow or orange.

OAK COLOR—a shade of orange; the color of polished oak wood.

Hues of Orange.—SALMON—a light orange with a golden tinge; the color of a salmon fish.

BUFF—a light yellowish orange.

Tints of Orange.—CREAM COLOR—a very light tint of orange tinged with yellow. Orange color made very light with white. The color of cream.

GREENS.

Pure Green.—GREEN—the brightest grass-green. Eight parts of blue and five parts of yellow will produce a good green. Equal parts of blue and yellow will make a common green.

Shades of Green.—OLIVE GREEN—a brownish-green; the color of an olive. This shade of green may be produced by mixing yellowish-green with brown.

BOTTLE GREEN—a dark, dirty yellowish-green; the color of bottles made of coarse common glass.

Hues of Green.—EMERALD—a very rich, brilliant green; the color of the emerald, a precious stone.

PEA GREEN—a light yellowish-green, the color of green peas.

SEA GREEN—a faint green with a bluish tinge; a color seen in deep water.

Tints of Green.—BERYLINE—a delicate pale green, the color of the beryl or aqua marine.

TEA COLOR, or TEA GREEN—a tint of olive-green. Olive-green made very light by mixing white with it.

PURPLES.

Pure Purple.—PURPLE—a color produced by mixing equal parts of pure blue and pure red. A purple with the blue predominating is made by mixing three parts of red with eight parts of blue. Such a purple might be called a *dark violet.*

Shades of Purple.—ROYAL PURPLE—a very rich dark purple. This color was formerly obtained from a sticky liquid found in small quantities in a kind of shell-fish. In consequence of being very difficult to obtain, it was so expensive that none but the most wealthy could wear cloth dyed with this color. This was the color of the robes worn by Roman emperors. It was the emblem of power—the sign of royalty.

AMARANTH—a dark red-purple, the color of the flower of the amaranth.

Hues of Purple.—VIOLET—a purple with a blue tinge. In this color the blue appears more prominent than the red. This color might be called a purple-blue. The amethyst has a beautiful blue-violet color.

MAUVE—a delicate light purple. One of the aniline colors made from coal tar.

AMETHYST—a violet with a bluish hue.

Tints of Purple.—LILAC—a tint of purple; a purple made lighter by mixing white with it; the color of lilac blossoms.

LAVENDER—a light tint of violet; a violet made much lighter by mixing white with it.

BROWNS.

The *browns* are usually composed of red, yellow, and black, in various proportions, and sometimes modified by the addition of white. These colors are known by various names—*dark brown*, *olive-brown*, *deep brown*, *red-brown*, *gold-brown*, *light brown*, *umber*, *chestnut*, *auburn*, *russet*, *hazel*, *chocolate*, etc., according to the prevailing color. It is generally a tawny or dusky color.

Shades of Brown.—UMBER—a very dark or blackish-brown paint, the color of burnt umber. Raw umber has a yellowish tinge.

CHESTNUT—a dark shade of brown, the color of a chestnut.

CHOCOLATE—a dark reddish-brown, the color of chocolate.

PUCE—a dark or purplish-brown, the color of a flea.

Hues of Brown.—AUBURN—a reddish-brown; this name is applied to a color of hair.

RUSSET—a light brown with a yellowish tinge. This color is composed of two parts red, and one part each of blue and yellow.

HAZEL—a light brown, the color of the hazel-nut. This name is used in describing the color of eyes.

SNUFF—a yellow-brown, the color of snuff.

CLARET—a purplish, light red-brown, the color of claret.

Tints of Brown.—BRUNETTE—a very light brownish color; a name given to dark complexions.

DRAB—a very light dull brown, of a yellowish tinge.

TAN—a light yellowish-brown.

STONE COLOR—a very light tint of brown.

GRAYS.

The *grays* are usually composed of black and white, modified by a mixture of red, yellow, or blue.

SLATE—a bluish-gray or a reddish-gray.

PEARL GRAY—a very light silvery-gray.

STEEL COLOR—a dark bluish-gray.

FRENCH GRAY—a grayish color somewhat resembling a drab.

WHITE.

White is the representative of light; it is also a modifier of colors. Sometimes it is said that white is not a color, but only a composition of all colors, because it is composed of the seven prismatic colors, as in sunlight. But to the child white is just as much a reality as red or blue. Since, by universal usage, this term is employed to distinguish the color seen in pure snow, and all objects having the same color, it is just as correct to use the word *white*, as the name of a color, as the word green or yellow. And I see no good reason why we may not call white a color as well as purple.

White substances reflect all the rays of sunlight; red substances reflect the red rays of light, and absorb all others; yellow substances reflect the yellow rays, and absorb all others; green substances reflect the green—or blue and yellow—rays, and absorb all others. Black absorbs all the colors of sunlight, and reflects none of them.

WHITE—the color of pure snow.

SILVER—the color of silver; a bluish-white.

PEARL—usually a bluish or silvery white; sometimes a pinkish-white.

MILK-WHITE—a white with a slight yellowish tinge, the color of milk.

BLACK.

Black is the opposite of light; it is the representative of darkness. White *reflects all* colors; black *absorbs all* colors. For the same reason that I would use the word *white* as the name of a color, I would use the word *black* to indicate the color of *coal*.

Although it is said that *black is no color*—that it only indicates the absence of all colors—yet, for all the ordinary distinctions of objects, it is just as much a color as blue or purple, and it may be so treated in the lessons on color in primary schools.

BLACK—the color of coal or jet.

COLORS OF ANIMALS.

Black Horse—a horse with a black body and legs, and black mane and tail.

Brown Horse—a horse with a dark brown body, and black legs, mane, and tail.

Chestnut Horse—a horse with a brown body and legs, and brown mane and tail. There are dark and light chestnut colors.

Bay Horse—a horse with a reddish-brown body, and black legs, mane, and tail. Occasionally a bay horse has brown legs. There are dark and light bays.

Sorrel Horse—a horse with a yellowish-brown body and legs, and usually a light yellowish-brown mane and tail.

Roan Horse—a horse with red and white hairs mixed, but with the red hairs predominating.

Cream-colored Horse—a horse with a yellowish, very light brown body and legs, and generally a yellowish-white mane and tail.

Dun—a very light dull chestnut, darker than a cream-color. Horses of this color usually have light mane and tail. This color is also seen on cattle.

Gray Horse—a horse with brown or black hairs mixed with white ones, but with the white hairs greatly predominating. The legs of gray horses are usually darker than the bodies An *iron-gray* has more dark hairs.

Pied Horse—a spotted horse, covered with small spots of different colors. Some dogs are pied.

White Horse—a horse with a white body and legs, and white mane and tail.

Red Cow—a cow with a reddish-brown body and legs.

Brindle Ox—An ox with black and brown hairs in stripes, or light and dark brown hairs in spots or stripes.

Fawn Color—a light tint of yellowish-brown.

APPARATUS FOR ILLUSTRATING COLOR.

Color is a subject which can be taught only by seeing it. The teacher must depend upon visible illustrations for giving definite ideas of colors. It is therefore very important that "Charts of Color,"* a "Box of Colored Cards," a "Set of Color Cubes," worsteds and pieces of silk of various colors, sealing-wax, wafers, colored papers, flowers and fruits in their season, a glass prism, colored crayons for the blackboard, etc., should be provided for this purpose.

If the teacher can not obtain more suitable apparatus for illustrating colors, she may procure a sheet of perforated pasteboard, and work upon it squares of about two inches by two inches with colored worsteds, leaving inch spaces between the squares. In this way very good illustrations of colors may be provided.

The Frontispiece of this book will serve as a guide in selecting the principal colors. "The Classification of Colors" and "The Descriptions of Colors" will also furnish information to aid in this matter.

* "Charts of Colors" and a "Box of Colored Cards" have been prepared for illustrating colors, and published by Harper & Brothers.

ORDER FOR LESSONS ON COLOR.

First Series.

The First, Second, and Third Steps of Resemblances and Differences in Color may be taken during the period in which the children are learning to read in a Primer.

Second Series.

Lessons on Naming Colors: First Step, Naming Colors at Sight; Second Step, Naming Objects by Colors; Third Step, Grouping Names of Objects by Color; Exercises with Color and Form combined. These lessons may be given during the time that the children are learning to read in a First Reader.

Third Series.

Ideas of Standard Colors: First Step, Red, Yellow, and Blue; Second Step, Orange, Green, and Purple; Third Step, White and Black. Idea of Shades and Tints of Color: First and Second Steps; Idea of Hues of Color; Idea of Classes of Colors, and Grouping Colors in Classes. These lessons may be given while the pupils are learning to read in a Second Reader.

Fourth Series.

Ideas of Primary and Secondary Colors, Mixing Colors, and Colors of Animals, may be given while the pupils are reading in the last half of a Second Reader, or in an easy Third Reader.

LESSONS TO DEVELOP THE IDEA OF RESEMBLANCE AND DIFFERENCE IN COLOR.

FIRST STEP.—DISTINGUISHING COLORS.

Having provided cards of several colors from the Box of Colors, also pieces of worsteds, silks, etc., the teacher may request the children to notice whether the colors look alike as the cards are shown. The cards may be held with their white sides toward the pupils, then with their colored sides. At first cards of the same color may be selected, as two reds, two yellows, two blues, two greens, etc. Afterward cards of different colors may be taken, as red and yellow; blue and orange; red and green; purple and yellow.

After several colors have been thus shown the children, and they have been led to notice that the colors of some cards and pieces of silk and worsted are alike and others unlike, the teacher may request the pupils to say *alike* when two objects of the same color are shown, and *unlike* when two different colors are shown.

Let the teacher hold the white sides of two red cards before the class; the pupils may answer, "Alike." Then hold the red sides before the class—"Alike." Then two yellow cards—"Alike." Then two blue objects—"Alike."

The teacher may then hold a red and a blue card before the class—"Unlike." Then a yellow and a green card—"Unlike." Then a red and a green card—"Unlike." Then the white sides of a green and a purple

card—"Alike." Then the colored sides of the same cards—"Unlike," etc.

These exercises should be varied and repeated for several days in classes of young children.

The teacher may continue the exercises for training the children to distinguish colors by placing before them the "Chart of Colors," and, holding up a red card, say, I have a red card; who will point to a color like it on the Chart? From the pupils that raise their hands, intimating that they desire to point to a color like that of the card shown them, the teacher may select several, calling out one at a time, to point to the red on the Chart of Colors.

The teacher may then take up a yellow card and proceed in the same manner; then a blue card, and so on, until the children have become familiar with red, yellow, blue, orange, green, and purple by sight and by name.

The teacher may next take colored crayons, and make a broad mark with each color on the blackboard, and as each mark is made let the children tell its color, thus: "Red; green; yellow; blue; orange; purple; white; green; blue; red," etc.

Let pupils select a crayon, and make a mark of a given color, as red, blue, yellow, green, etc.

The teacher may vary these exercises by pointing to a red color on the Chart, and requesting the pupils singly to select the same color from the cards, or worsteds and silks on the table. This method may be continued until the pupils can select all the six colors mentioned above.

Let the exercise be again changed by the teacher calling upon pupils to point to red colors on the Chart;

then blue color; then green color; and so on through yellow, purple, and orange.

Next let the pupils be required to select colors by their *names* from the colored cards, worsteds, silks, etc.

These exercises for distinguishing colors may be continued through several lessons, extending over a period varying in time from two weeks to one month, according to the ages of the pupils and their progress.

Ask the children how they know that all objects do not have the same color.

How would all colors appear where there is no light?

SECOND STEP.—GROUPING COLORS.

Children may be taught to group like colors by placing a red color on one end of the table and a green color on the other end; then, taking up several red and green cards, pieces of silk and worsteds, request the pupils, as each piece is held before them, to tell with which color it should be placed; and the teacher may place it with the red or the green, as the children direct.

In small classes the children might take the colors and classify them in two groups, by allowing each child to take two or three colors, and place each with the group which it is alike.

When the children have continued this exercise of grouping until they can readily classify any two of the six principal colors, a new series of exercises may be given with *three groups* of colors in each, as *red, yellow, blue; red, green, white; yellow, purple, white; blue, orange, black*, etc.; and the pupils may be required to place colors in three groups in the same manner as they before placed them in two groups.

These exercises should be continued until the pupils have become so familiar with red, orange, yellow, green, blue, purple, white, black, that they can readily group objects of each of these colors.

The children may now be required to arrange these colors in rows, like patterns given by the teacher, thus: Red, yellow, blue, orange, green, purple; yellow, blue, orange, green, red, purple; green, red, orange, purple, yellow, blue. Only one pattern should be given at a time.

During this step the children should not be taught shades and tints of colors; all these may be treated as reds, yellows, blues, greens, etc.

THIRD STEP.—LIGHT AND DARK COLORS.

The children, having become familiar with six or eight colors, may next be taught that the same colors can be light or dark.

The teacher may point to light reds and dark reds, light yellows and dark yellows, light blues and dark blues, dark greens and light greens, on the Chart of Colors, and thus illustrate this fact to the class.

Then the teacher may call upon pupils to point to light colors, then to dark colors, thus:

James may point to a light red; now to a dark red.

Henry may point to a dark green; now to a light green.

Freddy may point to a light blue; now to a dark blue.

When the children can readily point out the principal light and dark colors on the Chart, the teacher may place a *white* object upon one end of the table

and a *black* one upon the other end; then say to the class:

We will place all the *light colors* with the white object, and all the dark colors with the black object. Now I wish you to look at each color as I show it to you, and tell me where to place it. When I show a color, you may say "light" if you think it belongs with the light colors, and "dark" if you think it should be placed with the dark colors.

The teacher may now hold up very light colors and very dark colors, and let the children tell with which group each should be placed.

Subsequently light and dark colors may be grouped by the children making the selection themselves from the colors on the table, placing each with its appropriate group.

LESSONS IN

NAMING COLORS.

FIRST STEP.—NAMING COLORS AT SIGHT.

After placing the Chart of Colors before the class, the teacher may point to the colors in groups, requesting the pupils to give the name of the group, as reds, greens, blues, yellows, purples, oranges.

Next the teacher may take up colored cards, pieces of silk, worsted, etc., and request the children to give the name of the color as soon as shown, as red, blue, green, etc.

Another exercise may be given in which the pupils will be required, in the same manner, to give some of the other names of colors, as red, pink, yellow, straw, orange, cream, blue, sky-blue, green, light green, purple, violet, lilac.

First the teacher may point to the color on the Chart, and the pupils give the name; then she may hold up cards or other colored objects, and request the pupil to give the name of each color singly as soon as it is shown.

A very valuable exercise for securing the attention of a large class may be introduced in connection with these lessons on color. The teacher, taking several of the square colored cards from the Box of Colors, may hold them up, one at a time, and ask, What is the color of this? What is its shape? What is the shape of this? What its color?

When the pupils are able to answer readily and correctly each question as to shape, color, etc., the teacher may show the card, and indicate the question by simply speaking the words *color—shape*. Let the changes be made rapidly from shape to color, also from one color to another, so as to require the most watchful attention on the part of the pupils to understand correctly and quickly, and answer promptly.

Let the names of colors be reviewed by requiring the pupils to point out colors on the Chart; also to select colors from objects on the table as the teacher speaks the name.

SECOND STEP.—NAMING OBJECTS BY COLORS.

To train children to apply the appropriate names to the colors in articles of dress, flowers, fruits, and other familiar objects, let the teacher point to a red color on the Chart, or hold a red card before the class, and request the pupils to mention the names of objects which are *red*. First let each child that can think of a red object raise a hand, and mention the name of it promptly, in turn, as called upon by the teacher. In subsequent exercises upon the same color, each child may be called upon in turn to mention the name of an object with the given color.

Each color may be presented to the class in the same way until the pupils have learned to associate the right names with the colors seen in common objects, and have also learned to observe more carefully what colors may be seen in the various objects around them.

Other exercises for associating the names of colors with those seen in articles of clothing, and for leading

children to a more accurate observation, may be given in the following manner:

All the children that have a *blue* color in any part of their dress may stand. Mary, what part of your dress is blue? "My sack."

Cassie, what have you that is blue? "The ribbon on my head."

Ella, what have you that is blue? "My dress."

Thus each child may be called upon to point out and tell the name of the part of dress in which the given color may be seen.

Proceeding in the same way with the other colors, the teacher says:

All the children that have *red* in any part of their dress may stand. Then let each child mention the name of the part, and point out the color, in turn, as before.

Continue this exercise with each of the principal colors.

Subsequently the teacher may mention the names of objects, and the children tell their colors, as, Cherries—"Red." Apples—"Red; green; yellow."

You do not agree as to the color of apples; which is correct? "Some apples are red, some are green, and some are yellow."

Very good; all of you were right. What is the color of leaves in the summer? "Green." Of strawberries? "Red." Of currants? "Red, when ripe." Of plums? "Red; blue; yellow; green."

Yes; some plums are red, some are blue, some green, etc. What is the color of a lemon? of an orange? of a rose? of a violet?

THIRD STEP.—GROUPING NAMES OF OBJECTS BY COLOR.

For a class that can read well in a First Reader, the teacher may give exercises in grouping the names of objects by their colors, thus leading them to observe the colors of objects more carefully.

Let the teacher write on the blackboard the names of some of the principal colors, thus:

Red. *Yellow.* *Blue.* *White.*

Then the teacher may request the pupils to name objects that are red, and, as each pupil mentions a name, the teacher may write it under the word red. When several red objects have been mentioned, the names of those that are yellow may be given and written in a like manner. Then those that are blue, and so on.

The lesson on each group of colors should be repeated three or four times, to lead the children to extend their observations, and become able to give longer lists of objects having the colors than they could think of on the first presentation of the lesson.

These exercises may be continued with similar groups of other colors, until the children can readily group the names of objects representing eight or ten colors.

When the pupils are able to write readily on their slates, this exercise might be varied by requiring them to write a list of names of red objects, green objects, blue objects, etc., and then ascertain which pupil can write the longest list of each color.

EXERCISES WITH
COLOR AND FORM, COMBINED.

When the pupils have become somewhat familiar with the common colors introduced in the preceding lessons, exercises may be arranged which will furnish an interesting variety for the children by combining colors with *plane forms*.

Let ten more pieces of pasteboard or thick paper be procured than there are pupils in the class. Each piece may be about four inches wide and six inches long. Also procure colored papers which are good representatives of the six colors — red, yellow, blue, orange, green, purple.

If the class contains thirty pupils, cut each of the following forms from *four* of the colors represented by the papers. If the class contains forty pupils, cut each form from *five* colors. If there are fifty pupils, cut each form from *six* of the colors; and so on. This will allow a card with each form for the teacher.

Triangle.	Square.	Oblong.
Rhomb.	Rhomboid.	Circle.
Semicircle.	Crescent.	Oval.
Ring.		

For a class of thirty pupils, the triangle, oblong, rhomb, circle, and crescent may each be cut from the *red*, *yellow*, *green*, and *purple*.

The square, rhomboid, semicircle, and ring may each be cut from the *orange*, *blue*, *red*, and *green*.

Let each of these forms cut from the colored papers — the sizes of which should correspond to the forms in the box or those on the Chart — be neatly pasted in the centre of the pieces of pasteboard or thick paper.

The lessons on *form* and *color* may be conducted with these cards somewhat as follows:

Distribute the cards so that each child shall hold one. The teacher should select beforehand one card for each form. As the card containing the *square* is held before the class, all the pupils that have a card containing the same *shape* may stand up. Each pupil standing may then be called upon to tell what shape is on its card, and also the color of it. In this instance the shape on each card of those pupils who stand up should be a square, but there will be four different colors represented by these squares in a class of forty.

Next the teacher may hold before the class another form, as the *crescent*, and request all the pupils that have that *shape* on their cards to stand up. Then each pupil may tell what shape is on its card, and the color of it, as before.

After each form has been thus called for, the teacher may request all the pupils that have a color like the one shown by the teacher to stand up. Then each pupil may be called upon to tell the name of the color, and the name of the *form* on its card.

When sufficiently advanced in the lessons on form, the pupils may *describe* the form, thus: "The shape on my card is a square; it has four equal sides, and four square corners. Its color is—"

"The shape on my card is a circle; it has one evenly curved edge. Its color is—"

"The shape on my card is a rhomboid; it has two equal long sides, two equal short sides, and two sharp corners, and two blunt corners. Its color is—"

A variety of questions may be given, and the interest of the children kept wide awake when this exercise is properly conducted.

In one of the largest public schools in New York City the teachers arranged these forms and colors on pieces of white glazed muslin, and fastened the muslin to sticks like little flags. These are passed by the pupils from one to the other, and the lessons conducted somewhat like the manner described above. In this school the children use the flags for the form and color lessons in the classes that are just learning to read short sentences from the blackboard, as well as with pupils that are reading in the First Reader.

LESSONS TO DEVELOP THE IDEA OF STANDARD COLORS.

FIRST STEP.—RED, YELLOW, AND BLUE.

We have been talking about various colors, and about objects in which these colors may be seen. You have learned that some colors are dark, also that some are light; now we will try to learn which are the best colors.

Red.—You will observe that some of the *reds* on the Chart appear to be more red than others. Now Fanny may point to the reddest red on the Chart, and if you think she points to the right color, you may say Right; if you think she does not point to the reddest one, you may say Wrong. "Right."

Jennie may now point to the color which she thinks is reddest. "Right."

Let us see what the name of the color is to which Jennie pointed. It is *carmine*. This is correct; we will call a bright *carmine* the reddest of the reds, and take this for our *standard red*.

If you will look at the Frontispiece of this book you will find a good *carmine* red. This color should be like the pure red of the rainbow.

The pupils may now be called upon to select the standard red from the colors on the table.

Yellow.—When you look at the yellows on this Chart, you can see that they do not all appear alike. Who will point to the yellowest yellow?

Henry may do it. "Wrong." William may try it. "Right." James may now point to the yellowest color. "Right."

You may look at this color carefully; we will take it for our *standard yellow*. You can see this color on the Frontispiece of this book.

The children may now be requested to select the standard yellow from the colors on the table.

Blue.—On the Chart of Colors you will notice that some of the blues are light, and some are *very blue*. Now Cora may point to the bluest blue. "Right."

Lizzie may show us which she thinks is the bluest of the blues. "Right."

The name of this blue is *ultramarine*. It is a rich pure blue, and we will choose it for the *standard blue*. This color resembles the bright blue of the rainbow.

The children may now be requested to select the standard blue from the colors on the table.

The pupils may also be requested to select the three standard colors, and place them in one group on the table. This may be called the first group of standard colors.

SECOND STEP.—ORANGE, GREEN, AND PURPLE.

You may tell me how many standard colors we have selected. "Three."

What are their names? "Red, yellow, blue."

Who will point them out on the Chart of Colors? Anna may do it.

"Right; right; right."

Well done; now we will select more standard colors.

Orange.—When you look at the orange colors on the Chart, you observe that some of them do not have the same color as the orange. Carrie may point to a color which she thinks is like that of the orange. "Right."

We will take the color of the ripe orange for our *standard orange* color.

Green.—When you look at grass, or green leaves, and the colors on the Chart, you will notice that some greens are brighter than others. Let us choose the brightest color of green grass in early summer for our *standard green*. Who will point to a color which resembles it on the Chart? Fanny may show us that color.

"Right."

Let pupils be called upon to select the *standard green* from the colors on the table.

Purple.—You may look at the colors on the Chart, and select the best purple. Jane may show us which purple she selected. "Right."

Alice may show us which purple she selected. "Wrong; right."

Now let us examine these colors, and see if Alice is correct. She pointed to the royal purple, which is a very dark, rich purple. This purple is too dark for the purple seen in the rainbow, so we will choose the lighter purple which Jane selected for our *standard purple*.

The pupils may now be requested to select colors like the standard purple, after the teacher shows it on the Chart.

They may also be requested to select the last three standard colors and place them in a group on the table. This may be called the second group of standard colors.

How many standards of colors have we selected in all?

"Six."

What are their names?

"Red, yellow, blue, orange, green, purple."

Which did we select first?

"The standard red."

Which did we select at the first lesson?

"The red, yellow, and blue."

You may call these the *first colors*, because they are the three standards which we selected at the *first lesson*.

What was the color selected first at the second lesson?

"Orange."

How many colors did we select for standards at the second lesson?

"Three."

What are their names?

"Orange, green, and purple."

These were the standard colors selected at the second lesson, so we will call them the *second colors*.

Which do we call the second colors?

"Orange, green, and purple."

Which do we call the first colors?

"Red, yellow, and blue."

THIRD STEP.—WHITE AND BLACK.

White.—You may tell me what you call the lightest color that you ever saw.

"White."

What is the whitest object that you ever saw?

"Snow."

Very good; snow is the purest white that is known. This we call our *standard white*.

Sometimes we call sunlight white, but it is a golden white.

You may mention the names of objects that are white.

Black.—You told me the name of the lightest color that you ever saw, now you may tell me the name of the darkest color that you know.

"Black."

What have you seen that is black?

"Horses, cats, dogs, birds, coal, cloth, silk, ribbon."

These two colors, *white* and *black*, are the boundaries of all the other colors. I will try to explain what I mean by this on the blackboard. Here I will write the word *white* at one end of the blackboard, and I will write the word *black* at the other end. Next to the white I will write *yellow*, the lightest of the standard colors, and next to that *orange*, and next to that *red*. Now I will write *blue* next to black, then *purple* next to blue, then *green*.

You observe that all these colors come between white and black. Can you mention any color that is lighter than white? Can you mention any color that is darker than black? Then these two show how far colors extend each way.

Now I will write the name of the lightest color at the top of the blackboard. What is it?

"White."

I have written the word white; what shall I write next below it?

"Yellow."

And next below that?

"Orange."

And next below that?

"Red."

And next below red?

"Green."

And next below green?

"Purple."

And next below purple?

"Blue."

And next below blue?

"Black."

And next below black?

"There is no darker color."

Very good. Now you see that *black is at the bottom*, and *white is at the top* of the column of colors. Thus you see that all colors belong between these two extremes—white and black.

LESSONS TO DEVELOP THE IDEA OF

SHADES AND TINTS OF COLORS.

FIRST STEP.—SHADES.

You have already learned that some colors are light and some are dark; I am now going to tell you what we call those colors that are made dark by mixing some darker color, or a black, with them.

Where the sun shines it is very light; but if you go under a tree, or by the side of a house so that the sun can not shine upon you, you are in the— "Shade."

Right. Now tell me whether the shade is as light as sunlight.

Then a shade is where the light is not so bright. So when we mix a dark color with a light one, so as to make that light color darker than it was before, we say it is a *shade* of that color.

If I take red and mix black with it, so as to make a dark red of it, then it may be called a *shade* of red.

Suppose I should mix black with green, what would it produce?

"A shade of green."

If I should mix black with blue, what would it produce?

So if I should mix blue, which is a very dark color, with red, it would produce a *crimson*, which is a shade of red.

How may we produce shades of colors?

"By mixing black or dark colors with light ones."

SECOND STEP.—TINTS OF COLORS.

In the last lesson we were talking about— What?

"Shades of colors."

Now we will talk about making colors lighter. If I take yellow and mix white with it, what effect will it have on the yellow?

"Make it lighter."

If I take red and mix white with it, what effect will it have on the red?

"Make it lighter."

If I mix white with green, what will be produced?

"A light green."

When we mix white with any color so as to make it appear very light, we call it a *tint* of the color. If white be mixed with blue so as to make it look very light, we call it a *tint of blue.*

Suppose you should mix white with purple so as to make it very light, what would we call it?

"A tint of purple."

Now you may come to the Chart, one at a time, and point to a tint of some color, and tell what color it is a tint of.

You may select tints from the colors on the table.

You may point to shades of colors on the Chart.

Now you may select shades from the colors on the table.

LESSONS TO DEVELOP THE IDEA OF
HUES OF COLORS.

Sometimes we find a color which appears as if another color had been mixed with it. If you will look at *vermilion* on the Chart of Colors, you will see that it has more of a yellowish appearance than the other reds; so we might say it is a *yellowish hue of red.*

Hue.—When you can see that some other color has been mixed with the one you are looking at, so that it appears reddish, yellowish, bluish, or greenish, it may be called a *hue.*

Now look on the Chart of Colors, and see if you can find a yellowish hue of green. Who will point it out?

Who can point out a hue of orange?

Who will show us a hue of brown?

Emma may select a hue of blue from the colors on the table.

Carrie may select a hue of red.

LESSONS TO DEVELOP THE IDEA OF

CLASSES OF COLORS.

You have had several lessons on color; now I wish to see who can tell me the names of the groups or kinds of colors that you have learned. As you mention their names, I will write them on the blackboard.

Red. *Yellow.* *Blue.* *Orange.*
Green. *Purple.* *White.* *Black.*

How many kinds or groups of color have you named?

"Eight."

I will write three of these names on another part of the blackboard, and leave room to write other words under each, thus:

Red. *Yellow.* *Blue.*

Grouping Colors in Classes.—You may now tell me the names of all the colors that you can remember for each group, commencing with red.

Red.	*Yellow.*	*Blue.*
Pink.	Sulphur.	Ultramarine.
Rose.	Saffron.	Indigo.
Crimson.	Canary.	Mazarine.
Scarlet.	Lemon.	Prussian blue.
Carmine.	Straw.	Cobalt blue.
Cherry.	Citrine.	Turquois.
Vermilion.	Ochre.	Azure.
Magenta.	Golden.	Light blue.
Garnet.	Primrose.	French blue.

SUGGESTIONS FOR THE TEACHER.

Probably the first time this exercise is given the children will be able to mention only a few of the names presented above in each group of colors; but by requesting the pupils to try to find more names for each of these classes, by inquiring of their parents, or older brothers and sisters, in two or three days they will be able to add many more to their first lists. The teacher should also lead the pupils to perceive how the colors in each class differ from each other in the same group. A reference to "Facts about Color" will aid in this work.

A similar plan should be pursued in grouping the names of other colors in classes. And in each case give the children an opportunity to observe the colors and learn more names, and then teach them how the colors of the same group differ from each other.

Teaching the pupils to distinguish the differences in colors of the same class should not be undertaken until they have advanced so far as to read in a Second Reader, and are familiar with all the lessons preceding these on "Classes of Colors."

These distinctions of colors will require several lessons, each illustrated with the colors described.

Grouping Colors in Classes.—To-day we will take a new lesson in grouping the names of colors. You may mention the names of all the colors that you can think of, while I write them on the blackboard. When you have given me the names of all that you can think of to-day for each group, we will leave the lesson, that you may learn the names of more colors to give me to-morrow.

Orange.	*Green.*	*Purple.*
Amber.	Grass-green.	Violet.
Salmon.	Emerald.	Mauve.
Buff.	Pea-green.	Lilac.
Cream.	Olive.	Lavender.
Oak.	Tea-green.	Amaranth.

BROWNS AND GRAYS.

In our lessons on grouping colors you have mentioned the names of some that we could not place in either of the classes already given. I will try to teach you something about two other classes—*browns* and *grays*—so that you can group the other common names.

Browns.—Brown is a reddish color, but it usually has some other hue. Brown colors are produced by mixing red, yellow, and black. All colors, then, that appear to be composed of these three—red, yellow, and black—you may group with the class called browns.

Grays.—Gray is a color produced by mixing white and black. But this color is frequently modified by red, or blue, or yellow, so that the gray may have a reddish hue, or a bluish hue, or a yellowish hue.

Now you may try to give me names of colors to group in these two classes, and I will write them on the blackboard.

Browns.	*Grays.*
Dark brown.	Light gray.
Light brown.	Dark gray.
Chestnut.	Steel-gray.
Chocolate.	Iron-gray.
Auburn.	French gray.
Russet.	Slate.
Hazel.	Pearl-gray.
Snuff.	
Claret.	

LESSONS TO DEVELOP IDEAS OF
PRIMARY AND SECONDARY COLORS.

FIRST STEP.—MIXING RED, YELLOW, AND BLUE.

Who can tell me the names of the first group of standard colors which we selected?

Sidney may answer. "Red, yellow, and blue."

Very well. What did we call the first three standard colors that we selected?

"*First colors.*"

I am now going to take these *first colors* and show you something more wonderful than any thing you have seen in colors.

Mixing Red and Yellow.—I have here two colored crayons; what is the color of this? "Red."

What is the color of this? "Yellow."

I have also some red and yellow paints. I will place some of the red paint on this white paper, and then mix yellow paint with it. Now look at it, and tell me what the color is like.

"It is like the color of an orange."

Then what may we call it?

"An orange color."

What two colors did I mix together to produce the orange color?

"Red and yellow."

I will now make a broad red mark on the blackboard with the red crayon, and then make a broad yellow mark across one end of it, as you may see in Figure 1 of the

Frontispiece. When I rub these colors so as to mix them, what color do they form?

"An orange."

When I wish to make an orange color, what two colors must I mix together?

"A red and a yellow."

I hold a red color in my hand; what other color must I take that the two colors held will represent those that will produce an orange?

"A yellow."

What color must I mix with yellow to produce orange?

SUGGESTIONS FOR THE TEACHER.

It would be well, when the size of the class will permit it, to call upon individual pupils to select colors to represent those that will produce orange; also to request pupils to take the colored crayons and represent the mixing of these colors on the blackboard. What children learn to *do* they remember longer than what they learn to *repeat*.

The same practice should be introduced in teaching each of the secondary colors—orange, green, and purple.

Mixing Yellow and Blue.—I now have yellow and blue paints, and yellow and blue crayons, and I will show you how we can produce another beautiful color by mixing two of these. First I will place a little *yellow paint* on this paper, and then mix a little *blue* with it. Please to observe carefully what I do, so that you can tell me when I am through. What color have I produced?

"A green."

What colors did I mix together?

"Yellow and blue."

I will now make a broad yellow mark on the blackboard with this crayon, and a broad blue mark across the end of it, like Fig. 2 on the Plate of Colors, and then rub the yellow and blue colors together. What color does it produce?

"A green."

Which of the colors that I mixed together does the green look like?

"It does not look like either."

What two colors will produce a green?

I hold a yellow color in my hand; what other color must I take that the two may represent those which will produce green?

What color mixed with blue will produce green?

I hold a green; who will select the two colors that would produce it?

Let pupils come and select the two colors which produce green, and hold them in one hand, and select a green to hold in the other hand.

Now let me see if you have them right. John has red in his hand with the yellow. Is that right? "No."

What color would he have, should he mix these? "Orange." Try it again, John.

Mary, let me see yours. You have yellow and green in one hand, and blue in the other. Ella, you may show her how to hold them. Now all have the right colors, I believe.

What two colors have you in your left hand? "Blue and yellow."

What color have you in your right hand? "Green."

If you mix blue and yellow paint, what color will you have? "Green."

Mixing Red and Blue.—Now I have red and blue paints, and red and blue crayons. By mixing these we may produce another color. I will show it to you. Here is a little *red paint* on this white paper, and I will mix a little *blue paint* with it. Do you know any name for this beautiful color?

"It is a purple."

Very good. What two colors did I mix to produce the purple?

"A red and a blue."

Now I will see if we can make a purple with the colored crayons on the blackboard. What is the color of this mark?

"Red."

I will now draw a broad blue mark across it, as in Fig. 3 on the Plate of Colors, and rub the red and blue colors together. What have I produced?

"A dark reddish color, like a purple."

What colors must I take to make a purple?

"Red and blue."

What color must I mix with blue to make a purple?

What color must you mix with red to make a purple?

I promised to show you something wonderful with the *first colors*. Who can tell me what I did with them?

"You mixed them together, and made other colors with them."

Very good. When you saw these colors made by mixing the first colors, which one of the colors that I produced seemed most wonderful to you?

"The green."

I suppose this was because the green is so unlike both of the colors that we mix to produce it.

SECOND STEP.—PRIMARY AND SECONDARY COLORS.

Let us now talk about the colors that we mixed to make other colors. Who can tell me what colors we mixed together?

"Red and yellow; yellow and blue; blue and red."

How many colors did we produce by mixing the red, yellow, and blue?

"Three colors."

What are their names?

"Orange, green, and purple."

How many and which *first colors* did we use to make the orange?

"Two; the red and the yellow."

How many and which *first colors* did we use to make the green?

"Two; the yellow and the blue."

How many and which *first colors* did we use to make the purple?

"Two; the red and the blue."

Primary Colors.—What name did we give to the standard red, yellow, and blue?

"First colors."

Now I will give you a new name for this group of colors; we will call them *primary colors*. Primary means first, or simple. These first colors are simple colors; they can not be produced by mixing any other colors together.

What may we call these first colors?

"Primary colors."

Which colors do we call simple or primary?

"The red, yellow, and blue."

Why do we say these are simple colors?

"Because they can not be made by mixing other colors."

And we might also say, because each of these simple colors does not contain any other color. They are pure colors.

Secondary Colors.—Who can tell me what we called the second group of standard colors that we selected?

"Second colors."

Very good. Can you tell their names?

"Orange, green, and purple."

Right. What were the names of the colors that we produced by mixing the *primary colors?*

"Orange, green, and purple."

Are these names like those of either group of the standard colors?

"Yes; they are like the group of second colors."

I will give you a new name for the three colors that may be produced by mixing the *primary colors;* we did call them *second colors*, but now we will call them *secondary colors.* This means the second colors, or those *colors that may be produced by mixing together two primary colors.*

Which are the *secondary colors?*

"Orange, green, and purple."

What two primary colors will produce the secondary orange?

"Red and yellow."

What primary colors will produce the secondary green?

"Yellow and blue."

What primary colors will produce the secondary purple?

"Red and blue."

I will write the word *orange* on the blackboard, and then one of the class may take the two crayons that will produce an orange, and make a mark with each color under this word.

What are the colors of these marks?

"Red and yellow."

Now I will write the word *green*, and one of you may make marks under it to show what two colors will produce a green.

What colors do you see in these marks?

"Yellow and blue."

Now another pupil may make marks under the word *purple*, to show what colors will produce it.

What marks have been made under purple?

"Red and blue marks."

How many primary colors are there?

How many secondary colors did we make with the primary ones?

LESSONS FOR BOYS ON

COLORS OF ANIMALS.

First Lesson.—I suppose you have noticed that horses and cattle differ very much in color. Who can tell me the names of some of the colors of these animals?

"Bay; black; gray; white; sorrel; brown."

Which of the colors on the Chart does the *bay* most resemble?

Which color does the *sorrel* resemble?

I will write descriptions of these two colors on the blackboard, and to-morrow you may tell me how many bay horses and how many sorrel horses you have seen.

A bay horse has a reddish-brown body, and black legs, mane, and tail.

A sorrel horse has a yellowish-brown body and legs, and usually with a mane and tail of the same color.

Who can describe a bay horse? John may tell us how we may know when to call a horse *bay*.

"A bay horse has a reddish-brown body, and black legs, mane, and tail."

Who will describe a sorrel horse? Abram may tell us how we can know a sorrel horse from a bay one.

"A sorrel horse has a yellowish-brown body and legs, and a yellowish-brown mane and tail."

Very good. To-morrow you may tell me how many horses you have seen of each color.

Second Lesson.—Yesterday we were talking about the color of horses, and you were to notice the color of the horses that you saw, and tell me how many you have seen of each color. What were the names of the colors that you were to notice and count? "Bay and sorrel."

I will now write these words on the blackboard, thus:

Bay horses. *Sorrel horses.*

Now as each of you in order, commencing with the first boy, tell me how many *bay horses* you have seen, I will place the number under the words "bay horses." If any of you have not seen a bay horse, I will make a naught under these words.

The teacher may now proceed to place figures under the words "bay horses," as each boy gives the number that he has seen, thus:

Bay horses.
2
1
3
0
5
4
1
6
0
3

When the teacher has asked each boy in the class how many bay horses he saw, the same plan may be pursued to ascertain how many *sorrel horses* each saw.

Suitable remarks should be made to stimulate those who saw no horses to use their eyes better next time, and to commend those who appear to take notice of what they see.

The teacher may call upon individual pupils to describe one of the bay horses that he saw; also to tell where he saw it. The same may be done with those who saw sorrel horses.

To prepare for another lesson, the teacher may inquire whether any of the pupils saw horses of any other color. Those who did may describe the color, or tell the name of it. The pupils may mention the names *gray horse*, *brown horse*, *chestnut horse*.

The teacher may write a description of each of these

colors on the blackboard, and request the boys to learn them.

A brown horse has a dark brown body, and black legs, mane, and tail.

A chestnut horse has a dark brown body and legs, and a brown mane and tail.

A gray horse has brown hairs mixed with white ones, but with many more white than brown hairs.

The teacher may request the boys to notice horses, and tell how many each saw, as before, for a third exercise.

A similar plan may be pursued with all the colors common among animals.

NUMBER.

When a child has learned to distinguish objects by *Form* and *Color*, it soon perceives two or more objects alike, and thus gains its first idea of *more than one*. This is its starting-point in *Number*. It obtains this first notion of number at an early age, and, until it learns to count, its ideas appear to be limited to *one* and *more*. These ideas are enlarged by means of counting objects, and thus it takes its first step in a knowledge of *number*. Hence with counting objects should commence the child's training in the elements of arithmetic.

Veritable ideas of number, like those of *Form* and *Color*, belong to the facts that are chiefly acquired through the sense of sight. Early instruction in this subject must depend for success upon the actual presentation of objects. No description of numbers, or of arithmetic, nor the memorizing and repetition of rules, will ever teach a child true ideas of number, and lay a proper foundation for a practical knowledge of arithmetic.

A common error in the teaching of arithmetic consists in the abstract manner in which it is usually presented; and, owing to this, many pupils seldom think of finding illustrations of what they are taught in the daily transactions of life, or of making practical applications of what they learn in school to their experiences out of school.

How shall the lessons in *number* and *arithmetic* be-

come living representations of real transactions instead of mere abstract knowledge? How may these lessons in school be associated with the real affairs of life outside of the schoolroom? These are most important questions for the teacher to answer; and upon the manner in which these are answered in the practices of instruction will chiefly depend success in teaching.

To answer these questions properly, the teacher must go back of the usual course of instruction in arithmetic, and ascertain what is the true starting-point, and how children obtain their first ideas of number, and learn that they do not at first separate number from the things numbered; that, notwithstanding they may be able to count five fingers or eight apples, they can not reason about the numbers five and eight; that it is with *concrete numbers* that instruction should commence.

The following lessons are intended to suggest appropriate methods for an objective course of training, as a preparation for commencing the study of the science of number at the point where the subject is usually taken up in text-books on arithmetic.

Some teachers may say, "I have no time for this objective teaching." Then some of the other subjects, usually known as "higher branches," had better be omitted, for it is of vastly greater importance that the first steps be properly taken than that attempts be made to teach the abstract studies in which many pupils spend so much time unprofitably.

You can teach arithmetic thoroughly without this objective training? Ah, yes; I perceive that *your standard* of what constitutes a knowledge of arithmetic is to be able to *repeat* what the text-books *say* about it. Would you say that a farmer, a carpenter, a hatter, a

tailor, an engraver, or a watchmaker understands his business thoroughly because he can repeat what the books say about his occupation or trade, regardless of his ability and skill in performing the actual work pertaining to it?

What is your standard of a true knowledge of arithmetic?

What do you try to teach your pupils concerning it?

Why do you teach them this subject?

How do you commence your instruction in numbers?

A thoughtful consideration of these questions may lead to more natural methods of teaching arithmetic.

I

LESSONS TO DEVELOP THE

FIRST IDEAS OF NUMBER.

BEFORE commencing the first lessons in *Number*, the teacher should procure a variety of objects to be counted, as pencils, cents, buttons, beans, pebbles, nuts, marbles, books, apples; also a numeral frame.

FIRST STEP.—COUNTING.

First Group of Numbers, 1 to 9.—The teacher may place several objects of the same kind, as cents, buttons, pencils, or pebbles, on a table before a class, and arrange them in rows, thus:

*

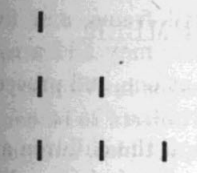
* *

* * *

The teacher may then commence counting, saying *one*, and at the same time pointing at the first object. Then beginning with the second row, pointing at the two in order, saying *one, two.* Next pointing at the row of three, saying *one, two, three.*

Now the teacher may commence as before, and proceed to point at each object in the order of their groups, and let the children count with the teacher, thus: "*One;*" "one, two;" "one, two, three."

When the children can count objects as far as three, let marks be made on the blackboard in similar groups, thus,



and the children requested to count them in the same manner as they counted the objects on the table.

When the children have learned to count *three* readily, the teacher may place under the other objects a row with *four*, and, commencing at the first, let the children count, as before, "One;" "one, two;" "one, two, three;" "one, two, three, four."

When the children can readily count *four* objects, and four marks on the blackboard, and four balls on the numeral frame, the teacher may add a group of five, so that the several groups or rows will appear thus:

*

* *

* * *

* * * *

* * * * *

The teacher should now commence counting at one

again, as before, and let the children count each line, thus: "One;" "one, two;" "one, two, three;" "one, two, three, four;" "one, two, three, four, five."

When the children can readily count five objects on the table, five balls on the numeral frame, and five marks on the blackboard, the teacher may add a row with *six objects*, and then commence at one, and proceed as before.

The same plan may be pursued until the children are able to count groups of objects from one to nine readily and correctly. Let the teacher ask the children, How many cents* in the first row? "One cent."

How many pencils in the second row? "Two pencils."

How many buttons in the third row? "Three buttons."

How many cents in the fourth row?

How many buttons in the fifth row? "Five buttons."

Thus the children may be led to read the objects or marks in groups, as "Three cents;" "four pencils;" "five buttons," etc.

At this stage it would be profitable to call upon individual pupils to count a given number of balls on the numeral frame, or objects on the table, or marks on the blackboard. Let one stand and count five balls, then sit down; another stand and count eight marks; another, four pencils; another, nine balls; another, seven marks; another, three balls, etc.

The children may be requested to count and hold up *three fingers;* then *five fingers;* then *eight fingers*, etc.

* The teacher will, of course, ask the question so as to correspond with the objects used for counting.

Ask the children, How many eyes have you? How many ears? How many feet? How many toes on one foot? How many hands? How many fingers and thumbs? How many wheels has a cart? How many has a wagon? How many wheels has a car? Thus lead pupils to count a great variety of objects.

Value of Numbers.—To lead the pupils to observe the value of numbers, ask them, What number is greater than eight? What number is less than seven?

Now you may tell me a number that is less than nine; one that is less than four; one less than eight; one less than six, etc.

Tell me all the numbers you know that are less than four; all that you know that are less than six; all less than three; all less than eight, etc.

Now tell me the numbers that you know which are more than seven; those which are more than five; those more than six; those more than four, etc.

Which is the largest number, three, six, or five? Which the largest, eight, four, or seven? six, nine, or five? two, five, or seven?

Which is the smallest number, four, one, or three? two, six, or five? eight, seven, or nine? six, four, or three?

Which is the smallest number that you know? which the largest?

Here are four cents in this pile, and six cents in this; which pile contains the greater number of cents? I have placed eight beans in one place, and eight cents in another; which contains the larger number?

The teacher will readily perceive how these exercises can be extended in an almost unlimited variety, and she

will vary them according to the attainments and progress of her pupils.

SECOND STEP.—COUNTING.

Second Group of Numbers, 10 to 19.—When the pupils have learned to count objects readily to *nine*, the teacher may proceed to teach them the numbers in order from *nine* to *nineteen*.

Plans similar to those for teaching the children to count from *one* to *nine* may be used, but the numeral frame and marks on the blackboard will be found more convenient for large classes than objects on the table.

When the pupils have learned to count objects, balls, marks, etc., readily as far as *nineteen*, a new mode of grouping may be introduced for numbers from twenty to ninety-nine inclusive, as in the next step.

THIRD STEP.—COUNTING.

Third Group of Numbers.—The teacher may now show the children how to count from *twenty* to *twenty-nine* by the balls on the numeral frame, by marks on the blackboard, and by other objects.

When they can readily count these numbers, teach them to count from *thirty* to *thirty-nine* in the same way; also to compare the numbers from thirty to thirty-nine with those from twenty to twenty-nine, and thus teach a new mode of grouping, as follows, viz.:

Twenty, twenty-*one*, twenty-*two*, twenty-*three*, twenty-*four*, twenty-*five*, etc.

Thirty, thirty-*one*, thirty-*two*, thirty-*three*, thirty-*four*, thirty-*five*, etc.

In the same way teach counting from forty to forty-nine; from fifty to fifty-nine; and so on through ninety to ninety-nine.

Order of Numbers.—Care should be taken to teach the *order of numbers*, so that the children can tell what number comes before, and what after, any given number. To accomplish this thoroughly, after the pupils have learned to count in order, ask them, What comes after six? What comes after twelve? What comes before seventeen? What comes after forty-eight? What comes after seventy-nine? What comes before thirty? etc.

LESSONS TO DEVELOP THE
FIRST IDEAS OF FIGURES.

When the children have learned to count readily from one to nine inclusive, they may be taught the *figures* from 0 to 9 as symbols of numbers, or signs of the number of things counted. While the pupils are learning this group of figures, they may be taught counting from *ten* to *nineteen*, and review from *one* to *nineteen*.

FIRST STEP.—FIGURES AS SYMBOLS.

First Group of Figures, 0 to 9.—The teacher may take a numeral frame, and, before moving the balls, ask, How many balls have I moved? How many fingers do I hold up? How many marks have I made on the blackboard? Continue similar questions until the pupils answer readily, "No balls;" "No fingers;" "No marks."

The teacher may then say, I will now make a figure on the blackboard that stands for nothing. It shows that there are no marks on the board—that you have not counted any balls or fingers. The name of this figure is *naught*. What is its name? "Naught."

How many balls does it stand for? "Not any balls."

How many fingers does it stand for? "Not any fingers."

Moving *one* ball on the numeral frame, the teacher says, How many balls have I moved? "One ball."

How many fingers do I hold up? "One finger."

You may now hold up *one* finger. I will make a

mark on the blackboard. How many marks did I make? "One mark." How many books am I holding up? "One book."

I will make a figure on the blackboard that stands for *one*. It shows that *one* ball has been moved, *one* finger held up, *one* mark made on the blackboard; it stands for *one* of any thing. It is called *figure one*. What do we call this figure? "Figure one."

How many balls does it stand for? "One ball."

How many apples would it stand for? "One apple."

Now look at the numeral frame again, and tell me how many balls I move? "Two balls."

How many fingers do I hold up? "Two fingers."

You may hold up two fingers. I will make more marks on the blackboard. How many marks did I make this time? "Two marks."

How many books am I holding up? "Two books."

I will now make a figure that stands for *two*. It shows *two* balls moved; *two* fingers held up; *two* marks; *two* books, etc. This is called *figure two*. What is this called? "Figure two."

How many balls does it stand for? "Two balls."

How many boys would it stand for? "Two boys."

Now look at these figures; we have one that stands for *no* balls, one that stands for *one* ball, and one that stands for *two* balls. Who will come and point to the figure that stands for no balls? Lucy may come and point to it. Maggie may point to the figure that stands for *one* ball. Ellen may point to the figure that stands for *two* balls.

To-morrow we will have another lesson with figures.

Who can tell me the names of the figures which you

learned yesterday? "Naught;" "Figure one;" "Figure two."

Very good; I will write them on the blackboard as before:

0 1 2

Now you may count balls on the numeral frame as I move them. "One."

Now count the balls that I move on the next wire. "One, two."

Now count the balls as I move them on the next wire. "One, two, three."

How many balls did I move on the last wire? "Three balls."

How many fingers am I holding up? "Three fingers."

You may hold up three fingers. I will make marks on the blackboard; how many marks have I made? "Three marks."

I will make a *figure three* to stand for *three* balls, three marks, etc. What is this figure called? "Figure three."

How many balls does it stand for? "Three balls."

Now look at these figures, and read them as I point. "Figure naught; figure one; figure two; figure three."

See, this is the way you count—*one, two, three.* Each figure tells how many you have counted.

You may look at the balls again. How many balls did I move on the first wire? "One ball."

How many balls were moved on the second wire? "Two balls."

How many balls did I move on the third wire? "Three balls."

Now count—"One, two, three, four." How many balls did I move on the last wire? "Four balls."

See how many marks I make. "Four marks."

I will now make the *figure four.* How many balls does this stand for? "Four balls."

Now count the balls on the next wire as I move them. "One, two, three, four, five."

How many balls did I move? "Five balls."

I will now make the *figure five.* How many fingers does this figure stand for? "Five fingers."

Now look at the blackboard, and see how I have made the marks and figures:

	I	II	III	IIII	IIIII
0	1	2	3	4	5

You may read these marks, and the figures that stand for them, as I point.

"No mark, figure naught; one mark, figure one; two marks, figure two; three marks, figure three; four marks, figure four; five marks, figure five."

I will make these figures that you have learned, and you may tell me their names. "Figure one." "Figure three." "Figure five." "Figure two." "Figure four."

Now, as I point to these figures, you may hold up as many fingers as each one stands for.

At subsequent lessons, let these exercises of counting and representing the number counted by figures be continued as before, until all the figures from 0 to 9 have become so thoroughly learned that the pupils can call each by name, tell how many it represents, and can readily point out each one in any order.

To give individual drill, call upon pupils to take the numeral frame, and move and count as many balls as a

given figure represents, thus: Point at the figure 5, and let a pupil hold the numeral frame, and, moving the balls, count "One, two, three, four, five." Proceed in the same manner with all the figures, thus giving a variety of exercises for learning the value of figures.

Care should be taken to train the pupils thoroughly with the figures from 0 to 9 before presenting any larger number. Time properly spent in this step will save double the time in subsequent steps.

SECOND STEP.—FIGURES AS SYMBOLS.

Second Group of Figures, 10 to 19.—Having become familiar with counting to *twenty*, and with figures to *nine*, the pupils are prepared to learn the second group of figures from 10 to 19.

Commence as in the first group, and let the pupils count "One, two, three, four, *five balls*" on one wire, and *six balls* on the next wire, and *seven balls* on the next, *eight balls* on the next, *nine balls* on the next.

Beginning with the new group, the pupils count "One, two, three, four, five, six, seven, eight, nine, *ten balls* on the wire next below the one with *nine balls*. The teacher represents this number on the blackboard thus: 10. Then *eleven balls* are counted in the same manner, and this number represented by figures, as before. Then *twelve balls* are counted, the figures representing them written, and so on to nineteen. During these exercises several other objects are counted also, and the figures representing each number from 10 to 19 are given as symbols of the number counted.

Now the teacher may arrange the figures on the blackboard in the following order, viz.:

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19

The attention of the pupils may now be called to the formation of the characters which represent numbers greater than *nine*. The pupils may be asked to tell the greatest number that can be represented by one figure; also what figures are used to represent *ten*, *eleven*, *twelve*, *thirteen*, etc. Thus lead them to observe that, to form the figures which represent the numbers from 10 to 19 inclusive, the figure 1 is written before each of the figures that stand for the numbers from 0 to 9.

Subsequently the pupils may be requested to read these figures as follows, viz.: "One ten and naught, *ten;* one ten and one, *eleven;* one ten and two, *twelve;* one ten and three, *thirteen;* one ten and four, *fourteen;* one ten and five, *fifteen*," etc.

The pupils should also be trained to read these numbers at sight, when pointed at in any order, after they have become familiar with them in the order of counting.

How can I write the figures for *ten?* "Make a figure *one*, and a *naught* on the right-hand side."

How shall I write *eleven?* "Make a figure *one*, and another figure *one* on the right-hand side of it."

How can I write *twelve?*

SUGGESTIONS FOR THE TEACHER.

A CAUTION.—During these elementary lessons on number and *figures*, do not attempt to explain the *local value* of figures, nor to teach the pupils to say *units*, *tens*, etc. This work belongs to a later period of development, and to attempt to do it at this stage would only result in a waste of time and an injury to the progress of the pupils. Do not attempt to teach more than one difficulty at a time.

All of these figures in both the *first and second groups* should be taught as signs of the number of balls or other objects counted. This ought to be so thoroughly done that 15 would represent to the child a whole number, or group of objects, just as completely as 5 does.

During the time of learning the second group of figures, the children should be taught counting to fifty.

THIRD STEP.—FIGURES AS SYMBOLS.

Third Group of Figures, 20 to 29.—When the pupils have become familiar with figures from 0 to 19 inclusive, as presented in the preceding pages, they are prepared to be taught figures representing numbers from twenty to twenty-nine.

The teacher may now proceed to require the pupils to count balls or other objects to twenty, and then write the figures representing this number on the blackboard, as in the second group.

When the pupils have counted and the teacher written the figures to represent all the numbers from 20 to 29, let the figures be arranged on the blackboard in the following order, viz.:

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29

The attention of the pupils should be called to the figures in each line, and led to observe that while the *second* line is formed by writing the figure 1 before each figure in the first line, that the *third* line is formed by writing the figure 2 before each figure in the first line.

The pupils may now be shown two groups of ten balls each on the numeral frame, also two groups of

marks on the blackboard with ten in each, and led to see that two groups of ten each make twenty balls or twenty marks. Three groups of ten may in a like manner be shown to make *thirty*. Let the pupils read the groups thus: "One ten, or ten balls;" "Two tens, or twenty balls;" "Three tens, or thirty balls."

Now point to the figure 10, and read it: "One ten, or ten ones;" to 20, and read, "Two tens, or twenty;" then to 30, and read, "Three tens, or thirty."

Ask the children, How many tens in ten ones? "One ten."

How many tens in twenty? "Two tens."

How many tens in thirty?

The children may be requested to read the figures in the second line as follows, viz.: "Two tens and naught are twenty; two tens and one are twenty-one; two tens and two are twenty-two; two tens and three are twenty-three; two tens and four are twenty-four," etc.

These figures should subsequently be written out of the order of counting, and the pupils trained to read each at sight; also to take the numeral frame, and count as many as any given figure stands for.

Group of Figures from 30 to 39.—The figures in this group should be taught and written in a manner similar to those from 20 to 29. When this has been done, the last two lines may be compared in a new way, as a means of teaching the succeeding groups of figures to 99 more readily, thus:

20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39

The teacher may now call attention to the resem-

blance between these two lines of figures by pointing, and reading with emphasis on the units, thus: Twenty, twenty-*one*, twenty-*two*, twenty-*three*, twenty-*four*, etc.; thirty, thirty-*one*, thirty-*two*, thirty-*three*, thirty-*four*, thirty-*five*, etc. Then adding, You see these figures have the same order in each line. Now we can write the figures from 40 to 49 in the same order, and 50 to 59 also.

At this point the teacher might be able to proceed with the figures without counting objects through all the groups to 99, and the pupils taught to read them by comparing the groups as in 20, 21, 22, etc., and 30, 31, 32, etc.

By this time the pupils will be prepared to learn all the figures from 40 to 99 in about half the time required for teaching them thoroughly from 0 to 39. But frequent reviews should be had to keep the children familiar with all the figures previously learned while teaching each new group.

By comparing the group from 20 to 29 with the one from 30 to 39 carefully, the pupils will learn how to read all subsequent groups more readily.

When the pupils can readily read the figures to 99, they may be subsequently drilled in counting as many objects as each figure represents.

Let the figures from 0 to 99 be placed on the blackboard and carefully reviewed in the following order, viz.:

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39

40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

Let the pupils read these figures in order, "Naught, one, two, three," etc., through to "ninety-nine."

Next let them read the *tens*, thus: "*One* ten, *two* tens, *three* tens, *four* tens," etc., to "*nine* tens."

Then they may read the *tens* as "One ten, or ten ones; two tens, or twenty; three tens, or thirty," etc., to "nine tens, or ninety."

The pupils may also read each line of tens as follows: "One ten and naught, ten; one ten and one, eleven; one ten and two, twelve; one ten and three, thirteen; one ten and four, fourteen," etc.

"Two tens and naught, twenty; two tens and one, twenty-one; two tens and two, twenty-two," etc.

"Three tens and naught, thirty; three tens and one, thirty-one; three tens and two, thirty-two," etc.

Proceed in the same manner through "Nine tens and nine are ninety-nine."

Subsequently the pupils may be asked to tell what figures must be used, and how, to represent each number, as, How can I represent seventy-five? "Make a seven, and a five on the right-hand side of it."

FOURTH STEP.—FIGURES.

The Group of Hundreds.—Having carefully taught the children figures, as symbols of numbers counted, through ninety-nine, the pupils are ready to learn to read three figures, or hundreds. The teacher may ask, What is the largest number that may be represented by *one* figure? "Nine."

What is the largest number that can be represented by two figures? "Ninety-nine."

I will now show you how we write a number that is one greater than ninety-nine—one hundred—thus: 100, with a figure one, and two naughts on the right-hand side of it.

The teacher may then proceed to place the tens from 10 to 90 on the blackboard, and to write the hundreds from 100 to 900 in another column, by the side of the tens, thus:

10	100
20	200
30	300
40	400
50	500
60	600
70	700
80	800
90	900

Now let the pupils read first the tens column, then the hundreds column, thus: "One ten, two tens, three tens, four tens, five tens, six tens, seven tens, eight tens, nine tens;" "one hundred, two hundred, three hundred, four hundred, five hundred, six hundred, seven hundred, eight hundred, nine hundred."

Lead the pupils to notice that it takes *two* figures to write each of the tens, and *three* figures to write each of the hundreds.

The class may next be shown, from the blackboard, the figures representing numbers from 100 to 199 in one group, and from 200 to 299 in another group, and so on, thus:

100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119
120	121	122	123	124	125	126	127	128	129
130	131	132	133	134	135	136	137	138	139

and so on to 199.

200	201	202	203	204	205	206	207	208	209
210	211	212	213	214	215	216	217	218	219
220	221	222	223	224	225	226	227	228	229
230	231	232, and so on to 299.							

300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319
320	321	322	323	324	325	326	327	328	329

etc.

When the children have become familiar with the figures of one group in the order of counting, they should be taught the same figures out of order. The same plan may be pursued for each group.

Children may be taught figures by means of counting, as described in the preceding lessons, so as to read any number readily, as a whole, from one through hundreds. To attempt, during this stage, to teach the pupils to analyze these numbers, and tell how they are composed of units, or to try to teach them the *units*, *tens*, and *hundreds*, would be little better than a waste of time. They might be taught to repeat words in any order, but they are not prepared to comprehend what is meant by "figures increase in a tenfold ratio from right to left." Remember that the *first steps are teaching figures as symbols of the number of objects counted, as signs for whole numbers or groups.*

LESSONS FOR TRAINING IN
ADDING.

FIRST STEP.—ADDING OBJECTS.

ADDING should be commenced with objects, as balls on the numeral frame, pebbles, beans, pencils, etc. Marks on the blackboard may be used after the children have become familiar with adding objects. Adding balls on the numeral frame should not be confounded with counting balls; the two processes differ, although the ability to count must be acquired before adding can be taught; it also aids in teaching adding.

First Exercises.—Commencing with the numeral frame, the teacher might proceed as follows, viz.: First moving one ball at a time, require the pupils to say, "One ball and one ball make two balls; two balls and one ball make three balls; three balls and one ball make four balls," etc. When the children can readily add thus as far as twenty, using balls, pencils, or other objects, let them be taught to add two balls, thus: "Two balls and two balls make four balls; four balls and two balls make six balls; six balls and two balls make eight balls;" and so on to ten balls and two balls.

At this stage much practice should be given the pupils in adding various kinds of objects, one and two at a time, as already described, until they can readily add *one* to any number below twenty, and *two* to any number below ten.

Second Exercises.—When the pupils have been thoroughly trained in the first series of exercises for adding, the teacher may proceed to teach them as before, to add *one* to numbers from twenty to fifty. Then to add *two* to numbers from ten to twenty.

These exercises, also the first series, should be thoroughly reviewed before taking up those of the third series.

Third Exercises.—During the third series of exercises the pupils may be taught to add *one* to numbers from fifty to one hundred; and *two* to numbers from twenty to fifty; and *three* to numbers below ten. The training should be sufficiently thorough to enable the pupils to add *one* or *two* to odd as well as to even numbers; also, that they may add them to any one of the numbers, out of its order as well as in order.

SECOND STEP.—ADDING.

First Exercises.—The pupils may now be trained in adding concrete numbers without having the objects before them. The teacher may ask, How many are one apple and one apple? "Two apples."

How many are two apples and one apple? "Three apples."

How many are three boys and one boy? "Four boys."

How many are four pencils and one pencil? "Five pencils."

In this manner teach pupils to exercise their conception of objects and numbers by adding one to numbers, in order and out of order, as far as fifty.

The pupils may then be trained in a similar manner to add *two* to numbers, in order and out of order, as far as twenty; and *three* as far as ten.

Second Exercises.—If the preceding exercises have been properly attended to, the pupils will now be prepared for adding *three* to numbers below fifty; and subsequently to add *four* and *five* to numbers below fifty. First let the balls on the numeral frame or other objects be used; then let them add concrete numbers, as in the first exercises of this step.

During these lessons in this step the teacher should make frequent use of the blackboard, making marks to be added, and also represent the numbers by figures.

During this stage a variety of exercises may be given, chiefly with a view of training the pupils more thoroughly in adding numbers already presented—one, two, three, four, five—to numbers below fifty. The teacher might ask questions similar to the following, viz.:

How many balls must be added to six balls to make seven balls?

How many cents must be added to three cents to make five cents?

How many pencils must be added to four pencils to make seven pencils?

How many apples must be added to five apples to make nine apples?

How many marbles must be added to three marbles to make eight marbles?

How many cents must be added to twelve cents to make fourteen cents?

How many cents must be added to twenty-five cents to make twenty-eight cents?

In this manner the teacher may continue questions until all the numbers from one to five have been thus presented to be added to numbers below fifty.

During these exercises the pupils may be required to tell what numbers may be added to produce each of the numbers below ten, thus: What numbers can you add to produce *three?* "Two and one; one, one, and one; one and two."

What numbers can you add to produce *five?* "Four and one; three and two; two and two and one," etc.

Third Exercises.—During these exercises the pupils may be taught to add *six*, *seven*, *eight*, and *nine* to numbers below fifty, in the same manner that the numbers three, four, and five were taught. The training should be varied and thorough as in the other numbers, and carefully reviewed by questions with concrete numbers.

THIRD STEP.—ADDING BY FIGURES.

When the pupils have been thoroughly trained in the exercises of the "First and Second Steps of Adding," they will be prepared to learn to add by figures as the representatives of numbers. This work should be as carefully graded as the adding by objects.

First Exercises.—Let the teacher commence the adding by figures by writing numbers on the blackboard in the following order, viz.:

0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1

Then proceed to add them, and write the sum under

each as the pupils tell the amount, thus: "Naught and one make one; one and one make two; two and one make three; three and one make four," etc.

Then let the adding be reversed, thus: "One and nine make ten; one and eight make nine; one and seven make eight," etc.

Next the teacher may write another exercise, thus:

0	1	2	3	4	5	6	7	8	9
2	2	2	2	2	2	2	2	2	2

and proceed to add through the line, and back again, as before, the teacher writing down the amount under each number as the pupils give it.

The class might occasionally go through with this exercise in concert, but the teacher must depend chiefly upon individual drill.

In the same manner the teacher may train the pupils to add *three*, *four*, *five*, *six*, *seven*, *eight*, and *nine* to the numbers from *naught* to *nine* inclusive.

Second Exercises.—The lessons in adding by figures in these exercises may consist of adding the numbers one, two, three, four, five, six, seven, eight, nine, to the numbers from ten to nineteen, as follows, viz.:

10	11	12	13	14	15	16	17	18	19
1	1	1	1	1	1	1	1	1	1

Let the children add as before, and the teacher write the sum under each as the pupils give it, thus: "Ten and one make eleven; eleven and one make twelve; twelve and one make thirteen," etc.

Then add these numbers in a reverse order, thus: "One and nineteen make twenty; one and eighteen make nineteen," etc.

The teacher may next proceed to write other numbers in a similar order, and train the pupils in adding them, as before:

10	11	12	13	14	15	16	17	18	19
2	2	2	2	2	2	2	2	2	2

10	11	12	13	14	15	16	17	18	19
3	3	3	3	3	3	3	3	3	3

and so on through all the numbers to

10	11	12	13	14	15	16	17	18	19
9	9	9	9	9	9	9	9	9	9

In all of these lessons the adding should be taught by whole numbers, as 15 and 9 make 24. Nothing should be said about adding *units*, or "carrying to the next column."

Third Exercises.—The third series of lessons for adding by figures from the blackboard may consist of adding the numbers one, two, three, four, five, six, seven, eight, nine, to the numbers from twenty to fifty. These lessons may be conducted in a similar manner to those in the *Second Exercises.*

Where the classes are small enough to admit of it, the children should have small slates, and, after they had learned to add the numbers on the blackboard, they should be allowed to copy them on slates.

When the pupils have become familiar with adding

by figures as far as the lessons of the preceding *Exercises*, it will be an easy matter to arrange lessons and teach adding of one, two, three, four, etc., to numbers below one hundred.

SUGGESTIONS FOR THE TEACHER.

Great care should be taken that the pupils be not hurried over these early steps too rapidly. Teach the combination of only one number at a lesson. Do not attempt to teach the pupils to add two and two, three and four, and five and three at the same lesson, except in case of a review, after these combinations have been taught in their order. Those who understand the condition of the infant mind, and the processes by which it acquires knowledge, will not attempt to lead the children over too much ground at one time. Such a course would rob the lesson of its *training power* on their minds. The presentation of single ideas, single facts, single difficulties, should be the rule in the early steps of all primary instruction. Let each difficulty be mastered by itself.

LESSONS FOR TRAINING IN

SUBTRACTING.

FIRST STEP.—SUBTRACTING OBJECTS.

SUBTRACTING should be commenced with objects as well as adding. Balls on the numeral frame, beans, pebbles, pencils, and other objects may be used in illustrating the first steps of subtracting. Marks on the blackboard will be found very useful in giving children their first ideas in taking one number away from another number.

First Exercises.—The teacher may commence with the numeral frame, as in adding, and proceed as follows, viz.: Arrange the balls on the wires in groups of *one*, *two*, *three*, *four*, *five*, *six*, *seven*, *eight*, *nine;* then move one ball away from each group, asking the children to tell how many remain, thus: "One ball from one ball leaves no ball; one ball from two balls leaves one ball; one ball from three balls leaves two balls; one ball from four balls leaves three balls," etc. Proceed in a similar manner with other objects; also with marks on the blackboard.

When the pupils have become familiar with taking away one ball, one mark, or other object, the teacher may arrange the balls in groups of two, three, four, five, six, seven, eight, nine; also arrange marks on the blackboard in the same order. The teacher may move away *two* balls at a time, then rub out *two* marks at a time, and require the children to tell the result, thus: "Two

balls from two balls leave no ball; two marks from two marks leave no mark; two balls from three balls leave one ball; two marks from three marks leave one mark; two balls from four balls leave two balls," etc.

Proceed in a similar manner until the pupils have become familiar with taking away *one* and *two* objects and marks from groups of less than twenty, and *three*, *four*, and *five* from groups of less than ten.

Second Exercises.—When the pupils have been thoroughly trained in the first series of exercises, the teacher may proceed in a similar manner to teach them to subtract *one* and *two* objects from groups numbering from twenty to fifty; also to teach them to take away *three*, *four*, and *five* objects from groups containing from ten to twenty.

To save the time which would be required for arranging a sufficient number of groups, the teacher might commence with *thirty*, and take away one ball; then one more from twenty-nine; then one from twenty-eight; then one from twenty-seven, etc.

In the same manner may the teacher take *two* away from thirty; then *two* from twenty-eight; then *two* from twenty-six, etc.

The same plan may be pursued with the numbers up to fifty, advancing ten each time. For the second lesson, commence with forty; and when sufficient drill has been had upon this, commence with fifty, and take away first *one* at a time, then *two* at a time, down to twenty.

Third Exercises.—During the lessons of this series of exercises, the pupils may be drilled in taking away objects, marks, etc., from larger groups, both from even

and odd numbers. This may be done out of order as well as in order, and embrace all the numbers taught in the previous exercises, and also be extended to other and larger numbers.

SECOND STEP.—SUBTRACTING.

During the several exercises of this step the pupils may be trained in subtracting concrete numbers without having the objects before them. The lessons may be similar in character to those in the second step of adding. The teacher may say, Take one apple from two apples, and how many will remain? "One apple."

Take one apple from three apples, and how many will remain? "Two apples."

Take two apples from four apples, and how many will remain? "Two apples."

Proceed in a similar manner until the pupils can readily take two, three, four, or five numbers away, and tell the number that will remain.

Subsequently these lessons may be extended, and the pupils trained in taking away six, seven, eight, and nine from numbers below fifty.

THIRD STEP.—SUBTRACTING BY FIGURES.

If the pupils have been properly taught in the two preceding steps of subtracting, they will now be prepared to learn how to subtract figures as the representatives of numbers. This work may be graded, and arranged on the blackboard in the same manner as the exercises in adding.

First Exercise.—The teacher may write numbers on the blackboard in the following order, viz.:

1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1

Then proceed with subtracting and writing the number left under each, as the pupils tell the number, thus: "One from one leaves naught; one from two leaves one; one from three leaves two; one from four leaves three," etc.

Let the subtracting be reversed thus: "One from nine leaves eight; one from eight leaves seven," etc.

The teacher may next teach them to take two away from other numbers, thus:

2	3	4	5	6	7	8	9
2	2	2	2	2	2	2	2

Then to subtract three, thus:

3	4	5	6	7	8	9
3	3	3	3	3	3	3

These lessons may be extended, as with adding, from 10 to 19; afterward from 20 to 29, etc.

LESSONS ON THE
ORDER OF NUMBERS.

It is necessary to teach children the succession of numbers in their order, according to the relative position in which the objects that they represent are placed, as first, second, third, fourth, etc. The importance of a special lesson on the order of numbers arises from the circumstance that frequently the idea of one, two, three, etc., is confounded with the notion which properly belongs to first, second, third, etc.

A successful mode of developing the ideas of first, second, third, fourth, etc., would be to let the children count the rounds in a ladder, as first round, second round, third round, etc.

The pupils might be required to walk and count their steps, as first step, second step, third step, etc.

A variety of objects should be counted thus, as first finger, second finger, third finger; first book, second book, etc., until a sufficient variety of exercises have been given to enable the children to clearly understand the order and names of numbers. They may be asked, Which is the first meal in the day? which the second? the third? Which is the first day of the week? which the second?

HOW TO TEACH

ADDING WITHOUT COUNTING.

THOSE who have observed the various ways by which children add are aware that very few who have not been specially trained learn to add without counting. Much that is called adding is nothing more than counting. It is a common occurrence, when a pupil is asked what is the sum of *fourteen* and *three*, for that pupil to say to himself, "Fifteen, sixteen, seventeen," and then answer aloud, "*Seventeen.*" Many children count their fingers, some count marks on their slates, some count swinging movements of their head or other parts of the body, and never learn to add properly.

Instead of allowing them to acquire the habit of counting to find the sum of two numbers, they should be trained in combining numbers by *adding*, so that they will become able to perform addition without counting as rapidly and accurately as they do multiplication. This desirable attainment may be achieved by teaching children to observe the results of the various combinations of numbers from one to nine, and training them to compare all other combinations with these. The process to be chiefly relied upon for this purpose may be called

Adding by Decades.—It is a familiar fact that children may learn to know readily that 7 and 5 make 12, and yet not know that 17 and 5 make 22, or that 27 and 5

make 32. The reason of this is owing partly to the fact of the children not having been taught to observe that the result in every case, where two given figures are added, is always the same; and partly to the fact of their not having been made familiar with these combinations in large numbers. But it will be found to be a very simple and easy matter to teach children to add each of the nine digits to every number from one to ninety-nine by this plan.

Let the teacher write the following combinations on the blackboard in the order and positions given here:

2	2	2	2	2	2	2	2	2	2
2	12	22	32	42	52	62	72	82	92
4	14	24	34	44	54	64	74	84	94

Then require the pupils to repeat these combinations as follows, viz.: 2 and 2 are four; 12 and 2 are 14; 22 and 2 are 24; 32 and 2 are 34, etc. Next lead the pupils to observe the fact that the numbers 2 and 2 always make 4 when added.

The pupils may afterward repeat the same combinations as follows, viz.: 2 and 2 are 4; 2 and 12 are 14; 2 and 22 are 24, etc. Then require them to repeat the same in a reverse order, as 92 and 2 are 94; 82 and 2 are 84; 72 and 2 are 74, etc.

Next the teacher may erase the several sums 4, 14, 24, 34, etc., and require the children to repeat these examples, adding and giving the answers as before.

Finally require the pupils to copy the figures of these combinations on their slates as ten sums, and add each, and write under them the several amounts or answers.

When the combinations of 2 and 2, by decades, have thus been learned, so that the pupils can readily add

them out of order, the teacher may arrange on the blackboard the combinations of 3 and 2, thus:

2	2	2	2	2	2	2	2	2	2
3	13	23	33	43	53	63	73	83	93
5	15	25	35	45	55	65	75	85	95

Proceed with the oral repetition of these combinations through *all* the various forms used with 2 and 2. Lead the pupils to notice that 3 and 2 always make 5. Also require the pupils to copy these sums on their slates, and add them.

Observe the same plan of procedure for each of the following combinations:

2	2	2	2	2	2	2	2	2	2
4	14	24	34	44	54	64	74	84	94
6	16	26	36	46	56	66	76	86	96
2	2	2	2	2	2	2	2	2	2
5	15	25	35	45	55	65	75	85	95
7	17	27	37	47	57	67	77	87	97
2	2	2	2	2	2	2	2	2	2
6	16	26	36	46	56	66	76	86	96
8	18	28	38	48	58	68	78	88	98
2	2	2	2	2	2	2	2	2	2
7	17	27	37	47	57	67	77	87	97
9	19	29	39	49	59	69	79	89	99
2	2	2	2	2	2	2	2	2	2
8	18	28	38	48	58	68	78	88	98
10	20	30	40	50	60	70	80	90	100
2	2	2	2	2	2	2	2	2	2
9	19	29	39	49	59	69	79	89	99
11	21	31	41	51	61	71	81	91	101

When all the combinations of 2 have been taught, as before described, up to 99 and 2, require the pupils to review them by writing on the blackboard these combinations out of the order in which they were first presented, thus:

2	2	2	2	2	2	2	2	2
25	36	47	58	69	75	86	97	17
19	49	79	69	39	89	29	99	59
2	2	2	2	2	2	2	2	2

and so on. These combinations should also be reviewed by questions from the teacher as follows: How many are 8 and 2? 19 and 2? 37 and 2? 49 and 2? etc.

By thus frequently changing the manner of presenting and repeating these numbers, the attention of the pupils will be secured, and the benefit will be tenfold greater than from the same number of repetitions in one form, in which the words might be repeated without that attention of the mind which would secure a repetition of the adding. With a class of children reading in a First Reader, the combinations of 2 would furnish sufficient exercises for half an hour a day for a week or two.

The teacher may observe the same general directions, and take up, during each succeeding week, the combinations of a new number, until additions of all the nine digits have been thus thoroughly taught and reviewed. The same arrangement of the figures should be observed on the blackboard, in the combinations of the 3, 4, 5, etc., as those given for the combinations of 2.

The following arrangement will show how the numbers may be placed on the blackboard:

3	3	3	3	3	3	3	3	3	3
3	13	23	33	43	53	63	73	83	93
6	16	26	36	46	56	66	76	86	96
3	3	3	3	3	3	3	3	3	3
4	14	24	34	44	54	64	74	84	94
7	17	27	37	47	57	67	77	87	97
3	3	3	3	3	3	3	3	3	3
5	15	25	35	45	55	65	75	85	95
8	18	28	38	48	58	68	78	88	98

Let these combinations of 3 be extended to 99 and 3. Then review these out of order, as with the 2. Next present in the same way and teach the combinations of 4. Then follow with the full combinations of 5, 6, 7, 8, and 9, in order.

Review of the Combinations.—When all the additions have been taught as already described, they should be reviewed in a different order. This review will be appropriate work for the next class above the one where these combinations are first taught. The following arrangement will indicate a good plan for this review.

Place on the blackboard all the combinations which produce 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, as follows:

Combinations that Produce 0.

5	5	5	5	5	5	5	5	5	5
5	15	25	35	45	55	65	75	85	95
10	20	30	40	50	60	70	80	90	100
4	4	4	4	4	4	4	4	4	4
6	16	26	36	46	56	66	76	86	96
10	20	30	40	50	60	70	80	90	100

3	3	3	3	3	3	3	3	3	3
7	17	27	37	47	57	67	77	87	97
10	20	30	40	50	60	70	80	90	100
2	2	2	2	2	2	2	2	2	2
8	18	28	38	48	58	68	78	88	98
10	20	30	40	50	60	70	80	90	100
1	1	1	1	1	1	1	1	1	1
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

Combinations that Produce 1.

1	10	20	30	40	50	60	70	80	90
0	1	1	1	1	1	1	1	1	1
1	11	21	31	41	51	61	71	81	91
2	2	2	2	2	2	2	2	2	2
9	19	29	39	49	59	69	79	89	99
11	21	31	41	51	61	71	81	91	101
3	3	3	3	3	3	3	3	3	3
8	18	28	38	48	58	68	78	88	98
11	21	31	41	51	61	71	81	91	101
4	4	4	4	4	4	4	4	4	4
7	17	27	37	47	57	67	77	87	97
11	21	31	41	51	61	71	81	91	101
5	5	5	5	5	5	5	5	5	5
6	16	26	36	46	56	66	76	86	96
11	21	31	41	51	61	71	81	91	101

Combinations that Produce 2.

1	1	1	1	1	1	1	1	1	1
1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92

3	3	3	3	3	3	3	3	3	3
9	19	29	39	49	59	69	79	89	99
12	22	32	42	52	62	72	82	92	102
4	4	4	4	4	4	4	4	4	4
8	18	28	38	48	58	68	78	88	98
12	22	32	42	52	62	72	82	92	102
5	5	5	5	5	5	5	5	5	5
7	17	27	37	47	57	67	77	87	97
12	22	32	42	52	62	72	82	92	102
6	6	6	6	6	6	6	6	6	6
6	16	26	36	46	56	66	76	86	96
12	22	32	42	52	62	72	82	92	102

Combinations that Produce 3.

1	1	1	1	1	1	1	1	1	1
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	4	4	4	4	4	4	4	4	4
9	19	29	39	49	59	69	79	89	99
13	23	33	43	53	63	73	83	93	103
5	5	5	5	5	5	5	5	5	5
8	18	28	38	48	58	68	78	88	98
13	23	33	43	53	63	73	83	93	103
6	6	6	6	6	6	6	6	6	6
7	17	27	37	47	57	67	77	87	97
13	23	33	43	53	63	73	83	93	103

Combinations that Produce 4.

1	1	1	1	1	1	1	1	1	1
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94

2	2	2	2	2	2	2	2	2	2
2	12	22	32	42	52	62	72	82	92
4	14	24	34	44	54	64	74	84	94
5	5	5	5	5	5	5	5	5	5
9	19	29	39	49	59	69	79	89	99
14	24	34	44	54	64	74	84	94	104
6	6	6	6	6	6	6	6	6	6
8	18	28	38	48	58	68	78	88	98
14	24	34	44	54	64	74	84	94	104
7	7	7	7	7	7	7	7	7	7
7	17	27	37	47	57	67	77	87	97
14	24	34	44	54	64	74	84	94	104

Combinations that Produce 5.

1	1	1	1	1	1	1	1	1	1
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
2	2	2	2	2	2	2	2	2	2
3	13	23	33	43	53	63	73	83	93
5	15	25	35	45	55	65	75	85	95
6	6	6	6	6	6	6	6	6	6
9	19	29	39	49	59	69	79	89	99
15	25	35	45	55	65	75	85	95	105
7	7	7	7	7	7	7	7	7	7
8	18	28	38	48	58	68	78	88	98
15	25	35	45	55	65	75	85	95	105

Combinations that Produce 6.

1	1	1	1	1	1	1	1	1	1
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96

2	2	2	2	2	2	2	2	2	2
4	14	24	34	44	54	64	74	84	94
6	16	26	36	46	56	66	76	86	96
3	3	3	3	3	3	3	3	3	3
3	13	23	33	43	53	63	73	83	93
6	16	26	36	46	56	66	76	86	96
7	7	7	7	7	7	7	7	7	7
9	19	29	39	49	59	69	79	89	99
16	26	36	46	56	66	76	86	96	106
8	8	8	8	8	8	8	8	8	8
8	18	28	38	48	58	68	78	88	98
16	26	36	46	56	66	76	86	96	106

Combinations that Produce 7.

1	1	1	1	1	1	1	1	1	1
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
2	2	2	2	2	2	2	2	2	2
5	15	25	35	45	55	65	75	85	95
7	17	27	37	47	57	67	77	87	97
3	3	3	3	3	3	3	3	3	3
4	14	24	34	44	54	64	74	84	94
7	17	27	37	47	57	67	77	87	97
8	8	8	8	8	8	8	8	8	8
9	19	29	39	49	59	69	79	89	99
17	27	37	47	57	67	77	87	97	107

Combinations that Produce 8.

1	1	1	1	1	1	1	1	1	1
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98

2	2	2	2	2	2	2	2	2	2
6	16	26	36	46	56	66	76	86	96
8	18	28	38	48	58	68	78	88	98
3	3	3	3	3	3	3	3	3	3
5	15	25	35	45	55	65	75	85	95
8	19	28	38	48	58	68	78	88	98
4	4	4	4	4	4	4	4	4	4
4	14	24	34	44	54	64	74	84	94
8	18	28	38	48	58	68	78	88	98
9	9	9	9	9	9	9	9	9	9
9	19	29	39	49	59	69	79	89	99
18	28	38	48	58	68	78	88	98	108

Combinations that Produce 9.

1	1	1	1	1	1	1	1	1	1
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
2	2	2	2	2	2	2	2	2	2
7	17	27	37	47	57	67	77	87	97
9	19	29	39	49	59	69	79	89	99
3	3	3	3	3	3	3	3	3	3
6	16	26	36	46	56	66	76	86	96
9	19	29	39	49	59	69	79	89	99
4	4	4	4	4	4	4	4	4	4
5	15	25	35	45	55	65	75	85	95
9	19	29	39	49	59	69	79	89	99

These combinations should be added in order and out of order, until the pupils can instantly tell what the sum of any two figures will make; also the sum of either of

the digits with any number below 100. The additions should be made upon their slates as well as orally.

These exercises of adding by decades will furnish profitable employment for the usual time devoted to arithmetic in the classes that are reading in a First Reader (*i. e.*, the second reading-book) during a period of some two months. However, it would be more useful to have this drill interspersed with other exercises in arithmetic, and made to extend over a period of four months. Careful attention to this matter at this stage will save time in the subsequent progress of the pupils.

The Process of Adding.—Let the *process of adding* be taught from the blackboard first, then from slates. Commence with small numbers, and write them in single columns, thus:

2	3	4	5	3	4
1	2	3	2	5	3
3	4	4	3	2	5
2	2	2	4	4	4

The pupils may add each of these columns, up and down, and the teacher write the sum underneath. In adding, only the several sums should be spoken, thus: "two, five, six, *eight;* three, seven, nine, *twelve;* two, six, nine, *thirteen*," etc. Several similar examples may be given on the blackboard, also written on slates, and added in a like manner, until the pupils become familiar with the process.

Gradually these single columns should be made longer, and larger numbers used, until the pupils can readily add ten or fifteen figures. During this stage of the process nothing should be said about "carrying."

Let each column be a complete example of itself. Pupils should be prevented from resorting to *counting* to find the sum of numbers. This may be done by leading them to observe the application of the fact that adding 3 and 2 always gives a 5; 4 and 3 always a 7; 5 and 3 an 8; 7 and 5 a 2; 8 and 8 a 6; 9 and 7 a 6; 7 and 7 a 4; 8 and 7 a 5, etc. To make this fact so familiar that children will observe the *unit* or *first figure* in the several amounts, as each succeeding number is added in a long column, the class may be trained as follows:

9
8
6
9
7
5
8
5
7
9
6
5
8
—

Having written a column of figures on the blackboard, the teacher may point successively to each figure, and require the pupils to name *only the unit figure* in the several sums, as each succeeding number is added, thus: 8, 3, 9, 8, 5, 0, 8, 3, 0, 9, 5, 3, 2.

Let the pupils repeat this process three or four times, or until they can thus readily name the *unit figures*, and then add the column as follows: 8, 13, 19, 28, 35, 40, 48, 53, 60, 69, 75, 83, 92.

After practice of this kind, with several examples from the blackboard, let similar ones be given on the slates, and the pupils drilled until they have *acquired the habit* of adding correctly and rapidly. By this process all counting in adding will be avoided, and pupils will attain the ability of adding long columns with greater accuracy and rapidity than they add short ones by the ordinary process.

How a Class may Drill Itself.—Select *nine* pupils from the class, place them in front of and facing the other members of the class, and assign number *one* to the first, number *two* to the second, *three* to the third, and so on to nine, requesting each pupil to remember what

number was assigned it. Then give the number *two* for each pupil in turn to ask the class to add to the number that was assigned to himself. For instance, the first pupil would say, "*One and two?*" The class would answer in concert, "*Three.*" The next child would say, "*Two and two?*" The class would answer as before, "*Four.*" The next pupil, "*Three and two?*" Class, "*Five;*" and so on until each of the *nine* had asked the class what is the sum of *two* and the number assigned to himself.

That those pupils who are not able to answer readily may have an opportunity to learn the answers, each question may be repeated twice, thus: Child, "Three and three?" Class, "Six." Child, "Three and three?" Class, "Six." Next child, "Four and three?" Class, "Seven." Child, "Four and three?" Class, "Seven;" and so on.

When the pupils have become familiar with the combinations in the regular order, as indicated above, let the numbers be assigned to the nine pupils promiscuously, thus: First pupil, 2; second pupil, 4; third, 6; fourth, 8; fifth, 1; sixth, 3; seventh, 5; eighth, 7; ninth, 9. The exercise should proceed as before.

After sufficient drill has been had with a variety of arrangements and modifications, and the pupils can add accurately and rapidly, the mode of answering may be changed by requesting all the members of the class to stand while the teacher gives the numbers to be added, and each pupil answers singly and in turn. But as a pupil fails to answer promptly and correctly, he must take his seat. The effort of each pupil to remain standing by answering correctly will be an excellent incentive. The one who remains standing after all the other pupils have failed may be declared the champion.

On the occasion of the next exercise of the class in adding, the champion may take his place in front of the class, and ask each member of the class one question. All who answer correctly may in turn each ask the champion one question. Should he fail to answer either question correctly and promptly, the pupil who asked the question may take the champion's place, when he shall be allowed to ask each member of the class one question, and those who do not fail may in turn each ask him one question, as before.

Should a champion answer correctly all the questions put to him, he shall then be entitled to ask each member of the class two questions in succession. Those who answer correctly may each in turn ask the champion two questions. Should the champion not fail this time, he shall be allowed to ask the members of the class three questions; and they may ask him, as before, three questions. These exercises may be continued from day to day, increasing the difficulties as the pupils acquire the ability to easily overcome them.

The success of this plan of class drilling will depend very much upon the manner in which it is carried out. The pupils should be required to *ask* and *answer* all questions promptly and rapidly. When a class has been thoroughly trained in this manner, the pupils will be able to answer the questions as rapidly as a teacher can ask them, although they embrace such combinations as 19 and 7; 17 and 9; 26 and 8; 25 and 9; 48 and 9; 74 and 7; 69 and 6; 87 and 5; 39 and 9, etc.

LESSONS TO DEVELOP IDEAS OF
NUMERATION AND NOTATION.

FIRST STEP.—NUMERATION.

When the first steps in *Numeration* are undertaken, the teacher may write a column of figures on the blackboard like the one marked *a*:

a.	*b.*	*c.*	*d.*	*e.*
0	00	10	20	30
1	10	11	21	31
2	20	12	22	32
3	30	13	23	33
4	40	14	24	34
5	50	15	25	35
6	60	16	26	36
7	70	17	27	37
8	80	18	28	38
9	90	19	29	39

First Exercise.—The children may be taught to read the column *a* as representing objects, thus: "No ball, one ball, two balls, three balls, four balls, five balls," etc. Then as "No apples, one apple, two apples, three apples," etc. Then as "No cent, one cent, two cents, three cents," etc. When the pupils have read these numbers in this concrete form several times with different objects, the teacher may tell them that there is another name—*unit*, which means a single thing—that may be used with these figures. We may read this

column "No unit, one unit, two units, three units, four units," etc.

When the children have become familiar with column *a* as *units*, the teacher may take the numeral frame, and place *ten* balls in a group on one wire, and call it *one ten*. Next another group of *ten* balls may be placed on the next wire, and both together called *two tens*. Then another group of *ten* balls may be placed on the next wire, and the three groups called *three tens*.

Illustrate Tens with Bundles of Sticks.—At this stage the teacher may provide several small sticks, about the size of common matches. In place of sticks, slips cut from cards might be used. Taking several single sticks, request the pupils to count *ten*; then tie these up in a bundle, and call it *one ten*. Let them count ten more, and tie them up as before, and call it *one ten*. Placing the last bundle by the side of the first one, say, Here are *two tens*. Proceed in the same way until five or six bundles have been made.

Now take single sticks and the bundles of ten, and place them in groups to correspond with the figures on the blackboard, thus:

One ten for 10.

One ten and *one* stick for 11.

One ten and *two* sticks for 12.

One ten and *three* sticks for 13, etc.

Now the teacher may write a column of figures on the blackboard by the side of column *a*, arranged as in column *b*. The 10 in this column may be shown to represent one group of ten balls; the 20, two groups of ten balls; the 30, three groups of ten balls, etc. Then, pointing at the figures in this column (*b*), it may be read

by the teacher, and then by the pupils, as follows, viz.: "No ten, one ten, two tens, three tens, four tens, five tens, six tens, seven tens, eight tens, nine tens."

Second Exercise.—With the second exercise the teacher may point to column *a*, and request the pupils to read it as follows, viz.: "No unit, one unit, two units, three units," etc. Then to read column *b* as "No ten, one ten, two tens, three tens, four tens," etc.

Next the teacher may write column *c* on the blackboard, and teach the pupils to read it as follows, viz.: "One ten, one ten and one unit, one ten and two units, one ten and three units, one ten and four units," etc.

The same column (*c*) may also be read as follows, viz.: "Ten, one ten; eleven, one ten and one unit; twelve, one ten and two units; thirteen, one ten and three units," etc.

Third Exercise.—Column *d* may now be written on the blackboard, and the pupils taught to read it as follows, viz.: "Twenty, two tens; twenty-one, two tens and one unit; twenty-two, two tens and two units; twenty-three, two tens and three units; twenty-four, two tens and four units," etc.

Next let column *e* be placed on the blackboard, and read in the same manner. Then the other numbers from 40 to 99 may be written, and read in a similar way.

FIRST STEP.—NOTATION.

When the pupils can readily read columns of *units* and *tens* as in the preceding exercises, they may be required to write these numbers on slates.

First Exercise.—The teacher may dictate the numbers to be written as follows: Write two units; write five units; four units; nine units; three units; eight units; six units; one unit; seven units.

When the pupils can readily write columns of units under each other from dictation, let them proceed to write column *c* from dictation, thus: Write one ten; write one ten and one unit; write one ten and two units; one ten and three units, etc.

Next let the pupils write from dictation column *d*, first in order, then out of order, thus: Two tens; two tens and one unit; two tens and two units; two tens and three units, etc.

Then two tens and three units; two tens and six units; two tens and nine units; two tens and four units; two tens and seven units, etc.

Second Exercise.—The writing of numbers may be continued from dictation, as in the first exercise. When the pupils can readily write in that manner any number below 100, these numbers may be dictated as follows, and the pupil required to tell how he wrote the number:

Write twenty-four. How did you write it? "With two tens and four units." Write thirty-six. How did you write it? "With three tens and six units." Write seventeen. What did you write? "One ten and seven units."

SECOND STEP.—NUMERATION AND NOTATION.

During this step the pupils may be taught to read numbers by *units*, *tens*, *hundreds*, through three places, or the period of units, and also to write them. To lead

the pupils to see that *ten tens make one hundred*, take the numeral frame, and let them count ten balls on each of ten wires. Then count the groups of ten, thus: "One ten, two tens, three tens, four tens, five tens, six tens, seven tens, eight tens, nine tens, ten tens." Then let the pupils add them by tens, thus: "Ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred." Then ten tens make how many? "One hundred."

How many balls in ten tens? "One hundred balls."

Illustrate Hundreds with Bundles of Sticks.—At this stage the teacher will find the use of bundles of small sticks one of the best plans for developing the idea of hundreds in the minds of young pupils. Having provided several hundred of these small sticks, as in the exercise for illustrating *tens* in the "First Step of Numeration," and tied up some thirty or forty bundles of ten each, let the pupils count *ten* of these bundles, then tie them up in one large bundle, and call it *one hundred.* Then let them count ten more bundles, and tie them up as before, and call it *one hundred.* Placing this by the side of the first *hundred* bundle, say, Here are *two hundreds.* Proceed in the same way to count and tie up three or more bundles of a *hundred.*

Now the teacher may ask the pupils, How many sticks are there in one bundle of *ten*, or one small bundle? "Ten sticks."

How many sticks in two bundles of *ten?* "Twenty sticks."

How many sticks in five of the *tens?* "Fifty sticks."

How many of these bundles make ninety sticks? "Nine bundles."

How many bundles of *ten* make one hundred sticks? "Ten bundles."

How many *tens* make a hundred? "Ten tens."

The teacher may now write the group of figures marked *f* on the blackboard.

f.	*g.*	*h.*	*i.*
100	123	156	101
200	321	201	320

Then take *one* of the *hundred* bundles to represent the first number, and *two* of the *hundred* bundles to represent the second number.

Next the teacher may write the group of figures marked *g*, and represent each with the bundles of sticks. For the first number take *one* of the *hundred* bundles, *two* of the *ten* bundles, and *three* sticks. For the second number of this group, take *three* of the hundred bundles, *two* of the *ten* bundles, and *one* stick. Proceed in a similar manner with groups marked *h* and *i.*

Pointing to the *first* place on the right of each group of three figures, the teacher asks, What is this place called? "Unit's place."

In the same manner, pointing to the *second* place in each group of three figures, the teacher asks, What is this place called? "Ten's place."

In the same way, point to the third place, and ask, What is this place called? "Hundred's place."

You may now name each place as I point at it. "Units, tens, hundreds; tens, units; tens, hundreds, units; units, tens, hundreds."

How many *units* does it take *for one ten?* "Ten units."

How many *tens* does it take *for one hundred?* "Ten tens."

The teacher may write figures on the blackboard, and require the children to read them as units, tens, hundreds, thus: "Four units, six tens, seven hundreds;" "Two hundreds, one ten, three units."

The pupils may now take their slates and write figures from dictation as follows, viz.:

"Write four units and five tens; write three units, four tens, and five hundreds; write eight hundreds, two tens, and one unit; write six units, no tens, four hundreds; write three hundred and twenty-four," etc.

When the pupils can readily read and write any number of hundreds, units, and tens, and can tell where each place is in any line of figures, they may be taught the numeration and notation of the period of thousands, as in the third step.

THIRD STEP.—NUMERATION AND NOTATION.

At this stage the pupils may be successfully taught to read and write numbers in the period of *thousands.* If they have been properly taught to read and write the period of *units*, this can be easily accomplished.

Lead the pupils to observe, by figures on the blackboard, that the smallest number represented by three figures is 100; that the largest number represented by three figures is 999; also that we must use *four* figures to represent 1000. Tell the pupils that the *fourth place is called thousands.* Then write the following figures on the blackboard, thus:

4 3 2 1

Commencing with figure 1, point at each in order, and repeat its name, thus: *units, tens, hundreds, thousands.* Then point at the same figures again, and let the pupils read them, thus: "Units, tens, hundreds, thousands."

When they have read them in this order two or three times, let them read in a reversed order; also out of order, as "Units, hundreds, tens, thousands."

Now ask, What is the first place called? "Units."

What is the second place called?

What is the third place called?

What is the fourth place called?

Which is unit's place?

Which is thousand's place?

Next the teacher may write on the blackboard the following figures, thus:

5 4 3 2 1

Commencing with figure one, as before, point at each in order, and repeat its name, thus: *units, tens, hundreds, thousands, tens of thousands.* Then point at the same figures again, and let the pupils read them, thus: "Units, tens, hundreds, thousands, tens of thousands."

Proceed as before to read them in order and out of order, and to ask the name of each place, etc.

Subsequently write the following figures on the black board, thus:

6 5 4 3 2 1

Point at and repeat the name of each, as before; then let the pupils read them, thus: "Units, tens, hundreds, thousands, tens of thousands, hundreds of thousands."

When the pupils are able to name each place readily, in order and out of order, they may be required to write

numbers through *hundreds of thousands*, from dictation, thus: Write three hundreds, two tens, one unit; four units, six tens, three hundreds, four thousands; two thousands, no hundreds, eight tens, no units; three units, four tens, five hundreds, six thousands, seven tens of thousands; no units, two tens, no hundreds, three thousands, four tens of thousands, five hundreds of thousands.

Subsequently dictate numbers as follows: Six hundred and fifty-four thousands, three hundred and twenty-one, etc. After each number has been thus dictated, ask the pupils, What figure did you write in unit's place? What in hundred's place? What in tens of thousand's place? etc.

When the pupils have been thus drilled until they can readily read and write any number from units to hundreds of thousands, they may be introduced to the period of millions. But care should be taken to first train them thoroughly through the period of thousands.

SUGGESTIONS FOR THE TEACHER.

Many teachers make a serious mistake in supposing that the early steps in reading and writing numbers may be rapidly taken at first, and afterward reviewed until the pupils know them thoroughly. Completeness of knowledge can be secured with the least labor and least time by taking each step in its appropriate order, and mastering it before attempting the next one. During this stage it should be remembered that *the work to be accomplished is to teach the pupils to read and write numbers correctly.* This object should therefore be kept in view, and *no attempt made* at teaching the pupils *to add* the examples given for training in numeration and notation during this stage of instruction.

FOURTH STEP.—NUMERATION AND NOTATION.

After the pupils have become familiar with reading and writing numbers through hundreds of thousands, place on the blackboard the following group of figures, thus:

9 8 7, 6 5 4, 3 2 1

These numbers may be read by the teacher and pupils in the same manner as were those of the period of thousands. The attention of the pupils may be called to the fact that these numbers are divided into groups, which are called *units*, *thousands*, and *millions;* that the first group contains units, tens, hundreds of *units;* the second group, units, tens, hundreds of *thousands;* the third group, units, tens, hundreds of *millions.*

When the pupils can read the numbers readily through millions, let them be taught to write these from dictation, as in the period of thousands.

ADDITION.

FIRST STEP.

In commencing the lessons in written addition, the examples should be simple and short at first, and so arranged that there will be nothing "to carry." The following examples will illustrate this step:

24 boys.	15 cents.	36 pens.	215 dollars.
5 "	13 "	23 "	163 "
29 boys.	28 cents.	59 pens.	378 dollars.

623 books.	180 pupils.	183 days.	409 men.
145 "	217 "	216 "	260 "

SECOND STEP.

When the pupils can write and add readily the small examples similar to those given above, they may be taught to add and "carry tens."

28 boys.	67 men.	309 men.
14 "	26 "	465 "
42 boys.	93 men.	

824	586	475
168	234	268

Thus proceed, increasing the difficulties gradually, until the pupils can readily add large numbers of four or five lines. There should be given, also, much practice in adding examples with one, two, or three columns, with eight or ten figures in each column. Avoid the habit of giving large and long examples for addition, which tend to exhaust the patience of the pupils, and to discourage them by many and great difficulties at the same time, during the early lessons in this subject. Much practice should be given in adding numbers composed of hundreds, until the pupils are able to add accurately and readily long columns, before the examples are extended to numbers which comprise thousands and millions.

Large and long examples may occasionally be given, when the pupils have become familiar with smaller numbers, as test examples, to encourage them in performing difficult tasks.

SUBTRACTION.

FIRST STEP.

THE first lessons in written subtraction, like those of addition, should comprise short, simple examples, and be so arranged that there will be nothing "to borrow." The following examples will illustrate this step:

9 apples.	18 cents.	29 pens.
5 "	7 "	16 "
4 "	11 "	13 "
825	693	976
414	382	853

SECOND STEP.

As an introductory step to an illustration of "borrowing" in subtraction, let the pupils subtract all the numbers from 1 to 9 from 10, thus:

10	10	10	10	10	10	10	10	10
1	2	3	4	5	6	7	8	9
9	8	7	6	5	4	3	2	1

Next they may subtract each of these numbers from 11 in the same manner; then from 12; then from 13; and so on to 19, thus:

19	19	19	19	19	19	19	19	19
1	2	3	4	5	6	7	8	9
18	17	16	15	14	13	12	11	10

Subsequently illustrate borrowing by an example in dimes and cents, thus: A man has 5 dimes and 2 cents, and wishes to pay 2 dimes and 6 cents. Since he has only 2 cents, he must get one of his dimes changed into ten cents, then he will have twelve cents, and can pay the six cents and have six cents remaining. He can also pay 2 dimes from this 4 dimes which he has after changing one of them, and he will then have 2 dimes left—in all, 2 dimes and six cents remaining. The following examples will illustrate the appearance of the work on the blackboard when performed in accordance with the above explanation:

4 10	5 10	2 10	7 9 9 10
5 2	6 4	3 5 4	X̸ X̸
2 6	3 8	2 6 3	8 0 0 5
2 6	2 6	9 1	5 3 6 7
			2 6 3 8

It will be seen that by the plan of taking away the number borrowed, there is no need of any "carrying to the next number in the lower line" to pay what was borrowed in the upper line. So soon as the pupils understand the process, so as to be able to perform subtraction in this way, and represent it as above, they may be taught to remember that *one* has been borrowed from an upper figure, and that it must be called *one less* than it appears in consequence of this. To assist in remembering that one has been borrowed, a *dot* may be placed over the figure, as in the examples below.

...
8325
5436
2889

In subtracting this example, the teacher might say, 6 from 15 leaves 9; 3 from 11 leaves 8; 4 from 12 leaves 8; 5 from 7 leaves 2.

... ...
800 000 000
411 888 999
388,111,001

In the above example, the subtraction might be performed as follows: 9 from 10 leaves 1; 9 from 9 leaves 0; 9 from 9 leaves 0; 8 from 9 leaves 1; 8 from 9 leaves 1; 8 from 9 leaves 1; 1 from 9 leaves 8; 1 from 9 leaves 8; 4 from 7 leaves 3.

When pupils become familiar with this process of subtraction, it is both simple and rapid. Besides, it can be easily understood by children, while the common plan of "carrying *one* to the next figure in the subtrahend, to pay for the *ten* that was borrowed in the minuend," seems about as difficult of explanation as why one should pay Brown for that which he borrowed of Smith.

MULTIPLYING NUMBERS.

MULTIPLYING is an artificial process derived from addition. Children usually tend in their reckoning to fall back on the natural process of addition. To obviate this, the artificial process should be taught through the natural one.

First Step.—Illustrate the first steps in multiplying by objects, as beans, buttons, pencils, or balls, on the numeral frame. Show the pupils that 2 balls and 2 balls make 4 balls, then that *two times two* balls make four balls; that 2 pencils and 2 pencils make 4 pencils, then that *two times two* pencils make four pencils, and so on.

Second Step.—For the second step, place numbers on the blackboard, and commence teaching the *Multiplication Table* as follows, viz.:

$2 \times 2 = 4$
$3 \times 2 = 6$
$4 \times 2 = 8$
$5 \times 2 = 10$
$6 \times 2 =$
$7 \times 2 =$

Let the pupils read these as if written out in full, *two times two are four;* three times two are six, etc.

The attention of the pupils should be directed to the fact that each succeeding product is two greater than its preceding one, as 4, 6, 8, 10, etc. This will give them the key to the table, and they may now be required to write it out on their slates, in order, from 2×2 to 12×2, or even to 20×2, and to write the product of each multiplication. When this table of 2 has been learned in

its true order, it may be reviewed in a different form, thus:

$3\times2=$
$5\times2=$
$7\times2=$
$9\times2=$
$6\times2=$
$8\times2=$
$12\times2=$
$11\times2=$
$15\times2=$, etc.

Let the pupils be required to give the products of each of these multiplications on their slates; also to recite them orally.

Then proceed to teach the table of *threes* in the same manner, first using the numeral frame, or marks on the blackboard, to illustrate the multiplying of threes:

3×3 are 9
4×3 " 12
5×3 " 15
6×3 " 18
7×3 "
8×3 "

The pupils should use their slates as before, and when this table has been learned in its order, let it be reviewed in the same manner as that of twos; then review the tables of 2 and 3 together, thus:

$4\times3=$
$2\times2=$
$6\times3=$
$8\times2=$
$5\times3=$
$7\times2=$
$5\times2=$
$8\times3=$
$4\times2=$
$7\times3=$
$2\times3=$
$9\times2=$, etc.

Proceed in the same manner to teach the tables of all the numbers to 12 times 12. Frequent reviews are necessary for learning the tables thoroughly but the reviews should not be mere repetitions in the same form as that used in learning the table. Children need variety to keep up their interest. This variety may be had, to some extent, by changes in the mode of conducting the exercise.

Multiplication Table Reviewed.—For a review of the entire multiplication table, the following plans will be found useful:

4×5 are 20, and 5×4 are 20.
5×6 " 30, " 6×5 " 30.
6×7 " 42, " 7×6 " 42.
9×6 " 54, " 6×9 " 54.
3×8 " 24, " 8×3 " 24.
8×5 " 40, " 5×8 " 40.
9×7 " 63, " 7×9 " 63.
8×9 " 72, " 9×8 " 72,

and so on through the tables.

During this stage of the instruction the pupils may be required to answer questions in the following forms: How many are three fours? five threes? four sevens? eight threes? seven fives? twelve nines? six eights? Also, How many sixes make thirty? sevens make forty-two? eights make fifty-six?

The pupils should be drilled upon the multiplication table in various ways until they attain the ability of giving the product of any two numbers below 12 times 12 instantly. By these drill-exercises the mind acquires a kind of self-acting habit in multiplying, which enables it to perform this work with great ease and rapidity. This power seems to be somewhat akin to that in the movements of the fingers of a skillful player on the piano—without conscious exertion of the mind.

Division Tables.—By reviewing the multiplication table in still another form, the division table may be taught, thus:

6 times 7 are 42; 7 is contained in 42 six times.

7 times 6 are 42; 6 is contained in 42 seven times.

This may be placed on the blackboard, thus:

4 times 7 are 28; 7 times 4 are 28.

4 in 28—7 times; 7 in 28—4 times.

5 times 7 are 35; 7 times 5 are 35.

5 in 35—7 times; 7 in 35—5 times.

6 times 7 are 42; 7 times 6 are 42.

6 in 42—7 times; 7 in 42—6 times.

Continue this exercise through 12 times 12.

Dividing numbers should be illustrated on the numeral frame, and with other objects.

Questions may also be asked in the following manner: How many *sixes* in 42? How many *sevens* in 35? How many *eights* in 72? etc.

LESSONS TO DEVELOP IDEAS OF

EQUAL PARTS, OR FRACTIONS.

It is important that children should early obtain ideas of *equal parts* of objects and of numbers, also of their comparative size. Ideas of *halves* and *quarters of whole things* may be readily illustrated by cutting an apple into *two equal parts*, and another apple into *four equal parts*.

Halves and Fourths.—Ideas of *halves* and *fourths of numbers* may be illustrated with the numeral frame, thus: Having placed two balls in one group, four balls in another, and six balls in another, ask the children, How many balls must be moved away from the two balls to leave *one half of them?* How many balls must be moved from four balls to leave *one half* of them? How many from six balls to leave *one half?*

How many balls are *one half* of four balls? How many balls are one half of six balls?

What is one half of two? What is one half of four? What is one half of six?

How many twos are there in four? How many threes are there in six? How many fours are there in eight? How many fives in ten?

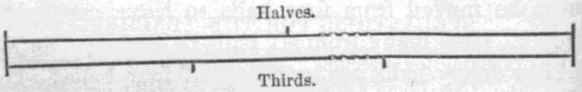
Here are four balls on this wire; I wish to take *one fourth* of them away; how many shall I move? Here are eight balls; how many must I move to take away *one fourth* of them?

What is *one fourth* of four? What is *one fourth* of eight?

How many *twos* are there in eight? How many *threes* are there in twelve? What is one fourth of twelve?

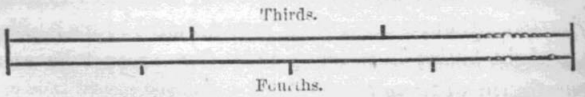
Thirds.—Ideas of thirds may be illustrated in a manner similar to that described for fourths. Let six balls or other objects be arranged in groups of *two* each; then let nine objects be arranged in groups of *three* each, etc. In this manner the idea of *equal parts of numbers* may be illustrated.

Comparative Size of Halves and Thirds, etc.—The comparative size of *halves* and *thirds*, and of *thirds* and *fourths*, can be readily illustrated with lines on the blackboard. For this purpose, draw parallel lines, as in the following diagram, dividing one of the lines into *two equal parts, or halves*, and the other into *three equal parts, or thirds:*



Lead the children to notice which is larger, one half or one third, and request them to draw lines on their slates, and divide them into halves and thirds.

Subsequently proceed in a similar manner to illustrate the comparative size of *thirds* and *fourths* with lines divided as in the following diagram:



It might aid in illustrating the idea of the comparative sizes of halves and thirds, and of thirds and fourths

to take sticks or strings, or slips of paper of equal lengths, and cut one into two equal parts, one into three equal parts, and one into four equal parts.

It would be well to illustrate each example by dividing lines, or strings of different lengths, to prevent the possibility of leaving an impression that either a half or a third is a fixed length, like an inch.

The object in comparing these fractions is not to teach their exact difference, but to early fix the fact in the children's minds that a half is greater than a third, that a third is more than a fourth, and that two thirds is less than three fourths. Let them see that the more parts any thing is divided into, the smaller each of those parts must be.

It is of much importance that these early impressions be correct, for they greatly influence the mind in comprehending subsequent relations of numbers.

SUGGESTIONS FOR THE TEACHER.

By examining the preceding pages on *Number*, it will be seen that the objective system of teaching commences preliminary instruction with the child's own experience of number, and leads him to examine this property of objects in various ways. The abstract form of the subject is avoided until the pupils have become familiar with the various combinations of objects upon which it is based.

It should be borne in mind that two distinct objects ought always to be kept in view in elementary instruction in arithmetic—*one to give the pupil skill in computation, the other to strengthen the powers of the mind.*

In the preceding pages on *Number* the aim has been to furnish such suggestions as would enable the teacher readily to devise methods for carrying out a thorough course of instruction and mental training in this subject simultaneously. Nevertheless, a few words of *caution* and additional hints may be useful here.

Do not Teach the Numeral Frame.—In using the numeral frame, the teacher should remember that it is to be employed as *a means of illustration*, not as something to be taught. Therefore it may be understood that the same manipulations of the balls ought not to be gone through with day after day, when they have served their purpose as illustrations. Besides, the tendency in the use of the numeral frame is too great toward concert repetition.

The main reliance for intelligent instruction must be upon individual answers. Illustrative exercises in number may be given to the entire class, but drills for thorough training must require individual answers, and the attention of the entire class at the same time.

Order of the Lessons.—Although the arrangement of the lessons indicates with considerable definiteness the order for taking up the successive exercises, yet a few additional hints upon this point seem desirable.

When the pupils have completed the *first step* in the "First Ideas of Number," they may continue the *second step* of this subject, and take up alternately with it the *first step* in "First Ideas of Figures." When these have been properly learned, and the *third step* in "First Ideas of Number" is taken up, the *second step* in "First Ideas of Figures" may be commenced. Thus *counting* should be kept one step ahead of *figures as symbols*.

"Adding Objects" and "Adding Figures" may properly follow in the order of the lessons; also "Subtracting Objects" and "Subtracting Figures." "Adding without Counting" may follow the preceding lessons, and should be extended over the period of learning "Numeration and Notation" and "Addition."

Repetition is not Learning.—It does not follow that a pupil is learning a *table*, or any other arithmetical exercise, because he is repeating it. Repetitions long continued in the same form are little better than waste time. To learn, the mind must act; and to secure its necessary action, the form of the exercise must be frequently changed. Most of those long-continued concert repetitions, so common in the school-room, do more harm than good by the bad habits which they give the pupils, among which are parrot-like recitations and sing-song tones. Good teachers will avoid both.

SIZE.

"Let children count, measure, weigh, and compare."

LESSONS TO DEVELOP THE IDEA OF SIZE IN GENERAL.

HAVING provided a variety of objects of different sizes, lengths, widths, as large and small balls, large and small cubes, large and small marbles, large and small boxes, cups, pebbles, fruits, nuts, sticks, strings, pieces of cards, strips of paper, etc., the teacher may address the class somewhat as follows:

To-day we will talk about the size of things. Some things, you know, are large, and some are small. Children are not all of the same size, nor of the same height. I have placed three boys in a row before you; now you may tell me which is tallest. Which is shortest?

Here you may see a ball, an orange, and a marble; which is largest? "The orange." Which is smallest? "The marble."

Now look at these apples, balls, and cup. Which is largest? "The cup." Which is smallest? "An apple."

I will place on the table cubes, balls, apples, oranges, boxes, and the cup. Now let a boy come to the table and take two large objects. Another boy may come and take two small objects.

I will hold in my hand the cup, and one girl may

come and take up two objects that are larger than this cup. Another girl may choose two objects that are smaller than this cup.

Here are several strings; which is longer, the one in my right hand, or the one in my left hand? Let a child come and pick out the longest string. Another may take the shortest string.

I have placed some strips of paper and some ribbons on the table. Let a little girl come and choose the widest ribbon. A boy may choose the widest strip of paper. A girl may choose the narrowest ribbon, etc.

Here are large and small strings. Who will pick out the smallest string? Who will select the largest string?

Of course it is intended that all the members of the class will take part in these exercises, giving answers, correcting the mistakes of individual pupils, etc.

Is a dog as large as a sheep? Which is largest, a dog, a sheep, or a cow? Is a rat as large as a cat? What is the smallest animal that you have seen? Could a horse walk through a common house-door?

Did you ever see an elephant? Is an elephant* as tall as a horse? Is an elephant as long as a horse? Is a horse as broad as an elephant? Do you think an elephant could go through the door of this room?

Which will hold most milk, this tumbler or a teacup? Here is a tin cup; will it hold more than the tumbler? Let us try it.

Let one child say the name of a large object, another of a smaller one, and another of a smaller one still, and so on.

* An elephant is from ten to twelve feet in height, and from ten to fifteen feet in length.

Let one pupil mention the name of a small animal, another of one a little larger, another of an animal a little larger than the last, another of an animal larger still, and so on until the largest animal has been mentioned.

At another exercise the children might commence with the largest, and continue to mention smaller ones in turn.

Words used to signify Size.—Let the teacher write on the blackboard a list of words used to express ideas of size, and request the pupils to form sentences with them. Thus teach the pupils to use the words correctly.

Size.

Large.	Monstrous.	Small.
Great.	Enormous.	Little.
Big.	Immense.	Tiny.
Vast.	Plump.	Fine.
Huge.	Chubby.	Thin.

The sentences formed by the pupils at this stage may be very simple, and somewhat as follows:

That is a large dog; the great door of the barn; it is a big mountain; a huge ox; a monstrous tree; it is an immense field; he is a chubby boy; it is a tiny flower; the thread is fine, etc.

LESSONS TO DEVELOP THE IDEA OF LENGTH AND OF MEASURE.

First Step, Length.—To give an idea of length, the teacher may show the children strings, sticks, strips of paper, pencils, and books of different lengths, and inquire which is longest, which is shortest, etc.

Lines may be drawn on the blackboard of various lengths, and pupils requested to point to the longest line; to the shortest line; to two long lines; to two short lines; to three long lines, etc.

Holding before the class two pencils, the teacher asks, Which is longer? The same question may be asked about two books, two sticks, two strings, etc.

Which is longer, the slate or the book? The pencil or the book? Which girl has the longest hair? Which boy has the shortest hair?

Children should be requested to come singly and choose longest strings, sticks, books, pencils, etc.; also the shortest of each. Then to select a stick of the same length as a mark on the blackboard, etc.

The teacher may draw lines on the blackboard, then, holding up a stick, ask, Which is longer, the line or the stick? Which is longer, this string or the line?

Pupils may be requested to draw a line as long as a stick which is shown them without measuring it; also to draw lines as long as a book or a slate, etc.

It would also be useful to request them to divide lines into two equal parts; to divide sticks into two equal parts, etc.

Words used to signify Length. — The teacher may write on the blackboard a list of words used to signify length, and talk with the pupils about their use, requesting them to form sentences with these words.

Length.

Long.	Short.
Longer.	Shorter.
Longest.	Shortest.
Lengthy.	

Second Step—Measure of Length. —The teacher, having provided a foot-rule, sticks, or pieces of card one, two, three, and six inches long; also sticks and strings one, two, and three feet long, shows the children the length of one inch on the rule, also sticks and cards one inch long; then places the tip of one forefinger against the first joint of the other forefinger, to show the length of an inch; then the children may be requested to place their fingers in the same position.

Next the teacher holds her two forefingers side by side, and one inch apart, and requests the children to do the same.

Next the teacher may make several marks on the blackboard, each one inch long.

In a small class it would be desirable to give each child a strip of paper, with a request to fold it in lengths of one inch each.

After the children have become familiar with this unit of measure, the inch, they may be trained to measure two inches, three inches, etc., and then to judge of these lengths in sticks, strings, pencils, and marks.

Holding up a stick two or three inches long, the teacher may ask, How long is this stick? When the chil-

dren have guessed, let it be measured. Thus train the eye to judge of measured length until it becomes familiar, and tolerably accurate in determining the length of one, two, three, and six inches.

Objects may be shown, their lengths judged and measured; marks drawn on the board, their lengths judged and measured; and finally the children required to draw on their slates, or on the blackboard, lines of these several lengths, as given by the teacher; thus the hand will be trained as well as the eye.

Here is a book; how many inches long is it? "Six; seven; five." I will measure, and see who is right—one, two, three, four, five, six, seven; seven is right. James, you guessed seven; take the rule and measure the next object. The girl or boy that guesses nearest to the correct length may be allowed to take the rule and test the accuracy of the guesses on the next object.

How many inches long is this knife? "Four, two, three, four, three." James measures and counts—"one, two, three, and almost another inch." Say then that it is nearly four inches long. "The knife is nearly four inches long."

When the children have become familiar with the measured length of one, two, three, four, five, and six inches, the foot-rule should be shown, and the number of inches counted on it. When they have learned that *twelve inches make one foot*, this measure should be made the unit for ascertaining the length of sticks, strings, marks, etc., as before.

Whenever practicable, the pupils should themselves measure as well as judge of lengths. If this can not be done to a sufficient extent in the school, they should be

encouraged to use measures at home, and thus, by experience, become familiar with inches and feet.

Children may amuse themselves in this way for hours by guessing at lengths and distances, and then measuring them to ascertain how nearly they had guessed. While the amusement is profitable to the child, the most valuable feature of this exercise is that it trains the eye and the judgment in determining length and distances.

During the exercises on measured length, the "Chart of Lines and Measures" will be of service, as it contains an inch and foot measure.

LESSONS TO DEVELOP THE IDEA OF WIDTH AND OF THICKNESS.

Width.—The teacher should provide wide and narrow ribbon, wide and narrow pieces of paper and of cloth. Let some of each be held before the pupils, and they be requested to tell which is widest, which is narrowest.

Pupils may be called upon to select a piece of ribbon of the same width as the piece of paper shown them, then to select a piece of cloth of the same width as the ribbon.

Broad marks and narrow ones may be made on the blackboard, and the children required to decide which are widest, which narrowest.

Parallel lines may be drawn on the board an inch apart, two inches apart, and three inches apart, and the children required to tell which have the widest spaces between them, which the narrowest spaces.

Show them narrow books and wide books, and require them to exercise their observation in determining which are widest and which narrowest.

Here is a slate, a book, and a ruler; which is the widest? What can you say of the slate and this sheet of paper? "They are both of the same width."

Which is the widest aisle in the school-room? Which is wider, the blackboard or the top of the desk? Let us measure and see. "The blackboard is wider than the top of the desk."

Which is wider, the school-room or the street?

Words used to signify Breadth and Width.—Let the teacher write on the blackboard a list of words used to signify *breadth* and *width*, and teach the pupils to use them correctly in sentences.

Breadth and Width.

Broad.	Wide.	Narrow.	Slim.	Neck.
Broader.	Wider.	Narrower.	Slender.	
Broadest.	Widest.	Narrowest.	Diameter.	

Thickness.—To develop ideas of thickness, the teacher should provide a variety of articles, as tissue paper, the thinnest and thickest writing paper, cards, window glass, pasteboard, binder's board, a piece of clapboard, a piece of flooring, and a piece of plank; also pieces of gauze, thin muslin, silk, linen, sail-cloth, sacking, and of carpet; wafers, buttons, and different coins.

The teacher may show these objects, two or three at a time, and request the children to tell which are thick and which thin. They may also be required to select objects that are thinner than window glass, then those that are thicker than window glass.

After a variety of exercises with these objects, selecting the thin and the thick ones of each class, and exercises in comparing one thing with another, as thick and thin books, the paper with the pasteboard, the wafer with the silk, the carpet with the gauze, etc., talk with them about the thickness of other objects, as thick and thin bread and butter, thick and thin cake and pie, thick and thin shoes, and coats, and hats.

Words which signify Thickness.

Thick.	Thicker.	Thickest.
Thin.	Thinner.	Thinnest.

LESSONS TO DEVELOP THE IDEA OF HEIGHT AND OF DEPTH.

Height.—When children have become familiar with the idea of length and thickness, they may be taught the meaning of the term height.

Let short and tall children be placed side by side in front of the class, and the other pupils required to tell which is tallest, which is shortest. The seat of the chair may be compared with the height of the table, the back of the chair with the table.

Let the pointer stand on the floor by the side of the table, and the pupils decide which is higher.

The children may be told that we use the word *height* when we mean the length or distance from the floor or ground upward. We may speak of the height of a boy, a man, a horse, a house, a tree, a hill, a mountain, etc.

Is the shade-tree as high as the house? Did you ever see a tree as high as the church steeple?

Words used to signify Height.—The teacher may write on the blackboard a list of words used to express ideas of height—distance above the surface—and the pupils may form sentences with them.

Height.

High.	Tall.	Elevated.	Top.	Low.
Higher.	Taller.	Lofty.	Apex.	Short.
Highest.	Tallest.	Towering.		
Aloft.		Pinnacle.		
		Summit.		

Depth.—The teacher may tell the children that, when we speak of distance below the surface of the ground, we say *depth*, and *height* for distance above the ground. And we may also say *depth* when we mean distance below the top, inside, as the depth of a cup, the depth of a pail, of a barrel.

Which is deeper, the cup or the tumbler?

Words used to signify Depth.—A list of words which express ideas of depth, distance below the surface, may be written on the blackboard.

Depth.

Deep.	Shallow.
Deeper.	Shallower.
Deepest.	Shallowest.
Fathom.	Shoal.

Illustrations of the proper use of these words should be given by the teacher, and afterward the pupils required to use them in short sentences, as, The well is deep; the stream is shallow; the pail is deeper than the cup; this is the shallowest dish; there is shoal water near the bank of the river; I can not fathom the ocean.

LESSONS TO SHOW THE NECESSITY OF STANDARD MEASURE.

First Step—Measure of Length.—One of you may go to the table and bring to me a long string; another may bring a long stick; another a short stick, and another a short string.

Now let me compare this long stick and the long string. What is the result? "The string is much longer than the stick." Now we will compare the short string and the short stick. What do you observe? "The stick is longer than the string."

Now suppose your mother or your sister wanted some ribbon for her bonnet, and she should go to the store and ask for a long piece of ribbon; the storekeeper would not know how much to give her.

You see, what one of you called a long string was a great deal longer than a stick which another called a long stick; and what one of you called a short stick was a great deal longer than the string which another called a short string.

If I should tell you to give me a thick board, you might hand me this piece of flooring when I wanted the plank; or if I wanted a thick piece of cloth, you might give me a piece of sail-cloth or carpet when I only wanted a piece of linen or of broadcloth.

Suppose you should ask for a thick piece of bread and butter, and Bridget should cut it as thick as this plank, you would tell her that you did not want it so thick: you wanted a thinner piece; then she might cut it almost as thin as the knife-blade.

After such examples, or similar ones, and the use of other familiar illustrations, the teacher may readily show the necessity for a fixed standard of measurement, to determine how long a long object is, or how short a short one is.

I presume that you now understand the importance of learning to measure the length of objects by inches, feet, and yards. Short lengths we measure by inches and feet, and tell how many feet and inches long they are; but longer distances we measure with rods and miles; but when we measure cloth and ribbon we use a yard-stick, and tell how many yards long they are.

Now if you should go to the store to buy ribbon, you would ask for some number of yards. If you wanted to buy boards, you would tell how many inches thick you wanted them, and how many feet long. Every storekeeper has a yard measure, and when any one asks him for a piece of cloth three yards long, he knows just how much to give.

The teacher might assist the children to fix in their minds the idea of the standard length for an inch, a foot, and a yard, by drawing lines on the blackboard an inch, a foot, and a yard long, side by side. Also by drawing similar lines on the floor.

By a few illustrations, the children may be shown that they can determine the width of ribbons by inches; also that with these same measures length, breadth, height, and depth are measured.

Second Step—Measure of Capacity.—The teacher may give similar exercises, and thus illustrate the necessity for standard measures of capacity as well as length. In

these exercises the necessity of measures for milk, molasses, etc., may be shown.

This plan may be pursued and similar illustrations given with gill and quart cups, and quart and peck measures, to explain liquid and dry measures, and show that we also have standards for these. Water and sand are usually so abundant that there can be no lack of materials, especially in a school located in the country. A few cups and measures might be borrowed for the purpose.

During all these lessons the eye and the hand of the pupil should be exercised as much as possible; the eye in observing length, width, and dimension of objects, and the hand in representing and handling what the eye has perceived. Care should be taken not to tell children any thing that they readily may be led to see or ascertain for themselves from objects, illustrations, and questions.

LESSONS TO DEVELOP THE IDEA OF

DISTANCE AND OF MEASURED DISTANCE.

First Step—Relative Distance.—Which is nearer to me, the door or the window? The door or the stove? The chair or the table? The blackboard or the table? Which pupil is nearest to me? Which pupil is farthest from me?

Which of you resides nearest to the school? Who has the greatest distance to come? Does James reside as near to the school as Henry? Which boy has the longest walk to reach home from school? Which is nearer to the school-house, the store or the grocery? Which would be the longer walk, from here to the church or to the post-office?

Lucy, whose house is nearest to the one where you reside? George, can you tell me which is nearer to your house, the drug-store or the shoemaker's? Mary, what streets must you cross to go from your home to the grocery? Which is farther, the bridge or Mr. Smith's orchard?

A great number of similar questions should be asked, until the idea of relative distance seems to be clearly understood by every child.

Words used to signify Distance.—The following list of words may be placed on the blackboard, and the pupils led by conversations to perceive how ideas of distance are expressed by their use:

Distance.

Far; afar; off; far away; afar off; yonder; a long way off; a great way off. Near; nigh; at hand; beside; alongside.

Second Step—Measured Distance.—You told me the other day that some of these objects in the school-room were near to me, and some of them farther away; that some of you live near the school, and some farther away. Now I want to talk with you about a way to find out how near and how far these objects are from me and from each other. How did you find the length of the sticks and strings? "By measuring them." Very good; now can you tell me how we may find the distance from this chair to the door? "By measuring it."

I will make two marks on the blackboard, and you may tell me how to find the distance from one mark to the other. "Measure it." I will take this foot-rule to measure the distance, and you may count the number of feet. "One, two." What, then, is the distance from one of these marks to the other? "Two feet."

Now I will measure the distance from the table to the door, and you may count. "One, two, three, four, five, six, seven, eight." What is the distance from the table to the door? "Eight feet."

Similar exercises may be given, and a variety of distances measured, until the pupils are familiar with such distances as may be illustrated in the school-room.

Third Step—Measured Distance.—When the children have become familiar with such short distances as would be described in feet, they may be taught the *yard* as a new unit of measure, and then taught to

measure distances by the yard in the school-room, and, when practicable, in the yard or street also. For measuring with this unit, a yard-stick or tape measure one yard long should be used.

Distances in the field or in the street may be measured with the yard-stick, and these may be extended as far as a hundred yards. The exercise of guessing at any given distance, in yards, should be practiced, and the accuracy of the guess determined by measurement. It is *what the child does* that *it learns to know.*

How to measure a Quarter of a Mile.—Give two boys a string ten yards long. One takes hold of an end of the string, and walks along the sidewalk or in the street, or wherever they are to measure the distance assigned them, until the string is drawn out to its full length, while the other boy stands still at the place where the measurement is to commence.

The boy who takes the lead carries eleven sticks and four pebbles. When he has carried his end of the string to its entire length, he drops a stick on the walk, or thrusts it into the ground at the end of the string, then proceeds as before. As the boy who follows comes to the stick, he holds his end of the string at that point until the leader has drawn it straight again and deposited another stick. The second boy now picks up the stick and goes forward to the place of the next, and proceeds as before.

When the following boy has picked up eleven sticks in this manner, he exchanges them with his leader for a pebble, and they proceed again as before. When the following boy has exchanged his sticks four times, and obtained four pebbles, they will have measured forty-

four lengths of their string, or four hundred and forty yards, which is a quarter of a mile.

The same process may be continued until half a mile or a mile has been measured. If more than a quarter of a mile is measured, the boys should be instructed to place some mark to indicate the quarters, half a mile, and the mile. In the same manner they may be required to measure the distance around a block in a city, or to some neighbor's, if in the country.

Subsequently pupils may be sent out singly to walk a quarter of a mile and back, or half a mile, or even a mile. By experiences such as the foregoing, children may learn to know what a mile signifies.

FOURTH STEP.—TABLES OF LENGTH AND CAPACITY.

When the pupils have been led to observe carefully the size and length of various objects, and have learned the units of measure by experience, they will be prepared to learn the tables of Cloth Measure, Long Measure, Liquid Measure, and Dry Measure.

To teach the table of cloth measure, let the children be made familiar with inches and a foot. Next show them a tape measure, or string, or stick *one yard* in length, and let them measure it, and see that it is just *three feet* long. Now write on the blackboard the

Table of Cloth Measure.

12 inches make one foot.
3 feet " " yard.
36 inches " " "
18 " " one half yard.
9 " " one quarter yard.

When the pupils have learned this table, let them write it on their slates from memory; also question them concerning it.

In one yard how many feet? If you should buy a yard of ribbon, how many feet long should it be?

In two yards how many feet? How many feet are there in four yards?

How many inches in a yard? How many inches in half of a yard?

How many inches in a quarter of a yard?

How many inches in three quarters of a yard?

How many quarters make one yard?

How many quarters in two yards?

Which is longer, nine inches or a quarter of a yard?

Which had you rather have, a piece of ribbon 36 inches long, or a piece three feet long?

Write on the blackboard the

Table of Long Measure.

12 inches make one foot.
3 feet " " yard.
16½ " " " rod.
5½ yards " " "
40 rods " " furlong.
8 furlongs " " mile.
320 rods " " "

When the pupils have learned this table so as to repeat it readily in order, they may write it on their slates from memory. Subsequently question them concerning it until they know it thoroughly.

What does it take to make one foot?

How many inches in three feet?

What is the length of a yard? How many feet in four yards?

How many feet make one rod?

Which is longer, $5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet?

If you had one string that was one rod long, another $5\frac{1}{2}$ yards long, and another $16\frac{1}{2}$ feet long, which string would be longest?

What does it take to make a furlong? How many furlongs in 80 rods?

What does it take to make a mile?

Which is longer, 8 furlongs or 320 rods?

When do we use these measures?

Write on the blackboard the

Table of Liquid Measure.

4 gills make one pint.
2 pints " " quart.
4 quarts " " gallon.

Barrels vary much in size; they usually hold from 30 to 40 gallons each.

Let the pupils learn to repeat this table, and to write it from memory:

How many gills in two pints? In one pint of milk how many gills? In one quart of water how many pints? How many pints in four quarts? What does it take to make one gallon? How many quarts in five gallons? If you had eight quarts of water in one pail, and two gallons in another pail, how many gallons would there be in both pails?

How many gallons in twelve quarts? What articles do we measure by gallons, quarts, pints? etc.

Write on the blackboard the

Table of Dry Measure.

2 pints make one quart.
2 quarts " " small measure.
8 " " " peck.
4 pecks " " bushel.

When this table has been memorized, and the pupils can tell what articles are measured by it, they may be reviewed in this table as in the others.

Grouping Words representing Kinds of Size.—An interesting and profitable exercise may be had in the use of words which represent various ideas of size, under the terms *length*, *breadth*, *thickness*, *height*, *depth*, and *capacity*. These words may be given by the pupils, and written on the blackboard in groups, to indicate the terms under which they may be classified, as below. Two or three exercises should be had with each group, that the several pupils may have an opportunity of giving words which represent the term.

Length.	*Breadth.*	*Thickness.*
Long.	Broad.	Thick.
Short.	Wide.	Thin.
Inch.	Width.	Slender.
Foot.	Narrow.	Slim.
Yard, etc.	Contracted.	Fine.
	Ample.	Slight.

Height.	*Depth.*	*Capacity.*	
High.	Deep.	Gill.	Pint.
Low.	Shallow.	Quart.	Gallon.
Tall.	Shoal.	Peck.	Bushel.
Short.	Depression.	Barrel.	Hogshead.

DRAWING.

"Doing can only be learned by doing; drawing by drawing; writing by writing; painting by painting."—COMENEUS.

THE ability to use the pencil or the pen, so that with a few strokes of either one can represent to the eye that which he can not describe, is an acquisition the value of which is too well known to need any commendation here; but that children may be trained to acquire this ability at school is not so generally understood.

It is believed by the ablest educators that children will learn to write in less time, if they are taught drawing and writing at the same time, than when taught writing alone. It was a saying of the great Swiss educator, Pestalozzi, that "without drawing there can be no writing."

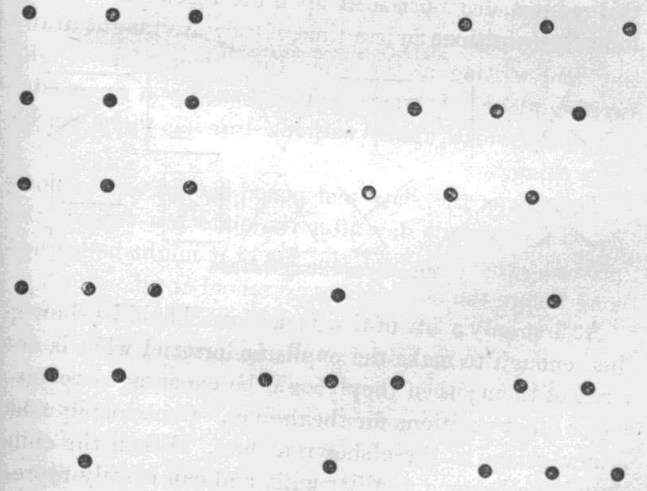
The use of the slate and pencil should not be postponed for a single day after the child has entered the primary school; indeed, the use of it might be learned long before the child is sent to school at all.

The practice of drawing on slates should be interspersed with the exercises of the primary school, not only as a means of supplying an interesting variety to the school employments of the pupils, but as the most valuable mode of training the eye in accuracy of comparing, and the hand in skill of representing objects. Care should be taken that these exercises do not come to be regarded as tasks.

HOW DRAWING MAY BE COMMENCED.

It is not intended to give a series of drawing lessons here, but simply to suggest how teachers may take introductory steps in preparing their pupils for a systematic course of instruction in this important subject. Many valuable aids have been published in the form of *Charts* and *Drawing Cards*,* to assist in acquiring this useful attainment, which will supply a series of appropriate lessons.

First Step.—The teacher may make dots on the blackboard, in rows of three each, and request the pupils to copy them on their slates, thus:



* *Harper's School and Family Slate*, with Cards. Also Professor Louis Bail's *Drawing Charts*.

When the pupils have acquired skill in making dots in rows, and arranging them in groups of various forms, they may be shown how to connect them by straight lines, and subsequently by curved lines, and thus to form a variety of figures.

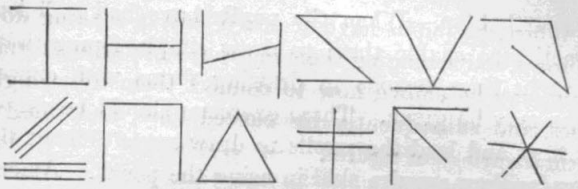
Second Step.—During this step the pupils may be taught to divide lines into two equal parts; then into three equal parts; then into four equal parts, etc.

They may also be trained to draw lines in various positions, as *horizontal*, *vertical*, *oblique*, *parallel*, etc.

Third Step.—The teacher may request the pupils to draw *two* straight lines in as many positions as they can place them. That the children may readily understand this request, draw *two lines* upon the blackboard in the following positions:

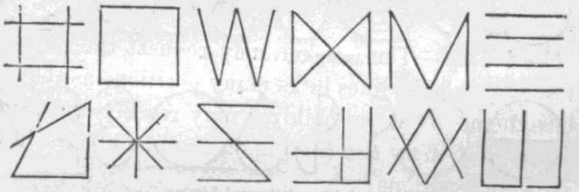
Drawing two Straight Lines.

At first only a few of these positions should be shown, just enough to make the pupils understand what is desired of them; then they should be encouraged to discover other positions for themselves. Occasionally add a new group to those shown at first. When the children have become familiar with, and can readily represent the several positions in which two lines may be placed, give them an exercise with *three lines*.



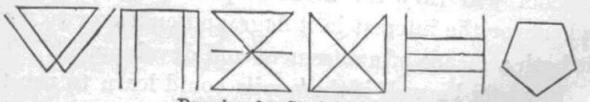
Drawing three Straight Lines.

When the pupils have become familiar with drawing three straight lines in groups of various forms, proceed to give them exercises in drawing figures with *four lines*.



Drawing four Straight Lines.

After a suitable amount of practice with four straight lines, give examples with *five lines*.

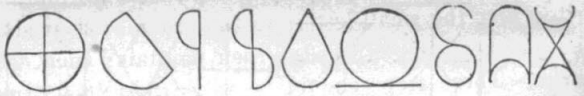


Drawing five Straight Lines.

By thus introducing an additional number of lines from time to time, the lessons may be continued to an almost indefinite extent; yet care should be taken not to go so far as to confuse the learner. In each lesson, such figures should be drawn upon the blackboard as will be most likely to suggest other forms to the pupils.

Fourth Step.—When the pupils have had sufficient practice to enable them to draw simple figures with straight lines, lessons in drawing forms with curved lines may be given. These exercises should be simple at first, and lead the pupils to draw more difficult figures as they acquire skill in using the pencil. Among other forms, the following illustrations of drawing curved lines, and curved and straight lines combined, might be given on the blackboard for the children to imitate:

Drawing Curved Lines.



Straight and Curved Lines.

Exercises with these lines combined will readily suggest a very great variety of forms. Of course, the teacher will vary the mode of presenting an exercise whenever the interest in it flags, and endeavor to make it both a means of amusement and development.

It would be well if the pupils could learn to use the chalk and blackboard during these elementary drawing exercises.

By the time the pupils have gone through with the preceding steps, they will have attained a sufficient command of the hand in the use of the pencil, and so trained the eye in distinguishing different forms and positions of objects and lines, and measuring distances, as to be prepared for taking a systematic course of drawing lessons.

WRITING.

It is not necessary to say any thing on the importance of attention to the subject of *writing*, since it is universally acknowledged to be an indispensable acquirement in education. But it is appropriate, in this relation, to suggest that early attention be given to printing words on slates and on the blackboard; that this work be commenced when the child takes its first steps in learning words and letters, and continued through the time of reading in the Primer. Let this practice be followed with simple lessons in learning to write: first the small letters in the order of their simplicity; then simple words; then capitals; then sentences. These steps should be taken first in writing on slates, afterward in writing with pen upon paper. By the time the pupil is able to read in a Third Reader, he should be able to write his name and the day of the month plainly; also simple words in sentences.

This subject of writing is so amply presented in various series of writing-books that it is not necessary to give farther suggestions here relative to the methods to be pursued in teaching it.

TIME.

"Still on it creeps,
Each little moment at another's heels,
Till hours, days, years, and ages are made up
Of such small parts as these."

LESSONS TO DEVELOP THE IDEA OF TIME AND MEASURE OF TIME.

First Step.—To give children an idea of the shorter divisions of time, as a second and a minute, the teacher may lead them in counting sixty at the rate of one count to each second, thus making sixty counts to a minute. To ascertain the proper rate, let the counting be done while observing the time that it takes the second-hand of a watch or clock to move once around its dial. At first trial the counting would probably be too rapid; but, after observing the movement of the second-hand for two or three revolutions, and counting sixty at each revolution, a very good standard for the second will be had, and also a standard for a minute. After the class have learned to count at the rate of sixty to a minute, single pupils may be requested to try counting at this rate.

When, by this means, a good idea of the length of one minute has been obtained, let the pupils count sixty five times, and thus attain an idea of five minutes.

If the teacher has neither clock nor watch to assist in measuring a minute, she might place one finger on

the pulse at the wrist, and count seventy-five pulsations for a minute. This will furnish a fair standard for a minute, since during childhood, in health, the pulsations range from eighty to eighty-five, and during adult age from seventy to seventy-five each minute.

Second Step—Time Table.—The children may be told that *sixty seconds make one minute*, and that *sixty minutes make one hour.*

To ascertain how well they remember the length of one minute, request all the pupils to close their eyes at a given signal, and keep them closed one minute, then to open them. Observe which pupils open their eyes too soon, which keep them closed too long.

Encourage the pupils to observe how many minutes it takes them to walk to school or to walk home.

Let various similar exercises be devised for training the children to observe and measure time. Subsequently teach them the table of

Time Measure.

60	seconds	make one	minute.
60	minutes	" "	hour.
24	hours	" "	day.
7	days	" "	week.
30 or 31	"	" "	month.
12	months	" "	year.
52	weeks	" "	year.
365	days	" "	year.

Teach the pupils to answer correctly questions similar to the following:

How many hours in a day?

How many hours do you spend in school each day?

How many days in a week?

How many days do you go to school each week?

What time does school commence? What time does school close in the afternoon?

Repeat the names of the days of the week.

Which is the first day of the week?

Which is the first school day?

Which is the last day of the week?

Which is the last school day?

Repeat the names of the months of the year.

Which is the first month? Which is the last month?

Repeat the names of the seasons.

Which months form the winter season?

Which months form the spring season?

Which months are called summer?

Which months are called autumn?

When do flowers appear, and trees put on leaves?

When do grains ripen?

When do fruits, such as apples, pears, and peaches, get ripe?

When do we have snow and ice?

How old are you?

How many summers have you seen?

How many winters have you seen?

SOUND.

IMPORTANCE OF TRAINING THE EAR.

THE organs of sense are the gateways by which knowledge must enter the mind; but if these gateways are only partially opened, or encumbered and blocked up, knowledge must come through them with difficulty, and often become much distorted by the passage.*

The ear is one of the avenues through which the mind gains knowledge of the external world. By means of the sense of hearing, we recognize the voices of our friends, enjoy the sweet strains of music, distinguish the sounds made by animals, and become acquainted with many of the phenomena of nature. The correctness of our knowledge of each and all of these things must necessarily depend greatly upon the condition of the organs through which this knowledge reaches the mind.

A child that is deaf does not learn to talk, because it can not hear. It may have all the organs of speech perfectly formed, but it can not learn how to use them because it has no knowledge of sound. So may defective speech result from defective hearing. It is impossible to teach a child to become a good reader until it has been trained to discriminate readily, and imitate, with a good degree of accuracy, the various sounds of the human voice.

Many persons hear musical sounds who take no pleasure in them simply because they have never been led to observe that harmony which gives pleasure through

* Human Culture, by Garvey.

the sense of hearing with sufficient attention to enable them to appreciate it.

Defects of hearing may be essentially remedied by suitable exercises for training the ear in distinguishing sounds with acuteness and accuracy. When the ear has been thus taught to hear properly, the voice can readily be trained in habits of clear and distinct enunciation.

The importance of early attention to training the ear in an accurate knowledge of sounds is not sufficiently appreciated by most teachers and parents. In endowing us with the sense of hearing, God gave with it the ability to derive pleasure from its exercise; but, like all our powers, it needs its appropriate culture to enable us to enjoy the sweetest pleasures which might flow from it.

Since so much of our knowledge of nature and the world, so much of our happiness, and so much of our usefulness in life depends upon the proper cultivation of the sense of hearing, it is deserving of the early and careful attention of all who have any thing to do with training children.

EXERCISES FOR
DISTINGUISHING SOUNDS.

THE following exercises are intended for training children to perceive sounds that are alike, and those that are unlike, and thus lead them to distinguish sounds with acuteness.

First Exercise.—The teacher may provide a large and small bell, a whistle, glass tumbler, tin cup, slate, key, pencil, etc. Let the children see what objects are struck, and notice the sound of each. After striking lightly various objects, as the table, blackboard, chair, stove-pipe, bell, tumbler, cup, etc., two or three times, request the pupils to close their eyes, and then tell by its sound what object is struck.

Change the position of some of the objects before striking them, and let the pupils discover the change from sound alone.

Call four or five pupils in front of the class, and let each read figures or spell words from the blackboard, while the eyes of the other members of the class are closed; and request the class to tell which pupil read by the sound of its voice.

Second Exercise.—The teacher may make sounds of the vowels, and request the pupils to tell which are alike and which unlike, thus: *ā, ā; ă, ă; ō, ō; ŏ, ŏ; ä, ä; ă, ă; ī, ī; ĭ, ĭ*, etc. When the pupils can distinguish these sounds, let them make each in imitation of the teacher; but do not teach them as sounds of letters.

EXERCISES FOR

COMPARING AND CLASSIFYING SOUNDS.

FIRST STEP.

Rapping and Rubbing Sounds.—Lead the children to observe and compare sounds made by *rapping* with those produced by *rubbing*. This may be done by gently striking on the table, chair, blackboard, slate, book, etc., with a pencil, ruler, pointer, or other object, and then rubbing, instead of striking, the same objects.

When the pupils are able to distinguish these sounds with their eyes closed, let them classify the sounds by saying, as each is produced, "Rapping sound," or "Rubbing sound," as the case may be.

Ringing and Tinkling Sounds.—To illustrate these sounds, and lead the pupils to compare and classify them, the teacher should provide a very small bell and a common hand-bell; also glass tumblers, some pieces of metal, and other sonorous objects. After producing several ringing sounds in succession, then several tinkling sounds in succession, let the same sounds be again produced behind a screen, or while the children's eyes are closed, and let the pupils tell, as each sound is made, whether it is a *ringing* or a *tinkling* sound.

The pupils may also be requested to mention objects that have a *ringing sound*, and those that have a *tinkling sound*.

Whistling and Hissing Sounds.—The pupils may be led to compare and classify *whistling* and *hissing sounds*,

and to make each. They may then mention various objects that can be made to produce the whistling sound; also those that give a hissing sound.

Talking, Singing, and Whispering Sounds may be compared and classified, and each kind made by the pupils.

In a manner similar to that indicated in the foregoing exercises, the pupils may be trained to observe and classify a great variety of sounds.

SECOND STEP.

Having given the pupils several lessons in comparing and classifying various sounds which may be produced in the class-room, the teacher may proceed to lead them to classify familiar sounds which may be heard away from school.

First Exercise.—During the first exercise in grouping sounds that have been heard elsewhere than in the school, the various sounds made by an animal may be grouped together, as,

Sounds made by Dogs.—Barking, growling, whining, howling.

Sounds made by Cats.—Mewing, purring, spitting.

Sounds made by Fowls.—Crowing, cackling, clucking.

Second Exercise.—The pupils may next be led to classify sounds that they have heard under the various heads of *whining sounds*, *squealing sounds*, *bleating*, *grunting*, *barking*, etc.

They may be taught to classify sounds that are loud,

confused, and continuous, as *roaring;* those that are low, heavy, and continuous, as *rumbling;* those that are low, indistinct, like running water, as *murmuring;* those that are loud and rapid, as if many things were falling and breaking at once, as *crashing;* those that are small, abrupt, and repeated rapidly, as *crackling;* those that are small, indistinct, and of quick succession, like the rubbing of silk, as *rustling.*

THIRD STEP.

Classifying Sounds as Long and Short.—By pronouncing several of the vowels, as *a*, *o*, with prolonged sounds, then with very short sounds, the teacher may readily lead the children to observe a difference in the length of sounds. Experiments may be made by uttering various sounds with the voice; also by striking a bell, a tumbler, a slate, the table, etc., until the pupils readily distinguish long from short sounds. Then let the pupils be trained to produce long and short sounds with the vowels; also by singing *la.*

Classifying Sounds as Loud and Soft.—By using the vowels, lead the children to observe that sounds may be loud or soft. When they can readily distinguish this quality in sounds, train them to utter loud and soft sounds by using *la, la;* also other elementary sounds.

Classifying Sounds as High and Low.—The teacher may readily train the children to distinguish *high* from *low* sounds by uttering the syllables *la la* first high, then low; also by using the several vowel sounds. Afterward let the pupils be taught to sing high and low notes.

HOW TO TEACH THE SOUNDS OF LANGUAGE.

When children have had sufficient training in exercising their sense of hearing to enable them readily to distinguish such qualities of sounds as have been presented in the preceding lessons, they can easily be taught the elementary sounds of language; and thus the training of the ear may be successfully continued, and the organs of speech be cultivated at the same time.

FIRST STEP.

Distinguishing Sounds of Speech.—With children that have not yet learned to read short sentences of familiar words, the first step should be to *train the ear to distinguish sounds of speech readily.* This may be done by the teacher making each sound several times, and then requiring the children to imitate it.

During this step nothing should be said about *vowels* or *consonants*, nor about the *number of sounds* that any letter has. As the object of this step is to train the organs of hearing in acuteness and accuracy, the sounds may be taken up without regard to the order of the letters in the alphabet; also without regard to the number of sounds given to any letter.

While the pupils are learning to read words at sight that are familiar to the ear, and to know them as names of objects or signs of ideas, they may be led to notice

which words have similar sounds, and to group them together, as:

Cat.	Cake.	Ball.	Cart.
Rat.	Rake.	Hall.	Park.
Mat.	Slate.	Call.	Mark.
Hat.	Day.	Saw.	Barn.
Old.	Box.	Bee.	Net.
Cold.	Fox.	See.	Men.
Stove.	Lot.	Me.	Ten.
Ice.	Tin.	Blue.	Sun.
Line.	Wind.	Tune.	Cup.
Fine.	In.	Cube.	Run.

When a list of words of similar sound have been thus arranged in a group, let the class pronounce each word in the group, and then repeat the prominent vowel sound, thus: Cat, rat, mat, hat—*ă, ă, ă, ă;* cake, rake, slate, day—*ā, ā, ā, ā;* old, cold, stove—*ō, ō, ō,* etc.

By this exercise the pupils will be prepared to distinguish the different sounds of the vowels when the lessons for that purpose are presented, and then they will soon learn to make all the sounds of each vowel.

At any time after the children have learned to distinguish some of the vocal sounds, the teacher may give consonant sounds, beginning with the simplest ones first, as *m, n, l, s, t, f, v, k,* etc., and request the pupils to imitate them. Thus let the order of procedure be,

First. Train the pupils to distinguish sounds of speech.

Second. Train them to make the sounds.

During this stage it is not desirable that these sounds be taught as sounds of letters. Indeed, I believe it would be much better to have the exercises of this step conducted solely for the purpose of training the pupils to *distinguish* and *make* the separate sounds of speech, without any attempt at associating them with the letters that are used to represent these sounds in written language.

SECOND STEP.

Distinguishing Sounds of Words.—At this stage the pupils will be prepared to commence analyzing the sounds of spoken words. The first words selected for this exercise should be short, and contain only simple sounds, as *me, see, man, cat, cake, saw, lot, stone, tin, ice, sun, face, snow,* etc. Let it be distinctly remembered that no attention is to be given to the silent letters, nor to any letters, during this step. *Only the sounds of the words as spoken* are to be distinguished and made separately.

To train the pupils in this work, let the teacher pronounce a short word very distinctly, then make each of its sounds separately, and next require the pupils to imitate her, thus: *Me, m–ē, me. Man, m–ă–n, man. Saw, s–ą, saw. Stone, s–t–ō–n, stone.*

This exercise should be commenced while the children are learning to read words at sight, as signs of familiar spoken words.

THIRD STEP.

Associating Sounds with Letters.—If the pupils have been properly trained in the preceding steps, they will now have acquired some knowledge of sounds as the elements of spoken words, and be prepared to learn which letters represent these several sounds. Although

it is common to commence with the vowel sounds, yet there is no good reason why the teacher may not begin this step with some of the simple consonants.

M.—The word *me* may be printed on the blackboard, and the pupils taught to pronounce it distinctly. Then they may be requested to say *me*, and to commence speaking it again, but keep the lips closed, so that the sound of *e* can not be made. The pupils may be told that the sound which is made in beginning to say *me* is the sound of *m*. Then let the pupils make the *m* sound three times. To furnish more practice in making this sound, place the following words and letters on the blackboard, thus:

Aim m m m make.

Let the pupils pronounce the word aim, prolonging the *m* sound; then make the sound of *m* three times, and pronounce the word *make*.

N.—Print the word *no* on the blackboard, and let the pupils pronounce it distinctly several times. Then let them say *no*, and commence speaking it again, but keep the tongue pressed against the roof of the mouth, so that the sound of *o* can not escape. For practice in making this sound, print the following on the blackboard:

Fan n n n nap;

and require the children to repeat it in the same manner as the sound of *m* was given above. To make the sound of *n*, the lips and teeth must be slightly open, the top of the tongue pressed against the roof of the mouth, and the sound caused to pass through the nose.

L.—To make the sound of *l*, place the lips, teeth, and tongue in the same position as for *n*, except that the edges of the tongue are slightly turned downward, so

as to allow the sound to pass out of the mouth. For practice the following may be placed on the blackboard:

Sail l l l lake.

F.—To make the sound of *f*, place the upper teeth upon the lower lip, and force *breath* through smoothly. The following may be written on the blackboard for practice:

If f f f fin.

V.—To make the sound of *v*, place the teeth and lips in the same position as for *f*, and force *sound* through instead of breath. For practice, write on the blackboard,

Five v v v vine.

S.—To learn the sound of *s*, say *see* several times distinctly; then commence saying it, but omit the sound of *e*. For practice, write on the blackboard,

Gas s s s see.

Z.—To make the sound of *z*, place the teeth and tongue in the same position as for sounding *s*, but force *voice* through instead of breath. Say *buzz* several times.

Freeze z z z zeal.

T.—To learn the sound of *t*, say *at* several times, pronouncing the *t* very distinctly. Press the tip of the tongue against the roots of the front upper teeth, and force breath through between the tongue and teeth suddenly. For practice, write the following on the blackboard,

Mat t t t tan.

K.—To learn the sound of *k*, say *kick* several times distinctly, observing with what sound the word ends. For practice, write on the blackboard,

Seek k k k keep.

P.—To make the sound of *p*, press the lips together lightly, and force them apart with breath.

Lip p p p pin.

B.—To learn the sound of *b*, say *bee* several times distinctly, then attempt to say it without separating the lips.

Cab b b b bad.

D.—To learn the sound of *d*, say *do* three times distinctly; then attempt to say it again without sounding the *o*.

Lid d d d did.

G.—To learn the sound of *g*, say *go* three times, then attempt to say it without sounding the *o*.

Beg g g g get.

J.—To learn the sound of *j*, which is the same as the soft sound of *g*, say *edge* several times, observing the last sound in the word.

Age j j j Jane.

R.—To learn the sound of *r*, say *fear* several times, taking care to sound the *r*.

Near r r r rear.

H.—To make the sound of *h*, open the mouth and eject the breath forcibly.

h h h hat.

To teach a pupil to pronounce the name of the letter *h* properly, require him to repeat the long sound of *ā* several times, following it with the sound of *ch*, thus: *ā, ā———ch, ch; ā——ch; ā—ch; ā-ch; āch.*

W.—To produce the sound of *w*, place the lips in the position for sounding *oo* in *moon*, or *o* in *do;* then contract the lips slightly as the sound of *oo* begins. The sound of *w* can not be prolonged.

w wall w wish.

Y.—To produce the sound of *y*, commence the sound of *e* as in *me*, but contract the sound by bringing the tongue and palate nearer together.

y ye y yes.

Ch.—To make the sound of *ch*, press the tongue lightly against the roof of the mouth and expel the breath forcibly; or say *rich* several times, observing the last sound in the word. For practice, write on the blackboard,

Each ch ch ch cheat.

Sh.—To learn the sound of *sh*, say *hush* several times, observing the last sound in the word. For practice, write and repeat,

Sash sh sh sh shall.

Th.—To make the whispered or sharp sound of *th*, place the tip of the tongue between the teeth and force the breath out gently. Say *teeth* several times, observing the last sound of the word. For practice, write on the blackboard and repeat,

Both th th th thin.

Request the pupils to say "*Thirty-three thousand things;*" "*Think thirty thoughts.*"

Those who lisp substitute this sound of *th* for the sound of *s*. This fault of speech may be corrected by training children to make the sounds of *s* and *th* separately, and then to give the *th* sound in the words where they improperly use that of *s*.

Th.—The vocal or hard sound of *th* may be produced by placing the tip of the tongue in the same position as for the sharp *th*, and forcing voice out instead of breath. Lead the children to notice the sensation of the tongue when this sound is made. They will say, "It makes the tongue tingle." Let the pupils pronounce *this, that,*

*th*ese, making the *th* emphatic. For practice, write and repeat,

Smooth th th th these.

Zh.—To make the sound of *zh*, place the tongue in the same position as for *sh*, and force voice out instead of breath. These two letters do not occur together, but the sound is heard in *azure*, *vision*, *glazier*.

Ng.—To learn the sound of *ng*, repeat the words *bring*, *ring*, *string*, making the sound of *ng* emphatic. Require the pupils to pronounce distinctly the following words, *sing-ing*, *bring-ing*, *ring-ing*. For practice, write on the blackboard,

Hang ng ng ng gang.

Wh.—To learn the sound of *wh*, pronounce the words *where*, *when*, *which*, making the sound of *wh* emphatic. For practice, write on the blackboard,

Where wh wh wh when.

Qu.—*Q* has no sound of its own. *Qu* represent the sounds of *kw*, as in *queen*, kween; *quite*, kwite.

X.—*X* has no sound of its own. It represents the sounds of *ks* in *tax* and *excel*, and the sounds of *gz* in *exist*, *exalt*, and *sh* in *anxious*.

C.—*C* may be said to have no sound of its own. It borrows or represents the sound of *k* in *cat*, *cup*, *cold*; and the sound of *s* in *cent*, *rice*, *face*; and the sound of *z* in *sice*, *discern*, *sacrifice*.

Gh represent the sound of *f* in *laugh*, *rough*, *cough*, etc.

Ph represent the sound of *f* in *phonic*, *sylph*.

When the pupils have become familiar with the sounds represented by the letters and combinations already given, they will be able to determine which letters represent each consonant sound in any word.

The Sounds of A.

1.	2.	3.	4.	5.	6.
Ale.	At.	Arm.	All.	Air.	Ask.
Fame.	Fan.	Far.	Form.	Fare.	Fast.
Late.	Lad.	Lark.	Law.	Lair.	Last.
Plait.	Plaid.	Part.	Pause.	Pair.	Pass.
Lā.	Lă.	Lä.	La.	Lâ.	Là.
ā.	ă.	ä.	a.	â.	à.

To learn the several sounds of *a*, commence with the first column, and repeat each word, ending with the long sound of *ā*; then repeat this sound of *ā* several times. Next repeat the words in the second column, ending with the short sound of *ă*; then repeat this sound several times. Next repeat the words of the *first* and *second* columns alternately; then the sounds of each alternately several times. Next repeat the words of the third column, ending with the Italian sound of *ä*; then repeat this sound several times. Next repeat the words of the three columns in this order: Ale, at, arm; fame, fan, far, etc., ending with ā, ă, ä.

Proceed in the same manner with each of the remaining sounds. Practice in this way until the pupils can readily give any sound of *a* that may be called for separately, as the first sound of *a*; the third sound of *a*; the second; the fourth; the sixth, etc. The same plan* may be pursued for teaching all the *vowel sounds*.

* "The Phonic Charts, *for Self-training in the Sounds of Language*, by N. A. Calkins," were prepared for teaching the sounds in accordance with the plans described in these pages. Even those who are not familiar with the sounds can learn them from these Charts so as to teach successfully. These Charts are published by Harper and Brothers, and may be sent by mail.

Sounds of E.		Sounds of I.	
1.	2.	1.	2.
Eve.	End.	Ice.	In.
Meet.	Met.	Fine.	Fin.
Seal.	Said.	Buy.	Build.
Lē.	Lĕ.	Lī.	Lĭ.
ē.	ĕ.	ī.	ĭ.

Sounds of O.			
1.	2.	3.	4.
Bone.	Box.	Boot.	Broth.
Cold.	Cot.	Cool.	Cost.
Sew.	Swan.	Soup.	Song.
Lō.	Lŏ.	Lọ.	Lò.
ō.	ŏ.	ọ.	ò.

In the Dictionary, the *o* in words like *dog*, *cost*, *song*, is marked the same as *o* in *nŏt;* and yet we are told by the same authority that to give the extreme short sound of *o* in *not* to these words is affectation; and that to give them the full broad sound of *a* in *all*, or *o* in *form*, is vulgar. Then why not give a special sound for this *o?*

Sounds of U.			
1.	2.	3.	4.
Blue.	But.	Bush.	Burn.
Cube.	Cub.	Could.	Cur.
Feud.	Flood.	Foot.	Firm.
Suit.	Sun.	Shook.	Serve.
View.	Wont.	Wolf.	Work.
Lū.	Lŭ.	Lụ.	Lû.
ū.	ŭ.	ụ.	û.

It is not claimed that the sound of *u* in *cur*, *i* in firm, *e* in serve, and *o* in work, are in all respects identical, yet the sound of each of these vowels is so nearly the same that, for the purposes of elementary training in the sounds of language, they may be treated as having the same sound.

The different vowel sounds are herein distinguished by numbers, as this is found the most convenient mode in teaching.

Double Vocal Sounds, or Diphthongs.			
Boil.	Boy.	Sound.	Cow.
Coin.	Cloy.	Out.	Owl.
oi.	oy.	ou.	ow.

FOURTH STEP.

Analysis of Words by Sounds.—Having learned the vowel and consonant sounds, the pupils may now be trained in their farther application to speech by being requested to make the several sounds in given words, or analyze them, as the teacher pronounces them. The pupil should pronounce the word after the teacher, then give distinctly each sound contained in it, and pronounce the word again.

Mate,	*m ā t,*	māte.	Care,	*k â r,*	câre.
Pail,	*p ā l,*	pāil.	Pair,	*p â r,*	pâir.
Mat,	*m ă t,*	măt.	Last,	*l à s t,*	làst.
Plaid,	*p l ă d,*	plăid.	Chance,	*ch à n s,*	chànce.
Far,	*f ä r,*	fär.	Seat,	*s ē t,*	sēat.
Fall,	*f ạ l,*	f ll.	Seize,	*s ē z,*	sēize.
Form,	*f ạ r m,*	fȯrm.	Men,	*m ĕ n,*	mĕn.
Bought,	*b ạ t,*	bȯught.	Head,	*h ĕ d,*	hĕad.

Guess,	*g*	*ĕ*	*s*,	gu*ĕ*ss.	Long,	*l*	*ȯ* *ng*,	l*ȯ*ng.
Dime,	*d*	*ī*	*m*,	d*ī*me.	Gone,	*g*	*ȯ* *n*,	g*ȯ*ne.
Height,	*h*	*ī*	*t*,	h*ī*ght.	Lute,	*l*	*ū* *t*,	l*ū*te.
Sing,	*s*	*ĭ*	*ng*,	s*ĭ*ng.	Suit,	*s*	*ū* *t*,	s*ū*it.
Sieve,	*s*	*ĭ*	*v*,	s*ĭ*eve.	Sun,	*s*	*ŭ* *n*,	s*ŭ*n.
Note,	*n*	*ō*	*t*,	n*ō*te.	Does,	*d*	*ŭ* *z*,	d*ŭ*es.
Four,	*f*	*ō*	*r*,	f*ō*ur.	Full,	*f*	*u̇* *l*,	f*u̇*ll.
Not,	*n*	*ŏ*	*t*,	n*ŏ*t.	Wolf,	*w*	*o̤* *l* *f*,	w*o̤*lf.
What,	*wh*	*ŏ*	*t*,	wh*ŏ*t.	Burn,	*b*	*ûr*	*n*, b*ûr*n.
Moon,	*m*	*o̤*	*n*,	m*o̤*o*n*.	Verge,	*v*	*ûr*	*j*, v*ûr*ge.
Group,	*g*	*r*	*o̤* *p*,	gr*o̤*up.	Mirth,	*m*	*ûr*	*th*, m*ûr*th.

Describing the Sounds.—*First Form.*—The most simple description should include the *number* and *name* of the *vowel sound*, also the *number of sounds* in the given word, the *number of letters* in it, and which are silent, thus: Come, *k ŭ m*, cȯme; *o* has the second sound of *u*. This word has *three sounds* and *four letters*; *e* is silent.

Second Form.—Pupils that are so far advanced as to read in a Second Reader may give a description similar to the following, thus: Late, *l ā t*, lāte; *l* has its own sound; *a* has its first sound; *t* has its own sound; *e* is silent. School, *s k o̤ l*, schōol; *s* has its own sound; *ch* has the sound of *k*; *o* has its third sound; *l* has its own sound. Though, *th ō*, thōugh; *th* has its vocal sound; *ough* the first sound of ō, or (the pupil may say) *o* has its first sound; *gh* are silent. Know, *n ō*, knōw; *k* is silent; *n* has its own sound; *ow* the first sound of *ō*.

Third Form.—Pupils that read in a Third or Fourth Reader may be taught to describe and name the sounds of letters somewhat as follows, viz.: Sauce, *s a̤ s*, sa̤uce; *s* has its own sound—it is an aspirate; *au* has the fourth sound of *a̤*—it is a vocal; ç has the sound of *s*—it is an aspirate; *e* is silent. Sphere, *s f ē r*, sphēre; *s* has its own sound—it is an aspirate; *ph* has the sound of *f*—it is an aspirate; *e* has its first sound—it is a vocal; *r* has its own sound—it is a sub-vocal; *e* is silent. Mouth, *m ou th*, mouth; *m* has its own sound—it is a sub-vocal; *ou* has its own sound—it is a vocal; *th* has its sharp sound—it is an aspirate.

How the Sounds are made.

The Vocal Organs.—The *vocal chords* of the larynx, the *lips*, *teeth*, *tongue*, *palate*, and *glottis*, are usually included in the list of vocal organs.

Vocal Sounds are made by the passage of breath over the vocal chords, causing them to vibrate. These vocal sounds are modified by the position of the lips, teeth, tongue, and palate, and thus made to represent the several vowel sounds.

The Sub-vocals are made by slight vocal sounds, more effectively modified by the lips, teeth, tongue, and palate.

The Aspirates are made by breath which passes out without acting upon the vocal chords. This breath is also modified by the lips, teeth, tongue, palate, and glottis, so as to represent the several aspirate sounds.

Letters formed chiefly by particular Organs.—In order that the attention of pupils may be directed to those organs which are most essential in the formation of given consonant sounds, the following classification are made on the charts:

Lip Letters—b, m, p, and *w.* To form the sounds of these letters, chief attention should be given to the *position of the lips.*

Lip and Teeth Letters—f, v, ph. To form these sounds, attention should be given to the *lips and teeth.*

Tongue and Teeth Letters—c, d, l, n, s, t, z, th. To

form the sounds of these letters, attention should be given to the *position of the tongue and teeth.*

Tongue and Palate Letters—g, j, r, y, ng, ch, sh, zh. To form these sounds, attention should be given to the *position of the tongue and palate.*

Glottis Letter — h — is formed by forcing breath through the open glottis, and allowing it to pass out of the mouth without modification by other organs.

Palate, Tongue, and Teeth Letter — x — commences with the sound of *k*, and ends with *s*.

Palate, Tongue, and Lip Letter—q, or *qu*—commences with the sound of *k*, and ends with that of *w*.

Other Classifications and Names.—Various other classifications are made, and other names used to distinguish the sounds of letters, as *Vowels, Semi-vowels, Consonants, Diphthongs.*

Some authors use the name *Tonics* for vowels, or vocals; *Sub-tonics* for semi-vowels, or sub-vocals; *Atonics* for aspirates.

Letters are sometimes described as *Labials* when chiefly formed by the *lips;* as *Linguals*, when chiefly formed by the *tongue;* as *Palatals*, when chiefly formed by the *palate;* as *Nasals*, when sounded through the *nose;* as *Sibilants*, when made by a hissing sound, as *s* and *z*.

Cognates are letters formed by the same organs, as *f* and *v; t* and *d; p* and *b*, etc.

Mutes are letters formed by a complete closure of the organs, and an entire interruption of the sound.

Sonants are letters uttered with the voice, as *vocals* and *sub-vocals.*

Surds are letters uttered with simple breath.

Simplest Classification Best.—For the practical purposes of teaching the Elementary Sounds, *as few divisions should be made in the classifications as is possible with clearness.* Experience has shown that the classes of sounds known as *Vocals, Sub-vocals*, and *Aspirates* are easily taught and remembered.

An attempt to teach the pupils of a Primary or a Common School all the distinctions, names, and classifications sometimes given, or even all that are mentioned here, would lead to confusion rather than knowledge. Besides, such information would be of little or no practical value.

The important work of the teacher in relation to Phonetics is,

1*st. To train the organs of hearing to distinguish readily and accurately* the different sounds of language.

2*d. To train the organs of speech to produce these sounds with ease and accuracy.*

These two points should receive the teacher's special attention. They can not be attained by teaching children names and classifications to be recited *about* the sounds and letters. It can only be accomplished by exercises for the *organs of hearing* and the *organs of speech*, to give them greater power.

Vocal Training—how to be used.—The teacher should by no means regard the vocal power imparted to the children by this phonetic training as the *end* of the work. This power should be daily applied to the correction of faults of *enunciation and pronunciation in reading and conversation.* This should be attended to constantly until the *habit* of distinct and correct pronunciation is securely formed.

SUGGESTIONS FOR TEACHERS.

The idea has already been stated that the *first step* to be taken in teaching the elementary sounds of language consists in *training the ear to distinguish these sounds*, and the *second step* in *training the organs of speech to make them*. The chief value of elementary sounds in Primary Education can be realized only by proper attention to these two steps. Whatever else may be learned about these sounds, their number, etc., can be only of secondary importance. Their *training power* upon the ear and the organs of speech should be the principal object of attention by the teacher.

In order that this idea may be most readily attended to during the instruction given in this subject, the number of sounds for each letter has been reduced to the lowest practicable limit for successful teaching.

Instead of saying that *A* has *seven* sounds, only *six* are given here; the seventh, that of *a* in *what*, is said to represent the second sound of *o*, as in *not*.

Instead of giving *five* sounds of *E*, only *two* are given here; the *e* in *there* represents the *fifth* sound of *a*; the *e* in *they* represents the *first* sound of *a*; the *e* in *serve* represents the fourth sound of *u*.

Instead of giving *four* sounds of *I*, only *two* are given here; the *i* in *pique* represents the *first* sound of *e*; the *i* in *bird* represents the *fourth* sound of *u*.

Instead of saying that *O* has *six* sounds, only *four* are given here; the *o* in *son* represents the *second* sound of *u*; the *o* in *for* represents the *fourth* sound of *a*.

Instead of saying that *C* has *three* sounds, it is represented as borrowing the sound of *k* in *cat*, the sound of *s* in *cent*, and the sound of *z* in *suffice*.

Sounds of other letters are treated in the same manner.

In analyzing words, it is very important to give the separated sounds, so that, as a whole, they shall resemble the sounds of the spoken word. This is especially desirable in that class of words commencing with *w* and *y*, as *waste*, *wall*, *was*, *wet*, *wind*; *yam*, *yes*, *young*.

Instead of making the sound of *w*, then of *a*, then of *s*, then of *t*, each separately, the sounds of *w* and the following vowel may be joined together by prolonging the *w* sound somewhat, thus: *w-ā s t*, waste; *w-ŏ z*, was; *w-ĕ t*, wet; *y-ă m*, yam; *y-ĕ s*, yes, etc.

PRIMARY READING.

SOME OF THE METHODS USED IN TEACHING.

The art of reading intelligently is one of the most difficult of human attainments. To examine the unphilosophical methods, and the arbitrary processes commonly employed in teaching children the first lessons in reading, would soon remove all astonishment at the slow progress made, and leave no cause for surprise that so many children find this threshold of knowledge unattractive. Some of these methods are old, long, unnatural, and tedious, affording little else than monotony to gratify the child's willingness to learn. Others may be shorter, but none the less unnatural and arbitrary. That teachers may readily distinguish good methods from poor ones, descriptions will be given of some of the plans employed for the first lessons in reading.

THE A, B, C METHOD.

This old, long, and tedious way consists in teaching first the *names* of each of the *twenty-six letters*, then in combining these into unmeaning syllables of "two letters," "three letters," and finally into words of "two syllables" and "three syllables." Very little regard is had to the meaning of the words. Indeed, it seems as if those who attempt to teach reading by this method suppose that the chief object should be to make their pupils fluent in oral spelling; and it ends in spelling usually, since children thus taught go on spelling out

their words through all the reading lessons, and seldom become intelligent readers. They give their attention to the *words* instead of the *ideas* intended to be represented by them.

When the child has succeeded in learning the *names* of the twenty-six letters, he has gained no knowledge of their real use as representatives of sounds, and, consequently, little ability in determining how to pronounce a new word from naming its letters. Besides, the names of the letters constantly mislead him when formed into words. He may have made the acquaintance of each of the twenty-six individual letters so as to recognize their faces and be able to call them by name singly, but when these same letters change places with their fellows, as they are grouped into different words, he is frequently unable to address many of them in a proper manner, or to determine what duties they perform in their different places.

Again, the words that are learned by naming over the letters which compose them seldom represent any ideas to the young learner; indeed, too many of the words learned by this method are only meaningless monosyllables. The children begin to read without understanding what they read, and thus is laid the foundation for the mechanical, unintelligible reading which characterizes most of that heard in schools where the A, B, C method is used.

This plan is in violation of fundamental laws of teaching; it attempts to compel the child to do two things at the same time, and to do both in an unnatural manner, viz., to learn reading and spelling simultaneously, and reading through spelling. Reading has to deal with *sounds* and *signs* of thoughts. Spelling rests on a

habit of the eye, which is best acquired as the result of reading. In attempting to teach reading through spelling, the effort of the pupil in trying to find out the word by naming the letters that compose it, distracts the attention from the thought intended to be represented by it; the mind becomes chiefly absorbed with spelling instead of reading. When properly taught, reading furnishes natural facilities for teaching spelling; but spelling does not furnish a suitable means for teaching reading.

Thus it will be seen that the usual plans for teaching reading by the A, B, C method compel children to do that for which their minds are not fitted, and thus cause a loss of power by restraining them from attending to the thoughts represented by the words, and to other things, which would greatly promote their development. The results are—a love for reading is not enkindled; good readers are not produced. The few cases in which the results are different owe both the love for reading and the ability in this art to other causes; the pupils learned to love reading, and became able to read well in spite of poor teaching during their first lessons. There is consolation in believing that this method, which produced so many halting, stumbling readers, is now abandoned by all *good* teachers of reading. May the number of such teachers be greatly increased.

THE PHONIC METHOD.

The "Phonic Method" has many forms of representation. Yet, in all the modes of using it, its prominent features consist chiefly in first teaching the pupils sounds of letters in place of their names, and then in

requiring the children to use these sounds in learning to read.

To read the word *man*, the pupils would be taught to make the sound of *m*, then the short sound of *a*, then the sound of *n*, and to pronounce it *man*. But in the use of this method the child soon encounters difficulties, and finds these sounds uncertain guides in determining what to call the word.

After being taught the sounds of the letters in the word *cap*, the word *cape* appears, and the child is told that in this word *a* has a different sound. Then he meets the word *car*, and finds that *a* has still another sound. At length he encounters the word *call*, and is told that the same character has yet another sound. Perhaps he finds the word *care*, and becomes more astonished on hearing that *a* has a fifth sound.

The pupil also learns the sound of *e* in *me*, and of *e* in *men*, and of *e* in *her*, and he soon is told that *e* has no sound in *time*. Thus it appears that many obstacles attend learning to read by the Phonic Method, as well as by the A B C Method.

Attempts have been made to systematize this method by classifying the sounds, and teaching first words containing only short vowel sounds, as *hat, mat, cat, hen, pen, pin, tin, hot, lot, hut, cup*. Having spent several months in learning this class of monosyllables, the pupils are next introduced to words containing the long sounds of the vowels, as *cape, hate, bee, me, find, pine, hope, told, tube, rude*. Subsequently words beginning alike, as *blind, block; brown, brew; clip, clog; drop, dry; gnat, gnaw; knee, knob; plug, plum; smut, smack; twill, twang*, are arranged in groups or classes. Afterward those containing similar silent letters are presented, as *light, night; plague, vague; edge, wedge; scent, scene*.

It will be readily seen that, with these classifications of words having similar sounds, an attempt is made to lead the pupils to master the difficulties of our language through a plan that reverses the natural order by treating the real office of the printed word—*that of representing thought*—as of secondary importance, and directing the child's attention first and chiefly to sounds of *letters*, which constitute no element of the thought represented. Although some success has attended this plan, yet it is accompanied with so much complexity as to prove inadequate as a successful means of teaching reading.

So long as a single sign is made to represent from one to six sounds, and the same sounds are frequently represented by different signs, and the same signs often have no sound at all, it will continue to remain a difficult task to teach reading in our language by the sounds of letters alone. Yet for teaching languages like the German and Spanish, whose phonic structure is regular, this method would be most appropriate. Those who advocate it on the ground that it is successfully used in Germany do not give due consideration to the difference in phonic structure between our language and the German.

But the chief defects of the Phonic Method for teaching our language lie in its unnatural and unphilosophical system. The natural way for a child to learn language is to begin with the units of language, which are words. Language deals with thoughts; words are symbols of thoughts. Neither letters nor sounds are elements of thought. Letters are elements of the *forms* of words; simple sounds are the elements of the *sounds* of words;

neither of these elements are units in language. The true starting-point for reading must be with the *thought* and its *sign* as a whole. Subsequently the sign may be analyzed, and the elements of both its *sounds* and *forms* learned.

To teach a child the *sound* of a single letter, then of another, and afterward to unite them into a compound sound or word, is no more natural in its relation to the child's mind, nor to the thoughts represented, than to teach it the *names* of two letters singly, and then to unite them together, and call the product a word.

Sounds of letters, when properly classified, furnish a most valuable aid in teaching reading, after the pupils have made some progress in learning printed words as the signs of familiar spoken words. This process, however, is not adapted to the child until it has learned some words as wholes, as units of language, and as representatives of thoughts.

Mechanical and artificial methods of teaching may be employed with apparent success, as systems of mnemonics are sometimes made to appear valuable as aids to memory, but careful observation and experience will prove that they possess little or no genuine merit.

PHONOTYPIC METHOD.

The "Phonotypic Method" is another form of the Phonic Method, yet it differs from that in its application, since it provides a character or letter for each sound in the language. The pupil is required to learn forty or more letters in place of twenty-six. As each of these phonetic letters always stands for the same sound, it avoids the difficulty of using the same letter to represent several sounds.

The desire of many who advocate this system is to have all our books ultimately printed in these characters; but this scheme is generally regarded as visionary. In the relations of the Phonotypic Method to teaching the first reading lessons, it has been considered by some as a valuable aid. The plan of using it is to introduce the child to these characters at once on its entering school, and teach it to read by the use of books printed with phonotypic letters. The reading lessons are confined to these books until the pupils can read fluently in them; afterward they are taught reading from books in the common letters. It has been claimed that pupils would learn both methods, and become able to read better thereby, in a given time, than they usually do when taught entirely from the common print.

The Phonotypic Method is liable to some of the objections that are urged against the Phonic Method, and it also has more serious faults. The forms of the words and their spelling are materially changed, and, in consequence of this fact, its use in reading is generally regarded as a hinderance rather than an aid in learning to spell the words of our language in accordance with the common orthography. Besides, it does not remove the irregularities of our language by its temporary use in learning to read. It only furnishes a means by which the difficulties to be surmounted in reading are delayed for a time. Its practical value, therefore, may be justly questioned as a means for teaching reading. It attempts such radical changes in the formation of the words of our language that it fails to commend itself to teachers or the people as a means of learning to read.

LEIGH'S PHONETIC METHOD, OR
PRONOUNCING ORTHOGRAPHY.

The Phonetic Method recently produced by Dr. Edwin Leigh seems to possess fewer objections than any other Phonetic system that has been devised for teaching children to read and spell our language as now printed. It provides signs to represent all the sounds of the language, using the common letters each to denote but one sound (the most frequent one) of that letter, and providing slight modifications of these letters to denote the other sounds. Thus the various sounds of *a* are represented by different forms of the letter *a*, and the various sounds of *o* by different forms of *o*, and the same with other letters, as is shown by the following illustrations:

This form of a represents its sound in cane.
" " a " " " " cap.
" " a " " " " car.
" " a " " " " call.
" " a " " " " care.
" " o " " " " old.
" " o " " " " on.
" " o " " " " do.
" " o " " " " look.
" " o " " " " or.
" " e " " " " me.
" " e " " " " men.
" " s " " " " see.

This form of s represents its sound in his.
" " c " " " " cat.
" " c " " " " ice.
" " g " " " " get.
" " g " " " " gem.

This method preserves the present forms of the words so far as relates to the spelling. By making the silent letters with hair lines only, the letters that indicate the sounds of the word appear prominent, and, when the characters have been learned, the pupils can readily determine the pronunciation of the words. The general form of the words and the number of letters in each being the same as in the common type, both the word as a whole and its spelling are readily learned.

This method is called a "Pronouncing Orthography," and is designed to be used as an introductory means in teaching children to read our common print. The pupils may first learn words printed with these letters, and then the sounds represented by each, and then learn the spelling as with common print. When children can read through the First Reader fluently, a reader printed in the common type may be placed in their hands, and instruction continued in nearly the same manner as if the "Pronouncing Orthography" had not been used.

THE WORD METHOD.

The "Word Method" begins at once with teaching the words in a manner similar to that by which children learn to distinguish one object from another, and

learn the names. It proposes to teach words as the *signs* of things, acts, and qualities, etc. It does not propose to teach pupils the alphabet, but to leave them to learn this after they have become familiar with enough words to commence reading.

In Europe this method is sometimes called "Reading without Spelling," and sometimes the "Look-and-Say" Method. When properly used, this plan introduces the learner to the meaning of the spoken word before teaching it the printed form; thus the idea is associated with the form which represents it.

THE WORD-BUILDING METHOD.

The "Word-building Method" was in limited use in Europe about forty years ago. The author who introduced it into this country, about fifteen years since, with some modifications, claims that "it unites all the advantages of the old system of teaching to read by first commencing with the alphabet, and the new and preferable one which begins with entire words."

Its plan is to commence with words of one letter, as A, I, O, and gradually form new words by prefixing or affixing single letters. The child is taught first to pronounce the word, then the letters that form it. Separate letters of the alphabet and spelling are taught by asking questions similar to the following: "What letter is placed after *a* to form *an?* What after *an* to form *and?* What before *and* to form *land?*"

Those methods which embrace the plans most commonly employed in teaching the first lessons in reading have now been described. There are, however, modifications of these methods in use, each of which may prove more or less successful, according to the skill of the teachers who employ them.

From the descriptions of methods already given, it will be perceived that there is a wide difference between the practical character of some of these plans. Notwithstanding so great a variety of methods is used for teaching reading, many children still acquire habits of reading in an unnatural and monotonous manner, and without understanding what they read, while these bad habits do not exist in the ordinary conversation of the same children. Why does this difference exist between the tones of conversation and those of reading? Is it caused by the use of unnatural methods for teaching reading?

May not this difference of manner between reading and conversation be due chiefly to the difference in the attention given to the *thoughts* and the *words* which represent them? In conversation the thoughts uttered receive chief attention; words are used simply as a convenient means of communicating these thoughts. In reading, owing to the habits usually formed from the way in which the early lessons are taught, greater prominence is given to the *words* than to the thoughts which they represent. In conversation children follow nature, giving thoughts the foremost place.

In some of the methods used for teaching reading the *forms* or *sounds* of the words are kept most prominently in view, while but little attention is given to the thoughts.

In view of the great importance of having those whose duty it is to give instruction in the first lessons of reading understand what is the proper starting-point in this

work, and the order of proceeding, attention is invited to a careful consideration of the following:

FACTS TO BE OBSERVED IN TEACHING READING.

1. Reading directly exercises the senses of *seeing* and *hearing*.

2. *Sounds* of words, i. e., the words as spoken, are learned by hearing only, and chiefly through their use in conversation. In view of this, they may be termed *Sound-words*.

3. *Forms* of words, i. e., the words as printed and written, are learned by *seeing*. These may be termed *Form-words*.

4. *Words*, both of sound and form, *symbolize ideas*. The ideas symbolized by sound-words are perceived through the *ear*. The ideas symbolized by the form-words are perceived through the *eye*. *Words constitute the units in language*.

5. *Sound-words* may be separated into simple or elementary sounds; but these simple sounds do not symbolize ideas, nor the elements of them.

6. *Form-words* may be separated into simple elementary forms or letters; but these letters do not symbolize ideas, nor the elements of ideas.

7. Children learn, naturally, by proceeding from the *known* to that which is akin in the *unknown*. This is the true order for teaching.

8. *Sound-words*, as used in conversation, constitute the *known* to the child just commencing to learn reading. *Form-words* are the *unknown* to this beginner, and the kin to the *sound-words*, or *known*.

9. *Whole words* are first learned in conversation. The

whole form of the word should be learned first in reading. The first object of the instructor should be to *teach the children to know by sight the forms of those words which are already known to the ear*.

10. Children learn the concrete before the abstract; the whole before its parts. Words are the *wholes* in the first lessons of reading. Their parts, or analysis into *sounds* and *letters*, belong to a subsequent step.

11. To secure a habit of reading with an easy, natural voice, the child must be trained from the first to treat printed words as signs of things, actions, and thoughts. Both the *form* and the *sound* of the word should be associated with the object or thought represented. Neither a spoken word nor a printed word means any thing to a child until it symbolizes an object or an idea which that child already knows.

"Let the child's mind be filled with as many ideas as possible, and with spoken words to represent them. When a child knows the audible sound for an idea, it will very soon learn to recognize the visible symbol of the same idea without reference to the letters that form the word, or the sounds that the letters stand for; and this is a far more effectual method of teaching it to read than the usual practice of making the pupil go through a weary synthetical process, which he is utterly incapable of comprehending. The mind of the child, daily increasing in its knowledge of things, and in the power of knowing, will not long be satisfied with the general *form* of the words that stand for the names of its favorite objects; he will want to know about the letters. This spontaneous movement of inquiry indicates the moment at which the teaching of the elementary sounds, and their combinations, should begin. The value of the

several letters is a more difficult process, and better suited to a more advanced state of mental culture than exists at the initial step of reading.

"The rapidity with which a child may be taught to read by recognizing the simple *form* of the words at first is surprising, and no less surprising is the facility and perfection with which spelling is afterward learned."*

THE OBJECT METHOD.

By the "object method" of teaching reading the attention of children is first directed to some object with which they are familiar by sight, name, and use. Whenever practicable, during the first lessons in reading, the object is shown, talked about, and its name spoken; then a picture of the object is presented, or a drawing of it made on the blackboard, and the pupils are led to notice this as a *picture* of the object. Next the name of it is plainly printed on the blackboard, or shown on a card. The pupils are now taught to distinguish the *object*, the *picture* of it, and the *word* from each other, as "the cup; the picture of a cup; the word cup." Several words may be taught in this manner before the *sounds* or the *letters* of the word are introduced to the pupils.

By this method the words are taught as symbols of objects, and of their spoken names; thus both the sound-word and the form-word will equally symbolize the object, and both possess equal power in recalling the qualities of the object to the mind. Whole words should be presented and learned, as above, until the children

* *Human Culture*, by M. A. Garvey.

have become familiar with the fact that the words are symbols for sounds, and things, and thoughts. During this time the pupils should not be taught to spell, as their eyes have yet become accustomed only to whole words. Subsequently the analysis of these words into sounds and letters may be taught. Then the value of the elementary sounds and of the several letters will be readily understood, and a knowledge of them easily acquired. This analysis will be greatly facilitated by familiarity with the forms of the words.

Children usually learn *names of things* first, and *names of qualities* and of *actions* afterward. Printed words representing the names of things should be taught first, as whole words, then words representing names of qualities and actions. The little words that are only joints and hinges in language, and those that are used as substitutes for other words, should not be taught until they are needed in the formation of phrases and sentences, and their use can be illustrated. This plan can be easily carried out by using the blackboard for giving these lessons.

STEPS IN READING BY THE OBJECT METHOD.

The following order should be observed in teaching beginners reading:

First Step.—Teach whole words by sight, that are already known by hearing, as signs of objects, qualities, and actions.

Second Step.—Teach the analysis of the word by its elementary sounds.

Third Step.—Teach the analysis of the word by the names of its letters, and their order in spelling it.

Fourth Step.—Require the pupils to *pronounce the word—sound it—spell it.*

Fifth Step.—Group words into phrases and sentences.

By observing these steps in teaching, the word as a whole, its sounds, and its spelling, will become intimately associated with the object or idea represented.

It may be asked, How will a child acquire the ability of learning the new words which it will find in reading? By observing their resemblances, and comparing words known with new words. Who that has carefully watched the operations of the child's mind in learning to read, does not know that the learner is constantly comparing the forms and sounds of words? The association of sound with form, which the child makes with one word, it endeavors to apply to every other word where the resemblance in form gives an opportunity. Where a proper use of the elementary sounds is made, the child adds to its ability to learn new words with each word acquired. Then the teacher may greatly aid the child in increasing this ability by showing it how to arrange in groups those words which resemble each other in sound, and those which resemble each other in form, and then directing the attention carefully to the meaning, sound, form, and spelling of each.

By this order for teaching reading—the *idea first*, its *signs second*, and the ability *to represent the idea by its signs third*—the natural order of learning language, and the natural order of using it, are made to correspond.

SUGGESTIONS FOR THE TEACHER.

That the plan of teaching children to read by the *object method* may be more clearly understood and readily applied, the following suggestions are given relative to it:

It is of little importance what words are taught first, if they are familiar to the children by use in conversation, and the objects which the words represent and their pictures can be readily shown.

First Step—Whole Words.—What am I holding in my hand? "A cap."

What do boys do with caps? "Wear them."

How many of these boys wear caps? All who do may hold up their hands.

Now look at this picture, and tell me what it is. "A cap." "A picture of a cap."

Those who think it is a real cap may hold up their hands. Now those who think it is the *picture* of a cap may hold up their hands. We will call this a *picture of a cap.* Can you wear a picture of a cap? What do I hold in my hand? "A cap."

What do you see on this Chart? "A picture of a cap."

I will now make the *word* **cap** on the blackboard. After printing the word, using the small letters, the teacher asks, What did I say I would make? "The *word* cap."

Here it is; now I will make it again. What is this? "The word cap."

How many words have I made? "Two."

Are these words alike? What is the first word that I made? "Cap."

What is the next word? "Cap."

What have I in my hand? "A cap."

What is this on the Chart? "The picture of a cap."

What is this on the blackboard? "The word cap."

Which of them can you wear? "The cap."

James may come and point to the picture of a cap.

Henry may point to the word cap.

When several words have been learned at sight and read from the blackboard, fix the attention of the children upon them again by rub-

bing off one word at a time quickly, and request the pupils to tell in each case what word was rubbed out.

When the pupils have learned several familiar words in this way, such as

cap,	top,	bell,	ball,	cake,
mat,	doll,	net,	wall,	slate,
hat,	box,	pen,	salt,	face,
man,	boy,	sled,	saw,	skate,
bag,	shoe,	egg,	chalk,	plate,

and the pupils have become so familiar with the form of each as to name it at sight, as the several words are pointed out on the blackboard, or on charts, or in a book, then proceed to take the *Second Step*.

In reviewing the words learned in the First Step, point to a word, and ask what we do with the thing which it represents or stands for, without mentioning the word, thus: Pointing to the word *cap*, ask, What do boys do with this? "Wear it." Pointing to *bag*, ask, What do we do with this? "Put things in it." Pointing to *cake*, ask, What do we do with this? "Eat it," etc. This exercise will awaken much interest, and lead pupils to associate the printed words with the objects which they symbolize.

Second Step—Words by Sounds.—Print on the blackboard, in a column, all the words which the pupils have learned that resemble each other in sound, as in the columns above. Let the pupils pronounce the words in the column—cap, mat, hat, man, bag—and notice that one sound is heard in each. Then let them make this sound several times—*ă, ă, ă, ă, ă.*

The word *mat* may now be taken, and each sound in it made distinctly by the teacher, thus: *m, ă, t, mat.* After repeating this two or three times, let the pupils make the sounds in the same way, and repeat them. Then take the word *man*, and sound its elements in the same way, thus: *m, ă, n, man*, and require the pupils to do the same. Proceed in this manner to teach the pupils to make the elementary sounds of the several words learned by sight.

Next let the teacher point to a word and say, *Pronounce it*, and the pupils speak it. Then the teacher, still pointing at it, may say, *Sound it*, and the pupils give the separate sounds which compose it.

Third Step—Words by Letters.—When the pupils have become so familiar with the words that have been taught by sight as to readily give their elementary sounds, proceed to teach the names of their letters.

Selecting the word *mat*, print it on the blackboard two or three times; also print each letter in it separately two or three times. Point to the word *mat*, request the pupils to pronounce it, then to sound it. Next tell them the name of the first letter; show them the same letter in the other words and among the separate letters, and request the children to give its name. Proceed in the same manner with *a* and *t*. Then require the pupils to name each letter in order as it is pointed at.

In the same way the letters of other words may be taught, until the alphabet is learned. Afterward the children may learn to repeat the letters of the alphabet in their order.

How to secure Attention.—The attention of the entire class may be secured while teaching the names of the letters and spelling by means of various exercises which a teacher of skill will readily devise and use. To lead the children to observe what letters form given words, and the order of their arrangement, rub out or cover up a letter, and let the pupils tell what letter was rubbed out or is covered up. Also let the pupils tell what letters must be made to form a given word, and the teacher print each letter as it is named.

Fourth Step.—Having taught a good list of familiar words in accordance with the three preceding steps, review them by requiring the pupils to *pronounce them at sight*, to *sound* them and *spell* them as the several letters are pointed at. *Do not allow the pupils to reverse this order, and spell the word before pronouncing it.*

From this time on each new word may be taught as a whole, then by its sounds, then by its letters, thus taking the three steps in succession at each lesson.

Fifth Step—Grouping Words.—When the pupils have learned a few words representing qualities and actions, they may be led to group them into phrases and sentences, as good boy; good girl; new hat; new dress; old coat; old cap, etc.

A dog can run; a cat can run; a dog can bark; a cat can mew.

See my new hat. See the old horse run.
See my old shoe. See my dog run.
See my new ball. See my top spin.

Place words on the blackboard so that several sentences may be formed by the change of one word in reading, thus.

A dog can bark.
bite.
run.
A cat can mew.
purr.

Point to the words, and let the pupils read them as follows, viz.: A dog can bark. A dog can bite. A dog can run. A cat can bite. A cat can run. A cat can mew. A cat can purr, etc.

Then change the sentence by placing *can* before it, thus:

Can a dog bark? Can a dog bite? Can a dog mew? Can a cat bite? Can a cat bark? etc.

When the pupils have become acquainted with a sufficient variety of words to render it practicable, arrange them in longer sentences, as,

A dog can bark, bite, growl, whine, walk, trot, run, and jump.

A horse can walk, trot, run, kick, draw, eat, drink, see, and hear.

A boy can sing, talk, read, spell, study, play, run, jump, hop, spin a top, fly a kite, and play ball.

A good girl will try to keep still in school, mind her teacher, learn to read, spell, and count.

Bad boys play truant, do not mind their teacher, and do not try to learn.

In this manner extend the reading lessons on the blackboard, making them more and more difficult as the pupils progress in their acquaintance with words.

Let the pupils give words to be printed on the blackboard and learned by the class. Do not be alarmed and decline to print them, even if they give you such words as breakfast, dinner, supper, mother, sister, father, brother, etc. The children can easily learn these words by the time they have been through the first three steps in reading, and are prepared to take the Fourth Step.

Also request the pupils to tell you what to write about a horse, a dog, a cat, a cow, etc. Thus lead them to think about what they read, and to aid in making their own reading lessons.

READING FROM BOOKS.

HOW TO TEACH THE FIRST LESSONS.

Many of the common faults in reading may be traced to the improper methods used during the first lessons in this subject. Bad habits formed at this period usually cling to the pupils during all their school days, and often seriously affect their entire educational progress. Hence it is of the greatest importance that the first lessons in reading should be given in a proper manner. To do this successfully, there must be system in the plans pursued. Each difficulty should be taken up singly and mastered.

First Step—Reading Words.—*Make the pupils familiar with the words of the lesson, so that they can readily pronounce them at sight.* Before placing books in the hands of the children, print the words of the reading lesson on the blackboard in columns, and teach the children to pronounce them, to sound them, and spell them. When they can readily pronounce all the words at sight instantly, place the books in their hands, and require the class to pronounce, without spelling, all the words of the lesson, beginning with the last word of each paragraph and ending with the first, so that the story of the lesson may not be learned before the pupils read it for that purpose.

If more practice be required, let the teacher pronounce the first word, the pupils the second in concert, the teacher the third, the pupils the fourth, and so on, al-

ternately, through the lesson. If some of the pupils do not then readily know all the words, let each of those pronounce the words of its paragraph before reading, commencing with the last word, as above.

Second Step—Reading Sentences.—*Let the standard for good reading be its resemblance to good conversation.* If the pupil does not read in such a natural manner, request it to look at the teacher and tell what it read. When it can do this properly, let it look on the book and *tell* it again. Thus train each pupil until the habit of reading in an easy, natural tone of voice, such as is used in a good conversational style, has become fixed.

The teacher may illustrate how a sentence should be read by reading it correctly, thus cultivating the ears of the pupils in good style. A good reader in the class may be selected to read a given sentence or paragraph, and each of the other members allowed to try to read it as well. Train the pupils to observe when two of their number read alike and equally well. Thus secure an appreciation of good reading, and use it in training the class to read correctly.

Such early training is worth more than all the rules of the elocutionist given at a later period of instruction.

Third Step—Telling what has been read.—When the lesson has been finished, let the children tell what they have read. At first they may give parts of the lesson without any order or connection. Accept these efforts at first, but ultimately train them so that the class can tell the story of any lesson read, in the order of the events narrated, by each giving a short item of it. Encourage them, in telling the story, to use their own language instead of repeating the words of the book. Avoid asking many questions about the lesson. Let the principal questions be, *What is this lesson about? What does it tell you?*

Fourth Step—Meaning of the Words.—Having finished the reading exercise, it is desirable to call the attention of the pupils more specially to the meaning of the words used in the lesson read. In doing this, do not teach the class to give formal definitions for simple, common words, as is sometimes done. Even the definitions usually placed in columns at the beginning or end of reading lessons should not be used as the chief mode for teaching the meaning of the words in these lessons. Too often the word thus given as a definition is more difficult to understand than the word to be defined.

Encourage the pupils to show that they understand the meaning of the words by using them in sentences, as *Cat:* a cat can mew. *Cow:* a cow gives milk. *Swim:* a fish can swim. *Reside:* I reside in ———. *Careful:* I must be careful with my books. *Obedient:* I am obedient when I do what my mother tells me to do. *Attentive:* I try to be attentive to my lessons.

SUGGESTIONS FOR THE TEACHER.

The following are some of the common errors to be found in the methods of teaching reading to beginners, viz.:

Allowing the children to take books before they have learned the words of the reading lesson at sight.

Teaching them "to mind the pauses" by requiring each child to stop and count "one" at a comma, "one, two" at a semicolon, and "one, two, three, four" at a period. Such attention to the pauses

generally leads to a mechanical, unnatural style of reading. **First** attend to the meaning of the sentences, and lead the pupils to see how the pauses aid in understanding their meaning. Do not teach reading as if attention to *commas* is the chief object to be attained. Learning and reciting definitions of pauses is not only useless, but it leads to a great waste of time. Of what practical benefit is it to a child just learning to read to be able to say, "A comma is the shortest pause; stop long enough to count one." For all the advantage that may be obtained from it in reading, the child might as well say, "Tommy showed his paws long enough to count one."

Teach the *use* of the pauses in the lesson, instead of the definition of them.

Some teachers "hear their classes read," and suppose they are teaching them to become good readers by telling each pupil what mistakes were made as the paragraph is finished. Usually the errors are so varied and numerous that the pupils are bewildered in their efforts to remember them. They are told of "words left out;" "words put in;" "words mispronounced;" "reading too fast;" "reading too low;" "kept the voice up at a period;" "did not let the voice fall at a comma;" "did not emphasize the words;" "called *and ann;*" "did not mind the pauses," and many other "faults of omission and commission." Notwithstanding so much is said to the pupils about their blunders, they are not *taught* how to read any better next time.

Do not suppose that it is necessary or desirable to have the class of beginners commence their lessons, in reading from books, with those sentences that are made up from words of two letters, as "I am up," "He is up," etc. If the pupils have been properly taught from the blackboard, it will be far better to skip all of this class of reading lessons, and commence at once with those composed of such words as children use, as,

"Ann has a new hoop. She can roll her hoop."

"Can she roll her hoop fast?"

"Ann runs when she rolls her hoop fast."

Such a lesson would be learned as quickly as those composed of "words of two letters," which mean nearly nothing to the pupil. The length of the word to be learned presents a much less difficulty than a lack of familiarity with its use and meaning. Familiarity with the use of the words in a lesson, rather than their length, should be the guide in selecting an elementary reading lesson. However, preference may properly be given at first to short words which are thus familiar.

Attend to Faults singly.—When you take a class in reading that has been allowed to form bad habits, first ascertain what fault is most serious and common among the pupils. Having determined this point, give special attention to correcting this one error until it has been brought under the ready control of the pupils; then take the next serious fault in order, and treat it with special attention until both the faults are under control. Thus remove each fault by special attention, and train the pupils to a complete control and avoidance of all of them. But it must be remembered that *telling* pupils of their faults in reading will not correct them. They *should be shown how to correct their faults*, and then *trained so as to secure their correction.*

To teach Reading successfully.—*Train the sight to know words* by the eye *readily.*

Train the hearing to know words by the ear *distinctly and accurately.*

Train the speech to utter words correctly and fluently, and in a clear and pleasant tone of voice.

Train the pupils to understand what they read, and to be able to tell the story, or the principal facts in the lesson.

Spelling.—A knowledge of spelling is chiefly valuable for the purpose of writing. It is of little worth as a means of teaching reading. When taught exclusively from spelling, reading seldom becomes natural, and the pupils frequently stumble all the way through school, calling *was saw*, *on no*, and making many similar mistakes. Spelling should be learned through reading, not reading through spelling. *Reading* words naturally *precedes spelling* words. To teach reading chiefly by spelling belongs to the A B C method.

Spelling should not be introduced until the children's eyes have become accustomed to distinguishing the *forms* of simple words as wholes. Spelling deals with the elementary *forms* of words, not with their *sounds* as spoken. The first lessons in spelling, given while the children are learning to read familiar words, should be conducted by printing words on the blackboard, and taught by *sight* instead of *hearing.*

The pupils should be taught to spell by printing words on their slates, copying them from the blackboard at first, subsequently from books. So soon as they can write, let spelling be taught by writing words on their slates. This should be the chief mode of teaching spelling. However, *oral spelling* may be employed as a valuable means of teaching *written spelling* successfully, thus causing *two senses*—sight and hearing—to take cognizance of the elementary parts of each word, instead of only one, as in the common plan of teaching oral spelling.

The plan of requiring pupils to pronounce each syllable separately while spelling is one of those customs which long usage has so firmly established that it is difficult to look upon any other mode without prejudice. From a long personal experience, and the results of the experience of others with many thousand children, I believe that, instead of its being an advantage to treat the several syllables as so many separate words, and then unite them together gradually by repeatedly pronouncing the previous syllables as each successive one is spelled, it is a positive hinderance to progress in oral spelling, and a loss of time. To spell *perplexity* thus, *p–e–r pĕr, p–l–e–x plĕx, pĕr–plĕx, ĭ ĭ, pĕr–plĕx–ĭ, t–y tĭ, per–plĕx–ĭ–ty*, seems to be a sort of "House-that-Jack-built" style, which may serve as an occasional amusement for children; yet to continue such repetitions daily as a part of the process of spelling is a needless *perplexity* to pupils, and a great hinderance to their progress in learning to spell. Every requirement that diverts the attention of the pupils from the order and arrangement of the letters that form the word retards rather than aids in learning to spell the word.

The following method has been thoroughly tested, and found to be entirely satisfactory for oral spelling:

A word is pronounced by the teacher; the pupil repeats the pronunciation distinctly, then spells it, speaking each letter plainly, and making a pause between each syllable; then finishes by repronouncing the whole word, thus: *Teacher.* Commandment.

Pupil. "Com mand ment; c–o–m m–a–n–d m–e–n–t, commandment." Care should be taken to *secure the pause between the syllables,* and the speaking of each letter distinctly.

QUALITIES OF OBJECTS.

IMPORTANCE OF TEACHING THEM.

Before children commence Lessons on Objects with a view to observing their several qualities and uses, it is desirable that they should receive special training in distinguishing and naming the qualities. Lessons have been given in the preceding pages for training children to perceive the shapes, colors, number, size, and sounds of objects, and it is important that lessons should also be given to aid them in distinguishing other properties. Besides, the plan of taking a single quality for a lesson, and training the pupils to discover it in a variety of objects, furnishes facilities for a thorough discipline of their minds, and leads to habits of classifying and associating like kinds of qualities and facts in accordance with the natural laws of mental acquisition. These lessons will also lead teachers to avoid those desultory and unprofitable exercises which are sometimes called "Object Lessons."

After having received such training, the children will be able to take up any object and readily distinguish and name its principal properties. These lessons will also prepare children to understand what qualities render objects most valuable for the several uses in which they are employed.

The exercises in "Home Training of the Senses," on pages 27 to 32 inclusive, may furnish some hints that will prove useful in giving these lessons on *Qualities.*

LESSONS ON QUALITIES.

TO DISTINGUISH AND NAME THEM.

Rough and Smooth.—To lead children to distinguish the qualities *rough* and *smooth*, request them to feel of a slate, of writing-paper, and a piece of polished wood; then to feel of sand-paper, of coarse cloth, and a piece of rough wood.

Tell them that when any thing has *an even surface*, like the paper, or the slate, or window-glass, we say it is *smooth*.

When any thing has *an uneven surface*, like sand-paper or coarse cloth, we say it is *rough*.

Also lead the pupils to notice that smooth substances are *pleasant to the feeling;* that rough ones are *unpleasant to the feeling.*

Then write on the blackboard, and require the pupils to read it:

SMOOTH—*having an even surface, pleasant to the feeling.*

ROUGH—*having an uneven surface, unpleasant to the feeling.*

Next request the pupils to tell the names of objects that are *smooth* and *rough*, and the teacher may write them in separate columns.

Ask the children, *Why* do you call these objects smooth?

"Because they have an *even* surface, and are pleasant to the feeling."

Why do you call objects rough?

"Because they have an *uneven* surface, and are unpleasant to the feeling."

When do you say an object is smooth?

Sticky.—To lead children to observe the quality *sticky*, provide a piece of paper with mucilage on one side; also a piece of wax or putty. Show the pupils how these substances *will hold to* any thing to which they may be applied. Tell them that we call those things that *will hold to* or *stick*, like wax, mucilage, etc., *sticky*.

Request the pupils to mention the names of things that will *stick* or *hold to*, like soft wax, and write them on the blackboard in a column, thus:

Wax,
Glue,
Paste,
Mucilage,
Molasses,
Honey,
Candy,
Putty,
} are called *sticky*, because they will hold to or stick.

We say any thing is *sticky* or *adhesive* that will *hold to*, or *stick*, or *adhere*.

Why do you say glue is sticky?

"Because it will hold to or stick."

When do you say any thing is adhesive?

"When it will stick or hold to."

Slippery.—The pupils may be led to understand the quality *slippery* by directing their attention to the feeling of soap when wet, of ice, of oil, etc. Ask how these objects feel. Some of the children may say "they feel

smooth." Tell them that any thing that is *smooth to the feeling* and *moves easily*, like wet soap, is called *slippery*.

Ask the pupils whether it is easy to hold a piece of ice, or any thing covered with grease. Request them to mention the names of substances that are slippery, and write them on the blackboard, in a column, as was done with the names of things that are sticky.

Why do we say a piece of wet soap is slippery?

"Because it is smooth to the feeling, and will move easily, or slip."

When do you say any thing is slippery?

"When it slips, or causes any thing to move easily."

Brittle.—To train the pupils to notice the quality *brittle*, take articles that will break very easily, as chalk, candy, cinnamon, small sticks, and show the class that each of these may be easily broken. Request the pupils to mention the names of objects that will break easily, and write them on the blackboard, thus:

Chalk,
Candy, } are *brittle*.
Glass,
China, etc., } They are easily broken.

Why do you say glass is brittle?

"Because it is easily broken."

Why did you say that china is brittle?

"Because it will break easily."

When do you say any thing is brittle?

Tough.—This quality may be readily illustrated with articles that are *not easily broken or torn*, as a piece of lead, copper, leather, linen cloth, etc. Require the pupils to give a list of tough articles, to be written as before.

Tell the pupils that we call those things *tough* which we *can not easily break or tear*.

Write, as the definition of TOUGH, *not easily broken or torn*.

Ask the usual questions relative to this quality.

Porous.—To lead children to observe the quality *porous*, provide a sponge, a cork, a rattan, etc. Let them look at the sponge and tell what they see. Cut one end of the rattan, and let them look at it and tell what they see in it. When they have noticed the "little holes" in the rattan, in the sponge, and the cork, tell them that we call these little holes *pores*; and we say any thing that is *full of little holes* is *porous*.

Request the pupils to give a list of objects that are full of little holes, to be written on the blackboard, thus:

Sponge,
Bread, } are *porous*.
Cake,
Rattan, } They are full of little holes or *pores*.

What do we call the little holes in the end of the rattan? "Pores."

What do we call the little holes in the sponge and the cake? "Pores."

What do we say of any thing that is full of little holes? "It is porous."

Why do you say sponge is porous?

Is glass porous? Is cloth porous? Will porous things hold water? Is candy porous?

When do you say any thing is porous?

What does porous mean? "Full of little holes."

Your skin is full of *very* little pores, through which the perspiration comes.

Transparent.—To teach children to notice the quality *transparent*, take a piece of glass, a cup of water, a tumbler, a slate, a sheet of paper, etc. Take a piece of chalk, hold it in one hand, and hold a piece of glass between the chalk and the class. Ask the pupils, What am I holding behind the glass? How do you know that it is chalk? "We can see it."

But the glass is between you and the chalk; how can you see the chalk?

"We can see through the glass."

Very good. I will now take a slate and hold something behind it, and you may tell what it is. But you must not guess. If you do not know what I have in my hand behind the slate, say "I do not know."

Why can you not tell me what I am holding behind the slate?

"We can't see it."

Why can't you see what I have now as well as you could when I held the chalk behind the glass?

"We can't see through the slate; we could see through the glass."

The teacher drops a slate-pencil and a piece of chalk into the cup of water, and asks the children to look into the cup and tell what is in the water.

"A slate-pencil and chalk?"

You did not see me put them in the cup; how do you know they are there?

"We can see them through the water."

After various illustrations, and the pupils have obtained the ideas that some things *can be seen through*

clearly, and some *can not be seen through*, request the pupils to mention the names of things that can be seen through. Write these on the blackboard:

Glass,
Water,
Air,
Alcohol,
Some ice,
} are *transparent.*
They can be seen through clearly.

Ask the pupils, How do you know that air is transparent?

"We can see through it."

Can you see the air?

How do you know that some oil is transparent?

Why do you say water is transparent?

When do you say any thing is transparent?

Is thin cloth transparent?

Do we say any thing is transparent when we look through *holes* in it?

We may also say any thing is transparent when light and color pass through it freely.

Why is glass so useful for windows?

Why is mica used in stove doors?

It might be well to explain that some things are *partly transparent*, should a substance be mentioned that will allow light to pass through, but will not permit objects to be seen distinctly through it. For this quality the term *translucent* may be given.

When a substance is translucent the light will pass through it, but we can not see objects distinctly through it. We can not distinguish shape and color through translucent objects.

Ground glass is translucent.

Opaque.—The pupils will now be prepared to give a list of objects which *can not be seen through.* These may be written on the blackboard:

Slate,
Wood,
Iron,
Paper,
Lead,
Tin,
Chalk,
} are *opaque.* They can not be seen through.

Can you mention as many objects that are transparent as you can that are opaque?

Why do you say the paper is opaque?

When do you say any thing is opaque?

Elastic and Elasticity.—The teacher, having provided herself with pieces of whalebone, rattan, steel spring, sponge, India-rubber, etc., takes up a piece of *whalebone*, and bends it, at the same time requesting the pupils to observe what it does when she lets the end go from one hand. Next the *rattan* is taken, and bent in the same manner; then the *steel spring.* Now the pupils are asked to tell what movement they observed in each of these substances. Some children say "they go back;" others say "they fly back again;" one says "they spring back;" some, that "they snap."

The teacher then remarks, When I bend the whalebone, and let one end of it go, you see that *it springs back to its place again.* When I bend the steel spring, and let one end of it go, it springs back to its place again. Now, when I bend the rattan, and let one end of it go, what does it do?

"It springs back to its place again."

When I let the end of the bent whalebone go, what does it do?

"It springs back to its place again."

What does the steel spring do as I let one end go after bending it?

"It springs back again."

The teacher next takes up a piece of *India-rubber*, stretches it out, and lets one end of it go, at the same time requesting the children to observe what the rubber does. Some of the pupils reply, "It snaps;" others say "it flies back again;" one says "it springs back again."

Again taking up the *whalebone* and bending it as before, the teacher asks, What does the whalebone do after being bent?

"It springs back."

What does the rubber do after being stretched?

"It springs back."

Next the teacher takes up a piece of moist *sponge*, from which the water has been squeezed. While compressing the sponge, she requests the children to observe and tell what she is doing. Various answers are given, as "squeezing it," "pinching it," "pressing it." On removing the pressure, she asks, What does the sponge do now?

"It goes back to its shape again."

The teacher then says, suiting her actions to her words, When I squeeze this sponge and let go of it—

"It springs back again."

When I stretch this India-rubber and let it go—

"It springs back."

When I bend the whalebone and let it go—

"It springs back."

Taking a flat piece of whalebone or thin steel, the teacher *twists* it, and requests the pupils to observe what it does when she lets one end go.

"It springs back to its place again."

Having thus fully prepared the class for the word which is used to signify this power of springing back, the teacher proceeds, I will now tell you a word which means *springing back;* it is *elastic;* and I will write it on the blackboard, that you may observe how it looks, and learn to spell it. At the same time she turns to the board and forms the word in plain letters. Again turning to the class, she says, Spell *elastic.* What does *elastic* mean?

"Springing back."

Now I wish you to mention such things as you think have this power of *springing back*, and I will write their names on the blackboard as you give them to me.

As the children mention the names of elastic substances, the teacher writes on the board, and soon a list is formed which presents an appearance similar to the following:

Whalebone,
Rattan,
India-rubber,
Steel spring,
Sponge,
Quill,
Feathers,
Wool,

are *elastic.*

Each has the power of *springing back.*

The lesson is now reviewed by questions somewhat as follows, viz.:

Why do we say whalebone is elastic?

"Because it will spring back after being *bent.*"

Why do we say a steel spring is elastic?

"Because it will spring back after being *bent.*"

Why do we say that India-rubber is elastic?

"Because it will spring back after being *stretched.*"

Why do we say sponge is elastic?

"Because it will spring back after being *squeezed.*"

When do we say any thing is elastic?

"When it will spring back after being *bent*, *stretched*, *squeezed*, or *twisted.*"

Is lead elastic?

"No; it will not spring back after being bent."

Are copper wire and tin elastic?

"No; they will not spring back."

You can stretch chewing-gum; is that elastic?

"No; it does not spring back."

Is a boy's ball elastic?

"Yes; it will bound or spring back when thrown against any thing hard."

At a subsequent lesson, after reviewing this quality, the teacher may inform her pupils that we sometimes call this *power* of springing back again *elasticity*, at the same time writing the word on the blackboard. She then adds, Every thing that will spring back after being *bent*, *stretched*, *squeezed*, or *twisted*, has *elasticity.*

Then India-rubber has—	"Elasticity."	
And whalebone	" —	"
And sponge	" —	"
And wool	" —	"
And a quill	" —	"

Now you have seen that *elastic* means springing back, and that *elasticity* means *the power of springing back.* Thus you see we may say that an object is *elastic;* also

that it has *elasticity*. *Why* do we say any thing has *elasticity?*

"Because it has the power of *springing back after being bent, stretched, squeezed,* or *twisted.*"

Is snow elastic?

"Snow has no elasticity; it has not the power of springing back after being squeezed."

Why does the boy's ball bounce when he throws it upon the ground?

"Because it has elasticity."

Will a ball of putty bounce when thrown upon the hard ground?

Is dough elastic?

Flexible and Pliable.—The quality of being easily bent or folded is expressed by the words *flexible, flexile,* and *pliable.* To lead children to perceive this quality, the teacher may provide pieces of leather, cloth, cord, paper, whalebone, willow, lead, etc., and show that each of these articles will *bend easily,* and that some of them may be folded, as cloth, paper, etc.

When the pupils have become familiar with this quality, tell them that all things which may be *bent* or *folded easily* are *flexible.*

Then request them to give a list of articles that can be *bent easily,* which the teacher may write on the blackboard:

Cloth,
Paper,
Cord,
Lead,
Leather,
} are *flexible.* They are easily bent.

We might also say these things are *pliable,* for this

word means easily bent, or folded. But it is more common to use the word *pliable* when the quality is that of being *easily folded.*

Why do we say leather is flexible?

"Because it is easily bent."

Why do we say sponge is flexible?

"Because it is easily *compressed* or bent."

Why do we say paper is pliable?

"Because it is easily folded."

Why do we say whalebone is flexible?

"Because it is easily bent."

When do we say any thing is flexible?

"When it can be easily bent."

When do we say any thing is pliable?

"When it may be easily folded."

Mention things that are *pliable,* or may be folded.

Mention things that are not pliable.

Liquid and Fluid.—To lead the pupils to perceive the qualities *liquid* and *fluid,* it would be well to procure small vials filled with water, milk, oil, molasses, etc., and, showing each to the pupils, tell them what the several vials contain. Then request the members of the class to observe *how* the water, milk, oil, etc., flow as you proceed to pour out each so as to cause it to form into *drops.* Call the attention of the pupils to the *manner of flowing* by saying, See how the water flows. Now see how the milk flows. Look at the oil; see how it flows. Who will tell me how each of these flow?

"They all *flow in drops.*"

Then say to the pupils, You may now tell me the names of things that flow in drops, and I will write them on the blackboard:

Water,
Milk,
Ink,
Vinegar,
Oil,
Molasses,
} are *liquids.* They *flow in drops, and wet.*

Why do we say water is a liquid?

"Because it will flow in drops, and will wet or moisten."

Why do you say milk is a liquid?

When do we say any thing is a liquid?

"When it will flow in drops, and will wet."

How do you know that these things flow in drops?

"We can see them drop."

Very good; but there are some things which *flow* that you can not see. If I should open a window, you might *feel* the wind or air flowing into this room. Could you see it? How, then, could you know that the air was flowing into the room?

"We could feel it."

If I should turn on the gas without lighting it, it would flow into the room. Could you see it? Then how might you know that gas was flowing into the room? "We could smell it."

Thus you perceive that we can not see *air* and *gas* when they flow; we can only *feel* them or *smell* them. As you feel the air flowing, does it seem to come in drops or in a stream?

"It flows in a stream."

We call any thing that flows easily, like air and gas, a *fluid.* Water, milk, etc., flow easily, so we may call these *fluids* also.

Now read what I write on the blackboard:

Any thing that flows easily, like air, gas, water, milk, etc., *is a fluid.*

Any thing that flows in drops is a liquid.

What do we call any thing that will flow easily?

What do we call any thing that will flow in drops?

You see that *all liquids are fluids;* but *some fluids are not liquids.*

If you put water or milk in a cup, what will be the shape of the water or milk?

If you put milk in a tumbler, what will be the shape of the milk?

If you put water in a pail, what will be the shape of the water?

Thus you see that *liquids always take the shape of the vessel that contains them.*

Have liquids any shape of their own?

How could you cause milk to take the shape of a cylinder?

You may now mention the names of fluids:

Air,
Gas,
Steam,
Mercury,
Alcohol,
Water,
} are *fluids.* They flow easily.

Why do we say air is a fluid?

Do you drink fluids?

Ask a sufficient variety of questions to make it certain that the pupils *know* what is meant by the terms *fluid* and *liquid.*

Solid.—To give children an idea of the quality *solid,* take a piece of chalk, a pencil, a marble, a piece of wood,

a key, and other objects, and lead the pupils to compare them with water and other liquids. Call attention to the fact that these substances will not *flow;* that they *have the power of retaining shape.* When the pupils are able to readily distinguish and name objects that have this power of retaining shape and will not flow, they may be told that each of these substances is a *solid.*

Ask questions similar to those in connection with the other qualities.

Absorbent.—For leading children to observe the quality *absorbent*, provide a sponge, blotting-paper, a lump of sugar, and piece of cloth. Show the pupils that the sponge, cloth, and sugar will *suck up water*, and that the blotting-paper will suck up ink, or other liquids. Tell them that we say any thing that will suck up liquids is *absorbent;* that *absorbent means drawing in or sucking up.*

Request them to name objects that are absorbent, to be written on the blackboard, proceeding as with other qualities.

Combustible and Inflammable.—The idea of the quality called *combustible* may be brought clearly to the comprehension of children by telling them that all *things that will take fire and burn*, as wood, coal, cloth, etc., *are combustible.*

The idea of *inflammable* may be made plain by telling them that all *things which take fire readily and burn with a flame*, as paper, oil, kerosene, gas, etc., *are inflammable.*

Write on the blackboard:

Things that will take fire and burn are combustible.

Things that take fire easily and burn with a flame are inflammable.

Request the pupils to give lists of objects that are combustible and inflammable, to be written on the blackboard in separate columns.

Fusible.—By directing the attention of children to the familiar fact that some things melt by heat, while others will not melt, they may obtain a clear idea of the quality known as *fusible.*

To aid in giving them a good understanding of this quality, let them mention names of substances that will melt by heat, and write these on the blackboard; then ask questions about the quality, as in the other lessons.

If the class be composed of pupils whose ages are more than ten years, the temperatures at which various substances will melt might be given. The following list will furnish the teacher with information for this purpose:

Degrees of Heat at which Substances Melt.

Ice	melts at	32°.	Zinc	melts at	700°.
Tallow	"	100°.	Silver	"	1870°.
Wax	"	150°.	Copper	"	1990°.
India-rubber	"	250°.	Gold	"	2200°.
Tin	"	445°.	Iron	"	2800°.
Lead	"	600°.	Platina	"	3000°.

Soluble.—Taking salt, sugar, gum-arabic, or glue, and dissolving them in water, will give children an idea of the quality known as *soluble.* The usual exercises, questions, etc., may be had, and the definition written on the blackboard:

Any thing that will melt or dissolve in a liquid is soluble.

Pungent.—By talking with children that have had special home training in the use of their senses, about the taste of pepper, cloves, ginger, mustard, etc., they may be led to understand the meaning and use of the term *pungent*. The usual exercises may be had with the blackboard, and the following definition given:

PUNGENT—biting to the taste; having a warm, pricking taste.

Astringent.—Direct the attention of children to the taste of alum, choke-cherries, oak bark, etc., and lead them to observe the effect of these substances upon the tongue and mouth. Tell them that the quality which will produce the feeling of drawing together, or a puckery taste, is called *astringent*.

Write on the blackboard:

ASTRINGENT—*drawing together, or puckery to the taste.*

Other *qualities* may be illustrated in a similar manner. Care should be had not to allow these exercises to become merely those of *teaching definitions of qualities*. They are equally valuable for their effects in the discipline of the pupils' minds, and in giving them habits of careful observation in relation to the properties of objects. They are also valuable for their influence on the teacher's general methods of instruction.

The following qualities may also be taught in accordance with the methods already illustrated.

Fibrous—*stringy; containing thread-like parts; full of threads or fine strings*, as whalebone, bark of some trees, rattan, willow, linen, etc.

Odorous—*having a smell, or odor*, as camphor, cologne, tobacco, onion.

Fragrant—*having a sweet smell, or odor*, as a rose, a violet, new-mown hay, coffee, etc.

Acid—*having a sour taste*, as lemon, vinegar, etc.

Crumbling—*breaking into small pieces easily*, as bread, cake, chalk, etc.

Granular—*composed of small grains*, as sugar, salt, sandstone, etc.

Malleable—*may be easily spread out by pounding or beating*, as lead, gold, silver, copper, some iron, etc.

Ductile—*may be drawn out into fine wire*, as gold, silver, copper, iron, etc.

Tenacity—*holding with great strength when drawn out into wire; very strong*, as wire made of silver, gold, iron, copper, etc.

Volatile—*easily passing into the air*, as camphor, spirits of turpentine, and the various perfumes.

Nutritious—*sustaining life and promoting growth*, as the various kinds of food.

Grouping Qualities by the Senses. — When several qualities have been learned, an interesting exercise may be had by requiring the pupils to arrange the qualities in groups, each to be designated by the sense through which it is perceived. To do this, the teacher may write the names of the senses on the blackboard, and, as each quality is mentioned, let the pupils tell where its name should be written, so that when the lesson is finished it shall appear somewhat as follows, viz.:

Qualities perceived through the

Sense of Sight.	Sense of Feeling.	Sense of Taste.	Sense of Smell.
Transparent.	Smooth.	Pungent.	Fragrant.
Opaque.	Rough.	Acid.	Odorous.
Porous.	Sticky.	Astringent.	Volatile.
Combustible.	Slippery.	Sweet.	Rancid.
Inflammable.	Brittle.	Bitter.	Aromatic
Absorbent.	Tough.	Spicy.	Spicy.
Fusible.			
Soluble.	Soluble.		
Elasticity.	Elasticity.		
Flexible.	Pliable.		
Liquid.	Fluid.		
Solid.	Solid.		
Crumbling.	Crumbling.		
Granular.	Granular.		
Malleable.	Malleable.		

SUGGESTION FOR THE TEACHER.

The spelling of the name of each quality should be taught during the lesson on that quality.

OBJECT LESSONS.

THEIR NATURE AND DESIGN.

Lessons on "Common Things," given chiefly to impart information about the thing selected for the lesson, without any system or order of arrangement, are frequently, but improperly, called "Object Lessons." Sometimes teachers who give occasional information about things of every-day life suppose that they are carrying out the principles of object teaching. This misconception of the true system of instruction by Object Lessons is one of the serious obstacles in the way of its general and successful introduction into all elementary schools.

True Object Lessons are arranged with special adaptation to the mental condition of the pupils to whom they are to be given; and they are made to keep prominently in view the development of the faculties of children, and the cultivation of habits of ready and accurate observation. The *manner* of giving information is made the means of training the mental powers of the pupils, so that the instruction necessarily becomes much more valuable than any exercise of the memory.

To hold an object before a class, and tell its shape, color, size, what it is made of, its name and use, and then to ask the pupils to repeat all of that information, is not giving an object lesson.

Again, to hold an object before a class, and ask, What is this? to what kingdom does it belong? where is it found? what is it used for? is not giving an object lesson.

All similar methods are at best merely an exercise of the memory, and fail to meet the conditions of object teaching. Telling a child that which it should be led to observe is not developing its mind. Filling the memory with words to be repeated in response to questions is not education. The children's own senses of sight, touch, taste, and hearing must be exercised to produce mental development. Any plan of primary teaching that does not provide for such training is defective. It is not in accordance with good common sense nor true objective teaching.

In giving these lessons, the object itself should be before the pupils, or it should have been previously so carefully observed by them that they can recall its shape, color, uses, and principal qualities.

"To *tell* a child this and to *show* it the other, is not to teach it how to observe, but to make it a mere recipient of another's observations—a proceeding which weakens rather than strengthens its powers of self-instruction; which deprives it of the pleasure resulting from successful activity; which presents this all-attractive knowledge under the aspect of formal tuition; and which thus generates that indifference and even disgust with which these object lessons are sometimes regarded. On the other hand, to pursue the true course is simply to guide the intellect to its appropriate food, and to habituate the mind from the beginning to that practice of self-help which it must ultimately follow.

"Children should be led to make their own investigations and to draw their own inferences. They should be *told* as little as possible, and induced to *discover* as much as possible. Humanity has progressed solely by self-instruction; and that, to achieve the best results,

each mind must progress somewhat after the same fashion, is continually proved by the marked success of self-made men."*

A very important point to be attended to in giving these lessons is the adaptation of them to the different stages of advancement of the children to whom they are given. A child of five years is quite a different being intellectually from one of ten; hence we should not attempt to lead children to the observation of those qualities that require the exercise of faculties which are not developed until the period of youth, nor to consider a subject which requires a previous training to understand before that training has been given.

To illustrate this idea more clearly, we will indicate some of the properties of objects that may be presented for observation during different stages of school life. Of course these divisions must not be considered as absolute; they are rather suggestive, and designed to aid teachers in making a proper arrangement of object lessons for their own classes.

Some teachers limit their lessons to specimens from cabinets of curiosities; the consequence is, that such lessons usually become mechanical as soon as the novelty of the objects has passed. Often these specimens are such as are rarely seen by the children, and they fail to awaken a desire to examine more common objects, and to cultivate those habits which will lead children to become interested in every thing around them.

It should be understood that these lessons on objects can not be properly introduced until the pupils have received training in some of the steps of Form, Color, Number, Size, etc.

* Herbert Spencer.

First Stage.—During this period the pupil may be required to *distinguish objects by their names, to observe and name their principal parts, to describe their form, color, and uses.*

Second Stage.—During this period, which may commence in the second year of school life, the lessons should embrace the *form*, *color*, *size*, *material*, *qualities*, and *uses* of objects, and answers to the simple inquiry, *where obtained?* or, *by whom made?*

Third Stage.—During this period, which should commence in the third year of school life, the lessons may include a more complete analysis of the several properties of objects, and attention to the adaptation of their prominent qualities to the purposes for which these objects are commonly used.

In presenting the following sketches of lessons, I have taken up a variety of objects, and endeavored to suggest how similar exercises may be given during the several periods of school attendance.

Teachers should not be satisfied with copying these sketches and teaching only these lessons; they should acquire the necessary skill by practice to enable them to prepare similar lessons on other objects. Those who do this will teach much more successfully than those who merely attempt to repeat what others have prepared.

LESSONS ON OBJECTS.

FIRST STAGE.

Suggestions for the Teacher.—In giving these Lessons on Objects, it is very necessary that the information obtained from the children should not be drawn out by such questions as will enable them to answer "Yes" and "No." They must be led to see, observe, think, and tell, to derive the intended benefit from the lessons. Train the pupils to do most of the talking about the object.

A CHAIR.

The teacher may place a *chair* before the class, and ask for the name of the object. Then the name may be written on the blackboard, the word pronounced, sounded, and spelled.

Parts.—Placing her hand upon the back of the chair, the teacher asks, "What is this part of the chair called?" "Back."

This word is then written on the blackboard, pronounced, sounded, and spelled.

Next the teacher touches the seat, its name is given by the pupils, and the word written under the word *back*, and pronounced, sounded, and spelled.

Then the legs are touched, name given, written, pronounced, sounded, and spelled.

Then the rounds or bars are touched, names given, written, etc., as before.

Each pupil may now be called upon to touch a part of the chair, and point to its name on the blackboard.

Suppose the chair had no back, would it be as com

fortable as it is now? "No; we could not rest well when tired."

Why not? "There would be nothing to lean against."

Suppose it had no seat, what would be the consequence? "There would be nothing to sit upon; it would not be of any use."

Suppose it had no legs. "The seat would be on the floor; it would be too low to be of use."

Suppose it had no bars. "The chair would soon fall to pieces."

How many parts are there in this chair? Of which parts are there only one each? "Of the seat and the back."

How many legs are there? "Four."

Why does a chair have four legs instead of two? "It could not stand on two legs."

How many bars or rounds are there?

Uses of Parts.—The teacher may next proceed to talk about the various uses of chairs, and then ask, What is the use of the back? "To lean against."

This may be written on the blackboard opposite the word back.

What is the use of the seat? "To sit on."

This may be written opposite the word seat.

What is the use of the legs? "To keep the seat up?"

This may be written after the word legs.

What is the use of the bars? "To hold the legs together, and make the chair strong."

Shape of Parts.—The teacher may now proceed to point to the parts of the chair, and ask the shape of each, thus: What is the shape of the back? "It is oblong, with curved sides and end."

This may be written on the blackboard after the use of the back.

What is the shape of the seat? "Four-sided, with sides curved."

This may be written after the use of the seat.

What is the shape of the legs? "Cylindrical."

What is the shape of the bars? "Some are cylindrical, and some are flat and oblong."

When the lesson is finished, its appearance on the blackboard will be somewhat like the following:

CHAIR.

Parts.	*Uses of Parts.*	*Shape of Parts.*
Back.	To lean against.	Oblong, with curved sides and end.
Seat.	To sit on.	Four-sided, with sides curved.
Legs.	To keep the seat up.	Cylindrical.
Bars, or rounds.	To hold the legs together, and make the chair strong.	Some are flat and oblong, and some cylindrical.

Pupils may now be called upon to go to the blackboard, and, while pointing to what has been written, describe the chair somewhat as follows:

"The chair is made of wood. The parts of the chair are back, seat, legs, and bars. The use of the back is to lean against; the seat, to sit on; the legs, to keep the seat up; the bars, to hold the legs together, and make the chair strong. The shape of the back is oblong, with curved sides and end; the seat is four-sided, with curved sides; the legs are cylindrical; some of the bars are flat and oblong, and some are cylindrical."

Afterward pupils may point to the parts of the chair, and describe it, without reading from the blackboard.

Kinds of Chairs.—This lesson may be extended, or an additional one given on the chair. Write on the blackboard *Kinds of Chairs* and *their Uses;* then request the pupils to give the names of all the kinds of chairs that they have seen, and let these names be written under the proper head. Then their uses may be mentioned, and these written under the appropriate head. When the lesson is finished, the blackboard might contain something like the following:

Kinds of Chairs.	*Their Uses.*
Dining chair.	To sit on at the table.
Parlor "	" " " in the parlor.
Easy "	" rest in.
Rocking "	" " " while rocking.
Arm "	" " the arms while sitting.
Little "	For little children to sit on.
High "	Some are for little children to sit on at the table.

The preceding sketch of a lesson on a chair will serve as a model for lessons on the following objects, viz.: table, pail, stool, bench, door, desk, box, basket.

When properly conducted, these lessons on objects become exceedingly valuable aids in teaching reading and spelling, as well as in training children to observe carefully and describe intelligently.

BELLS.

Taking a bell in her hand, the teacher asks, What is this? "A bell." What do we do with it? "Ring it;" "Make it ring."

I will make the word *bell* on the blackboard, and you may pronounce it, and sound it, then spell it.

Taking up the bell by its handle, the teacher asks,

With what am I holding this bell? "With the hand." What part of the bell do I take hold of? "Its handle."

Very good. I hold the bell with my *hand*, and I take hold of the *handle*. We call this the handle because it is the part which we take with the "———."

The word *handle* may now be written on the blackboard under the word *Parts*. When the handle has been pronounced, sounded, and spelled, the teacher takes up the bell, holds it with the mouth upward, so as to make it resemble a *cup*. She then asks, What have you seen of the shape of this part of the bell? "A cup;" "A tea-cup."

Very good. We will call the name of this part of the bell the cup. I will write the word under handle. What word have I made under handle? "Cup."

Of what is this word a name? "A part of the bell."

Holding the opening of the cup toward the children, the teacher says, When you open your mouth and speak, something moves inside of it. Can you tell what it is? "The tongue."

When you look in the mouth of this bell, what can you see? "A tongue;" "A clapper."

What does the tongue do to the cup? "It makes it ring."

Where do you see the tongue? "In the cup."

What may we call the open part of the cup? "Its mouth."

Let the words *tongue* and *mouth* be written under cup, and spelled as before.

The teacher may next proceed to talk about the *uses of parts*, and ask, What is the use of the handle? "To take hold of."

Write this on the blackboard after the word handle, under the head "*Uses of Parts.*"

What is the use of the cup? "To ring."

Write this after cup.

What is the use of the tongue? "To make the bell ring."

Does your tongue tell any thing when you speak?

Then your tongue enables you to talk. Does the tongue of the bell tell any thing?

Why do I ring this bell when you are in the yard?

Why do I ring it in school?

Then it tells you something each time that I ring it, but it does not always tell the same thing. When you talk your tongue tells something, but it does not always tell the same thing. Now what is the use of the tongue of the bell? "To tell something."

Write this after the word tongue.

When you talk, do you keep your mouth shut?

Why do you open your mouth when you talk? "So we can speak;" "To let the sound out."

Very good; you open your mouth to let the sound out. What use is the mouth of the bell? "To let the sound out."

At this stage the lesson on the blackboard might appear somewhat as follows:

BELL.

Parts.	*Uses of Parts.*
Handle.	To take hold of.
Cup.	To ring.
Tongue.	To tell something.
Mouth.	To let the sound out.

Pupils may now be required to point to the words

on the blackboard, and read them thus: "A bell. Its parts are handle, cup, tongue, and mouth. The uses of the parts: The handle is to take hold of; the cup, to ring; the tongue, to tell something; and the mouth, to let the sound out."

By a suitable conversation with the pupils, they may be led to mention various kinds of bells, and tell why they ring. These names, etc., may be written on the blackboard somewhat as follows:

BELLS.

Kinds of Bells.	*What they tell us.*
Door bell.	Somebody at the door.
Dinner "	Dinner is ready.
Tea "	Come to tea.
School "	Come to school. Take our seats.
Church "	It is time to go to church.
Fire "	A building is on fire.
Car "	Stop the car. Make the car go on.
Steam-boat "	The steam-boat is going to start.
Ash "	Bring out the ashes.
Cow "	Where the cow is.
Sleigh "	A sleigh is coming.

Let the pupils read this in a manner similar to the "Parts of Bells and Uses of Parts."

PIN.

The teacher, showing a large *pin* to the class, may say, What am I holding in my hand? "A pin."

After illustrating the use of the pin in pinning things together, What can I do with the pin?

Why does this pin go through the cloth so easily? "Because it has a sharp point."

Why does not the pin hurt the finger when we push against the end of it? "Because it has a head to push against."

I will now write the word *Pin* on the blackboard; also the words *Parts*, *Shape*, and *Uses*.

Now, if you will tell me the names of the parts of the pin, I will write the words on the blackboard under the word *Parts*. "Head;" "Point;" "Body."

What is the shape of the body of the pin? "Cylindrical."

Can some one tell me any thing else about the body of the pin? "It is straight;" "It is smooth."

Would the pin be useful if it was crooked? What do we do with crooked pins? Would the pin be useful if it was rough? Why not? "It would not go through cloth easily;" "It would tear the cloth."

What is the shape of the point of a pin? "Tapering and sharp;" "Conical."

Could we use a pin if it had no point?

What is the shape of the head of this pin? "Round and flat on the top;" "Like an oblate spheroid."

A needle will go quite through a piece of cloth; why will not the pin go through? "The head of the pin will not let it go through."

Could you sew with a needle if it had a head like a pin?

What is the use of the head of a pin? "To keep the pin in its place;" "To prevent it from hurting our fingers when we fasten any thing with it."

What is the use of the point?

What is the use of the body of the pin?

When the lesson is drawn out and written on the blackboard, it will appear somewhat as follows:

PIN.

Parts.	*Shape.*	*Uses.*
Point.	Conical.	Go through cloth easily.
Head.	Oblate spheriod.	Push against; hold the pin in its place; to keep it from hurting the fingers.
Body.	Cylindrical. Straight.	To hold parts of the dress together.

The teacher may talk about the size of pins, as *large* and *small;* of the color, as *white*, *black*, and *yellow*.

The children should be shown the importance of not using pins where strings or buttons should be used; also the danger of placing pins in the mouth.

The lesson should be read, the words spelled, etc.

WATCH.

Holding a watch before the children, the teacher asks, What is this? "A watch."

Now look at it, and tell me what you can see. "I see the face." "The hands."

Where are the hands? "On the face." "The face is white." "It has figures on it." "It is circular."

Very well. What else do you see? "There is a glass over the face." "There is a rim around the face."

What is the use of this rim? "To hold the glass."

What else can you say about the watch? "It has a case." "The case will open." "It has a stem." "There is a ring in the stem."

What is the use of the ring? "To take hold of when pulling the watch from the pocket, and to fasten the chain to the watch."

Is there any part of the watch which you do not see? "Yes, we can not see the inside."

Let us look inside of the watch. What do those wheels do? "Move round."

Does any part of the watch which you can see move round? "Yes, the hands."

Who can tell me what these hands are for? "To point out the time of day."

How many hands are there? "Two."

Are both alike? "No; one is longer than the other."

You have told me several parts that you could see; now is there any way by which you could tell that there is a watch in my hand without seeing it? "We could hear it if it was near to our ears."

When you hear the watch, what do you say it does? "It ticks."

The teacher may now write on the blackboard the words *Watch* and *Parts*, and the name of each part under the word *Parts*.

Now let us talk about the use of a watch. "It is to show us what time it is."

Is there any thing else that tells us the time? "Yes, a clock."

Which is the largest—a watch or a clock?

What are the uses of the parts of the watch? "The wheels are to turn round and make the hands move." "The case is to hold the wheels." "The face is for the figures and hands." "The hands point out the time." "The glass keeps the hands from being broken, and the dirt out of the watch." "The stem is to take hold of." "The ring is to fasten it to the chain."

The names and uses of the parts may be written on the blackboard, and spelled as in former lessons.

HAT.

We will have a talk to-day about something that is worn on the head. What do you think it is? "A cap;" "A hat;" "A bonnet."

I will print the name of it on the blackboard, and then you may tell me what it is. "A hat."

Very good. Who will lend me a hat to look at while we talk about it? Thank you, Willie, I will try to make a good use of your hat. I have placed the word *hat* on the blackboard; now I will write the words *Parts*, *Shape*, and *Uses*.

Now, as I touch a part of the hat, the class may tell me the name of that part. "Crown." "Brim." "Body." "Band." "Binding." "Lining." "Trimming."

James may come here and touch the *crown* of this hat.

Henry may point to the *body* of the hat.

George may show us which part is called the *brim*.

Henry may point to the *band*.

Horace may show us which part is called the *binding*.

John may point to the *lining*.

Charles may show us where the *trimmings* are.

You may now tell me the *shape* of these parts, and I will write it on the blackboard. "The *crown* is circular." "The *body* is like a hemisphere." "The body of most hats are cylindrical." "The *brim* is circular, somewhat like a flat ring." "The *band* is like a hoop."

The *binding*, *lining*, etc., have various shapes, and it would not be worth while to trouble a class to try to give the shape of these.

Let us now talk about the *uses* of these parts of the

hat. The teacher may proceed to ask various questions, until the children have observed and mentioned uses for these several parts, and these should be written on the blackboard. When the lesson is completed, it will appear somewhat as follows:

HAT.

Parts.	*Shape.*	*Uses.*
Crown.	Circular.	To cover the top of the head.
Body.	Cylindrical.	To cover the sides of the head and give shape to the hat.
Brim.	Flat ring.	To protect the face and neck from sun and storm.
Band.	Like a hoop.	To keep the size of the hat. To make it look well.
Binding		
Lining.		
Trimming.		

This lesson should be *read* by the pupils from the blackboard in a manner similar to preceding lessons.

SHOES.

What do children wear on their feet? "Shoes." "Stockings." "Boots."

We will talk about only one of these things to-day, and I will write the name of that one on the blackboard. What word did I make? "Shoes."

When do children wear shoes?

Do they wear shoes all night?

Why do *you* wear shoes?

Can you tell me what shoes are made of?

Which do you think are better to wear—shoes made of leather, or shoes made of cloth?

Why do you think shoes made of leather are better than those made of cloth?

What is the man called who makes shoes?

Who can tell me the names of parts of a shoe? "Toe." "Heel." "Sole." "String." "Upper part." "Inside." "Tongue."

Continue the conversation, leading the children to give the names of different kinds of shoes, and their uses. When finished, the lesson on the blackboard may show the following statements:

SHOES.

Kinds.	*Parts.*
Kid shoes.	Toe.
Morocco "	Heel.
Cloth "	Sole.
Buttoned "	String.
Laced "	Tongue.
Gaiter "	Inside.
Slipper "	Upper part.

DOOR.

What do you open when you go into a room? "The door."

What should you shut when you enter a room? "The door."

What is the use of a door?

What are doors made of?

What is the shape of the door?

Which way is the door longer? "Up and down."

What keeps the door from falling down when we open it? "The hinges."

What holds the door shut? "The latch; or a lock."

Talk with the pupils about the *parts* of the door, and their uses, until they are able to give information that may be written on the blackboard in a form similar to the following:

DOOR.

Parts.	*Descriptions and Uses of Parts.*
Panels.	Oblong thin parts in the centre of the door.
Stiles.	Long, narrow, upright parts by the sides of the panels.
Rails.	Horizontal parts at the ends of the panels.
Hinges.	The iron parts on which the door hangs and moves.
Latch. } Lock. }	Parts used to hold the door shut.

Let the pupils *read* this; also spell the names of the parts.

A LETTER.

Show the children letters inclosed in envelopes. Request them to tell the shape of an envelope.

Shape.—Oblong, flat.

Color.—*Envelopes* are white, buff, bluish, sometimes straw color. The *paper of the letter* is white, sometimes bluish.

Parts.—OUTSIDE. The *envelope* is a paper pocket or cover for the letter, to keep it clean, and to prevent any one from seeing what is written in the letter. The *writing on the envelope tells the postman where to take the letter*, and *to whom it should be delivered.* The *postage stamp*, in the upper right-hand corner, *pays for carrying the letter.* The stamp must be put on the letter before sending it. The *seal* or *gum fastens the letter* so that no one can read it before it reaches the person for whom

it was written. It is a great crime to open a letter that does not belong to you. The *post-mark*, or circular stamp containing letters and figures, near the postage stamp, *tells where the letter was mailed*, or from what place it was sent; also *when it was sent.*

INSIDE. The *inside of the letter* contains a *date*, showing *when* and *where* it was written; also the name of the person who wrote it. This is called a *signature.* The writing between the date and the signature tells what the person who wrote the letter wants the person to know to whom it is sent.

All of these facts should be properly brought out by showing letters, by conversation, etc., and, when finished, the principal facts may be written on the blackboard and read by the pupils.

Thimble.—A lesson on the *thimble* might lead to a consideration of the following facts relative to it: It tapers toward the top; is *bell-shape;* hollow inside, and fits on the finger like a cap; is worn on the middle finger of the right hand when sewing, to keep the needle from pricking the finger while pushing it through the cloth; the *outside is covered with little holes* called *cells;* the cells keep the needle from slipping while pushing it through the cloth; it has a *rim* around the bottom to guard the finger from injury should the needle chance to slip; it has a *border* around it, between the cells and the rim.

Write the outline of the lesson on the blackboard as it proceeds, and let the pupils review the whole by reading the outline when the lesson is finished.

The same plan should be pursued with all similar lessons.

Key.—A lesson on this object might lead the children to observe the following facts: The *key* has a *cylindrical barrel*, which is *hollow* at one end; it has an *oval-shaped ring* at the other end; it has *rings* around the barrel; on one side of the hollow end of the barrel is an *oblong piece*, sometimes called the *lip;* the lip contains *grooves* or notches. The oval ring is to turn the key; the lip to move the bolt in the lock; the hollow end of the barrel fits on a *stem* in the lock, which keeps the key in its place while moving the bolt. For what are keys used? What kinds of keys have you seen?

The methods of conducting the preceding lessons will suggest how lessons may be given on the following objects:

Blackboard.	Cap.	Hammer.
Slate.	Cup.	Needle.
Window.	Pencil.	Knife.
Clock.	Boot.	Book.
Numeral Frame.	Stove.	Broom.

SUGGESTIONS FOR THE TEACHER.

During the lessons of the "first stage," such heads as the following might be written on the blackboard, and the pupils requested to mention appropriate objects, the names of which should be written under the headings to which they relate, as:

"*Things we have for breakfast.*" "*Things we get for dinner.*" "*What is used in the kitchen.*" "*What is in the parlor.*" "*Rooms in a house.*" "*Parts of our clothing.*" "*Things that may be bought at the grocery.*" "*Things that grow in the garden.*" "*Kinds of meat used for food.*" "*Kinds of fruit that we eat.*"

LESSONS ON OBJECTS.

SECOND STAGE.

Suggestions for the Teacher.—In giving lessons on objects in this stage of training, it will be appropriate to lead the pupils to consider the *materials* of which the objects are made, their most prominent *qualities, form, color, size, parts, uses, where found,* or *by whom made.*

Care should be taken not to allow these lessons to fall into a barren monotony by requiring the pupils to frequently mention those qualities which are so common to objects as almost to permit their being called universal qualities, as *opaque, solid, useful, inanimate,* etc. Chief attention should be given to the leading characteristics of objects, and especially to those qualities which contribute most to the usefulness of the objects.

SPONGE.

Pieces of sponge may be shown, and the children allowed to handle them, while a conversation is had between the teacher and the pupils which will lead them to observe that the *color* of the sponge is *yellowish;* that it is *soft* to the touch; that it is *compressible,* or easily squeezed by the hand; that it is *elastic, porous,* and *absorbent.*

The conversation may also consider the *uses* of the sponge, as for *bathing,* for *washing carriages,* for *cleaning slates,* etc.; and what qualities make it useful for these purposes, as *soft, compressible, elastic, absorbent,* and *fibrous.*

If this lesson has been well presented, the blackboard will now contain an outline somewhat as follows, viz.:

SPONGE.

Its Qualities.	*How these make it Useful.*
Soft.	Will not scratch.
Compressible.	Water may be easily squeezed out.
Elasticity.	Will quickly return to its shape again.
Porous.	The holes or pipes enable it to be absorbent, or to suck up liquids.
Absorbent.	
Fibrous.	Not easily torn.

It is Useful for

Washing carriages, cleaning slates, and bathing.

Its Color is	*It is Found*
Yellowish.	On rocks in sea-water.

The teacher should now question the pupils about these qualities, their uses, etc., until they clearly understand how the sponge becomes useful by possessing these properties. Afterward tell *where* and *how* the sponge grows, and how it is obtained.

HOW THE SPONGE GROWS.

Suppose you were standing by the shore of the Mediterranean, on a rock which jutted out a little way into the sea, you might observe a pile of sponge fastened under the water on the rock, and, as you watched it carefully, you would see now and then a jelly-like looking thing, resembling a drop of the white of an egg, and somewhat of the shape of a pear, but very small, fall off the side of an old sponge. This little thing is called a *gemmule*, or bud. It has no shell nor skin to cover it, no eyes, no ears, no feet, and no fins, yet it has life, keeps itself from sinking, and not only moves up and down with quickness, but soon it becomes partly covered with fine hairs like eyelashes, called *cilia*. The

gemmule moves these *cilia* about quite rapidly, making a motion in the water, and starts off. As it swims, it looks as if it did not know what it wanted, nor where it was going. But its Creator knows, for He cares for it, and draws the little sponge *gemmule* far away from the old sponge, that it may live in another place, and so spread the good of its existence over the sides and bottom of the sea.

If two of these *gemmules* happen to meet and to touch each other, they instantly stop moving their *cilia*. The next moment they turn themselves round, and then off they go on their way through the water. After wandering about for some three days, the *gemmule* seems to become tired of roaming, and settles down upon some piece of rock, or shell, or wood, and begins to fasten the smaller end of its body to this hard substance. The place where it settles thus becomes its home as long as it lives. While this *gemmule* is making itself fast to the rock, its cilia keep the water around it in motion; but in a few hours after it has fixed itself tight, these *cilia* become quiet, and this jelly-like animal lies down flat on the rock.

Soon after the *gemmule* has become quiet, a great number of dark spots may be seen floating in its clear little body. These dark spots are the *fibres* of the sponge beginning to grow in the live jelly. These fibres are made of silex, lime, glue, and albumen, which substances are drawn into the body out of the sea-water.

These little spots of sponge soon join together like a net-work, and make a sort of frame-work or skeleton for the live jelly to rest upon. As the sponge's frame-work grows in the *gemmule*, its live jelly grows too, and the

jelly fills all the tubes and holes of the sponge, and even covers quite over the outside of the sponge.

When the jelly is much grown, a great many fine spikes are sometimes seen to shoot out of the sides of the sponge tubes. It is supposed that these fine spikes are made to grow in the inside of the tubes, to prevent the weight of the growing sponge from pressing too heavily upon the live animal jelly. All around that part of the sponge which is fastened on the rock you may see a clear rim of jelly spread out; and when two sponges grow so near each other that these rims touch, they immediately grow together, and make one lump of sponge.

Persons have tried to take hold of the living jelly of the sponge, in order to see what it is like; but they are always disappointed, for as soon as it is taken off the sponge, it turns into a kind of thick oil or glue, and soon dries up.

As the sponge grows on the rocks, it throws up many round or cone-like heads, with large holes at the top. The sides of the sponge are full of *little* holes or *pores*. It is by these little holes that the sponge draws the sea-water into its substance; and after letting the water run through the whole mass of its body, the living creature throws out what it does not want through the large holes at the top, and often sends this water out with such force as to cause it to rise up like a little fountain.

These sponge animals are of many shapes, according to their species. Some grow like shrubs, some like vases and tubes, and some like globes. All the sponges stick so tight to the rocks upon which they are fastened that the dashing of the waves hardly ever tears them

off. In some places they are seen to cover cliffs and rocks; in other places their soft bodies line the walls of caves deep under the waters; and sometimes they hang in drooping branches from the roofs of the caverns.*

Sponge is found in the various parts of the ocean, but the strongest sponge is obtained from the Mediterranean Sea.

When the sponge is taken from the water, the animal jelly soon dries up and crumbles to pieces. That which we call sponge is the frame-work, or soft bones of the animal.

The inhabitants who live near the water where sponges grow are taught to dive for the sponge when they are children. They learn to remain under the water from one to two minutes at a time, pulling the sponges from the rocks, that they may bring them up to the surface and take them on shore.

WATER.

Talk with the children about what they can do with *water;* also about the uses which people make of it, as for *drinking*, *cooking*, *washing*, etc. Lead them to observe and tell how it looks, as *clear*, *transparent;* also that it is *cool*, *tasteless*, *colorless*, and *inodorous* — it has no smell; that it will *flow in drops and wet*, consequently is a *liquid;* that it can not be gathered up again when spilled; that it soaks into the ground, or dries up.

Lead the pupils also to observe how the water comes from the clouds as *rain;* that some of it soaks into the

* *How the Sponge grows* is from "The Observing Eye."

ground, and some of it runs away in little streams and flows into rivers; that the rivers flow into the sea. Also that water flows from *springs;* that the streams from several springs unite and form a river.

Lead them also to observe that water will turn into *vapor* or *steam* by heat, and become hard by cold; that it is useful to move machinery and warm our houses when in the form of steam; and valuable as *ice* in preserving various kinds of food during warm weather.

At the close of the lesson, the outline on the blackboard will appear somewhat as follows, viz.:

WATER.

Qualities.	*Uses.*	*Where Obtained.*
Transparent.	Drinking.	From clouds, as rain.
Tasteless.	Cooking.	" the ground, as springs and wells.
Colorless.	Washing.	
Inodorous.	Moving machinery and	" streams.
Liquid.	warming houses.	" ponds and lakes.
Will evaporate.	Preserving food in summer.	
" Freeze.		

It is the most useful liquid, hence God provides it most abundantly.

MILK.

A lesson may be given on milk in a manner similar to the one on water. During this lesson these two liquids should be compared. The exercise on *Milk* should lead the children to consider the following properties, which may be written on the blackboard as each one is talked about during the lesson:

MILK.

Properties.	*Uses.*	*Where Obtained.*
White.	Making cheese.	From cows; also from goats, in Switzerland; from reindeer, in cold countries; from camels, in hot countries.
Opaque.	" butter.	
Liquid.	Cooking.	
Sweet.	Drinking.	
Nutritious.	Food for young animals.	

GLASS.

Taking pieces of window-glass, and a tumbler, and other kinds of glass, the teacher may lead the children to notice the principal qualities and uses of glass in a manner similar to that pursued in teaching transparency in the lessons on *Qualities.* Experiments may be had with the glass, and the pupils allowed to feel of it, and look through it, etc. Afterward questions should be asked somewhat like the following, to lead the pupils to consider all the important properties and uses of this material.

Who will tell me something about glass? "We can see through it."

What word means *can be seen through?* "Transparent."

What else can you tell me about glass? "It will break easily."

What word means *will break easily?* "Brittle."

What else can you say about it? "It is smooth." "It is thin."

How do you know it is smooth and thin? "By feeling of it."

Who can tell more about glass? "It is used in windows."

Why do we put glass in windows? "So we can see through."

Suppose there were no windows in this room, could you see what is in it? "No."

What then must be in the room to enable you to see in it? "Light."

How does the light get in this room? "It comes through the glass in the window."

Then for what other purpose is glass used in windows besides seeing through? "To let the light in."

Can you see through the door when it is closed? Can you see through the blackboard?

What is made of glass? "Tumblers; "Dishes;" "Bottles;" "Beads;" "Mirrors;" "Inkstands."

You have examined these pieces of glass, now you may tell me the names of the different kinds. "Window-glass;" "Flint-glass;" "Bottle-glass;" "Stained glass."

Which is the flint-glass? "The white, clear glass of which goblets are made."

For what is stained glass used? "For church windows."

When the exercise is finished, the blackboard will contain an outline of the lesson somewhat as follows:

GLASS.

Qualities.	*Uses.*	*Kinds.*	*How Made.*
Transparent.	Windows.	Window.	Some kinds by melting sand and pot ash together.
Brittle.	Tumblers	Plate.	
Smooth.	Dishes.	Flint.	
Colorless.	Bottles.	Bottle.	
Stained.	Mirrors.	Stained.	
	Watch crystals.		
	Inkstands.		

WOOL.

What have I in my hand? "Some wool."

Where does wool come from? "It comes from the back of sheep."

How is the wool obtained from the sheep? "It is cut off with large shears."

When is it cut off? "When the weather becomes warm in the beginning of summer."

What is done with the sheep before the wool is sheared from them? "They are taken into a stream of water, or into a large tub into which clean water runs, and the wool is washed."

Who can tell me of what use wool is to the sheep? "To keep them warm."

Yes, wool is the sheep's clothing. Can the sheep make its own clothing? "No."

Who gives the sheep their clothing? "God; He makes the wool grow."

After the children have felt of a piece of wool, ask, How does the wool feel? "Soft." "Warm."

Because wool is soft and warm, it is very useful for clothing, for it prevents the warmth of the body from passing away, and thus it keeps us warm.

Here is a little water in this basin. I will place some wool in it. What do you observe? "The water has disappeared; the wool has sucked it up."

What did we say of the sponge when we found that it would suck up water? "That it is an *absorbent*." What, then, may we say of wool? "It is an *absorbent*."

Why do we call any thing an *absorbent?* "Because it sucks up water or other liquids."

Squeeze the wool and then let go of it. What do you observe? "It is *elastic*."

What is the color of wool? "White."

Did you ever see a black sheep? For what is wool used? "For making cloth for coats, pantaloons, vests, and cloaks; for flannel, blankets, shawls, carpets, stockings, hats, etc."

What is done with the wool when cloth is made of it? "It is spun into yarn, and the yarn is woven into cloth."*

You may now read what has been written about *wool* on the blackboard:

WOOL.

Qualities.	*Uses.*	*Where, when, and how Obtained.*
Soft.	Cloth for clothing.	From sheep, when the warm weather begins, after washing them, by shearing.
Warm.	Shawls.	
Absorbent.	Carpets.	
Elastic.	Blankets.	
	Hats, etc.	

SALT.

This substance may be presented by observation, experiment, and conversation, and the children led to consider the following qualities, uses, kinds, etc.

Qualities.—*Saline, soluble, granular, sparkling, hard, white.*

* The extent to which the teacher should lead the pupils to consider and describe the processes of manufacture of woolen goods must depend upon their age and their familiarity with the process employed. In a town where woolen goods are manufactured, it would be proper to extend this subject with the older pupils, so as to include the various processes of the manufacture of woolen goods.

Kinds.—*Rock salt, coarse salt, fine or table salt, bay or sea salt.*

Uses.—*Seasoning food, preserving meat, glazing earthenware, manure, for animals.* It is necessary to health and life.

Where and how Obtained.—*Rock salt* is dug from salt mines in the earth. The salt used in the United States is obtained chiefly from springs and wells of salt water. *Coarse salt* is made by evaporating the water in shallow vats, or tanks, by the heat of the sun. *Fine or table salt* is made by boiling the brine in large iron kettles. The most extensive salt-works in this country are at Syracuse, New York.

SUGAR.

Proceed with this substance as with salt; show specimens of it, experiment with it, talk about it, and consider the following properties, uses, etc.:

Qualities.—*Sweet, soluble, fusible, sparkling, crumbling, brittle, nutritious.*

Kinds.—*Brown sugar, loaf sugar, powdered sugar, crushed sugar, maple sugar.*

Uses.—*To sweeten food and drinks*, as cake, pie, pudding, tea, coffee, etc. *To preserve fruit.*

From what Obtained.—Chiefly from sugar-cane; some from maple-trees. It may be obtained from some kinds of beets; also from sorghum.

GLUE.

By suitable observation and experiments, lead the children to consider the following:

Qualities.—*Hard, soluble in hot water, sticky or adhesive, tenacious, brown color.*

Uses.—*To join pieces of wood together, to bind books.* A weak solution of glue, called *size*, is used in whitewash to prevent it from rubbing off. Glue is used by carpenters, cabinet-makers, etc.

Where Obtained.—From hoofs and skins of animals. Some fine kinds are obtained from parts of fish.

Kinds.—*Gelatine* is a kind of refined glue, used in cooking. *Isinglass* is the finest kind of glue, obtained from the air-bladders of fish, and is used for jellies, etc.

GUM ARABIC.

Qualities. — *Semi-transparent, hard, soluble, adhesive, yellowish color, inodorous, insipid taste.*

Uses.—*For sticking thin articles*, as postage-stamps, envelopes, etc.; *for mucilage; for making ink; for stiffening crape, bonnets of straw*, etc.

Where Obtained.—From the acacia-tree, which grows in sandy regions in the East Indies and in Africa. It is the *gum of the tree*, and oozes out of the bark during the hot weather, as gum oozes out of the plum, cherry, and peach trees in this country. It becomes hard by exposure to the air.

CORK.

Qualities. — *Light, soft, compressible, elastic, inflammable.*

Uses. — *Stoppers for bottles, life-preservers, floats for fish-nets, inner soles of shoes*, etc.

What it is and where Obtained. — Cork is the outer bark of an evergreen-tree that resembles a kind of oak. The cork-tree grows in Spain, Portugal, southern part of France, in Italy, and the northern part of Africa. This tree lives to a great age. When fifteen or twenty years old, it is customary to commence peeling off the outer bark. This is done in July or August. The bark is cut lengthwise of the tree, and a blunt instrument inserted under the bark to peel it off. Care is taken not to injure the inner bark. The outer bark may be removed once in six or eight years. The bark is slightly charred on one side, then pressed out flat. It is cut up for stoppers of bottles, and other uses, by hand, with a sharp, thin knife. This knife is sharpened on a board by one whet or stroke on each side of it after every cut. It must also be frequently sharpened on a stone. Corks for bottles are cut lengthwise of the bark, so that the pores will all extend across the cork.

Other Objects. — Lessons may also be given, during the second stage, on the following objects:

India-rubber.	Coal.
Blotting-paper.	Wax.
Blackboard crayon.	Putty.
Whalebone.	Alum.
Honey.	Starch.
Honey-comb.	Bread.

LESSONS ON OBJECTS.

THIRD STAGE.

Suggestions for Teachers.—During the lessons in this stage of training, the pupils may be led to analyze objects more completely, and to consider their adaptation to the purposes for which they are commonly used.

The examination of the several objects, and the observation of their various properties, should be performed by the children as far as possible. Lead them to notice the qualities, but do not tell the pupils of the existence of those which they can readily discover.

Only a few lessons will be drawn out in this stage, to suggest the general plans of giving them. Other objects will be mentioned, with their most prominent qualities, leaving the teachers to supply the exercises in experimenting, talking about the object, and questions for the pupils relative to its qualities, uses, etc.

LEATHER.

Children, you may tell me what I hold in my hand. "Pieces of leather."

You may look at these pieces of leather, and feel of them, and then tell me what you observe. "One side is black, and the other is a light brown." "It is smooth."

Is it smooth on both sides? "The black side is smoother than the brown side." "Some are yellow." "Some pieces are red." "Some are white."

What can you do with it? "Bend it—it is *flexible.*" Why do you say it is *flexible?* "Because it may be easily bent."

What could you do with paper? "Tear it." Try to tear the leather. "We can not tear it." Why?

"Because it is tough." When do you say a thing is *tough?* "When it can not be torn easily."

You say this leather is *smooth, flexible,* and *tough;* take it between your thumb and finger, and see if you can observe any thing more of it. "It is thin." "It is light."

How did you discover that leather is *smooth, flexible, tough, thin,* and *light?* "By feeling it."

Now shut your eyes. What is near your face? "Leather."

Did you see the leather while I held it near your nose? "No." How, then, did you know that I held it there? "We could smell it."

What, then, may you say of leather? "It has a smell." What do we say of any thing that has a smell? "It is *odorous.*"

What, then, may we say of leather? "It is odorous."

How did you find out that leather is odorous?

How did you find out the color of the leather? "By looking at it."

What qualities did you find out by feeling?

For what is leather used? Are you wearing any thing made of leather? Why is leather good for shoes? "It is tough."

Can you think of any other reason why it is good for shoes? "It is flexible." "It is thin and light."

Paper is thin and light; why would it not make good shoes? "It would not keep out water."

Now we have found out a very important reason why leather is good for shoes: it keeps the water from our feet. Because it will keep out water so well, we say it is *water-proof.*

Who will now tell me several reasons why leather is

good for shoes? "Because it is *tough, flexible, thin, light*, and *water-proof*."

Observe this piece of leather when I put it in the fire. "It frizzles up." "It has a very unpleasant odor."

Do you remember what happened when I put the paper in the fire? "It was soon burnt up."

That, you remember, was made from a vegetable—a plant. Leather is an animal substance, and when it burns it frizzles up and gives out a disagreeable odor.

Who can tell me where we get leather? Is it dug from the ground? "No; it is the skin of an animal."

Can you mention some animals, the skins of which are used for leather? "The cow, the calf, the horse, the sheep, the dog, the hog."

Does the skin of either of those animals look like this leather? What is the difference? "Their skins are covered with hair."

What must be done to them in making leather? "The hair must be scraped off, and the skin tanned."

After talking with the children about the process of tanning leather, and the several kinds that are made, the teacher may require the pupils to read what has been written on the blackboard during the lesson:

LEATHER.

Kinds.	*Qualities.*	*Uses.*	*How Obtained.*
Upper.	Smooth.	Boots.	From the skins of the
Sole.	Various colors.	Shoes.	cow, ox, horse, calf,
Calfskin.	Flexible.	Gloves.	goat, sheep, hog,
Cowhide.	Tough.	Harness.	and other animals,
Morocco.	Thin.	Reins.	which are tanned
Kid.	Light.	Saddles.	with an astringent
Harness.	Odorous.	Trunks.	bark, then dressed
Chamois.	Water-proof.	Pocket-books.	and colored for use.

WIND.

Sometimes we hear a low, roaring sound out of doors; sometimes a whistling sound; sometimes the windows rattle, and the shutters slam, and the limbs of the trees move back and forth, and the leaves rustle. Can you tell me the cause of these sounds and movements? "The wind."

Did you ever see wind?

You can not see wind, and how do you know that it is the wind that makes these sounds, and causes the leaves of trees to move? "We can hear it." "We can feel it."

How do you feel wind? "We feel it move."

What is wind? Can you tell me what air is? "Something that we breathe."

Very good. *Wind is air in motion.*

What Wind does.—Who can tell me what wind does? "Moves trees." "Rustles leaves." "Makes clouds move." "Makes kites fly." "Makes ships sail." "Whistles." "Throws dust in our eyes." "Blows hats off." "Blows down signs." "Breaks umbrellas," etc.

Kinds of Wind.—Sometimes the air is so quiet that we can not feel it move, then we say it is a *calm*.

Did you ever feel a gentle wind? That is called a *breeze*.

Did you ever feel the wind blowing so strongly that it carried away hats, and made it hard to walk? What would you call such a wind? "*A strong wind*." "*A hard wind*." "*A high wind*."

Very good. Such strong winds sometimes do great damage to ships.

Did you ever hear of a violent storm of wind that tore down barns, and houses, and fences, and trees? Such a wind is called a *hurricane.*

Did you ever have a whirling wind lift your hat from your head and whirl it up in the air along with dust from the street? What would you call such a wind? "*A whirlwind.*"

Sometimes whirlwinds are very violent, and move rapidly, and destroy all that comes in their way. These are called *tornadoes.*

Winds often do much damage, yet they are very useful. They move the clouds to bring us rain; they move ships across the lakes and over the sea; they dry our clothes, and dry the mud in the roads; they help to ripen grain; they purify the air; they scatter seeds; they cool the air.

You may now read what I have written on the blackboard about

WIND.

It is air in motion.

What it does.	*Kinds of Wind.*	
Moves the leaves of trees, grass, and grain.	No	wind—*calm.*
	Light	" —*breeze.*
Makes kites fly, ships sail, clouds move, waves dash on shore.	Hard	" —*strong wind.*
	Violent	" —*hurricane.*
	Whirling	" —*whirlwind.*
It whistles, blows hats off, breaks umbrellas, and blows down signs, buildings, and trees.	Rapidly whirling	" —*tornado.*

Winds are useful in many ways—to bring rain, cool the air, purify the air, move ships, dry our clothes, etc.

WAFERS.

Show the children wafers of various sizes and colors. Lead them to notice their lightness, brittleness, shape, color, adhesiveness when wet, etc. Then they may be requested to find out and tell their uses. Afterward the teacher may tell the pupils that wafers are *made of* a *thin paste of flour* and water, and *colored with paint;* that *the paste is poured into smooth iron pans which shut together* something like waffle-irons, but *so closely as to press the paste into very thin sheets;* these wafer-pans are then held over a charcoal fire, and *the paste is baked in them.* The pans are greased before the paste is poured in to keep the wafer from sticking. Several of *these large wafer sheets are placed in a pile,* and *the wafers are cut out with circular punches.* Illustrate the process of cutting by talking with the children about cutting dough into cakes with a cake-cutter, or a punch for cutting holes in leather or tin.

Tell them that *the paint used for coloring is poisonous;* hence we must not eat wafers, nor hold them in the mouth.

When the lesson is finished, the blackboard may contain something like the following:

WAFERS.

Shape and Qualities.	*Uses.*	*How Made.*
Circular. Thin. Smooth. Glossy. Brittle. Adhesive. Of various colors. Poisonous.	Fastening letters; also for seals after names of persons signed to deeds and other legal documents.	Made of thin flour paste, colored with paint; pressed and baked in smooth iron pans; cut out with circular punches.

LEAD.

Show the children pieces of lead in sheets, bars, pipe, bullets, etc. By experiments, lead them to observe its properties; and talk with them about its uses, where found, how obtained, and tell them such facts as they can not readily ascertain. Afterward the pupils may be required to tell all they can about lead, under the guidance of the teacher, and the names of the several properties, uses, etc., may be written on the blackboard as they are observed and described by the pupils. Care should be taken not to allow one or two pupils to do all the talking; encourage each one to tell something about the lesson.

What can you say about lead. "It is heavy. I know this by lifting it." "It will sink in water. I know this by experimenting." "It is soft. I know this because it is easily cut, or scratched, or dented; also because it will mark on paper." "It is softer than any other metal." "It is *pliable*. I know this because it is easily bent." "It is *fusible*. I know this because it melts in fire." "It is *malleable*. I know this because it can be made into thin sheets by pounding it."

For what is lead used? "For water-pipes." "Bullets and shot." "Lining tea chests." "For solder, by mixing it with tin." "On roofs of houses, for gutters, etc."

Where is lead obtained? "From lead mines in the earth." What is it called when dug out of the earth? "Lead ore." "It is smelted in furnaces, to separate it from the earth."

What are those called who work with lead? "Plumbers."

The principal facts of the lesson should be read from the blackboard by the pupils.

Similar lessons may be given on *iron*, *copper*, *silver*, *gold*, etc.

Iron.—*Qualities.*—Hard, ductile, tenacious, malleable, fusible, heavy. *Uses.*—For stoves; cooking utensils; made into steel for knives, and forks, and tools; used for railroads, car-wheels, wagons, houses, bridges, boats, etc. *Where found.*—In the earth. Called ore. Smelted in large furnaces. Fire very hot.

Iron, when converted into steel, exceeds in hardness other metals. It is more ductile than gold, and may be drawn into a wire as fine as human hair. It is the most tenacious of the metals; a wire of one tenth of an inch in diameter will support 550 pounds. In the state of steel it is the most elastic of metals. It is also the most useful of metals.

Copper.—Heavy, tenacious, sonorous, fusible, ductile, malleable, poisonous.

It is eight times heavier than water. A wire one tenth of an inch in thickness will support 300 pounds. It is the most deeply sonorous of all the metals. It is more easily melted than iron. It is used for printing pictures; for printing calico; for making brass, by mixing zinc with it; for bronze, by mixing tin with it; for making bells, gongs, etc.

Silver.—Heavy, ductile, malleable, tenacious, fusible, brilliant, reflective, not affected by common acids.

Silver is about eleven times heavier than water. It can be drawn into the finest wire. It can be reduced to an extreme thinness. A wire of silver one tenth of an inch in thickness will support 200 pounds.

Gold.—Heavy, malleable, ductile, tenacious, fusible, brilliant.

Gold is considered a perfect metal, because it does not change nor

lose any of its weight when melted. It is nineteen times heavier than water. It is the most malleable of metals: a piece of gold of the size of a pin's head may be hammered out so as to cover a space of fifty square inches. It is so ductile that one dollar can be drawn out into a wire that will reach nearly two miles. Its tenacity is much less than that of iron. A wire one tenth of an inch in diameter will support 160 pounds.

Other Lessons on Objects may be given during this stage upon *Whalebone*, *India-rubber*, *Camphor*, *Cotton*, *Linen*, *Silk*, *Mirror*, *Snow and Ice*, *Brass*, etc.

The teacher may also write on the blackboard the following heads, and the pupils be required to ascertain and give appropriate information to be written under each, as:

What may be seen in a farm-yard. Materials used for building. Materials used for furniture. Tools used by a carpenter. Tools used by a shoemaker. What may be bought at a hardware store. How to air the house.

Things made of iron. Things made of wood. Things made of leather. Things made of glass. Things made of India-rubber. Things made of wool.

What farmers plant. What farmers sow. Grains that farmers raise. Kinds of fruits. Kinds of nuts. Kinds of vegetables that we eat.

HUMAN BODY.

"A healthful body and a vigorous mind,
A countenance serene, expanded chest,
Heroic stature, and a temperate tongue."

An examination of the Human Body ever awakens feelings of wonder in each observer, as it did when the divine psalmist exclaimed, "I am fearfully and wonderfully made." One of the most curious and remarkable things in the world is the house that each human being lives in—the *body*. A knowledge of its frame-work, its parts, the uses of each, and how to keep it in good condition, is of the greatest importance to every one, and especially so to the young.

When lessons on the Human Body are properly presented, it becomes not only an appropriate object of examination and study for children, but one of the most important and interesting subjects that claim their attention. These lessons are valuable for leading children to habits of taking a proper care of their bodies, as well as for the knowledge which they impart, as a foundation for a subsequent study of physiology.

These lessons will furnish suitable opportunities for correcting any vague and imperfect notions which children may have acquired about their bodies, and for giving them suitable terms for description; also for preparing them to understand many wonderful details in the modification and adaptation of the organs of ani-

mals to their peculiar habits, propensities, and localities.

The summaries given in the following exercises, which appear in smaller type, are intended to be repeated by the pupils, to aid them in remembering the facts taught in the several lessons on the Human Body; but in no case should a summary be presented to the pupils before they have been taught the facts which it contains by a training exercise.

It is just that I should state that these summaries were prepared, nearly as given here, by Miss Margaret W. Lewis, the teacher for object lessons in the Primary Department of School No. 49, in this city, for the classes of that school. The success of these lessons, as given by Miss Lewis during the past two years to some two thousand children, between the ages of six and ten years, led me to make arrangements with her to incorporate the summaries into a series of training lessons on the Human Body, in place of those given in the former editions of this work. Miss Lewis also furnished some of the material for the training lessons. I trust that these exercises can be readily given by teachers, and that they will be found interesting and profitable.

TRAINING LESSONS ON
THE HUMAN BODY.

FIRST EXERCISE.

The Human Body as a Whole. — The lessons on the Human Body may be introduced by means of conversations about our bodies — those of children and of grown persons; what children can do; what men and women can do; also about houses as places to live in; then about the body as the house of the soul.

Talk about the building of houses, their frames, and coverings. Afterward request the children to feel of the face, arms, etc., and then tell of what their bodies are built. Some will probably say, "Of bones."

What covers the bones? "Flesh."

What covers the flesh? "Skin."

Of what, then, may you say the frame of your body is built? "Of bones."

With what is your body covered? "With flesh and skin."

You may say, *My body is built of bones, covered with flesh and skin.* I will print this on the blackboard, and you may read it.

SECOND EXERCISE.

Parts of the Body.—The teacher can best illustrate the principal parts of the body by showing a doll to the class. Let the pupils name and tell the position of the head, the neck, the body or trunk, the arms, the hands,

the legs, and the feet, as each is pointed out by the teacher. An appropriate conversation should be had about these parts, and the children led to point out and name the same parts of their own bodies.

One pupil may stand before the class, and point out each of these parts as the teacher names them. Then the class may name them as the pupil points them out in the same order as before.

When a sufficient variety of exercises have been had, and the pupils can readily point out and name all of these parts, in order and out of order, and have learned to know their *right* and *left* hands, etc., the teacher may print on the blackboard, for the pupils to read, the following:

PARTS OF MY BODY.

The parts of my body are my *head*, my *neck*, my *trunk*, my *arms*, my *hands*, my *legs*, my *feet*.

As the children repeat the above, let them touch each part as it is named by them.

THIRD EXERCISE.

Breathing.—The teacher may take a deep, full breath, and request the children to stand up and imitate her. When they have repeated this several times, ask them what they have been doing. "Breathing" will be the answer of some.

Do we breathe all the time? "Yes." Do you breathe when you are asleep? If the children can not answer, tell them to watch their baby brother or sister when it is asleep. If you should stop breathing, what would happen? "We would die."

Now let the pupils repeat the full breathing, and lead their attention to the *drawing in* and *throwing out* of something, which they may feel by holding the hand before the mouth. Ask them what they call that which they feel blowing upon the hand? Some of the children will say "Wind." Tell them that *wind is only air moving*. Also talk about air, and lead the children to understand that we take it into the body when we draw in the breath, and that we throw out the air again, then take in more, and so on.

Now who can tell me what you breathe through? "The mouth." "The nose."

You may hold your hand on your chest, between your arms, and take a full breath. Now where does the air go that you take in when you breathe? "In the trunk." "In my body." "In my chest."

The teacher may now tell the pupils something about the windpipe and the lungs, and that the lungs are our breathing machines. When the pupils appear to understand these facts about breathing, they may be required to read the following from the blackboard:

BREATHING.

I breathe through my *nose* and my *mouth*, and take the air into my *lungs*.

FOURTH EXERCISE.

The Blood.—Children, if you prick your finger, what will flow out? "Blood."

If you cut your foot, what will flow from it? "Blood."

If you scratch your face, what will flow from it? "Blood."

Where is the blood in your body? "In all parts of it." "All through it."

Where do you think the blood comes from? "From the head," some may answer.

Now place your right hand on your left side. What do you feel? "Something beats." "I feel my heart."

Show me how it beats by moving your hand.

Now tell the pupils that every time the heart beats it throws out blood, which passes through tree-like pipes or tubes to every part of the body. When does the blood flow through the body? "When the heart beats."

Does the heart beat when we are asleep? "It does not." "It does."

Correct the error of those who think the heart does not beat while we sleep by leading them to understand what would happen to us should the heart stop beating. The pupils may now read the summary from the blackboard:

THE BLOOD.

The blood flows through my *body* all the time from my *heart*.

It will now be proper to talk about blood being made from our food and drink; of its flowing through the body, leaving something in every part of it to keep it alive and make it grow; of its taking away the waste particles, and thus becoming impure, and needing to be changed or purified before it is fit to go through the body again. Tell the pupils that the impure blood goes into the lungs, and there meets the air that we breathe in, and that the air takes away the waste particles, and makes the blood pure, or freshens it, after which it returns to the heart, and is again sent all through the

body. Lead the children to understand the importance of eating wholesome food and breathing pure air, that the blood may be in a good condition for building up the body.

Now the *summaries* of the four exercises may be placed on the blackboard, and repeated by the pupils, each one touching the parts mentioned. The whole subject may also be reviewed by questions:

ABOUT MY BODY.

My *body* is built of *bones*, covered with *flesh* and *skin*. The parts of my body are my *head*, my *trunk*, my *arms*, my *hands*, my *legs*, my *feet*. I breathe through my *nose* and my *mouth*, and take the air into my *lungs*. The blood flows through my *body* all the time from my *heart*.

FIFTH EXERCISE.

Head and its Parts. — Talk with the children about the head and its parts; where it is; its shape; what we do with it; what it is covered with; where the face is; which part we see most; where the ears are; what the top of the head is called; about the nose, mouth, etc.; and let the pupils touch each part as it is talked about.

When the pupils have become familiar with the parts of the head, they may learn to repeat the following summary from the blackboard, at the same time touching each part mentioned:

THE HEAD.

The parts of my *head* are the *crown*, the *back*, the *sides*, my *face*, and my *two ears*.

SIXTH EXERCISE.

Face and its Parts.—Talk with the children about the face and its parts; its shape, round, or oval, narrow part lowest down; the forehead, the highest part of the face; the temples on each side of the head, in front of the ears; the eyes below the forehead, each side of the nose; the nose in the middle of the face, long up and down; the cheeks are each side of the face, soft and smooth; the mouth below the nose; the chin below the mouth, the lowest part of the face, pointed, sometimes has a little hollow in it called a *dimple*. Teach the children that the face tells many things about us—when we feel happy, when we feel sad, when we feel ashamed, when we are good, and when naughty.

Neck and Throat.—Talk with the pupils about the neck, to join the head to the body; its shape; how it can bend, and turn; the back of the neck, and the throat; that the throat contains the windpipe and the food passage, etc.

Let the pupils now learn the following summary from the blackboard, and touch each part mentioned:

FACE AND NECK.

The parts of my face are my *forehead*, my *two temples*, my *two eyes*, my *nose*, my *two cheeks*, my *mouth*, and my *chin*. The parts of my neck are the *back of my neck*, and my *throat*.

SEVENTH EXERCISE.

Trunk and its Parts.—Talk with the pupils about the back, its position, how it will bend; about the sides; about the chest, its use; the shoulders, and their position on the sides of the trunk at the top; the arms, joined to each shoulder; the hands, at the end of each arm; the legs, as two props on which the trunk rests, and which keep it up from the ground; the knees, at the middle of each leg; the feet, at the end of each leg, to enable us to stand. When the pupils have learned the position and names of these parts, they may learn the following summary from the blackboard, and touch each part:

TRUNK.

The parts of my trunk are my *back*, my *two sides*, my *chest*, my *two shoulders*, my *two arms*, my *two hands*, my *two legs*, my *two knees*, my *two feet*; and now I am sitting erect.

EIGHTH EXERCISE.

Arms and the Parts.—Talk with the children about the arm, its use for reaching things; lead them to notice its two parts joined at the elbow, and why it is better to have two parts than one, by illustrating the movements of the arm without bending it at the elbow.

Request the children to bend their wrist and elbow joints in every possible direction. Show them the hinges on a box, or shutter, or door, and let them compare the movements of their elbow and wrist joints with those of the hinges; then request them to tell what name may be given to these joints. Some children will say "Hinge-joint."

Now let the children move the arm at the shoulder; tell them that the end of the upper arm is rounded like a ball, and that it fits into a hollow place or cup. Then ask, What name may be given to the joint at the shoul-

der? "Ball and cup joint" some will say. Tell them we call it a *ball and socket joint.*

The pupils may now learn the following summary from the blackboard:

ARM.

My arm has two parts and three joints; my *upper-arm* and my *fore-arm*; my *shoulder*-joint, my *elbow*-joint, my *wrist*-joint.

NINTH EXERCISE.

Hand and its Parts.—Talk about the hand, and its uses for *holding*, *throwing*, *catching*, *lifting*, *pulling*, and *feeling*; about using one hand more than the other; about the parts of the hand—the back of the hand, where the knuckles are; the palm of the hand, inside; of the fingers, naming each; of the thumb, showing how it can touch each of the fingers; of the joints, and number in the thumb and in each finger; the nails; veins; tips of the fingers; the ball of the thumb; and the lines where the flesh is bent. Compare the skin with the tight-fitting glove, and inquire why it would not be as well to have the flesh drawn tightly over the bones; also talk about the importance of clean hands and clean nails. The pupils may now learn the summary for the

HAND.

My hand is used in holding, throwing, catching, lifting, pulling, and feeling. The *palm* of my hand.* The *back* of my hand. My *fingers*, my *thumb*, my *forefinger*, my *middle finger*, my *ring-finger*, my *little finger*. My *knuckles*, my *finger-joints*, my *nails*. The *tips* of my fingers, the *veins*, the *ball of my thumb*, and the *lines* where the flesh is bent.

* As this is spoken the children *clap* their hands. They also touch each part as it is mentioned by them.

TENTH EXERCISE.

Leg and its Parts.—Talk about the parts of the leg, and their uses when standing, walking, running, jumping, and sitting; of their position, shape, etc.; of the thigh, the upper part nearest the body; of the knee, joining the thigh to the lower leg; of the knee-pan—its uses; of the lower leg with two bones; of the hip-joint—a ball and socket joint; the knee-joint; and the ankle. Let the pupils now learn the summary of the

LEG.

My leg has two parts and three joints. My *thigh*, and my *lower leg* My *hip-joint*, my *knee-joint*, my *ankle-joint*.

ELEVENTH EXERCISE.

Foot and the Parts.—Talk with the children about the uses of the foot for standing, walking, running, jumping, and skating; about the instep, the part in front of the ankle, top of the foot; the toes, their number, names, etc.; the sole, the bottom part; the ball, the part on which the foot rests; the *arch*, or hollow, the part between the ball and heel; the use of the toe-nails, to protect the toes, etc. These parts may be illustrated by showing a shoe.

The summary of the lesson may now be learned:

FOOT.

My foot is used in standing, walking, running, jumping, and skating. My *instep*, my *toes*, the *sole* of my foot, the *ball*, the *hollow*, my *heel*, my *toe-joints*, and my *toe-nails*, which protect my toes.

TWELFTH EXERCISE.

Review.—At this stage the teacher should carefully review the exercises on the *Arms*, *Hand*, *Leg*, *Foot*, and their parts, by questions, etc.

Afterward the pupils may be taught to repeat the following

SUMMARY OF THE LIMBS.

My arm has two parts and three joints; my *upper arm*, and my *fore-arm*; my *shoulder-joint*, my *elbow-joint*, my *wrist-joint*.

My hand is used in holding, throwing, catching, lifting, pulling, and feeling. The *palm* of my hand, the *back* of my hand. My *fingers*, my *thumb*, my *forefinger*, my *middle finger*, my *ring-finger*, my *little finger*. My *knuckles*, my *finger-joints*, my *nails*. The *tips* of my fingers, the *veins*, the *ball of my thumb*, and the *lines* where the flesh is bent.

My leg has two parts and three joints. My *thigh*, and my *lower leg*. My *hip-joint*, my *knee-joint*, my *ankle-joint*.

My foot is used in standing, walking, running, jumping, and skating. My *instep*, my *toes*; the *sole* of my foot, the *ball*, the *hollow*; my *heel*, my *toe-joints*, and my *toe-nails*, which protect my toes.

Suggestions for Teachers.—In each of these exercises, it should be distinctly understood that in the conversations had with the pupils, the teacher should lead the children to *observe* and *tell* as much as possible about the subject under consideration. The point or fact which they should be led to notice is only briefly given in the exercise; the teacher should lead the pupils to perceive these facts by conversations and questions. Sometimes the several parts of the summary may be written on the blackboard as the lesson proceeds; but in some of the exercises it may be found necessary to talk about each fact, and then review all by leading the pupils to tell what may be written on the blackboard about the lesson.

N. B.—The twelve preceding exercises may be completed before the children finish reading in the Primer, or first reading-book.

LESSONS ABOUT THE BONES OF THE HUMAN BODY.

FIRST EXERCISE.

Names, Shape, and Number of Bones.—Let the children feel of their arms, hands, face, head, etc., and learn that all parts of the body do not feel alike; that some are *hard* and some *soft*. Ask, What makes this difference? "Bones."

Let the children ascertain that there are *bones in every part of the body*—in the head, face, neck, shoulders, trunk, arms, hands, legs, feet; also that *the bones are not all in one piece*; that in some parts of the body *a great many small bones are joined together*. Lead the pupils to observe that the *bones are of different sizes and shape*, as the long bones of the legs and arms, the small bones of the hands, etc. That those of the skull are curved and cup-like; those of the shoulders, flat; those of the arm and legs, round like a cylinder.

Tell the children that there are about *two hundred bones in the whole body*, besides the teeth; that *the face has fourteen bones; the ear has four little bones*, which are the smallest bones in the body; that *the root of the tongue has one bone*. Let the pupils notice that the lower jaw is hinged to the skull, at the back part of the jaw.

Bones of the Trunk.—The children may now touch the back-bone, and the teacher give them its name—*spine*, writing it on the blackboard.

In the same manner they may touch, and the teacher

give the name and write the word, as before, of the *curved bones in the sides — ribs;* the *upright bone in front of the chest—breast-bone;* the *bones near the top of the back—shoulder-blades;* the *bones crossing from the breast-bone to the shoulder-blades—collar-bones.*

The pupils may now learn the summary of

BONES IN HEAD AND TRUNK.

My bones are hard; they make my body strong, and keep it upright. There are more than two hundred bones in my body. The bones of my *head* are my *skull*, my *lower jaw*. My *face* has fourteen bones. My *ear* has four small bones, and at the root of my tongue is one bone. *The bones of my trunk* are my *spine*, my *ribs*, my *breast-bone*, my *two shoulder-blades*, and my *collar-bones*.

SECOND EXERCISE.

Bones of the Arm and Hand.—Lead the children to notice that there is only one bone in the *upper arm;* that there are two bones in the *fore-arm;* eight bones in the *wrist;* that from the wrist to the knuckles there are five bones in the *hand;* two in the *thumb;* three in each of the *fingers*, making nineteen bones in the hand.

BONES OF ARM AND HAND.

My *upper arm* has one bone; my *fore-arm* has two bones; my *wrist* has eight bones; *from my wrist to my knuckles* are five bones; my *thumb* has two bones; *each finger* has three bones, making *nineteen bones in my hand.* [Here let the pupils point to and count the bones of the hand, commencing at the thumb knuckle, and ending with the lower bone of the little finger.]

THIRD EXERCISE.

Bones of the Leg and Foot.—Tell the pupils of the one bone in the *thigh*, which is the longest bone in the body; of two bones in the *lower leg;* of one bone over the *knee*-joint, called the *knee-pan;* of seven bones, *near the heel*, in the foot; of five bones in the *middle of the foot;* of two bones in the *great toe;* of three in each of the *other toes;* and that the whole number of bones in the leg and foot is thirty.

BONES OF LEG AND FOOT.

My *thigh* has one bone; my *lower leg* has two bones; my *knee-pan* is one bone; in my foot, *near my heel*, are seven bones; in the *middle of my foot* are five bones. My *great toe* has two bones; each of my *other toes* has three bones, making thirty bones in my leg and foot.

Suggestions for the Teacher.—These exercises on the *bones* may be reviewed, and the several *summaries* taught together, as in the twelfth exercise. The lessons about the bones may be commenced before the pupils have finished their first reading-book.

LESSONS ON THE

ORGANS OF THE SENSES.

FIRST EXERCISE.

Introduction.—Talk with the children about the uses of windows and doors to a house; also about the windows and doors to the *body*—the house of the soul; of the mouth, as the door for food and drink, and the *taste* of things to go in, and the voice to come out; of the nose, as the door where the breath goes in and comes out, and where the *smell* of things goes in; of the *ear*, as the door where *sounds* go in; of the *eyes*, as the windows where the soul looks out, and sees the beautiful things in the world; of the *eyelids*, as curtains for these windows.

The Eyes.—Talk with the children about the uses of the eyes; of their *shape*—round like a ball; of their *movements*—as upward, downward, to the right, to the left. Illustrate the movements by requesting the children to hold their heads still and look down at the floor, then up at the ceiling, then to the right, then to the left of them. The teacher may look in this manner, and request the children to observe the movement of her eyes. Where children have an opportunity for observing the eyes of fowls and birds, let them notice that their eyes are placed on the sides of their heads, and that they do not move them around as we do ours. Thus lead them to see that our eyes are placed in the very best position for us.

By showing a cube, cone, cylinder, and sphere, lead

the pupils to observe that the ball-shape is the best form for an eye. Tell them that the eyes are called *eyeballs*, because they are round like balls; also tell them of the great delicacy of the eye, and its need of protection. Lead them to notice how it is protected from injury by feeling of the forehead, the temples, the cheeks, and nose, thus observing that the eyes are placed in deep cups, or *sockets* of bones.

Eyelids.—Let the children also notice and talk about the two *eyelids*, that can be drawn up and down like curtains, or some window-blinds, and thus protect the eyes by shutting out the light when it is too strong; also by covering them when we sleep, and keeping dust from getting into the eyes.

Parts of the Eye.—To lead the children to observe the parts of the eye, let them look at each other's eyes, and notice the *white of the eye*, that part which is called the *eyeball;* also the colored *ring* inside the white, called the *iris;* that the ring is not of the same color in all eyes; also to notice the small *circular spot*, like a hole, in the centre. Tell the children that this black, circular spot is the part that we see with; that it is called the *pupil* of the eye; that the colored *ring* around the pupil is called the *iris;* that it is a curtain to close and open the pupil; that when the sun shines brightly this curtain draws together around the pupil and leaves a very small spot uncovered, so that only a little light can get in; when we are in a room where there is but little light, this curtain opens and the pupil becomes large, so as to let in enough light to enable us to see. Request the pupils to observe the eyes of cats in a light room, also in a dark room, and notice the difference in the size of the pupils of their eyes; also the shape of

their pupils. After the children have observed the cat's eyes, talk with them about the use of their having pupils that can be opened so wide as to enable them to see in the night.

SECOND EXERCISE.

The Tears.—The children may be told that the *tears* come into the eye-socket at the outer corner, and pass out at the inner corner of the eye into the nose; that sometimes the tears flow into the eyes so fast that they can not all pass out through the small opening into the nose; then they run over the eyelids, and fall on the cheeks. Did your tears ever run over the eyelids? What made them do so?

To lead the children to understand the use of tears, talk with them about their mother using oil on her sewing-machine. Why does she use the oil on the machine? "To make it go easily." "To keep it clean." "To keep it from wearing out."

We are moving our eyes about nearly all the time, and they keep clean, and move easily, and do not seem to wear out by rubbing against the sockets. Can you tell me what washes your eyes, and oils them so that they move easily, and do not wear out? "The tears."

Yes, the tears keep the eye moist, and the eyelids wash it like a soft sponge.

Eyelashes.—Let the children notice the hair-fringes along the edge of the eyelids, called the *eyelashes;* tell them that these help to keep out the dust by brushing it away when we wink; that they also help to shield the eye from strong light; and they make the eye more beautiful.

Eyebrows.—The pupils may observe the arches of hair, called *eyebrows*, which project over the eyes somewhat like the eaves of a house; and notice their *crescent-like* shape. Tell the pupils that these help to keep the perspiration which rolls down the forehead from getting into the eyes; that the *eyebrows* conduct the perspiration down the sides of the face; that they also make the eyes and face appear more beautiful.

Direct their attention to the wonderful structure of the eye; its beauty; its uses; how it enables us to gain knowledge; and the importance of taking care of our eyes. Ask the children, Who gave us our eyes, and placed them so that they may be preserved from injury?

Now request the pupils to assist in forming short sentences, which will tell what has been learned about the eye. Thus the following summary of the lesson may be placed on the blackboard, and learned by the children:

THE EYE.

I have two *eyes* to see with. They are like balls in deep, bony *sockets*, which protect them from injury. The black *circle* in the middle is the *pupil* or window of my eye. The *colored ring* around the pupil is the *iris* or curtain. The *white part* is the *eyeball*. My *upper* and *lower eyelids* cover my eyes and protect them from dust. My *eyelashes* are for beauty, and to brush the dust away from my eyes. My *eyebrows* keep the perspiration from rolling into my eyes; and they are also for beauty. My eyes are washed by *tear-drops* every time I wink my eyelids.

To preserve my eyes, I must keep them clean and cool; I must not read or sew in a faint light

THIRD EXERCISE.

The Ears.—Lead the children to observe the *position* of the ears, each side of the head; their *shape*, *concave* or dish-shape, to catch sounds; of the outer edge, or *rim;* the *flap*, the lower, soft part, in which ear-rings are placed; the opening or passage which leads to the place where the sounds are made, the *drum* of the ear—a part which can not be seen, as it is about an inch from the outer opening.

Tell the children that sounds are produced by waves of air striking against the drum of the ear, and that the *hearing nerves*, inside the drum, receive the sound. Illustrate the waves of air by the circles formed on the surface of water when a stone is thrown into it. Tell them of the danger of injury to the drum by putting a pin or other hard substance into the ear.

Call attention to the bitter *wax* in the passage of the ear; to its yellow color; its *use* for keeping insects from going into the ears, it being so unpleasant that insects avoid it, and so sticky that they could not crawl through it; that sometimes a great deal of this wax collects in the ear, and stops up the passage, and prevents the waves of air from going in to the drum; that the ears should be kept clean. Also tell the children about the *stiff hairs* in the passage, and that the wax collects around the roots of these hairs.

Now teach the pupils the following summary from the blackboard:

THE EAR.

My *ears* are to hear with. The *rim* of my ear; the *flap* of my ear; the *drum* of my ear. The *drum* of my ear is protected by short, *stiff hairs*, and by *bitter wax* about the roots of these hairs.

To preserve my hearing, I must keep my ears clean, and not injure the drum with a pin or any thing else.

FOURTH EXERCISE.

The Nose—its Parts.—Lead the children to notice the *position* of the nose, in the middle of the face, over the mouth; of the *bridge*, or top; the point, or *tip;* the *nostrils*, the oval openings through which we breathe and smell; the *cartilage*, which separates the nostrils. Tell the pupils that the cartilage is like the white, tough substance seen in beef, called *gristle.* Tell them, also, that the inside of the nostrils are lined with a spongy kind of flesh, and that just below the thin skin of this soft substance are the *smelling nerves.*

Uses.—Let the children notice how easily we breathe through the nostrils, with the mouth closed; the use of the sense of smell, to enable us to know whether our food is good or bad before putting it in the mouth; to give us pleasure in smelling sweet odors; of the use of the nose in making the voice agreeable. Now let the pupils learn the summary of

THE NOSE.

My nose is to smell and breathe with. It is in the middle of my face. The *bridge* of my nose; the *tip* of my nose; my two *nostrils;* the *cartilage*, which separates my nose into two parts. My *nostrils* lead to a passage back of the mouth, through which I breathe. I must not destroy my *sense of smell* by using snuff.

FIFTH EXERCISE.

The Mouth—its Uses.—Talk about the mouth as the place from which the voice comes; of its use for eating and drinking, that the body may be sustained; of its use for breathing when the nose is stopped.

Parts of the Mouth.—Lead the pupils to notice the *two lips*—the *upper lip* and the *lower lip;* their *shape*, curved and rounded; and color, red; their *motion*—up and down, out and in; also that they are *soft.*

Of the *tongue;* its uses for speaking, eating, and drinking; of its color and shape; covered with little red dots; that it is the *organ of taste; root of the tongue*, fastened in the throat, yet soft and flexible, and can be moved about easily; of the *teeth*, for chewing; and the *jaws*, of which only the lower one moves when we eat; and the *gums*, the flesh which covers the jaws.

The following summary may now be learned of

THE MOUTH.

I use my *mouth* for *speaking*, *eating*, and *breathing*. My *upper lip;* my *lower lip*. In my mouth are my *tongue*, to talk with; my *upper teeth;* my *lower teeth;* and my *upper* and *lower jaws*, covered with flesh called *gums.*

SIXTH EXERCISE.

The Teeth.—Direct the attention of the children to their teeth. Ask the pupils where they are; how arranged; of what they are made; tell them about the *enamel*—the white, hard substance which covers the teeth; that eating unripe, sour fruit will injure the enamel. Lead the pupils to notice that their teeth are not all alike; that some are sharp for *biting* or *cutting*, as the front teeth; that some are *pointed* for *tearing*, like those each side of the four cutting teeth; that some are broad, for chewing or grinding, like the back teeth.

Let the children count the number of their teeth in each jaw. Tell them about the first set of teeth, those that came when they were little children; how a new set of teeth grow under them, and push the first ones out. Lead the pupils to notice the difference between their own teeth and those of cats and dogs.

Tell them of the use of the teeth in talking. This may be illustrated by the use of the teeth in making some of the sounds of letters. Let the children now learn and repeat the summary for

THE TEETH.

My *teeth* are used in eating and talking. My teeth are covered with *enamel*. A grown person has four kinds of teeth—*cutting teeth, tearing teeth, crushing teeth*, and *grinding teeth*. In each jaw there are *four front teeth*, or *cutters; two tearers; two crushers;* and *four grinders*. A young child has *twenty teeth—ten in each jaw;* a grown person has *thirty-two teeth—sixteen in each jaw.*

To *preserve my teeth*, I must keep them *clean;* I must not *scratch the enamel*. I must not *eat* unripe fruit, nor *drink any thing very hot* or *very cold*. I must not use my teeth for *scissors*, or *nut-crackers.*

SEVENTH EXERCISE.

Eating.—A very important lesson on eating may be given the children while they are taking their lunch. Lead them to notice that they move only the lower jaw; that the upper jaw does not move; that the food is rolled about by the tongue; that it becomes moist with saliva before it is swallowed; that we cut or bite

our food with the front teeth; that we grind it with the back teeth. Tell them of the importance of chewing the food finely before swallowing it; that we have no control over it after it is swallowed.

Tell them about the two tubes in the throat—one, the food-pipe, leading to the stomach; the other, the windpipe, leading to the lungs. That the windpipe has a trap-door to close it when we swallow. That the food passes over this trap-door; that when we talk or laugh this trap-door opens; that sometimes, on its way down, a little bit of food gets into the windpipe, and produces violent coughing and great distress. Tell the children of the danger of laughing, or talking, or causing others to laugh when they are swallowing food or drink.

Let the pupils now learn the following summary of

EATING.

When I eat, I move my *lower jaw* only. The *tongue* brings my food between my *teeth*. The *cutters* cut it; the *tearers* tear it; the *crushers* crush it; the *grinders* grind it. The *saliva* moistens it; and my tongue helps me to swallow it.

To preserve my health, I must not eat too often nor too fast. I must not swallow my food until it is well chewed. I must not talk or laugh while swallowing.

Suggestions for Teachers.—These exercises on the "Organs of the Senses" may be given to any class in the First, Second, or Third Reader, provided that each fact is so presented that the children understand it. But to teach any class to repeat a summary of a lesson without first giving the pupils a *training exercise* on that subject would be a violation of the principles of good teaching.

N.B.—It will add interest to each summary of these lessons to allow the children, as they repeat them, to touch or point to the parts mentioned, as indicated by the words printed in *italics*.

LESSON ON THE

SHAPE, USES, AND GROWTH OF BONES.

FIRST EXERCISE.

The Skull.—Let the children feel of the head; tell how it feels, and why it feels hard; notice its shape; tell them the name of the bones of the head—*skull;* also that the skull is composed of several pieces of thin bones joined together at the edges. Cut pieces of paper to illustrate the toothed edges of the skull bones, and show how they are hooked together.

Tell them that the bones of the skull are not perfect on the top of a baby's head; that care should be taken not to injure the tender skull of a young child. Tell them also about the use of the skull as a case for protecting the brain from injury.

A summary may be written on the blackboard of

THE SKULL.

My *skull* is formed of several bones, united at the edges like two saws with hooked teeth.

SECOND EXERCISE.

Backbone.—Let the children show the position of the *backbone*, and feel of its projections at the back of the neck. Tell them that these bones, which they can feel, are a part of the *spine*, or backbone; that the spine is composed of about *twenty-four* bones, piled upon each other somewhat like a pile of cups, or saucers, bottom

side up; that between these bones is a thick, tough gristle, or elastic *cartilage*, which allows the bones of the back to move freely.

Tell the children that the pile of bones and cartilages which form the backbone is called the *spinal column*. Illustrate the term column, and lead the pupils to understand that it is a *flexible* column. Lead them also to consider the advantages of having the backbone composed of several pieces, and made to bend easily.

The pupils may now be requested to aid in constructing the summary for the

SPINE.

My *spine* extends from the base of my *skull*, behind, down the middle of my *back*. It is made up of *twenty-four short* bones, *piled* one upon the other, with elastic cartilages between them. These bones are fastened together, forming an *upright and flexible column*, which makes me erect and graceful.

THIRD EXERCISE.

Ribs.—Let the children touch their ribs, and lead them to ascertain that these bones are fastened to the spine and breast-bone; that they have twelve ribs on each side; that seven on each side extend to the breast-bone, and the other five are connected with it by cartilages; that the shape of the ribs is curved. Show a picture of the ribs, and lead the pupils to see that these bones form a cage or hollow place to hold and protect the heart, lungs, and stomach.

Tell the children of the *strength* of the ribs; also that they are *light*. Lead them to understand why these bones should be strong and light. Show them the importance of wearing clothing so that it shall not press

the ribs together, and leave too little room for the heart and lungs.

The pupils may now assist the teacher in constructing the summary for

THE RIBS.

I have twenty-four ribs, twelve on each side. They are fastened at the back to my *spine*, in front to my *breast-bone*, forming a *hollow place* for my *heart*, *lungs*, and *stomach*. My ribs are curved, strong, and light.

FOURTH EXERCISE.

Shoulder-blades.—Let the children feel of the *shoulder-blades*, and learn their shape—broad, flat, thin, and triangular; and that the arms rest upon them.

Collar-bones.—The pupils may also learn the position and shape of the *collar-bones* by touching them. Tell them that these bones form a kind of brace between the shoulder and the breast-bone, and keep the arms from going too far forward.

The summary may now be taught for

SHOULDER-BLADES AND COLLAR-BONES.

My *shoulder-blades* are flat, thin, and of a triangular shape. They are for my arms to rest upon.

My *collar-bones* are fastened to my shoulder-blades and my breast-bone. They help support my arms, and keep them from moving too far forward.

FIFTH EXERCISE.

Growth of Bones. — Talk with the children about young and old trees, how one may be more easily bent than the other; how the bones of children will bend,

while those of old persons break more easily; thus lead them to perceive the difference between the bones of children and those of grown people.

Tell the pupils of the importance of standing and sitting erect, that their bones may grow in a proper shape; and of the need of wearing loose clothing while young.

Bones made from Food.—Tell the children more about the making of blood from the food, and that the bones, as well as the flesh, are formed from the blood. Tell them also of the importance of eating good food, that good blood may be made, and the bones grow to be strong.

Use of pure Air.—Call the attention of the pupils to what they have previously learned about the effects of air upon the blood, and then lead them to understand the importance of breathing *pure air*, if they would have healthy and strong bones.

The teacher may now write the summary on the blackboard for the

GROWTH OF BONES.

The bones of old people are hard and brittle; those of children are soft and flexible. *I* must *sit* and *stand erect*, that my bones may not be bent out of shape. I must not wear tight clothing, nor do any thing that will crowd my bones out of their places.

My bones are made from my food, after it has been changed into blood; so I must be careful to eat good, wholesome food, that my bones may be strong and healthy. I must not breathe impure air, because it makes bad blood, and bad blood makes poor bones.

Suggestion for Teachers. — This series of exercises may be commenced when the pupils are able to begin reading in a Second Reader.

LESSONS ABOUT
THE SKIN.

FIRST EXERCISE.

Qualities of the Skin.—Talk with the children about the covering or skin of the sheep, cow, horse, cat, dog, birds, etc.; then of the thin skin which covers our bodies. Let the pupils see that it is *elastic*, by squeezing the skin of the hands and cheeks, and noticing that it returns to its shape again. Let them see that it is *flexible*, by bending the finger and by pinching the skin.

Ask them what comes on the face and other parts of the skin in very warm weather. Tell them that the *perspiration* oozes from the skin through little holes called *pores*. Ask them what we say of any thing that is full of little holes. Tell them that we say the skin is *porous*, because it is full of little holes, through which the *perspiration* comes out. These pores are so small and so numerous that the end of the little finger, if placed on the hand or face, would cover hundreds of them.

Parts of the Skin. — The children may now be told about the three layers of the skin—the outside, or *cuticle*, the inside or *real skin*, and the middle layer, or *coloring matter*. Explain to them that the outside skin has no feeling; that it is transparent; that it is the part which rises when the skin is blistered; that the *cuticle* is thicker in the palms of the hands, and on the soles of the feet; that it becomes thick and hard by using the hand in work, to protect the true skin from injury.

Explain by suitable illustrations that the real skin is like net-work; that it is composed of very fine blood-vessels and nerves, so numerous that we can not prick it with a sharp needle without touching some of the blood-vessels, and causing blood to flow out, nor without touching some of the nerves and causing pain.

SECOND EXERCISE.

Color of the Skin.—Call attention to the differences in the color of the skins of people of different countries, as of the Indian, Negro, Chinese, and others. Tell the children that between the *cuticle* and the *real skin* there is a very thin, jelly-like substance, which is spread all over the body; that this substance is white in those whose skin is white, and black in the Negro, red in the Indian, and yellow in the Chinese; that it differs in people as the color of their skins differ.

Talk with the children about what happens after the skin is cut or scratched; lead them to notice that when only the outside skin is scratched, it heals up, leaving no mark or scar; and that a deep cut, or burn, which destroys the real or inner skin, leaves a scar when it heals, because the inner skin will not grow again when once destroyed.

Perspiration.—Teach the children that some of the waste or worn-out substances of the body are always coming out through the pores of the skin, whether we feel the perspiration or not. Talk with them about the importance of washing the skin of the body to remove all this waste matter, and keep the pores open. Tell them also of the importance of wearing clean clothing, that the skin may keep healthy.

The pupils may also be told of the beneficial effects of pure air and sunlight. Illustrate this by the sickly appearance of plants that grow in cellars or dark places.

It may be found desirable, in giving this lesson on the skin, to divide it into three exercises. Whenever the children understand the various facts presented about the skin, let the following summary be taught:

THE SKIN.

My skin covers my body. It is thin, elastic, flexible, porous, and absorbent. My skin has three parts, or layers. The outer skin, or *cuticle;* the inner, or *real skin;* and the *colored substance* between them. My outside skin is not of the same thickness over my whole body. On the *palms* of my hands and the *soles* of my feet, it is very thick and tough. If my outer skin be destroyed, it will grow again; but if my real skin is destroyed, it will never grow again.

More than half the waste substance of my body passes from it through the pores of my skin in the form of perspiration. To preserve my health, I must keep my body clean; I must wear clean clothing; I must breathe pure air, and live in the sunlight.

MORAL TRAINING.

"Simple thoughts of God and Christian virtues, impressed upon us in early childhood, are never erased from memory or heart."

"TRAIN up a child in the way he should go" is not only God's command to parents, but it is society's first demand on both teacher and parent. This training, too, is one of the first needs of the child's own nature. With it, happiness is within his reach; without it, not only is his own happiness impossible, but he will interfere with the rightful enjoyment of others.

This training should be commenced at home very early. As soon as emotion is exhibited by the child it may be biased by education. The impressions that adhere longest to us, and are the deepest rooted, are those of which we remember not the origin—those which we imbibed unconsciously in infancy. The child's disposition may receive during this period a strong bent to good. Then there are no obstacles to overcome; nothing to unlearn; the affections are soft and pliable. If this period pass without moral training, the difficulties are greatly increased, the affections take a bent of their own.

The great means of training the moral feelings is to draw them out into action. A feeling without action is mere sentiment; it does nothing. If we would cultivate kindness in children, we must show kindness in our deeds; if reverence, we must exhibit the example

of reverence; if we would develop ideas of justice, honesty, truthfulness, we must improve the opportunities of daily intercourse to exemplify them.

It will be of little use to tell the child about reverence, justice, honesty, truthfulness, if these are never acted before it; it is only by *acts* that the child can know them. We have too much abstract teaching in morals, as well as in mental education. The *law of exercise* is of universal application to moral and mental, as well as to physical training. And there is greater room for activity here than most of us at first suppose. The daily occurrences of the schoolroom, and the incidents of the playground, furnish opportunities for the most effective lessons in morals. To seize upon these opportunities, and to improve them in the right spirit, should be the earnest aim of every teacher.

Let the golden rule be the key-note in moral training; teach the children to do to others as they would have others do to them. This positive teaching is the characteristic feature of the morality of the New Testament. This moral instruction should be commenced with the first day's attendance at school, and continued by *practice* and precept with every day's lessons, or incidents that furnish an appropriate opportunity.

Much of this instruction may be most profitably given incidentally, without stated times for moral training; yet there are first ideas of God, virtue, right, love to others, duty, etc., which might be taken up and presented in regular succession for the development of simple moral and religious truths as a foundation for future instruction.

Children should be taught ideas of *God as a kind father;* of *God as the maker of all things;* of *an immor-*

tal mind; of *conscience;* of *truth;* of *obedience;* of *industry;* of *cleanliness;* of *order.* And all of this training should be simple, familiar, and free from technical phrases and formal teaching; it should be chiefly illustrated by examples and incidents from life. "Our Father, who art in heaven," should be the key-note of this instruction; then love, reverence, and obedience to Him would have a real significance to the young.

Let the fundamental ideas of religion be thus established in early childhood, and they will shine out clearly in future years, an anchor of rescue to the soul when happiness and life seem in danger of being wrecked by the billows of passion or avarice, or by evil habits. Simple moral truths thus early implanted in the heart have rescued many a noble youth from the whirlpool of corruption, when all other lessons of wisdom had been washed away by the wild waves of passion.

A few lessons and subjects for lessons will suggest what course may be pursued in giving children ideas of God, of the soul, of conscience, of truthfulness, honesty, obedience, etc.

TO DEVELOP THE IDEA OF

GOD AS A KIND FATHER.

I WISH to talk with you, children, about those you love. Some of you may love your mothers best, some your fathers; some love your brothers, your sisters, and your cousins. Those who would like to tell me whom you love best may hold up their hands.

Very well; you have told me whom you love best; now who can tell me *why* you love one person better than any body else? Why do you love your mother best?

Why do you love your father best? Why do you love your sister? Why do you love your brother?

What did your mother do for you before you came to school this morning? What will she do when you go home? If you are sick, or any one hurts you, to whom do you go and tell your trouble? Who is pleased to hear that you have been a good child? Who works to get money to buy your clothes, and food for you to eat?

In this manner, by familiar conversation, the teacher should lead the children to talk freely upon the different acts which show the love of their friends, and endeavor to call out their warmest feelings of love and gratitude in return.

Why do your parents thus feed and clothe you, and kiss you, and watch over you when you are sick?

Yes, because they love you. All of you have some kind friends who love and care for you.

Now, children, listen very attentively, and I will tell

you about a Friend that you all have—one who is kind to all of you—one who loves you better than your father or your mother does—one who takes care of you at all times—one who watches over you when you are asleep as well as when you are awake; for he never sleeps—one who is ready to give you all things you ask him for. Do any of you know who it is that I mean?

This good friend is God. You can not see him, but he always sees you, and knows all about you. He tells us to call him Father because he loves us as a father. He is in heaven—he is our Father in heaven.

Now tell me what kind, good Friend we all have? What does he tell us to call him?

Who is this good Friend? Where is he? What does he do for us?

How ought you to feel toward so good a Friend? "Love him."

What should you do in return for the many kind things which He does for you? "Thank him every day."

How should you act when you know what He desires you to do? "Obey him."

The teacher may now write on the blackboard, and require the pupils to read and learn the following: *God is our Father in heaven. He loves us, and takes care of us. We ought to obey Him, and love Him, and thank Him every day.*

The teacher should aim to impress the children with a feeling of reverential love to God. This *love* may be awakened by bringing the affection to their parents into lively exercise, and then directing it to their heavenly Father; their *reverence* may be awakened by making them feel that God is far above us in heaven; though

invisible to our eyes, that he still cares for and watches over us day and night—that he is our *heavenly Father.* Much of the effect of these lessons will depend upon the manner and feeling with which they are given. They should be so conducted as to call into exercise the *emotions* and *moral feelings* of the children.

TO DEVELOP IDEAS OF

GOD AS THE MAKER OF ALL THINGS.

Let us have a talk to-day about making different things that you wear and see about you. Who made your shoes for you? Who made your dress? Could things make themselves?

No, it would be very silly to think they could. Who made the bread you eat? Could the bread make itself?

Other questions should be asked, leading the children to see that things must have a maker, and that they could not make themselves.

Can your father make any thing? Here allow the children to talk about what their different fathers can do. The art of the teacher is first to call out the mind and heart into activity, and then to direct the thoughts and feelings.

You can tell me who made your shoes, your clothes, and the bread you eat, but I want to talk about something much more beautiful than these, and see if you can tell who made them. You have all seen the sun. How brightly it shines! It warms us and gives us

light. Can any of you tell me who made this beautiful sun? "It was God who made the sun to warm us and give us light and heat." What did God make? Why did he make the sun?

What did I tell you about God the other day? All of you may repeat it together.

"*God is our Father in heaven; He loves us, and takes care of us. We ought to obey Him, and love Him, and thank Him every day.*"

What has God made? "God made the beautiful sun that warms us and gives us light."

If there were no sun you could not see. It would also be cold, and nothing would grow. God is good, then, to give us the sun. Who made the sun? For whose good has God made the sun?

What good is it to us? "It gives us light and warmth, and causes the grain to grow."

God makes all the trees, and plants, and flowers grow; He made all the animals and birds; and He made us also. Now let us think what He has given us. How do you know what is in this room? "We can see the things."

What do you see with? "Our eyes."

Who gave you eyes?

How do you know I am talking to you? "We can hear you."

With what do you hear? "With our ears."

Who gave you ears?

How do you know that fur is soft and iron hard? "By feeling them."

Who gave you feeling?

How do you know that sugar is sweet and lemon sour? "By tasting them."

Who gave you taste?

How do you know that the rose has a pleasant odor? "By smelling it."

Who gave you smell?

Now all these things give you pleasure; it is pleasant to see, and hear, and feel, and taste, and smell; and these things should make you happy, and make you love God for giving you so many senses to add to your happiness.

How should you feel toward God for giving you all these good things? "We should love Him and thank Him."

The teacher may write on the blackboard, and request the pupils to read, the following:

God made the sun to give us light and heat, and cause the grass, and flowers, and grain, and trees to grow. He made the birds and animals, and made us also. He gave us our eyes, and ears, and taste, and smell, and feeling. For all these we should love Him.

TO DEVELOP

IDEAS OF THE SOUL.*

CHILDREN, have cats, dogs, horses, and cows bodies? "Yes."

Can they see? and hear? and taste? and smell? and feel? Can they talk?

Have they flesh, and blood, and bones, and skin?

Are their bodies like yours?

Who gave them their bodies? "God."

Who gave them taste, and feeling, and sight, and hearing? "God."

Are the bodies of animals like your bodies?

How many legs have you? How many legs has the dog? Has the dog arms? Has the dog hands?

No, the dog has legs instead of arms. Your skin is smooth; with what is the dog's skin covered?

Is the cat's body like yours? Is the chicken's body like yours? How many legs has the chicken? Has the chicken feet like yours? With what is the cat's body covered? What covers the chicken's body?

What has the chicken in the place of arms, or two legs?

Who gave bodies to dogs, horses, cows, chickens, and flies? Who keeps them alive?

* In a little volume entitled "Peep of Day," published by the American Tract Society, ideas of the body, of God as a father, and of the soul, are admirably drawn out in simple illustrations for children. We are chiefly indebted to that volume for this lesson on the soul. We can not do a better service in illustrating how to proceed in moral training than by commending that book to teachers and parents.

Can a dog or a horse thank God? No; dogs, and horses, and cows, and chickens can not thank God; they can not think of God. They never heard of God. They can not understand about God, because they have no *souls*, or minds, like yours. Your *soul* can think of God, and thank him for all that he does for you. It often tells you *what is right* and *what is wrong*.

If you had no *soul* or *mind* you could not learn to read and write. You could not learn about God and all the beautiful things that He made for us. Your *soul* will never die. It is the best part of you.

Your body is made of dust. God made the dust into flesh, and bones, and blood. Your soul is made of the breath of God.

Some day the dog will die, and its body will be thrown away. The dog will be quite gone when its body is dead. But when your body dies your soul will still live; it will go back to God who gave it. Your body will decay, and turn to dust again; but your soul will live forever; it will never die.

It is your soul that thinks; if we wish to make any thing, we can think how to make it, and then use the tools to make it. If we want more tools we can make them too. Birds can build nests, but they can not use tools, nor make any thing except what God taught them to do. Animals can learn a few things, but children can learn a great many things.

The teacher may write on the blackboard, for the pupils to read, as a summary of the lesson—

God gave each of us a body, and placed in it a soul. The soul is that part of us which thinks, and will never die.

In a manner similar to that pursued in these lessons, the teacher may proceed to develop ideas of *Conscience*, right and wrong; of self-control, gentleness, truthfulness, honesty, kindness to others and to animals; of obedience, punctuality, order, cleanliness, industry, etc.

Ample illustrations will occur to exhibit what is meant by right and wrong; and the pupils should frequently be called upon to decide in simple cases which is the one and which the other. A little volume by Jacob Abbott, "Learning about Right and Wrong," will be useful in suggesting how to give these lessons.

Illustrate the unkindness of calling names, and of mocking the aged or infirm; of pinching and teasing each other; and train children to understand the importance of forming *good habits*, and the danger of forming bad ones, in childhood.

Finally, take the examples of the Great Teacher as a model. Observe how He selected familiar scenes and objects to illustrate His truths. Study His methods, seek His guidance, accept His promises, and success and happiness will be the crown.

THE END.