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TEACHING TO THINK

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TEACHING TO THINK

BY

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1922

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Set up and electrotyped. Published February, 1922.

Press of J. J. Little & Ives Company New York, U. S. A

PREFACE

A preface should indicate those beliefs or viewpoints of the author which constitute the basis or background of his book and which will enable the reader to understand its general purpose. I shall, therefore, state briefly the convictions which influence the chapters that follow.

Real success in the various vocations into which pupils enter after leaving school is, I believe, directly dependent on the ability of the individual worker to think effectively; that is, on his ability to apply acquired information rather than on his ability to offer it in mere repetition.

Harmless enjoyment and healthful recreation depend chiefly on our ability to plan, choose, make adjustments, invent, organize, and decide when to stop; in other words, on our ability to think rationally.

The most practical and lasting kindness in family and community life has its foundation in the ability and willingness to think coöperatively.

The success of a democratic government like ours is dependent on the practical thoughtfulness of its citizens, shown on the one hand in initiative and leadership, and on the other hand in ability to select the best leaders and follow them discriminatingly.

A considerable and varied experience in public and private schools has convinced me that we have too often

neglected to train our pupils to think practically and effectively. As a result of this neglect much, if not most, of our work in the schoolroom has failed to produce in the lives of pupils those results for which we hoped; namely, constructive labor, thoughtful kindliness, intelligent citizenship, and genuine happiness.

The main purpose of this book is to discover the principal types of thinking which are required in everyday life, and to indicate practical ways and means for their development in the ordinary school.

In discussing the various problems I have tried to give due recognition to important contributions available on this subject, both experimental and philosophical. I have also tried to write in such a manner as to avoid the excessive use of technical terms and to avoid such modes of presentation as might trouble the general reader.

It is a pleasant duty to acknowledge my great indebtedness and to express my sincere appreciation to President Lotus D. Coffman of the University of Minnesota for a critical reading of the entire manuscript, and for the contribution of many important suggestions which have been embodied in the various chapters of this book.

JULIUS BORAAS

Northfield, Minnesota, December seventh, 1921.

THE VOLUME OF THE RESERVE

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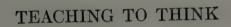
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## TEACHING TO THINK

I

## THE GREATEST THING IN TEACHING

Can a person teach so well that the world will remember him for twenty-three hundred years?

One man did. His method is spoken of to this day. He had no diploma, no degree. For him were no school-room and no equipment, not even a teacher's desk. He gave no examinations, and did not trouble himself about grades or promotions. He just helped young people to think, that was all. But his doing this made him famous; and what was more, it made some of his pupils famous.

Socrates met the youths of Athens wherever there was a chance for conversation and at any time of the day. Some of these youths came to him because they were in trouble. They felt rebellious against the prevailing blind acceptance of traditions and customs and found no satisfaction in the extravagant and often conflicting assertions of the Sophists. Socrates helped these young men to formulate their questions, to investigate, and to arrive at opinions of their own. There were other youths who came with the swagger and conceit of the "stand-patter" or the iconoclast. They had no problems or difficulties. On any topic they glibly quoted either traditional sayings

or the latest word of some noted Sophist. Socrates listened patiently. Then very humbly he asked them to explain their views more fully so that he might better understand. The harder these youths tried to explain the more entangled and improbable their statements became. If they were manly young fellows they confessed their ignorance. Then the great teacher guided them to think carefully and persistently about their perplexities so as to arrive at a satisfactory solution and a well founded conviction.

Socrates hated all sham and make-believe. He cared nothing for knowledge as a mere ornament. He did care for those things that make life a success. His favorite topics were, "Concerning what is pious, what impious; what is becoming, what unbecoming; what is just, what unjust; what is sanity, what insanity; what is fortitude, what cowardice; what a state is, and the character of a statesman; what is the nature of government over men, and the qualities of one skilled in governing them." "Of anything whose practical bearing was not at once manifest," says one writer, "he was openly impatient." 2

Two classes of people hated Socrates. The "stand-patters" thought him an enemy of their most cherished traditions and of the existing order of things. The Sophists regarded him as an opponent of their personal views and ambitions. Neither group dared squarely to face the man who asked them to give reasons for traditions and opinions alike.

Bakewell.—Sourcebook in Ancient Philosophy, 91. Rogers.—Student's History of Philosophy, 52.

So they accused him of leading the young men of Athens astray, put him in prison, and sentenced him to die. His friend Crito bribed the jailer, but Socrates refused to escape, saying, "Whatever inconvenience ensue, nothing is to be preferred before justice." "The fame of this prison, the fame of the discourses there, and the drinking of the hemlock," says Emerson, "are one of the most precious passages in the history of the world." ¹

The present world crisis has forced upon the youth of our time a situation not unlike that in which the young men of Athens found themselves. Customs and traditions are losing their sway. Nothing is accepted merely because of its age. Venerable beliefs in science, politics, education, and religion are being questioned. Discoveries and inventions are being made with marvelous rapidity in many fields. There is a flood of new opinions and beliefs, many of which seem to contradict one another. How shall we be able to select the right from the wrong, the useful from the useless? What shall we do to save our souls from confusion?

We need a Socrates in every schoolroom; a teacher who can stimulate and guide his pupils to think honestly, persistently, and effectively about the important problems of life.

Do we really need such a teacher in every schoolroom? Will it not be sufficient that a few leaders be trained to think? "There are by nature," says Thorndike, "many more learners than thinkers." ² This statement seems to be true in general experience. If we observe any of

¹ Emerson.—Representative Men, "Plato." ² Thorndike.—The Principles of Teaching, 153.

the fields of human activity we find that a few individuals appear to do all the thinking and that they tell the rest of the people what to believe and what to do. The great majority willingly accept what the leaders say and follow them whithersoever they go. Human nature being what it is and the laws of experience being what they are, shall we conclude that life for the great majority of individuals must be lived by custom and conventionality; that is, by habit rather than by thought?

One reply to this question is that, whatever a person's original nature may be, it is still possible for him to be molded and refined; and that, whatever general conditions may be, according to the present organization of society, it is not necessary that they should remain unchanged. Perhaps the reason why so few of us do our own thinking is that the schools never seriously attempted to teach us to think for ourselves. Perhaps the reason why so many of us are blind followers is that we have been trained to be blind followers. In seeking for a final and satisfactory answer to our question we must make an inquiry as to the importance of thinking in the affairs of daily life.

Let us digress for a moment to consult our general experience regarding this matter. Let us think first of the conditions of our work. What is the most important factor of success in the various vocations of men and women? Is it physical strength or speed? Is it ability to repeat an action day after day without variation? Is it unusual memory of facts? Or, is it ability to see new objectives and to invent, adapt, and use labor-saving tools and methods for attaining one's purposes? Why

are there so many misfits and failures in the various occupations? Are they due mainly to lack of special talent and opportunity? Or, are they caused by lack of forethought and judgment in the choice of, and preparation for, a vocation? In other words, do we fail to work well mainly because we do not think well?

Consider next some of the problems of our leisure time. What is the chief difficulty in respect to recreation? Why do people indulge in harmful amusements? Is it because they are unable to think of anything better? What is the most basic element in neighborliness? Is kindliness and good will fundamentally good thought? What is the big requirement for an efficient citizenship in a democracy? Would there be any hope at all for a democracy consisting of thoughtless people? How about our moral and religious life? Compare the virtue of an act performed in blind obedience to a precept or command with one that springs from genuine insight and understanding of moral relations. Compare the value of a religious observance which consists of a mechanical compliance with certain customs or conventions, or of violent emotional paroxysms, trances or phantasies, with the excellence of a religious life which springs from a careful meditation concerning the laws of spiritual life and a constant search for truth and which results in an intelligent fellowship and coöperation with God.

What is the conclusion toward which we are driven? Is effective thinking a most, if not the most, important factor of successful living? Then what place should it have in our education?

What place has it had in the past? The various edu-.

cational ideals most frequently mentioned in the history of education give no clear answer to this question. Culture, general development, knowledge, discipline, skill, social efficiency—as we regard them at the present time—would all include thinking as their most essential element. History does not indicate that they were generally so understood in the past. Undoubtedly there have at all times been exceptions, but the common practice has always been that an education was to be acquired by memorizing and following the thoughts of others rather than by actual thinking.

What place is accorded to thinking in our schools of to-day? Several years of experience as a teacher and superintendent have convinced me that real thought exercises are exceedingly rare in ordinary school work. Nearly all the time and effort is spent in memorizing, in repeating what has been memorized, or in acquiring some form of skill by means of mechanical repetition. Occasionally apparent thought questions or thought exercises may occur; but even in these the thinking is done mostly by the teacher. They seldom cause a real perplexity or involve serious thought on the part of the pupils.

Any teacher can make a very illuminating investigation by analyzing the examination questions which are given from time to time and finding the percentage of real thought questions that occur. Some time ago I made such an analysis of the questions which had been sent out by the High School Board of Minnesota during a series of years. High School Board examinations were uniform for the entire state; they were taken by pupils in the eighth grade and in high school classes in city schools,

and also by a considerable number of pupils in rural schools. They represented fairly the standards of the state and were no doubt of better quality pedagogically than most of the local examination questions. The analysis was made by separating the questions into the following groups: (1) Evident memory questions, (2) Questions which might require some thought, but which could easily be answered from memory, (3) Questions clearly intended to require thought, (4) Miscellaneous questions which it was impossible to classify. The results are given in the following table.

Table I.

Analysis of the State High School Board Examination Questions Given in Minnesota Schools During the Years 1899-1912.

SUBJECT	DATES OF EXAMINA- TIONS	NO. OF QUESTIONS	MEMORY	PART THOUGHT QUESTIONS	THOUGHT	MISCEL.
Geography	'99-'03, '06, '08-'12, '14-'15	86	68	18		
Physiology	'99-'03, 06, '08-'12, '14, '15	96	77	19		
U. S. History	'00-'03, '06, '08-'12, '14, '15	106	72	<b>2</b> 8	4	2
Civics	'99-'01, '03, '06 '08-'12, '14, '15	170	130	30	2	8
Totals Per Cent		458 100	347 76	95 21	6 1	$\begin{array}{c} 10 \\ 2 \end{array}$

In order to corroborate the results obtained by analyzing the High School Board Examination questions, a similar analysis was made of a number of state examina-

tion questions for teachers' certificates. These examinations were offered by the Department of Public Instruction and were uniform for the entire state. As to quality they were no doubt fairly representative of similar examination questions in other states. The results of the analysis are given in Table II.

TABLE II.

Analysis of Teachers' State Examination Questions Given in Minnesota During the Years 1907-1914.

SUBJECT	DATES OF EXAMINA- TIONS	NO. OF QUESTIONS	MEMORY QUESTIONS	PART THOUGHT QUESTIONS	THOUGHT	MISCEL.
Geography Physiology U. S. History Civics	'07-'14 "" " "	102 101 113 114	68 73 85 97	15 23 15 15	13 2 6 1	8 8 7 1
Totals Per Cent		430 100	323 75	68 16	22 5	17 4

The results of the two analyses show that only about five per cent of the questions were thought questions while seventy-five per cent were of the memory type. This result is in general agreement with the findings of other investigators. In a report by Colvin is found the following summary:

"I have recently analyzed five hundred questions asked by teachers in their first year of high school experience. These questions I have taken at random from a much larger number that I have observed and recorded. Out of this total number, I have found about five per cent that could be considered genuine thought questions. Over one-quarter required no more definite answer than yes or no. Over three-quarters

were purely informational or quiz questions. About twenty per cent were so suggestive in their phrasing that they were questions in form only."1

In another report Colvin states that out of ninety-five questions asked in a class period in which the topic considered was the development of a spirit of national unity in Greece, ninety-two were fact questions. During one hundred and eight minutes given to the study of Julius Casar he found that three hundred and seventysix fact questions were asked.2

As an exception to the almost uniform absence of thought questions in the average recitation, Colvin states that he found some classes in history in which the percentage of thought questions was as high as sixty.3

Miss Stevens gives the following report of her investigations:

"If you ask teachers in history why they are teaching it, the most customary answer is, that 'history develops judgment.' In hundreds of classrooms where I have made observations of questioning, I have found very few questions so framed by teachers of history that they called for any individual judgment. . . . I have found such questions as this: 'Was the king right in imposing the stamp tax upon the colonists?' This sounds like the appeal for a possible judgment by the pupils, but it can not be a real judgment when the pages of all the texts distinctly reveal marked censure of the king. . . . Analysis of six stenographic lesson reports on history reveals the fact that, by classifying as a judgment question every one which could possibly involve the element of judgment, the

³ Ibid., 31.

¹Colvin.—"The Most Common Faults of Beginning High School Teachers"; School and Society, 8: 461-9, 1918.

²Colvin.—An Introduction to High School Teaching, 313.

highest attainment is twenty-eight in a total of one hundred and twenty-five, while the lowest record was three in sixty." 1

This agrees closely with the findings already mentioned.

It is evident from these reports, which can easily be verified by anyone who will visit a number of classes or analyze the questions given in a number of recitations or examinations, that thought questions constitute a very small part of our school work. No doubt there are exceptional teachers here and there who devote themselves to the development in their pupils of the ability to think clearly and effectively. However, the great majority of teachers are satisfied with the mere memorizing of given facts and principles.

If we examine the writings of educational leaders we find that thinking is given a prominent place. One writer says:

"The problem is how to force children to think. Work will then take care of itself. The desire to answer questions that seem to contradict knowledge and experience and which will not down until the apparent contradiction has been removed. is what is wanted in school. When this attitude is produced and responsibility put upon the pupils, they develop the power to start things and carry them through." 2

The same general idea is expressed by an English writer:

"All teaching which does not stimulate real and careful thinking makes for stupidity. It may be the stupidity which

¹ Stevens.—The Question as a Measure of Efficiency in Instruction, Teachers College, 59.
² Swift.—Learning by Doing, 64.

in later life shows itself in obstinate prejudice. Often this euphemistically disguises itself under the name of conscience, or party loyalty. Its essence is that the mind is closed against all considerations which oppose its belief. Even facts must give way before it, or at any rate, the records of impalpable facts is not accepted. . . . Such an attitude of mind takes conviction as a test of truth, ignoring the fact that others hold exactly the opposite view with equally firm assurance." ¹

In his survey of instruction, the course of study, and the supervision in the New York City School Inquiry ² Frank McMurry announces four standards by which the work was measured. They are (1) Motive on the part of the pupils, (2) Consideration of values by the pupils,

(3) Attention to organization of ideas by the pupils,

(4) Initiative by the pupils. Notice the emphasis on thought and the absence of any mention of memorizing.

Flexner in his proposal for A Modern School summarizes the aims of the various school subjects in the following words:

"But in the end, if the Modern School is to be adequate to the need of modern life, this concrete training must produce sheer intellectual power. Abstract thinking has perhaps never before played so important a part in life as in this materialistic and scientific world of ours—this world of railroads, automobiles wireless telegraphy, and international relationships. Our problems involve indeed concrete data and present themselves in concrete forms; but, back of the concrete details, lie difficult and involved intellectual processes. Hence the realistic education we propose must eventuate in intellectual power. We must not only cultivate the child's interests, senses, and practical skill, but we must also train him to interpret what he thus gets to the end that he may not only be

¹ Welton.—The Psychology of Education, 392. ² McMurry.—Elementary School Standards, Ch. II.

able to perceive and to do, but that he may know in intellectual terms the significance of what he has perceived and done. The Modern School would prove a disappointment, unless greater intellectual power is procurable on the basis of a realistic training than has been procured from a formal education, which is prematurely intellectual and to no slight extent a mere make-believe." ¹

What are the aspects of thinking which we should especially attempt to develop in our schools?

First of all we ought to become very clear in our own minds as to the relationship between thinking and general behavior. If ideas and thoughts are tools to be used for accomplishing things and if thinking itself is a struggle for success and for mastery, then we ought to teach our pupils to think in such a manner that they will succeed in the practical affairs of daily life.

Years ago, when books were scarce and libraries few, mastery in any subject was achieved by memorizing the facts included in that subject. Now the situation is entirely different. Encyclopedias, digests, and handbooks are common tools. Mastery of a subject means general knowledge of the field and ability to find exact information quickly when it is wanted. In other words, it means ability to use information rather than to memorize. It means a command of facts vastly more extensive and decidedly more reliable than that which was obtained by the old method. Just compare the mastery of fact represented by a well stored memory with that represented by a good encyclodepia at one's elbow. Compare the mastery of a business that can be obtained by trying to

¹ Flexner.—A Modern School, 10.

remember all the details about the various transactions with the mastery secured through an efficient system of bookkeeping. If one's memory is put up against a vest pocket memorandum, it is safer to bet on the memorandum.

The memorizing of facts in any vocation practically takes care of itself. Those facts which are frequently used will by their repetition be learned and retained in the memory of the worker; those which are seldom used will be forgotten and can be better preserved in a card file. There is no getting away from this law of repetition as a determiner of what we are to remember. What has become of all the facts that we committed to memory and could repeat acceptably in school examinations? They have deserted by squads, companies, and regiments because they were never called into actual service after inspection day. It is true that some things which happen only once in a lifetime are remembered ever afterward; but most of the things which we were asked about in examinations did not seem to have that degree of vividness or importance.

The ability to exercise good judgment in regard to affairs of practical life is an important element of successful living and should be emphasized much more than it has been in our schools. Who does most of the judging in the ordinary school? But will any amount of practice by the teacher develop skill in the pupils? Would any practical teacher of agriculture to-day expect to develop his students into good judges of corn or stock by doing all the judging himself? There is a crying need for better methods in the development of this type of thinking in

connection with the teaching of the ordinary school subjects and the management of school activities generally.

We must do better than we have done in training our pupils to appreciate and use the important thoughts of the group and nation to which they belong. In other words, we must train them to think as others think; not blindly or slavishly, but with an intelligent appreciation of the "big thoughts," the "long thoughts" of the race. Our schools must train for a successful and happy group life in which thinking is a method of adjustment between the individual and the group.

All effective thinking is creative in the sense that it is not a mere repetition of something learned. It is a variation, an adaptation, an invention. When an individual or a group experiences a real perplexity, it means that mere repetition of what has been done before no longer avails. It is necessary that someone "start something"; that is, propose new methods or means. Time was when the surest way for a boy to land in the "corner" or to be kept after school was to "start something" not in the regular schedule or school routine. Now "self-starters" are beginning to be appreciated. Yet, even now, there are timid persons who say that if we let the pupils have the privilege of initiative in school, they will invent many things that will prove worthless. So they will, no doubt, and that is a very good reason why such inventions should be made in school where the pupils can learn, with the least amount of waste and harm, to distinguish between starting something worth while and starting something that will be useless or harmful. The real danger is that if a pupil is not allowed to originate anything during all

the years he is in school, he will never be able to show the initiative which is required for success.

Problem solving must continue to be one of the important aspects of thought training. However, we must develop better methods for securing this training than those which are used in the ordinary school. We must select more vital problems for the pupils to solve. Then, too, we must discover methods for making the pupils consciously clear as to the best methods and means for solving the different types of problems. We must also give our pupils more practice in the solving of long problems, such as will take not only days but weeks and months for their solution. Success in life requires "longheadedness." Most of our school work has been a training for the opposite.

Efficiency in thought requires broadmindedness and ability to exercise criticism. We must do much more than we have done to develop these characteristics in the thinking of our pupils. How can this be accomplished? It can be done only by practice in thinking about affairs that involve a large number of considerations which the pupil must judge as to their relative values. It requires practice in dealing with questions and problems about which there are differences of opinion, and in the solution of which success depends on a fair appreciation of such opinions and a tactful adjustment of differences. This means that we must let—no, that is not strong enough—we must require our pupils to think about the large problems of the school and take a part in carrying forward the general management of the institution. Many teachers object to such a proposition on the ground that the pupils are too immature to have any appreciation or insight as to problems involving wide considerations. To let them have any share in the general management of the school would lead to the making of mistakes and lessen the efficiency of the institution. All of which probably is quite true. But what is the real purpose of our work as teachers anyway? Is it to make the school perfect as an institution or to make the pupils a success?

Does this mean that the teacher will cease to be the manager of his school? By no means. Rather it means that he must become a very skillful and efficient manager. Which is easier, to tell pupils how to behave, or to so manage the school that they will, of their own accord, learn to behave and want to do so? Which is easier, to tell pupils what to believe and say, or to interest them in problems of such vital importance as to compel investigation, solution, and verification and thus lead their minds to convictions of their own—convictions which are right because the teacher saw to it that all the essential facts were met?

To the timid and reticent teacher this whole topic of training pupils to think for themselves opens a world of difficulties and perplexities. To the one who is anxious to be more than a hearer of lessons and a keeper of order, who is ambitious to become an expert in his profession, it means the very essence of teaching. It is the touchstone by which he tests himself as to whether he is a real teacher or a mere hireling. And though it tries his very soul he is not discouraged, for he calls to mind that one man did attain to this ideal in teaching, and that the

world has looked back with appreciation upon that teaching for twenty-three hundred years.

The following chapters will deal with practical ways and means for promoting what someone has called the "most important strictly private business"; but which may with equal truth also be called the most important business of the public in a democracy—thinking. However, before going to our next topic I have one suggestion to make. An interesting writer says that, in reading, a person should give one hour of thought to every hour of reading, claiming that this would "certainly be more beneficial than two hours devoted entirely to reading." 1 The exercises which follow are offered as suggestions for beginning the hour of thinking.

#### THOUGHT EXERCISES

- 1. What danger is there, if any, that teachers may depend too much on courses of study, textbooks, and equipment for the efficiency of their work? In an ideal school, should all the equipment be furnished or should some of it be constructed by the pupils? If the pupils feel no stimulus toward constructing any tools or devices for their work, what conclusion would be warranted?
- 2. Is thinking really such an important factor in practical life as this discussion tries to prove? If you doubt it, try to find some other factor more important. If you believe it, find other—yes, and better—illustrations than those that have been given.
- 3. Gather as many examination questions as you can and analyze them for the percentage of thought questions. What do you conclude? How do your own questions measure up?

  4. Are the standards used by McMurry in the New York

¹ Hazlitt.—Thinking as a Science, 140.

Inquiry fair? Are they too radical? Should teachers gen-

erally try to live up to them?

5. Is the idea about mastery of facts right or wrong? Which is the more valuable for a teacher, mastery of facts or the memorizing of facts? Test also by application to other

vocations and to specific situations in life.

6. Count the number of questions asked by the teacher and the number of questions asked by the pupils during an hour or half a day. What is the conclusion? If you could have a school in which the teacher asked all the questions, good questions, or in which the pupils asked all the questions, also good questions, which would you prefer?

7. The author's comment about letting pupils "start something" is entirely wrong, isn't it? How else might pupils be

trained in initiative?

- 8. Is it practical to let the pupils have a share in making plans for school entertainments? Suppose there were fifty entertainments planned by the teachers alone and fifty entertainments planned by the pupils under the guidance of their teachers, which group of fifty would result in the greater number of real successes?
- 9. Make a list of problems or perplexities that occur in daily life. Make another list of problems that are used in the ordinary school. How do they compare?

10. Professor Rapeer gives the following list of aims, or

"goods" of life and of education:

(1) Self-preservation; (2) Race-preservation; (3) Association, including all that makes social organization, social cooperation, and social happiness, through group activities, advance to a higher plane; (4) Emancipation from fear; (5) Individual growth and self-realization. What part must thinking play in the realization of these aims for the individual and for the group?

¹ Rapeer.—Teaching Elementary School Subjects, 10.

## II

# THINKING AS AN EFFICIENT FORM OF BEHAVIOR

How is thinking related to behavior? Is it a process entirely different in nature from sensation, memory, instinct, habit, and other activities, or is it similar to and closely related to them?

The common view held in the past by psychologists and by people generally was that thinking is an activity entirely different from and higher in kind than all other mental activities. The mind was regarded as made up of a number of "faculties." Thinking was considered as the highest of these, was called Reason, and this word was spelled with a capital R. With this conception of the mind it was natural to think of education as a process through which the various "faculties" could be strengthened. As it was observed that a man could increase the power of his arm by exercising it, so it was assumed that a person could train his memory, or imagination, or reasoning by exercising these "faculties" on the various school tasks.

Modern psychology has very little to say about faculties of the mind. It regards the mind as a unit or organization which is able to function in a multitude of ways. According to the statement of Dewey there are

"a great number of original native tendencies, instinctive modes of action, based on the original connections of neurones in the central nervous system. These are impulsive tendencies of the eyes to follow and fixate light; of the neck muscles to turn toward light and sound; of the hands to grasp and turn and twist and thump; of the vocal apparatus to make sounds; of the mouth to gag and to spew out unpleasant substances and to curl the lip, and so on in almost indefinite number. But these tendencies (a) instead of being a small number sharply marked from one another, are of an indefinite variety, interweaving with one another in all kinds of subtle ways. (b) Instead of being latent intellectual powers, requiring only exercise for their perfecting, they are tendencies to respond in certain ways to changes in the environment so as to bring about other changes." 1

The old and general view emphasized the difference between the body and the mind. The development of physiological psychology has shown the intimate relationship between physical and mental life. No one can tell where the physiological aspects of an action end and where the mental aspects begin. The recognition of this close relationship opened a new and exceedingly fruitful field of investigation. Students could assume that the laws which were found to operate in the physical organism would operate also in mental life. This made it possible to attack the problems of psychology experimentally. So valuable has this method been that the results of a few years of such work far exceed those of many centuries of speculation.

The old view of psychology with its emphasis on consciousness depended on introspection for its chief method of investigation. As no one could "look into" any mind

² Dewey.—Democracy in Education, 73.

but his own, there was nothing more to do than for each student to describe his own mental life and to assume that the lives of others were like his own. While this method lent itself to "extend discourse," it gave the student little or no control over the minds of others.

The new view of psychology with its emphasis on the unity of mental and physical life, while not disregarding the method of introspection, depends chiefly on observation of the behavior of others for its information. Students find that by applying a specific stimulus to a person certain specific reactions may be expected. This opens the way for definite control of human behavior and is exactly the kind of psychology which a teacher needs to study.

Without attempting anything like a complete statement of the main facts of the psychology of behavior, it seems necessary here for the sake of orientation to summarize those which are, for our particular purpose, the most significant.

#### TYPES AND LAWS OF BEHAVIOR

Behavior may be regarded from several viewpoints, and as a result we speak of it as being of different types. It is well, however, when we speak of different types of anything to bear in mind that they are the results of the several viewpoints taken. If a person looks at a building from the south, west, north, east, and top, and as a consequence speaks of the south, west, north, east, and top sides as being entirely different one from another, it does not follow that the whole building is broken into five disconnected sections.

When behavior is regarded from the physiological viewpoint it resolves itself into a stimulus of some sort followed by a reaction, both of which may be relatively simple or complex. Some of the simpler forms of such behavior are called *tropisms*, a term which designates the direct reactions of organism to external forces. Among the tropisms most frequently mentioned are the turning toward or away from light, reactions to the various colors, to gravity, chemical substances, electricity, water, and currents of water, currents of air, heat, and sound.

If a certain behavior is studied with regard to how it originated we may call it instinctive or habitual. To say that an act is instinctive means that it is performed without previous practice, as, for example, the sucking movements of babies. To say that an act is habitual means that it has been acquired by practice, as, for example, the movements in writing one's name. It would be erroneous to suppose, however, that there is a sharp distinction between instincts and habits. Many instinctive actions are perfected by practice. Note, for example, the pecking of chicks, the flying of young birds, the walking of children. Many so-called habits are instinctive actions which have been fixed and perfected by many repetitions.

If behavior is considered with respect to the amount of consciousness which it involves, one will notice that some actions are performed without our being aware of them at all. We are dimly or vaguely conscious of some. Others require the most concentrated attention. It is surprising to find how many important activities take place without our being aware of them. The eyelids

wink, the heart beats, the lungs breathe, the stomach and intestines do their work, the various glands contribute their secretions, the pores of the skin open or close without our being conscious of them in the least. Only when there is trouble do we become aware of these forms of behavior and then only vaguely.

As a general rule it is true that the more perfectly habitual an act becomes the less we are conscious of it. A very large portion of our daily life is given to habitual behavior which is performed almost automatically and with a minimum of consciousness. This being so, as anyone can very readily determine by recalling all the actions performed during a single day or part of a day, will it not follow that the schools ought to devote a similar portion of their time to the cultivation of habits? Then development of thinking must receive a minor place in the school program and—well what becomes of the idea that the development of thinking is the greatest thing in teaching?

Suppose, for the sake of argument, that ninety per cent of our daily behavior is habitual and takes care of itself without our giving it any thought; may it not yet be possible that the quality and importance of the remaining ten per cent of thoughtful behavior can be such as more than to outweigh the larger quantity of the other? One moment given to constructive thought may determine a course of action and groups of habits which will occupy us for a long time. Habits are like the rails, moments of thought are like the opening and closing of switches. The former seems to constitute the main part of the railroad, but the operation of the latter changes

the lines of rails into a system which multiplies by many times their efficiency for transportation. If the world is so constituted that it changes a little from day to day and if we ourselves change a little, it is quite likely that the adjustment of these changes is the principal factor in our success or failure in life.

How is habitual behavior acquired? A very simple exercise will answer this question. Take a piece of ruled writing paper and place it on the bureau or sideboard in such a position that it can easily be seen by looking into the mirror. Now take a pencil and without looking

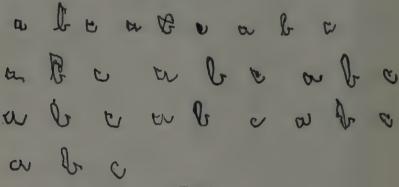


Fig. 1.

directly at your hand or at the paper, but looking all the time at the paper as it appears in the mirror, write the letters a b c ten times, trying as hard as you can to improve both in the speed and quality of the writing. Having someone keep a record of the time adds interest to the exercise. In order to examine the results the paper must be held against the light and be looked through from behind.

It took me just five minutes to write the letters ten times and the results, as you will notice from Figure 1, on page 24, are nothing to brag about.

Upon examination of the results of my efforts, I find that the letters look very stiff and cramped, showing that the pencil was held very tightly. There is a large number of little kinks and crooks, showing that many unnecessary movements were made. Of course! didn't it take five minutes of hard work to accomplish the task? The writing improved as the practice progressed, but the improvement was far from continuous or uniform. There were relapses at several points. Notice the fourth b. It is poorer than the first one.

But the writing does not tell the whole story. If someone had watched me while the writing was being done he would have noticed that my entire body was tense and active. I shifted position several times. There was a bending toward the task with occasional relaxations. The eyes stared at the reflection in the mirror. Several times there were incipient movements of the eyes toward the paper itself. The muscles of the face gave expression to the success or failure of the hand. In other words, it was my whole self that worked, not merely the right hand.

It used to be thought that we learn to do things by putting together what we know before. So in teaching writing, children were set to making simple marks of various sorts which later were to be combined into letters. There may be cases in which learning proceeds wholly or partly in this manner; but the ordinary way of learning things is as typified in the exercise just performed. At first there is more or less general confusion. Then

there are a large number of random and apparently unnecessary movements. Gradually the attention of the learner centers on certain ones of these which seem to be more successful and satisfying than the others. These movements are repeated while the others are gradually eliminated, but may recur from time to time.

Notice how a person learns to ride a bicycle. He holds on to the handlebars for dear life. He pushes and pulls. He kicks and climbs. His eyes stare and his face twitches. The whole man works. After a few minutes he is as tired as if he had made a century run. By and by he begins to omit the useless movements and may finally become so skillful that he can glide down the road while apparently sitting perfectly still, and even without touching the handlebars.

The learner's attitude has much to do with his success or failure in acquiring skill. If one is physically well, feels interested in the work, realizes the value of the task, and is anxious to improve, progress is generally rapid. Practice without intention to learn or improve brings little or no result. The listless or careless person is as likely to repeat the useless movements as the useful ones, and no amount of repetition of useless movements will produce skill. It is not always true that practice makes perfect.

Suggestions from others may be of value, especially if they encourage the learner to make further attempts or if they point out at the right time which movements should be eliminated and which should be emphasized. However, most persons rely too much on the help of others. They would accomplish more by trying to do more for themselves.

The following suggestions summarize the most important information available about the acquisition of motor skill:

- 1. Get the right attitude toward the task to be accomplished; that is, get a specific aim which is to be attained. Strengthen the interest in this aim by contact with persons who are enthusiastic about it.
- 2. Start promptly and energetically no matter how unsuccessful the first attempt promises to be. Random movements and mistakes constitute a part of the learning process.
- 3. Practice with a will to learn. Watch for successful movements. Try to eliminate unnecessary movements.
- 4. Get suggestions from others, but do not depend on them too much. They may not fit your case. Try them to discover whether they work or not.
- 5. Watch the results of your practice and measure the amount of improvement from time to time in order to keep interested. If possible represent your progress by a learning curve.
  - 6. Avoid excitement, confusion, and worry.

In order to make these suggestions stand out more clearly it may be worth while to state them negatively:

## How Not to Learn to Do Things

- 1. Regard the task as worthless. Avoid persons, books, and papers that might stimulate interest in it.
- 2. Hesitate to make a first attempt. You might make some mistake. Wait until you can work without making any mistakes.

- 3. Do not practice much. If you do practice, do not think about whether you improve or not. Just try to get through the practice period as easily as possible. Watch the clock.
  - 4. Do not listen to suggestions from anyone.
- 5. Do not try to measure the amount of improvement. There will be none.
- 6. Seek entertainment and excitement. Think of something else than the task to be accomplished.

#### TYPES AND LAWS OF THINKING

We are now in position to advance a working hypothesis about the nature and laws of thinking. If thinking is closely related and similar to behavior, it will show some of the same characteristics. This means that it will appear to be of different types, according to the viewpoints from which it may be considered, and that its development will follow more or less closely the general laws of behavior.

Regarded from the standpoint of outward activity, thinking is an inward activity. "Stop and think" does not mean that all activity shall cease, but refers merely to outward work. In this sense recalling past experiences, imagining new things, solving a problem, systematizing a mass of details, constructing an argument, and judging of values are all classed as thinking.

When contrasted with sensations, thinking means the ability to recall past experiences, imagine new combinations, grasp meanings, and pass judgments.

From the standpoint of a perplexity to be met, think-

ing is not regarded as separated from sensations, but means the ability to apprehend the nature of the perplexity and to devise some scheme for avoiding or mastering it.

To a manager of affairs thinking means ability to secure order in a mass of details.

To a merchant it means ability to judge of values.

To a scientist it means ability to discover and grasp a problem and to hold it in mind for a considerable time while materials are gathered, sifted, and organized into a satisfactory solution, and the solution tested as to its accuracy and adequacy.

To a debater or lawyer it means the ability to construct a convincing argument.

To the judge it means the ability to define and to discriminate.

To a philosopher it means the ability to see common elements in apparently differing or contrasting groups of ideas.

Other types could be mentioned. The point is that one can find as many types as there are viewpoints from which thinking can be regarded, and that the "types" are due to the viewpoints rather than to actual demarkations in the thinking process. The thinking involved in a given situation may include some or all of the characteristics that have been mentioned; and, while in a general way one may distinguish it from sensation and behavior, there is really no line of demarkation where one activity ceases and the other begins.

A very good illustration of the close relation of thinking to behavior may be had by watching children of different ages play Hide and Seek. The little fellow who is to find the hidden ones for the first time works out his problem mainly through his feet. He runs hither and thither without plan and without any regard for his exposing the goal. An older and experienced boy solves the problem mainly by headwork. Even while counting he calls to mind the usual hiding places and makes guesses as to where each one of his playmates is likely to go. He begins his search by carefully looking around in all directions and particularly scrutinizing certain spots for the appearance of a head or a bit of color. He knows that he is being watched and he pretends to start off in a certain direction only to return very quickly when he thinks someone has ventured from hiding. It is a game of strategy rather than of running, a work of the head rather than of the legs. How, then, is thinking related to outward behavior in this game? Thinking is the outward activity transferred to the central station. The thinker makes all the runs mentally and recalls from experience the results that each one will bring. Any stage in this transfer of activity can be seen by observing children of different grades of development. In no case is the problem solved exclusively by outward or inward activity. It is always a combination of the two. Thinking itself is a form of behavior.

Lest someone find it difficult to accept the statement that thinking is a form of behavior, an inner behavior, because such a statement appears to oppose the belief usually held, that thinking is entirely different from bodily activity, I shall take the risk of being prolix and mention another illustration. Suppose the following

situation: In a room is an empty box measuring nine by fifteen by seventeen inches. In an adjoining room there is a pile of small packages, each four by five by seven inches. The problem is to find how many of the small packages can be put into the large box. How will different persons solve such a problem? One person will do it in this way: he will carry the packages to the box and proceed at once to put them in. When the box is full he may discover that there are certain spaces left and he may resolve to try again and to use another method for placing the packages. If they were laid on the side the first time he may set them on end the second time. Another person who depends more on head work will take the big box into the room where the small packages are, set it conveniently in order to save work, and discover the best method for placing the packages by using only a few of them. A person skilled in headwork will picture to himself how the little packages will fit into the big box if placed in this or that position. He may take his pencil and make a few marks on a piece of paper and when he is through he answers "Fifteen" without having touched any of the boxes. The point is that, in a certain sense, he did everything that the others did, the only difference being that he worked with his head while they worked with their hands.

Efficiency in management means the ability to go through an action or a series of actions and to picture to oneself the results without actually performing the work outwardly. Watch a foreman and his crew at any kind of work. The foreman seems to be doing nothing. He merely points here and there and gives orders. The men

toil and perspire. Yet he is actually doing more than they, for he is carrying out not only the work of one man but of every man in the whole crew and is so far ahead of each man that he can tell him how to follow. Watch an architect draw the plans for a house. He builds the whole house and knows just how it will look when finished. The difference between the architect and the carpenter is that what one builds by means of headwork with comparatively little physical labor, the other must expend much time and energy to build with his hands.

Emerson said that thinking is the hardest thing in the world. It is also the thing which gives us the most ease by enabling us to perform our tasks with the least amount of labor. It is a wonder that so few people make it their business.

It is interesting to note the relation of thinking to outward activity in the development of civilization. The primitive man solves his problems largely through the work of his hands and feet. He makes many random and unnecessary movements. Gradually he begins to accumulate memories of specific acts that proved satisfying and of others that resulted in failure and annoyance. When an occasion for action again presents itself he recalls his previous experience and performs only those acts which brought satisfaction. If his present difficulty is similar to his former experience this method brings him success. If it is a new kind of difficulty and only apparently similar to his former experience, he may find that his recall of the past is of no avail. He then resorts to the original method of "trial and error." Memories are the habits of the "inner" behavior, produced and

operating in the very same manner as the habits of the "outer" behavior. Most, or perhaps all, of the "inner" behavior developed from the "outer" behavior.

If one considers the history of the various trades and industries the same development is apparent. They began in some form of handwork. The degree of advancement to which they have attained is directly proportional to the change manifested from handwork to headwork. The civilization of a group or a people advances as a larger and larger number of persons become able to transfer a part or all of their work from their hands to their heads.

If we agree that thinking is an "inner" behavior and not a mystical process entirely different from general outward behavior, we are in position to advance some propositions as to its possible modes of development. We shall assume that thinking will be developed in much the same manner as other behavior and consequently we shall expect some or all of the following aspects:

- 1. It will require a specific aim or objective. In other words, we shall not expect to develop "thinking in general," but specific thoughts, just as we do not expect to cultivate "behavior in general" but to develop skill in specific acts.
- 2. It will grow by the process of "Trial and Error"; that is, the pupils must be given opportunities to make attempts, even though such attempts involve the making of mistakes.
- 3. It will be developed by actual practice, not by the teacher, but by the pupil, in which he continually looks for the successful thoughts and eliminates the unsuccessful.

- 4. The teacher will give the best assistance by stimulating the pupil to make new attempts when he has become discouraged, and by calling attention to the successful thoughts that have been overlooked or to the defects which should be eliminated, provided the pupil verifies the advice by his own practice.
- 5. Development will be aided by maintaining a lively interest in the aim to be attained. This can be stimulated by keeping a record of the improvement made.
- 6. Good thinking is facilitated by avoiding excitement, confusion, and worry.
- 7. Finally, if thinking is an "inner" behavior which began as an "outer" behavior, we shall expect to find that it can best be developed by beginning with practical situations in which something needs to be done. Its development will, however, differ from the development of skill in one important aspect. While it begins with doing, skill in thinking is achieved only in so far as the particular activity is changed from being wholly or mainly bodily work to becoming mainly or entirely headwork.

What are the chief advantages of the "inner" as compared with the "outer" behavior?

- 1. It takes much less time.
- 2. It requires less effort.
- 3. It saves materials. Compare the amount of waste in the work of a dressmaker or carpenter who is a good headworker with that of one who is a poor headworker.
- 4. It enjoys the freedom of time and place. One can work anywhere and at any time.
  - 5. It makes it possible for an individual to accomplish

tasks vastly bigger than he otherwise could. Think of all that has been achieved through the invention of tools and machinery, practically all the results of headwork. Think of the mighty enterprises which have been made possible through the formulation of long plans and through the organization of men and women into industrial armies. It was headwork that did it.

Every teacher should be a promoter of the business of thinking. He should be so enthusiastic about it that every term of school becomes a "campaign," a "drive" for its development.

#### THOUGHT EXERCISES

1. If paper can be classified as freight, writing material, printing material, building material, wrapping material, towels, clothing, table covering, plates, spoons, and fuel, are the distinctions due primarily to the characteristics of the paper or to the attitudes which we take to it?

2. Do human beings show any forms of behavior that you

would designate as tropisms? Make a list of them.

3. Apply the laws of learning to the teaching of handwriting. Is there a specific aim or objective to be accomplished in each practice period? Are erroneous or superfluous movements actually being eliminated? Does the teacher give effective suggestions? Do the pupils measure their own progress? Do they work without being distracted?

- 4. Would it be possible to give pupils some insight into how they actually learn to do things? Suppose they could measure their achievement from time to time and that they discovered that at certain times they made much better progress than at other times, what stimulating questions might they be able to ask?
- 5. What do you think of this advice to pupils: "Now, be sure not to make any mistakes"?

6. What is the attitude of some of the most efficient persons that you know toward making mistakes?

7. What part, if any, did your own mistakes play in your development as a teacher?

8. How does the game of "Prisoner's Base" illustrate the

transfer of behavior from footwork to headwork?

9. Is "Pull Away" a game mainly for the feet or the hands or the head when played by little children? When played by

boys in the seventh grade? When played by adults?



10. Draw a diagram like the one in Figure 2 without lifting the pencil and without retracing any of the lines; that is, start somewhere and keep on drawing without retracing until the diagram is complete.

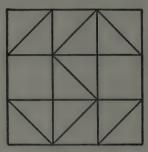


Fig. 2.

As you recall your experience in drawing the diagram, would you classify it as handwork or headwork or both?

11. Take a sheet of ordinary writing paper, eight and one-half by eleven inches. How many cards, two by three inches can be cut from one sheet? Use any tools that you like. Can you solve it by headwork only? No, the answer is not fifteen.

12. A farmer had a twenty-acre field of wheat 160 rods long and 20 rods wide. One morning he sent his two boys, John and Will, each with an eight-foot binder, to reap the field. John drove first and Will followed. At noon they had gone around the field exactly six times, after which they drove the binders into the yard. How much more did John reap than Will? How would you classify your experience in solving this problem? Can you separate your thinking from the handwork, the sensations of sight, the memories of tables and of previous examples solved?

### III

# THE DEVELOPMENT OF INDIVIDUAL JUDGMENT

During a number of years of experience in school work the writer made more than three thousand visits to schools and classes in rural, graded, and high schools, as well as in colleges and universities; yet he never witnessed what might be called a Judgment Recitation. By a Judgment Recitation I mean one in which the aim is to train the pupils to judge correctly by having them make comparisons, determine relative importance or values, weigh evidence, or test inferences and conclusions regarding things, persons, situations, or ideas.

Does this mean that judgment plays such an unimportant part in the affairs of daily life that no attention needs to be given to its development? Or, does it mean that ability to judge correctly is a native ability that cannot be developed by practice? Or, does it mean that the schools have been neglecting a very important matter?

What about the first question as to the importance of judgment in the affairs of daily life? Oh, you will say, there is no need of discussing that; for it will be granted at once that the ability to pass accurate and reliable judgments is an essential factor of success in any voca-

tion. Even in unskilled labor the workman needs to judge for himself whether his work will be satisfactory to the foreman or not. Every time a person makes a purchase of anything he needs to judge of its quality, fitness, and relative value. All our conduct is subject to the judgment of others and is wise or foolish according to the kind of judgment we exercise. Yes, truly, sane judgment in practical affairs is of great importance.

The next question, then, is whether ability in judging can be developed or not. Is it not so that some persons are born foolish and remain foolish while other persons are naturally clever and remain so in spite of any training that they receive? Are not some persons naturally good judges of stock or land or buildings or music or other things?

Suppose we try a simple experiment to discover how a person develops a more accurate judgment in estimating the length of strips of paper. Prepare a number of strips of equal width. Cut them off in different lengths from ten centimeters to twenty. Mix the strips and place them under a large sheet of paper. Now take one of the strips, place it on the table in front of you and try to judge as well as you can its correct length, noting your estimate on a record sheet. Next measure the strip and record its correct length and the error of your estimate. Follow the same procedure with the other strips. Find the average error of the first five estimates. Do the same for succeeding groups of five. Repeat the experiment at convenient periods and try to make a better record each time. Ask yourself, "Am I becoming a better judge of these strips? How am I really learning to

estimate their length more correctly?" For more accurate judgment the strips should be cut to lengths differing by one-half centimeter.

Get someone else to try the exercise in order that you may observe how a person behaves when he is attempting to render a judgment. In order to make this exercise suitable for school work it may be necessary to cut the strips of paper so as to have greater differences in length, especially for the lower grades.

If one examines the results of such an exercise, it at once becomes clear that there is nothing very strange or mysterious about the development of a specific judgment. It is found that the process is not purely a mental one but that it contains many elements of outward behavior, easily noticed if one allows oneself to act freely and naturally while performing the exercise. The method is clearly one of "Trial and Error," and the secret of success lies in the discovery of certain "clues" or methods for eliminating the errors. If it is found that one has a rather constant tendency to overestimate, there will be an effort to correct it, which in turn may result in the underestimation of the next sample. Certain lengths will be remembered more vividly than others and become the standards with which new samples are compared. Special objects may be called to mind, such as the ruler, a sheet of writing paper, or a lead pencil. Different standards may be used for the different lengths. Many individual differences will appear. Some persons are much more erratic than others. Some underestimate quite consistently, others tend to overestimate. Some are quite reliable in regard to certain lengths and unreliable in respect to others. Some make much more rapid improvement than others. In the case of some the improvement is gradual, while in the case of others it is uneven, showing "spurts" and relapses according to the "schemes" or "clues" which are discovered and applied. Some feel more certain than others of the correctness of their judgments. There are some individuals who seem to base their judgments on an indefinite feeling which they are unable to analyze. The feeling of certainty varies in the same individual.

As one can acquire skill in judging the length of strips of paper, so, and by a similar process, skill can be developed in judging horses, cattle, poultry, corn, grain, bread, butter, fruits, literature, houses, farms, teachers, schools, institutions, governments—in short, anything. Suppose, for example, that a person wishes to develop his ability to judge ears of corn. He must begin by making judgments about ears of corn, comparing one with another, noting their similarities and differences. A good teacher can shorten the process of "trial and error" by directing the attention of the student to the various aspects in which ears of corn may be compared, such as color, size, tip, butt, regularity of rows, and shape of kernel. When the different characteristics have been noted, the question arises as to their relative importance. This calls for further judgments and should result in the producing of a score card, which is one of the best tools for rendering judgments accurate and reliable.

The principal reason why so many people are quite erratic in their judgments is that they have not developed or adopted any definite standards for noting and comparing the different characteristics of the objects which they attempt to judge. This is well illustrated in the ordinary judgments of declamations, orations, and debates. Many judges are satisfied with listening in a passive sort of way and rendering their judgment more or less intuitively on the basis of an indefinite feeling that this or that contestant excelled. If such a judge is called upon to justify his judgment, he discovers the unsatisfactoriness of his method and begins to cast about for definite characteristics by which the performances might be compared. The next time this person serves as a judge at a contest he may develop a simple score card by which he rates each contestant. If he has opportunity to judge at a number of contests he will revise this score card several times, both as to the items enumerated and as to the values assigned to each. By eliminating the unsatisfactory methods and improving those which are partially satisfactory he acquires the skill of an expert.

When it happens, as it usually does, that the judges at a contest differ very radically in their rating of a contestant, it is generally due to the fact that one or all the judges have depended on a general impression for their judgment. If the attention of one judge was attracted by one characteristic in the performance while the other judges were impressed by some other characteristic, it is not to be expected that they will agree in their ratings. In order to secure a reasonable agreement between judges it is necessary that they judge a performance according to the same standards. The same is true if an individual wishes to have a judgment which is rendered at one time conform to a reasonable degree

with his judgment of the same object or performance at another time.

Now the thought may occur to someone, that if it is such a simple matter to develop ability in judging things, then it is a wonder that there are so many who show such poor judgment. Yes, and you may have noticed that it is always someone else who shows the poor judgment. There are many who are perfectly willing to say that they have poor memory, but I have yet to meet the person who will admit that he has a poor judgment. We feel that to admit having poor judgment would be the same as to class ourselves as defectives. If the question were whether we have ever given any judgments that were erroneous, it would be quite different. Of course we have, and furthermore it was to be expected, and we are quite normal and sensible even if we do make such mistakes occasionally. The expression "good judgment" has been used so long that it gives us a feeling akin to awe. It seems to imply a mystic power of some sort. However, if we undertake to look for "good judgment" as such, it is not to be found. No one renders a judgment in general. Judgments are always about specific things and qualities. A good judge is one who renders many good judgments and few poor ones in the activity that forms his specialty. Saying that a man is a good judge in law means that his decisions are seldom reversed by the higher court. It implies nothing as to his ability to judge of the merits of doughnuts or poems or of candidates for office.

The problem of the development of good judgment

should therefore be restated to read, How can a person learn to render accurate judgments in regard to specific things in the various activities or occupations in life? With the problem so stated, the next thing to do will be to try to discover some of the typical and important specific judgments which are most frequently demanded in daily life. The following list is intended to be suggestive rather than complete.

- 1. Judgments of quality; such as color, sound, smell, taste, touch, and temperature. *Examples*: The cloth is dark blue-green. That is the fragrance of lilies. This water has a temperature of about sixty degrees.
- 2. Judgments of quantity; such as size, weight, pressure, and amount. Examples: This piece of board is six feet long. That tree is about fifty rods from the house. The hog weighs about two hundred and seventy-five pounds. The bin has about one hundred and seventy-five bushels in it. That wheat will run about fifteen bushels to the acre.
- 3. Judgments of time and speed. Examples: According to the position of the sun it is now two o'clock in the afternoon. The man is driving twenty miles an hour.
- 4. Judgments in regard to the relation of the parts to a whole. *Examples*: The rolling cutter is fastened too far ahead on the beam of the plow. That is the breast collar of a buggy harness. This is an apple seed. The manager is elected by the board of directors and makes his report to them.
- 5. Judgments of cause and effect. Examples: He learned his lesson because he studied attentively, not

because he kept on so long. The board bulges because it is wet on one side. The dough rises because the bacteria in the yeast produce carbon dioxide gas.

- 6. Judgments of economic values. Examples: This land is worth \$185 per acre. That piece is worth only \$65. A shoe like that is worth about \$6.50. This breed of poultry will bring a better price as broilers than the other kind.
- 7. Judgments of social values. Examples: Mr. X has done more for this community than any other man This poolroom is demoralizing some of our young men That game was good enough twenty years ago, but this one is better for our present conditions.
- 8. Judgments of esthetic values. Examples: Yards look better with the fences removed. The house of Mr. N looks better than the house of Mr. O; it is better proportioned. That wall will look better if you hang a picture in the space next to the window. The walls of this room should be painted light brown.
- 9. Judgments about governments. Examples: This candidate will not make a good official, but that one will. The government of the public schools should be centralized in order to secure more efficiency. The government should regulate the railroads. The Federal Government should equalize the educational opportunities in the various states.
- 10. Judgments about religious values. Examples: Christianity helps people to live cheerfully and helpfully. These two denominations differ more in their practice than they do in their creed. Mr. X is correct

enough in his beliefs, but he does not live according to them.

11. Judgments about persons. Examples: John is naturally slow and can master only a minimum assignment; Will is quick and can do more than the average pupil. The pet hobby of Mr. Z is to have more time devoted to spelling in our school. I admire Lincoln more than Washington.

What can the schools do to train their pupils to judge correctly in any of the lines that have been mentioned? First of all we must become thoroughly alive to the fact that ability in this line, as in other lines, can be developed only by practicing that which is to be learned. The pupils must be given opportunity—no that is not strong enough—they must be put into situations where they will be compelled to exercise their judgment. No amount of practice in judging things by the teacher will develop judgment in the pupils. A part of every school exercise should be devoted to the development, expression, or evaluation of specific judgments.

In the next place we must take an entirely different attitude toward the erroneous opinions which the pupils are likely to express. The value of a judgment expressed by a pupil in school does not consist in its accuracy but in the training which the pupil receives. An erroneous opinion, frankly expressed by a pupil, evaluated by the pupils and the teacher, amended so as to be correct, verified, compared with the erroneous one, and the difference between the two, as well as the reasons which lead to each, carefully noted, will be worth very much more to

the pupil than the accidental expression of a correct opinion which receives no critical examination. In order to learn through his own experience the difference between right and wrong judgments, the pupil must be allowed to make both kinds freely.

Finally, it must be the constant aim to develop in the pupils the ability to question their own judgment. Suppose that the practice of the teacher is to tell the pupils every time they express erroneous opinions. They will learn what they practice, which in this case is to depend on the teacher to tell them when they are wrong. But in life success depends on detecting and correcting one's mistakes before anyone else has a chance to notice them.

Individual judgments need constant verification or correction. This can best be secured by the use of exact scales and measures. In those fields of thought where exact scales or measures are not available, some standard or score card is usually developed. This enables the various individuals to base their judgments on those characteristics which by common consent have been accepted as the most important in the thing to be judged and thus in a large measure to eliminate differences of opinion. Judgments not verified or corrected by any of these means receive their sanction or disapproval through the gradual increase of experience and knowledge and the development of public opinion. Education should enable the individual to correct his judgments promptly and thus to become a factor in the formation of public opinion. The decisions of a true leader must be verified before they are submitted to the public.

This means that every school child should by actual practice become thoroughly familiar with the tools and methods now most commonly used by progressive people for the measurement of things used in connection with their work. Rural schools should give their pupils much actual practice in measuring dimensions and figuring contents, in the use of dry and liquid measures, in the use of thermometers, and in the various tests which are used in modern farming. City schools should in a similar manner teach their pupils to use the tools most commonly employed in city homes and in city life. This means, for example, that city children should learn to read gas meters, water meters, and electric meters, and to use their knowledge in such a way that they can figure the cost of running an electric iron, or an electric toaster, or the lights in a room for a given length of time, or to figure the relative cost of a dinner that has been prepared in the oven as against one that has been prepared on the top of the gas range. Children should receive practice in measuring the quantity and testing the quality of goods received from the store and should learn how to figure the cost per unit of energy of the common articles of food according to the change of prices. Many other things might be mentioned. Those that have been named will serve to indicate the general idea: namely, that the pupils should learn the use of those tools and devices which they will have occasion to employ in life generally, in order that their judgments about practical things may be accurate and reliable.

The score card has become recognized as one of the most important devices for obtaining reliable judgments.

No teacher of agriculture would expect to develop in his students discriminative judgments about corn without the use of a score card for corn. The same thing is true in other lines. Practically everything exhibited at the various fairs is judged by the use of score cards. Why not make more use of this device in our schools? The pupils should be familiarized with the common forms of score cards and given some practice in their use.

The most valuable exercise for the development of judgment will probably be found, however, in the attempts to make new score cards. And this can very well be done in connection with the work and equipment of the school. Suppose, for the sake of illustration, that our problem was that of developing a score card for the physical conditions of textbooks, in order that we might more accurately determine the material value of the textbooks in the hands of the pupils. How could we proceed? If the pupils have seen various forms of score cards they will know that such cards consist of a list of those characteristics which are considered of significance in the thing to be judged, and that each item is given a number of points to indicate its relative weight, or importance. The first thing to do, therefore, is to make a list of the physical characteristics of textbooks. This can most readily be accomplished by the direct examination of a number of the used books. One pupil notices that the covers of a certain book are torn; another, that a title page is lost; others find torn pages, marked pages, soiled pages, and so on until a long list has been made. The next problem is how to arrange the items in the most convenient order. One pupil suggests a certain

order, another pupil thinks it should be otherwise. Each one must give reasons for his views and try to convince the rest of the pupils. Finally, a motion is carried for a specific order. Then the question arises as to the number of points to be assigned to the total maximum score and to each item on the card. This, too, requires thought and must be settled by a consensus of opinion. If the score card thus produced happens to be rather imperfect, the teacher should let it stand without criticism. It will be worth much to the pupils to discover the limitations of the card through actual use.

An exercise such as the one described calls for discrimination as to what are the significant aspects or traits of the thing to be judged. It gives practice in arranging the various items so as to produce the most convenient total combination. Finally, it is an exercise in estimating the relative values of the various items. The pupils who prepare such a score card attain considerable ability to notice and evaluate the physical conditions of books. (For a sample score card see Appendix A.)

Valuable exercises can be found in making score cards for lead pencils, penholders, writing paper, blackboards, school desks, window shades, door mats, and school yards. This same method is helpful for establishing standards for judging oral or silent reading, language papers, letters, blackboard work, maps, and drawings.

If further exercises are wanted, it will prove interesting to develop methods for judging sleds, skates, skiis, shoes, sweaters, mittens, caps, and coats, always bearing in mind that one must not hurt the feelings of those

pupils who happen to have poor specimens of any particular article.

Does it seem unpractical to do these things in school? But when pupils become old enough to buy their own shoes they ought to have some idea of the characteristics of a good shoe, ought they not? Which will they really and truly need the most, to know a practical good shoe when they see it or to be able to bound any state in the Union or locate some city or river rarely mentioned in books or papers? Which is more important, to be able to select a coat with an eye to the quality of the cloth, the style and fit, as well as the general makeup and serviceableness, or to be able to tell what Sir Walter Raleigh did with his cloak? Or, what is more valuable for a boy, to be able to tell a good hatchet from a poor one or to recite the dubious story about Washington and the hatchet and cherry tree?

Pupils should always be expected to judge the value of their own work. Next to the ability to produce a piece of work is the ability to estimate its worth by a critical judgment of its merits and demerits. Our schools do not seem to be aware of this fact, for pupils are rarely asked to rate their own work. The rating is usually done by the teacher, who, as a result, gets more practice in judging the work of others than any individual should have.

Someone may think that it would be unsafe to let children judge the value of their own work. That is the very reason why they should be trained to do it in school, where through proper supervision each pupil may learn to detect his own errors. If a pupil is not to judge

of the merits of his own work before he can do this without making any mistakes in his estimates, when will he learn to do it? If we think seriously about the matter, is it not a discredit to our teaching if our pupils must always ask someone else whether their work is correct or not? With the invention of standard scales and measures it is becoming increasingly practicable to have the pupils measure their own work. If a school has a copy of the Thorndike or the Ayres Handwriting Scale. for example, any pupil can easily be taught to determine the quality and speed of his writing and to keep a record of his improvement. In order to verify his own judgment he should be trained to invite the cooperation of other pupils and the teacher. This leads us to the problem of how to develop cooperative judgment, a question to be discussed in the next chapter.

#### THOUGHT EXERCISES

1. Prepare a score card for judging the merits of business letters. Include both form and content.

2. Prepare a simple score card for the selection of texts in

arithmetic for the upper grades in a rural school.

3. Prepare a score card for the selection of texts in geography for the seventh grade.

4. Prepare a score card for the evaluation of school

parties.

5. Prepare a score card for the evaluation of English themes.

6. Prepare a score card for the rating of teachers.

7. Prepare a score card for the rating of superintendents.

8. What influence, if any, does emotional excitement have on one's judgment of things? How could this be made clear to children?

9. How, if at all, can judgment be developed in beginners'

classes in foreign language?

10. Professor Freeman says that the "critical examination of sources is too difficult for high school pupils" in history. Do you agree with him? If not, how would you amend his statement?

11. Think of examples from history where it would be pos-

sible to develop judgments of cause and effect.

12. Compare the following groups of questions:

a. "What is the latitude of Alaska? Name and locate the towns. Locate the Klondike region. Describe the Yukon River. What islands lie to the southwest? What strait sep-

arates Alaska from Russia?"

b. "What other regions lie between the same parallels of latitude which bound Alaska? Compare their climate with that of Alaska. Why are the towns of Alaska near the coast? Tell some advantages each town has on account of its particular situation. Would it be nearer to go by water or overland to the Klondike region? Which route would be easier? At what time of year would the river trip have to be made? Find by the use of the scale of miles how far it is across the Behring Strait. What nation might enter America across this strait?" ²

How would you rate a teacher who asked questions like those in group (a) as compared with a teacher who asked questions like those in group (b)? What would be the effect of each group of questions on the pupils?

¹ Freeman.—The Psychology of the Common Branches, 159. ² Rapeer.—Teaching Elementary School Subjects, 365.

### IV

# THE DEVELOPMENT OF COÖPERATIVE THINKING

The previous discussion related to the development of practical individual judgments. Such judgments, valuable as they are, have many limitations and are subject to errors which it is impossible for the individual alone to overcome. The following list indicates the most important of these limitations or errors:

- 1. Errors due to sense defects, such as color blindness.
- 2. Errors due to the lack of information about the characteristics of sensations. For example: suppose one is ignorant of the effects of contrast, and judges the water which he drinks after eating a dish of ice cream to be of the temperature which it appears to have. Or, suppose one is ignorant of our tendency to overestimate vertical lines, or to overestimate a period of time in which few things happen as compared with a similar period that is crowded with events.
- 3. Errors due to inability to concentrate attention on the important aspects of things. For example: if in listening to a speaker one pays so much attention to the gestures or the number of mistakes in grammar that are made that one fails to note the ideas that are presented.
  - 4. Bias due to instinctive interests. Note the differ-

ence in the judgments of men and women concerning fighting.

- 5. Bias due to first impressions which linger and influence later judgments. If a speaker as he steps before an audience shambles or stumbles, he will have much to overcome before he gains the good opinion of the audience regarding his address.
- 6. Bias due to previous experience or training. Note the opinion about ice cream held by a person who has once eaten too much of it. Note how our opinions about the beauty of names is influenced by our likes or dislikes for the persons whom we have known to bear those names. Notice the bias of most people concerning church denominations or political parties or lodges other than those to which they belong.
- 7. Errors due to emotional excitement. Mark the unreliable character of judgments rendered when one is angry or violently in love.
- 8. Errors due to human nature generally. Compare the opinions of those who are naturally easy-going with the opinions of those who are strenuous and always trying to reform somebody or something. Compare the judgments of those who are naturally hasty and who jump at conclusions with those of persons who are naturally cautious and careful.
- 9. Errors due to self-interest. We believe more easily those propositions which are in our favor. Promises of big dividends on proposed investments are more easily accepted than predictions of assessments on investments which we have made.
  - 10. We favor opinions which we already hold because

we are accustomed to them and have adjusted our mental life to them. We hesitate to accept opinions which will necessitate the readjustment of many of our beliefs and of our life generally.

- 11. Our judgments are influenced by the various attitudes which we take toward things. If we are "conservative," we render different judgments from those who are "progressive." If we pride ourselves on being original. we judge things differently from those who are afraid of being different in any way from others. If we have selected certain persons as our chief authorities we accept whatever they say on any topic and are inhospitable to the opinions of others. If we have once adopted certain philosophical, political, or religious doctrines we find it very difficult, if not impossible, to entertain impartial and just opinions regarding views which do not agree with such doctrines. Epithets and slogans create strong bias for or against persons and opinions. As soon as a person or an idea has been labeled with a name implying something undesirable, it becomes almost impossible to judge such a person or idea fairly. Promoters are constantly making use of epithets to influence the judgments of those whom they wish to control.
- 12. Individual judgments are subject to the limitations of personal experience and information. Even the most learned scholar touches but a small portion of life. He is more or less ignorant in all fields except his specialty, and he recognizes that he cannot know his specialty completely because he cannot know all its relationships and implications. Consequently the careful scholar hesitates to express opinions categorically and dogmati-

cally while the ignorant person, who does not know his limitations, feels cocksure of his opinions.

These and many other errors and limitations appear in the simple as well as in the more complex opinions and views which individuals hold. Our judgments are far from being reliable or fixed. The fact that we hold a certain opinion to-day is no guaranty that we will hold the same opinion a year from now. The fact that I entertain a particular view is no guaranty that my neighbors will favor the same view.

The explanation of this unreliability of 'individual judgments and opinions is quite clear. Judgments depend on two factors, the person who judges and the thing that is judged. If either of these factors changes, the judgment will change. Judgments are attitudes which we take toward things about us. They are reactions by which we adjust ourselves to our environment in order that we may the better live. Some of them are almost purely physiological in their nature. Note, for example, the attitude or opinion of a hungry man toward a dish of meat and potatoes compared with the attitude or opinion of a man who has eaten and is satisfied. Others are more intellectual. Note the attitude of an intellectually hungry person who comes to listen to a Chautauqua lecture as compared with the attitude of one who has listened to lectures until his mind is surfeited.

How can variations in individual judgments be eliminated or corrected? First and best, through the use of standard measures wherever such are available and can be applied. If one man says that a box weighs five pounds and another says that it weighs seven pounds,

they can have their estimates corrected by weighing the box. If a parent thinks that the children in a certain grade do not learn how to spell and if the teacher claims that the children are good spellers, a test by means of a spelling scale will correct the judgment of either or both. If a business man claims, as business men frequently do, that the pupils do not learn how to write and do not learn how to add or subtract, a test by means of a handwriting scale and another test by means of a standard measure for the fundamental operations in arithmetic will determine whether the opinion of the business man is correct or not.

Where exact measures cannot be applied the score card has proven a useful device for correcting the errors of individual judgments. Persons who have based their opinions on general impressions discover that their judgments are very unreliable. Their judgments become reliable as they learn to analyse the thing or situation to be judged into its significant characteristics and to give the proper weight to each characteristic.

Exact standards and measures are now available in many fields and the judgments of workers in those fields have changed from general estimates to scientific accuracy. In other fields excellent score cards have been devised and judgments are at least approaching scientific reliability and accuracy. When the judges of this or that line of exhibits at a fair have "scored" the various articles exhibited and awarded the prizes, people generally feel that the judgment can be depended upon. However, there yet remains a large territory of "no man's land" where the opinion of one individual is pitted

against that of another, and where no inventive genius has been able to devise any accurate standards. What can we do for the correction of individual judgments in such a case?

If we belonged to a group that was ruled by an autocrat, our opinions would be submitted to him or to one of his representatives. If the opinions in question happened to support and promote the power of the ruler, he would accept them and perhaps promote us to some office. If our opinions appeared in any wise to oppose the power of the ruler, they would be stamped as heresies and we might be put in prison.

In a democracy there is no authority above the consensus of opinion of the people. Here individual opinions are tested by public opinion. If our views support and promote the ideals of the people, they are welcomed by the people, and we shall be regarded as likely candidates for office. If our views appear to be contrary to the aspirations and ideals of the people, they will be rejected, and after the election we shall be counted among those who "also ran." If there is no consensus of opinion within the group, then a state of anarchy exists in which the opinion of every person is as good as that of every other person, and in which there is no way of selecting and approving useful opinions or of discarding those which are harmful. The important thing in democracy is consensus of opinion, or group judgments. How are group judgments formed?

Every time the back alley baseball team stops for a discussion or a fight in order to settle some point in the play it means, "Gone into a committee of the whole for

the purpose of arriving at a group judgment." Such a committee meeting reveals very clearly the development of group judgments. In the most primitive stages of the game the opinion of the strongest prevails, as it did in primitive society. He who can lick the others is right. Later the contests become more wordy and the opinion of the best talker prevails. There is no vote. Those who lose enthusiasm for their own opinions "shut up and give up" and the matter settles itself by the not altogether uncommon rule that he who gets the last word wins. There is in reality no positive group opinion where the ideas of the strongest man or of the best talker prevail. The group merely acquiesces in the views of self-appointed leaders. Real group opinions and judgments can be obtained only where all the members of the group have an opportunity to receive information about the matter in question, and where they have the means for registering the opinion of each individual; the former requires education and a public press, the latter requires the ballot. As group life develops, public opinion within the group becomes more and more intelligent, and the group discovers better and better methods for expressing its judgment.

Every individual in an enlightened democracy is a member of many groups, some large, some small. There is first of all the family group, consisting of parents and children living in the same house. There is also the larger family group, including uncles, aunts, nephews, nieces, and more distant relatives. Then there are the various societies, the church, and the club. Finally, there is the entire community of which one is a member

whether he will be or not. In all these forms of group life the opinions of the individual are tested and approved or condemned by the judgment of the group.

The usefulness of an individual as a member of a group depends on his ability to merge his thinking with that of the group. This implies two things. It means that the individual measures his own ideas by, and adjusts them to, the consensus of opinion of the group to which he belongs. It also means that he makes his own ideas count in forming the public opinion of the group in order that such opinion may show the enlightenment and efficiency of the best private thought. In other words, our opinions of to-day must either be in agreement with the judgments of our group or they must have the clearness and practical usefulness which will appeal to the group and make them the public opinion of to-morrow. He whose opinions harmonize with those of the group is regarded as a good fellow and given credit for having common sense. He who does not agree with his group but can win that group to think as he does is a leader and will receive credit as his ideas demonstrate their real merit. He who does not agree with his group and who does not have the ability to win the group either is a genius who for his own comfort should have lived in some other place or at some other time, or is a fool.

In a democracy everything depends on public opinion. Does someone think there is need of a certain law? He must create a public opinion so strong that the legislature will feel its urgency. Shall a certain law be enforced? Public opinion must be stimulated and be given an expression such that the officials will get the courage

and the willingness to enforce that law. If a law has been enacted and if public opinion changes to such an extent that there is no interest in the enforcement of that law, then such a law is simply forgotten. Some obsolete laws are formally repealed. Most of them die with the public opinion that created them.

What I have been trying to show thus far is that in a democracy such as ours everything depends on intelligent and positive group judgments, and that individual judgments must find their highest utility by influencing

and shaping group judgments.

Has group thinking had as prominent a place in our schools as it has in the affairs of practical life? How often does it happen in the ordinary school that the individual pupil gets a chance to have his opinions or his work evaluated by the other pupils in his class? How much of the time and attention of the school is devoted to learning by actual practice how public opinion is formed and how it operates?

"Oh, well," someone will say, "the situation in school is different from that of life. Children are immature and cannot be allowed to settle things as adults do." We teachers are much afraid that if a proposition is submitted to a vote of the pupils they may decide it unwisely. But the public does not hesitate to provide for taking a vote or for holding an election involving the most important and far-reaching issues, even though it is known that numerous mistakes have been made in the past and that others will be made in the future.

Faith in democracy does not rest upon the assumption that the people will always decide matters correctly or select the best men for office. Faith in democracy means essentially that if the common people are allowed to think and decide for themselves, they will gradually, through the method of "trial and error," learn to think better and to select more wisely than they could before. Faith in democracy means that it is preferable that the people govern themselves, though they do it poorly, if they improve thereby, and that it is undesirable that a people be governed by others, however well it may be done, if it hinders the development of that people toward self-government.

It is time that we develop more of this faith in democracy and that we seriously undertake the business of training the pupils to think coöperatively. Can it be done? Not by the method which has been used hitherto in the majority of our schools. What is that method? It is essentially the method of autocracy, traditionally inherited from those times and countries in which the idea of a king was the big idea, and in which the chief duty of the people was to be loyal subjects.

Is it true that our teachers are autocrats who continually are forcing their pupils into subjection? Do not many of them, as a matter of fact, let the pupils do entirely too much as they please? Do not statistics show that more teachers fail because they do not maintain proper order than for any other reason? That is quite true, and I will say right here that I have no enthusiasm whatever for a disorderly school; neither do I here propose to give any comfort to any teacher who, through laziness or other incompetency, fails to maintain order.

What, then, do I mean by saying that our schools have

been conducted too autocratically?—and please note that I say our, not your. I mean that we teachers usurp too many of the opportunities for exercising judgment. Who decides how long the lessons shall be? Who decides what are the important points in each lesson? Who decides whether a class should continue to study a certain topic through another lesson or take up a new topic? Who decides when a class ought to take a review? Who plans the review? Who decides the kind of examination to be taken, how many questions it shall contain, whether it shall have any options or not, or whether the questions shall be memory questions or thought questions? Who judges the merits of all the written work of the pupils, whether it be in the form of blackboard work or written exercises on paper? When, if ever, do the pupils have a chance to decide matters for themselves? Only on the playground when the teacher is off duty. We are afraid to let them decide anything relative to their work. We do not think they can be trusted to do it rightly. So is every autocrat afraid to let the people determine things; he does not think they can be trusted to do it rightly.

There is one difference between us and the autocrat, and it is in his favor. He does not pretend to develop his subjects for self-government; he trains them consistently to be loyal subjects. There is no inconsistency between his theory and his practice. We claim that we want to train our pupils to become citizens who shall be able to face the important and intricate problems of a self-governing people by impartially investigating and judging the merits of all the evidence available, and by deciding, as individuals who think coöperatively, what is

the best policy to pursue for the group to which they belong. That is really our aim, is it not? The trouble with us is that our practice does not conform to our theory.

Lest some reader become alarmed at the seeming radicalism of the above statements, let me say that while I object to a school in which the teacher decides everything autocratically, I object just as much to a school in which the pupils govern by a system of mob rule. A school is a community consisting of both teachers and pupils and should, as a self-governing body, be ruled by the teacher and the pupils thinking and acting together.

How may coöperative thinking be developed in connection with the school studies? Let us take a concrete example. It is readily agreed that, outside of school, an intelligent person must exercise judgment concerning the merits of what he reads. Efficient reading implies always the ability to judge of the relative values of the ideas presented. It means that some portions of an article or a chapter are studied with care until they are mastered, while others, mere fillers, are dismissed from the mind as soon as their general content has been noted. It means that some portions are skipped because they are of no interest to the reader.

Can pupils be trained to judge the relative values of what they read? Suppose the next topic to be studied in a history class covers five pages. Make the assignment by directing every pupil to select what he considers the five most important thoughts in the new lesson and to rank them by marking the most important 5, the next in importance 4, and so on. For convenience every

pupil should be trained to locate ideas on a page by the following method: Let the parts of the page from the top to the bottom be designated by the letters A, B, C, D, E. Thus, page 25 C will mean the middle of page 25; page 30 B will mean between the top and middle of page 30; page 45 D will mean between the middle and bottom of page 45. A page that consists of thirty lines will have six lines for each section. When mastered this method will save much time and effort in all kinds of book work. The report of a pupil, as a result of such an assignment, might look something like this:

The five most important thoughts about the Settlement at Plymouth.

VALUE	PAGE
5	55 C
4	57 B
3	56 D
2	54 E
1	54 D

The next thing to do is to tabulate the individual ratings in order to obtain a consensus of the class. On page 66 is given a simple scheme for a score sheet which shows how the record of judgments by a class of eight pupils might look.

The work of tabulating the individual judgments and of figuring the total score and final ranking, as well as the deviations of each individual from the final rank, can easily be done by a committee from the class, after all the pupils have had some preliminary training in the general method to be used. Note that the deviations repre-

Score Sheet for the Cooperative Rating of the Important Thoughts in a Lesson

Pupils

Page		a	b	c	d	e	f	g	h	Total Score	CLASS VALUA- TION
52	D E					·					
<b>5</b> 3	A B C								2	2	
	D E A	$\begin{bmatrix} 2 \\ 1 \end{bmatrix}$	3	1 3	3	1 2	4	3	1	18 6	3
54	B C D							1		1	
	E A B							5		5	
55	CD	5	4	2	5	3	1		3	23	4
	E A							2		2	
56	B C D		1	5	2		3	4	5	11 0	1
	EA									20	5
57	B C	4	5	4	4	4	5		4	30	2
	D E	3	2		1	5	2			13	2
Deviation	ons	6	0	14	4	10	6	24	14		

sent the number of points by which each individual deviates from the class valuation. Thus, if the class has rated an idea four points, or next to the highest, and if pupil A

has rated it five points, he deviates one point. If pupil G has overlooked the idea altogether, he deviates four points. If pupil G rates a certain idea as most important and gives it five points and if that idea is not included among the five that are selected by the class, he deviates five points. A more definite rating can be secured by figuring the number of points for each idea and giving weight accordingly, but it is not worth the extra work.

The report of the committee should be placed on the blackboard or be written on a large sheet of paper in order that the whole class may study it and discuss it. Every pupil now has an opportunity to compare his own judgment with that of each member of the class, as well as with the group judgment of the entire class. This should result in a vigorous and stimulating discussion. Why is idea 57 B more important than idea 55 C? Why did pupil C think that 56 C was so important? What was the matter with the judgment of pupil G? Did he misunderstand the assignment? Is he unable to distinguish between important and unimportant ideas in a history lesson? If so, why? How can he be helped to judge more efficiently?

If one or more of the pupils are able during the general discussion to convince the others that the class valuation is faulty, a second rating may be made on the following day or when the topic is taken up for its final review. Sometimes amendments can be proposed and carried at the time of the general discussion. The main purpose should constantly be kept in mind. It is to aid the pupils to become better judges of the relative values of ideas in what they read. There must be no censure of those who judge poorly; but they must be helped to analyse their own judgments and to discover why they are not as good as those of the class. Pupils who prove to be good judges may safely be detailed to act as coaches in a few practice exercises before the next recitation. Some pupils should be called for private consultations with the teacher.

All this seems to be very easy and practicable. But suppose the class should decide that a relatively unimportant idea is the most significant. Then the teacher has a very fine opportunity by joining in the general discussion as one of the group to demand that he be convinced. I take it that no teacher who values real thought in his school will ever try to settle a question concerning relative merit by an autocratic decree.

This type of work can be varied in a great many ways. In place of rating the ideas the pupils may be asked simply to select a given number of ideas which they consider most important. In that case the class rating is obtained by finding the number of votes which each idea receives. A time limit may be set in order to develop speed. The plan may be used for a review of a large topic. Newspapers or magazines may be used, the task being to find in a given time the most important articles or items in the paper or the most important thoughts on a given page or in a certain article. The method may also be applied to the reading of stories. In place of asking for the most important ideas we could ask for the most beautiful idea, the finest description of nature, the most likable characters, the best anecdotes, or the cleverest jokes.

The method of obtaining a consensus of opinion by the rating of the various items in question has long been used in declamatory, oratorical, and debating contests. It was used by Thorndike in preparing his handwriting scale, and by Hillegas in preparing his composition scale. In modified forms it has been employed in the arrangement of other scales. An interesting and suggestive application is illustrated in the rating of the importance of the various dates in United States history. According to Bagley 1 the twenty most important dates are the following:

Rank	Date	Value	Rank	Date	Value
1	1776 -	1323	11	1812	752
2	1492	1261	12	1765	629
3	1607	1363	13	1783	618
4	1799	1100	14	1865	389
5	1620	961	15	1850	591
6	1803	955	16	1854	590
7	1861	901	17	1775	585
8	1787	821	18	1781	584
9	1863 -	808	19	1823	521
10	1820	793	20	1846	470

The method of rating has recently been applied in regular elections in the form of a preferential ballot by which the voter expresses his first and second choice of candidates for a certain office.

One reason why public opinion fails to accomplish more than it does and why groups of people or communities suffer nuisances to continue which no individual would tolerate is that we have not yet devised methods

¹ Bagley.—Yearbook of the National Society for the Study of Education, 1915.

sufficiently convenient for gathering the consensus of opinion and expressing it in such a form as to be clearly understood. Not long ago I stood with a school superintendent on the platform at a railway station waiting for a late evening train. A number of young high school pupils were "hanging around" at the station according to their regular habit. The superintendent spoke of it and deplored the situation, which seemed to be without remedy. These young people should have been in their homes or among their good friends instead of seeking adventure in the chance acquaintance of strangers. Now if that community could only devise some convenient and positive method for expressing its disapproval of such conduct, the situation would probably improve without further ado. The trouble was that while the majority of the people condemned the practice as individuals, the community did not know how to express its condemnation as a group.

Professor Scott gives an interesting illustration of the force of group judgment, clearly expressed, in a case reported to him by a distinguished Boston educator. There had been some misbehavior and the teacher said to a certain boy, "Well, there is no doubt that I shall have to punish you." The boy answered in the presence of the class, "Oh, yes, punish me; you're always down on me." Then the teacher said, "I'll leave it to the rest if you don't deserve it. More than that, I'll leave the class entirely to itself in deciding. I'll turn my face to the wall, and they can vote without my seeing them, and I'll never ask a boy how he has voted." When the vote was reported as being unanimously in favor of the boy's

being punished, he broke down and said, "Well, it must be right, since everybody says so." 1

Professor Scott makes the following comment upon this incident:

"The interesting and significant feature of this experience is the effect of the class sentiment on the boy. His attitude of defiance in the first place was evidently conditioned by his thought that the class was back of him; and, indeed, so it might have been but for the action of the teacher. case throws a strong light on the real nature of punishment. This is never the mere infliction of pain or other inconvenience. ... Punishment is the disapproval and repression of the group one feels he belongs to. Nothing else is punishment."

We defend ourselves against the censure of an individual by claiming that our own opinion is worth as much as or more than his. When individual opinions are gathered into a clear and unmistakable public opinion they gain an intensity impossible to withstand. This is the secret of the success of self-government in school or out of school. It depends on the ability of the group to form and express effectively a consensus of opinion. The teacher who is to make a success of self-government in his school must devise ways and means by which the pupils can do group thinking and express group thoughts.

Without attempting to discuss all the possible variations or applications of cooperative rating, or preferential balloting, as a method for making group thinking effective, its main advantages can be summarized in the following points:

1. Every pupil must exercise his own judgment.

¹Scott.—Social Education, 96.

- 2. Individual judgments may, whenever it seems desirable, be anonymous.
- 3. A definite group judgment expressing the exact opinion of the group with regard to the matter in question is obtainable.
- 4. It becomes possible for the individual to compare his own judgment with that of the group as a whole.
- 5. The comparison of individual judgments with that of the group stimulates vigorous thinking and discussion.
- 6. The teacher has an opportunity to discover the abilities and weaknesses in the judgments of the individual pupils.
- 7. The teacher has a chance to compare his own opinions with those of the class and is thereby saved from falling into the error of believing that he is infallible.
- 8. The method can be used as a laboratory demonstration of what is meant by public opinion, of how public opinion can be modified, and of how its strength will vary in proportion to its unanimity.
- 9. When a rating has been made the class may decide that the lack of agreement is due to the want of sufficient information. It may happen that the attempt to arrive at a consensus develops into a problem which extends over several days or weeks, and leads to much energetic scouting for information. Any individual who is not willing to accept the first consensus of opinion of his group should have a right to apply for a "stay of proceedings" until further information has been obtained.
- 10. It gives a splendid opportunity for the development of leadership in thinking, in that it stimulates every individual who has an opinion different from that of the

whole group to try to convince the group and bring them to see things as he sees them.

11. It changes hard thinking into a competitive game, and makes the ability to form a valid judgment an aim worthy of the best endeavors of the pupils.

#### THOUGHT EXERCISES

- 1. How can the fact be explained that intelligent voters will entertain such divergent opinions about a candidate for office?
- 2. Someone has said that we believe many things because we like to believe them rather than because of evidence. Is he correct or not?
- 3. Develop a coöperative exercise for rating cities, or states, or countries according to their desirability as places in which to live.
- 4. Develop an exercise for rating historical characters as to their values as examples to be followed.
- 5. Develop an exercise for rating various forms of enter-tainment as to their value for those who attend.
  - 6. Develop an exercise for the group rating of oral reading.
- 7. Would it be a good general rule that all compositions should be placed in the hands of committees, and that they should later be read before the class or a part of the class and a report by the committee presented at the same time?

8. An investigator 1 has found that pupils do better when working in groups than when working alone. Do you think

his findings would apply in your school?

9. Another investigator holds that the school work of children is, for the most part, better than their home work. Do

you think his conclusion would apply to your school?

10. Whereas, such a large portion of our daily life is lived as a group life, and whereas such a small portion is lived as a hermit life; be it resolved that the studying of lessons, the working of problems, and other types of school work should be in the form of group work, and that to think or work as a

¹ Smith.—An Introduction to Educational Sociology, 366.

hermit should be discouraged in school as it is in life. Discuss this statement.

11. It has now become quite common to have in colleges a "Student Council"; that is, a council consisting of faculty members and students, in order that the students may have a share in the affairs of their institution. Should high school students have any share in the affairs of the high school? How about the pupils in the grades? Is it true that the affairs of a rural school probably seem as important to the pupils and can give them as much training in judgment as the affairs of a college do to its students?

12. Suppose a class has finished a term's or a year's work in a certain school subject. Suppose the teacher should ask the members of the class to name the ten facts which they consider most important in what they have learned and to rate these facts according to their importance. What would be the benefits of such an exercise to the pupils? To the

teacher?

13. Suppose at the end of a course in a school subject the teacher should ask the pupils to name ten facts which they have studied and which they consider the most worthless, rating the facts according to their degree of uselessness. Would such an exercise have any value for the pupil? For the teacher?

14. Is it true that in a democracy the majority is always right and that in an autocracy the minority is always right?

15. Under what circumstances might the judgment of an individual be more reliable than the consensus of opinion of

an entire group?

16. If the opinion of an individual differs from the general opinion of the group to which he belongs and if he is unable to change the group opinion to agree with his, must he take that as conclusive evidence that he is mistaken in his view?

17. Is the statement that a decision must await the "test of time," or the "verdict of history" merely another way of saying that individual opinions or individual merit must be established by group judgments?

### V

# THE VALUE OF THINKING AS OTHERS THINK

"Science has taught by a thousand proofs that the universe is what it is because of what it was and that men are what they are now because of what men were before." This general statement is borne out in detail by the following summary given by Professor Starch in his chapter on the inheritance of mental traits: "The general impression from all experimental, statistical, and historical material thus far accumulated on the problems of mental heredity would seem to be somewhat as follows: Barring paupers, invalids, and those suffering from want of food and shelter due to conditions beyond their personal control, and referring to all others living in the same community at the same time, the ultimate achievement of any given individual is due to his original ability, probably to the extent of 60 to 90 per cent, and to actual differences in opportunity or external circumstances only to the extent of 10 to 40 per cent." 2

Much of what we are is undoubtedly due to direct physical transmission from our ancestors. General stature and build, color of skin, hair, and eyes can easily be traced in families with pronounced traits. Intellectual ability or lack of ability is inherited as is abundantly demonstrated by the studies which have been made of such families as the "Jukes," "Zeros," "Kallikaks," "Dwellers in the Vale of Siddem," the Edwardses, and others. Characteristics of energy and vitality, of temper

¹West.—"The Immortal Conflict," School and Society, 8:31-35, 1918.
²Starch.—Educational Psychology, 94, 1918.

and temperament, of fundamental likes and dislikes are easily noticed in various family groups.

In addition to physical heredity we have the fact of social heredity brought about by the influence of the home and the immediate environment in which a person is raised. Innumerable customs and traditions are transmitted from one generation to another. Children unconsciously accept the social customs, the religious beliefs and ceremonies, the political and economic views, of their parents and of the neighborhood to which they belong.

There are a number of factors or conditions which are favorable to social heredity. The most important of these is isolation. This may be caused by geographical barriers, such as mountains or rivers, or by distance from other groups. It may also be caused by differences in language, social status, religion, political views, race, by clannishness, and by other conditions of group life. Lack of general education is another form of isolation. Ancestor worship, whether in the extreme form of some of the oriental nations or in the milder form of selecting none but old men for leading positions within the group, is an important factor in the transmission of customs and traditions. Peace and the absence of competition are favorable conditions. Where any or all of these factors or conditions prevail each succeeding generation will feel, think, and act like its predecessor.

Social heredity is operative not only in communities but also in occupational groups; in some more, in others less. The legal profession has in the past been remarkably dominated by precedent both in regard to principles and procedure. Some forms of religion are more conservative than others. Some trades follow ancient practices more than others.

What is the value, if any, of social heredity? Why should customs and traditions be respected? They serve for the group exactly the same purpose as habits do for the individual. They save both time and effort by making it unnecessary to invent a solution anew for each question that arises. They make for continuity and for stability in the group life. They carry forward the accumulated experience and wisdom of the past, and furnish a reliable foundation upon which each generation may in turn continue to build the temple of civilization.

As it is of great importance that we should think and act in harmony with the customs and traditions of our ancestors, so it is imperative that we should in the main think and act in harmony with our contemporaries. Effective thinking must show deference to conventionality. Common feelings, beliefs, and ideals constitute the very essence of group life. Conventionality forms the unwritten constitution of social life. He who fails to share in the "common" things of social life is essentially alone though he be surrounded by friends and neighbors; he is a hermit though he live in the center of a city. Whatever success he may attain will have the limitations of hermit life.

Through conventionality and imitation the majority of individuals within a group tend to adopt the views, ideals, and methods of the most successful members of that group. This tends to raise the imitators from mediocrity to the level of those who are more successful.

Conspicuous success in any line attracts attention and stimulates emulation. Wealth, education, social position, political success, business or professional success, ability to foresee events, eloquence, and skill as a writer invite the imitation of a large number of people. Rural districts imitate the towns and these in turn imitate the large cities.

Conventionality is not a thing to be disregarded or spurned. This is especially true in a democracy. It forms the "common sense" of the people and thus makes self-government possible. If there were no conventional beliefs, ideals, and methods of work a democracy would change into anarchy. Back of the laws which are truly the laws of the people, back of the institutions which are of and for the people are the common beliefs and ideals of the nation. He who desires to promote democracy must find these "common" things and build on them the better democracy of the morrow.

Conventionality makes possible the establishment of standards of achievement and behavior in all walks of life. These, in turn, make it possible for him who masters these standards and conforms to them to attain to a degree of achievement and self-expression far beyond that which can be attained by those who disregard the common standards. The reader can readily think of illustrations of this proposition by considering the requirements for success in his own line of work.

We are realizing to-day as never before how dependent we are on each other. "Society," says Burke, "is a partnership not only between those who are living, but between those who are living and those who are deadand those who are to be born," and the Bible tells us that "None of us liveth to himself, and no man dieth to himself." One of the final tests of efficient thinking is that it enables a person to live well with his fellowmen. This is the test which must be met by the industries of America to-day. We have quite successfully passed the tests for initiative, inventiveness, organizing ability, and salesmanship. We have only partially met the test of coöperation between capital, management, and labor; and we know that our industrial life will fall short of real success if we do not meet that test and meet it fully. It is the test which we must meet in our political life. We are realizing clearly how each individual within a group is dependent upon each other individual within that group and owes it, as a sacred duty, to adapt himself to the standards of his group. We are not realizing so well how each group within our nation is dependent on all the other groups and owes it, as a sacred duty, to adapt itself to the standards and needs of the nation as a whole.

Why do I place so much emphasis on the thoughts that are common to us all? This is the reason. We are prone to regard "common" opinions and ideals as being commonplace and uninteresting. As teachers we are in danger of looking upon teaching the "common" branches in the "common" schools as work that is without distinction. As a result our teaching lacks in enthusiasm and we ourselves become, as teachers, very ordinary. The "common" thoughts of mankind are the important thoughts. They have stood the test in the struggle for existence. People live by them. A teacher should regard himself as the custodian of the important "common"

thoughts of his people. When he trains his pupils to think and appreciate these thoughts he is doing no commonplace work.

A textbook in the "common" branches is a wonderful book. Just imagine for a moment that all the geographies were destroyed and that all the information contained in them was lost. Suppose mankind were to begin to-day to make its textbook in geography. Think of the amount of travel that would have to be done, the discoveries, the inventions that would have to be made. Think of all the work and the time it would take to write a geography of one county alone. How long would it take a person to travel over his own state, to make a map of it such as the one found in the school geography, and to describe the state as this book does? Think of what a task it would be to explore the United States: North America. Think of the hosts of men and women who have traveled on land and sea, who have explored far-off countries, who have gone into regions where no one lived but savages and wild animals, who have patiently and carefully gathered bit by bit the information which we have about the earth and the life upon it. When we study our geography we are receiving a part of the heritage accumulated by the labors of millions.

Think of the multiplication table for a moment. There must have been a time when it was unknown. Perhaps there was an inventor of the multiplication table. There ought to be a school holiday in his honor. Think of the amount of time and labor which this simple device saves in the commercial world even in one day. If it were collected it would make many holidays.

I doubt very much whether anyone can be a good teacher if he does not feel enthusiasm for these "common" thoughts of mankind as he finds them in the subjects which he teaches. They are the thoughts of the race winnowed and garnered from centuries of trial and error. To teach them in such a way that they seem to the pupil commonplace and uninteresting is a sacrilege.

What are the chief advantages of thinking as others

think?

1. It is the easiest way. Oh, yes, I know. We teachers always condemn "paths of least resistance," and advocate everything that is "hard" as if it had a virtue of its own. But if we are at all clever we perform our own work in the easiest way by which the desired results can be obtained. Nature always seems to follow the paths of least resistance.

"There is no more miserable human being," says James, "than the one in whom nothing is habitual but indecision and for whom the lighting of every cigar, the drinking of every cup. the time of rising and going to bed every day, and the beginning of every bit of work are subjects of express volitional deliberation." ¹

- 2. It is the quickest way, for it uses goods that are already produced and does not require the spending of time in gathering information and making tentative attempts that original thinking does.
- 3. It is the most efficient method for the individual of small or average talents, because it enables him to act on the thoughts of the best minds in his group. He can save himself from failure by adopting the plans of those

¹ James.—Talks to Teachers, 67.

who are more clever than he, or who have had access to information that he could not gather. His life is lifted by vicarious experience.

4. It is the most effective for the progress of the group.

"Every thinking being," says Smith, "is the result of social, as well as individual, work. World-conquering ideas do not spring full-grown from the brain of individual men. They are accretions from many sources, or genetic developments of a series of thinkers and workers. Great men merely form the crests of waves of advancement. The discovery of America was the outgrowth of an era of exploration and adventure, and must have taken place shortly if Columbus had never been born. A number of inventors, each building upon the success of his predecessor, were necessary to perfect the steam engine." ¹

5. It gives historical continuity and stability to our thinking. The thoughts which have sprung from the experiences of one individual, no matter how talented or experienced he may be, have but a small basis for their reliability when compared with the same thoughts after they have been adopted and verified in the lives of the people.

So important are the "common" beliefs, ideals, and activities of a people as factors in the development of that people, that prominent men have claimed that education should consist essentially in the transmission to the coming generation of the spiritual heritage of the race.

"It must mean," says President Butler, "a gradual adjustment to the spiritual possessions of the race, with a view to realizing one's own potentialities and to assisting in carrying

¹ Smith.—An Introduction to Educational Sociology, 170.

forward that complex of ideas, acts, and institutions which we call civilization. These spiritual possessions may be variously classified, but they certainly are at least fivefold. The child is entitled to his scientific inheritance, to his literary inheritance, to his æsthetic inheritance, to his institutional inheritance, and to his religious inheritance. Without them all he cannot become a truly educated or a truly cultivated man." 1

This whole argument seems to lead us into a pedagogy of long ago. If it is so important to share the beliefs, ideals, and activities of the group to which one belongs, then it must follow that teachers should regard it as their highest duty to convey to their pupils the various elements of the racial heritage. Teaching, in other words, ought to be a process of memorizing the accepted thoughts and of drill in the conventional practices of the group to which one belongs. How can this be harmonized with the ideal that the development of thinking is the most important aim of teaching?

What is the relation between thinking and memorizing? Are they processes that are essentially different and opposite, or are they complementary? In order to answer these questions let us take a concrete illustration. The Hahn-Lackey Geography Scale ² gives two kinds of questions, memory questions and thought questions. The following are examples of memory questions:

What is the capital of the United States? Name five wild animals. Name the five great lakes of North America.

Butler.—The Meaning of Education, 25.

Hahn-Lackey Geography Scale; State Normal School, Wayne,
Nebraska,

How will a pupil answer these questions? If the words, "Capital of the United States," have been in his experience regularly associated with the word "Washington," then he will promptly respond with that word without stopping to think about it. The readiness with which the response is made will be in proportion to the strength of the bonds or associations established, and these, in turn, will be in proportion to the vividness and frequency of the experiences by which the bonds or associations were established.

When the pupil is asked to name five wild animals, he may respond without thinking and give the names which first come to his mind. Ordinarily, however, this question is likely to call for some thinking. If more names come to the mind of the pupil than the question calls for, he must make a selection by determining whether they are the names of wild, semi-wild, or tame animals. In other words, such a memory answer may involve selective judgment. The problem of naming the five great lakes of North America may be solved thoughtlessly by naming the five great lakes between the United States and Canada, simply following the suggestion contained in the words "five great lakes." If the words "of North America" are prominent, and if the pupil knows the names of a considerable number of lakes, then the problem calls for comparison of the various lakes as to their relative size and may involve complex processes of thought.

Now consider the following thought questions from the same geography scale: Name four natural conditions favorable to the location of cities.

Give the principal reasons why Argentina is a progressive nation.

Why doesn't California grow much corn?

How will a pupil respond to these questions? He must first be able to recall some facts relative to the matter in question. If only one idea comes to mind and if the pupil replies by stating that idea, then his answer is clearly a memory answer. If more ideas come to his mind than the problem calls for, then he must exercise discrimination and determine which idea best meets the wishes of the questioner. In such a case the answer would involve thought.

Thinking is like remembering, in that it involves the recall by means of previously formed bonds or associations of ideas more or less relevant to the problem at hand. If the first idea that comes to mind does not seem to fit the case, we "stop to think," which means that we try to recall other ideas. If more ideas come to mind than we need, we select and use those which appear to be most applicable. Suppose a pupil be asked the question, "How many are seven times nine?" If his attention happens to center more on the seven than on the nine, he may recall the numbers 49, 42, 56. If his attention centers on the nine, he may recall 45, 54, 63. When he hesitates before answering the question, it means that he is trying to judge which number will satisfy the teacher. If his first answer is wrong, he decides to try one of the other numbers. After thorough drill this element of guessing is eliminated, and the pupil responds correctly "without thinking."

Ordinary discussions give excellent illustrations of the close relationship between remembering and thinking. Notice what usually happens. Someone makes an assertion to which another person takes exception. The party of the first part now calls to mind an idea which supports his contention and states it as a "point" in his favor. This calls up in the mind of the party of the second part ideas or facts which he proceeds to state as far as the first speaker will allow. Each "point" that is made becomes a stimulus which calls forth other "points." The discussion will be of high or low grade, according to whether the contestants are able to recall many or few ideas and whether or not they are able to exercise discrimination so as to inhibit the more irrelevant ones.

In summarizing what we have been trying to illustrate, we may say that ideas have two aspects, a past and a present. They come to us according to the laws of association. We inhibit them or use them according to their apparent fitness for our present needs. When we consider how ideas come to us, we call it remembering. When we consider how they are selected according to their fitness, we call it thinking. The process is all one, and the unconscious selection, due to the vividness of the first impression or to the frequency of repetitions, gradually shades into the conscious selection which is fully aware of the fitness or irrelevancy of an idea. No one can tell where the one ends and the other begins.

As a summary of the whole argument we may say that, as the efficiency of any business management depends on

the mastery and application of the accumulated experience in that business, so the efficiency of one's thinking in any field depends on the mastery and use of the accumulated thoughts in that field. Please note that I used the words mastery and use, and that I did not say that efficiency in thinking can be attained by merely repeating the thoughts of others. Mastery means discrimination. rejection of that which is irrelevant, immaterial, or unfounded. It means rearrangement according to the needs of the hour, and use in such a way as to obtain practical results.

#### THOUGHT EXERCISES

1. Professor Bagley says that habit is nine-tenths of life. Would it be true to say that habitual thoughts form ninetenths of the ordinary thinking in life?

2. Give examples to show how traditions serve as philosophy of life for the less educated members of society.

3. How are sayings and proverbs related to tradition?

4. What is the effect of war upon traditions?

5. What are the results of too much subservience to customs and traditions?

6. Compare the functions of conventionality in a democ-

racy with its functions in an autocracy.

7. What could a teacher do to develop in his pupils appreciation of such inventions as decimals? Dictionaries? Punctuation? Paragraphing? Mathematical formulas? Maps?

8. Someone has said that the person who is most original is also a great imitator. Do you agree? Can you improve on

the statement?

9. Should we differentiate between the truth of a statement and its value? Can you give an example of a statement which is true, but not valuable? Valuable, but not true?

10. In what ways should education alter a person's rela-

tions to customs and conventionalities?

- 11. The following questions are taken from the Hahn-Lackey Geography Scale. Some were classed as memory questions and some as thought questions. Can you tell which are which?
  - a. Name two things that plants must have to live.
  - b. In what direction would you go to reach Canada?
    c. Name an animal useful to man in desert countries.
  - d. To whom do the streets or roads belong?
  - e. Name a plant used for making cloth.
  - f. Name two kinds of work that men do in getting food for us.
    - g. Give two ways in which water gets away when it rains.
    - h. Where does the water in the well come from? 1
- 12. If the thought aspect of ideas depends on the selection and use of the ideas rather than on the way they came to us, what is the most important rule to follow in producing thought exercises?

¹ In the Scale, b, c, e, g are given as memory questions, and a, d, f, h as questions that "provoke thought."

## $\overline{\mathbf{VI}}$

# THE DEVELOPMENT OF INITIATIVE IN THINKING

Life for the individual, as for the group, is a constant struggle for freedom and self-expression. We are all the time in the bondage of our habits, which seize us with an ever tightening grip, as the years go by, and carry us inevitably into an old-fogyism of one sort or another. This bondage is very seductive in its nature! It promises ease, efficiency, and peace of mind. To think our habitual thoughts and to perform our accustomed duties in the accustomed ways, seems to be much more satisfying than to be forever adjusting ourselves to new conditions and new duties. Then, too, it seems extremely safe. One is not in danger of making mistakes, or of getting oneself talked about, or of being unable to defend one's conduct if it can be said that "he has always thought that way" or "he did just what he always has done in similar circumstances." In some way or other the thoughts and actions of yesterday have acquired a standing such that they are in no danger of being haled into court for trial.

The bondage or slavery against which a person has to struggle for his life as an individual, may be of many forms. Without attempting to enumerate them all, it may be worth while to call to mind those which are the most important.

- 1. Fears. Nearest to us perhaps is the tyranny of our own fears. According to Hall 1 the most common causes of fears are thunder and lightning, reptiles, wild and domestic animals, darkness, and strange persons. Every individual has a large number of fears which dominate him more or less. Pupils occasionally have such a fear of a large class that they are utterly unable to recite orally. Others may be afraid of the teacher, the superintendent, or of some pupil in the class who has a sarcastic tongue. Then there is the fear of failure which holds many, both young and old, in its grip; and for causing this fear, some teachers will need to wear sackcloth and ashes for a long time. The fear of examinations and of low marks is supposed to be a very salutary fear. However, it has always seemed to me that it fails to grip those pupils who need it the most, and that it causes harm to those who are generally inclined to worry about their work.
- 2. Monotony. The adult for whom life has settled down to a dull repetition both of work and pleasure immediately recognizes monotony as one of the most oppressive forms of slavery against which he has to struggle. Men and women who are caught by it attempt to escape by seeking adventure, and are willing to risk health, wealth, and reputation in order to get rid of the deadening feeling. So powerful can monotony become that the individual sometimes sees no possibility of escape from it and in despair commits suicide. And such a monotony is not necessarily one of pain or hard work or

¹ Hall.—"A Study of Fears," American Journal of Psychology, VIII, 148-249 (1897).

solitude. It may be one of wealth, luxury, or of a continuous round of pleasure.

Is this a slavery of adults only? To one who has forgotten his own childhood and who gets his impressions of children merely from casual observations of their games, it may seem so. However, there is an abundant literature to show that children are frequently subject to feelings of monotony and boredom. Much of the irritability of little children during bad weather is due to the fact that they can think of nothing to do, and that they become almost desperate on account of the monotony before them. And we teachers may as well admit that a whole school day may loom up before a little boy as such an accumulation of sameness and boredom that he really feels sick to think of it. I cannot help but sympathize a little when I hear a youngster plaintively tell his mother in the morning before going to school that he is not feeling very well. I can sympathize, too, with the boy who, when he thinks of the eight or nine months of school ahead of him with nothing but lessons—lessons —lessons, wishes that the schoolhouse might burn down or that the teacher might get sick; yes, and with the boy who, when spring calls him to freedom and adventure, skips school and goes a-fishing. But, of course, I do not mean that we should turn school into a circus—even that would become monotonous. I do mean that we should attempt to understand and genuinely sympathize with our pupils when the lonely feeling crowds in upon them and life seems dull and gray. Many children come from homes or live in surroundings that are full of deadly monotony. There is no one to show them interesting

things to do or to tell them about the stirring and inspiring adventures of life—except the teacher.

3. Drudgery. The type of slavery commonly termed drudgery may be brought about by many causes. It may be due to lack of that skill through which a person can feel himself a master of his work and without which all tasks become tiresome and disagreeable. It may be caused by insufficient compensation, either in the form of money or in appreciation. It may come from the fact that the work gives no opportunity for inventiveness or change; for thought, in other words.

Here again we must guard ourselves against the belief that it is only adults that are sufferers. Home and school tasks may constitute a real drudgery for children. When a teacher assigns a lesson without showing the pupil the value of that lesson, without giving him sufficient directions how to proceed to master it, and without stimulating him to contribute something of his own thought, learning will become nothing but plain drudgery and the spirited pupil must be expected to try to escape it if he can. And this drudgery is not limited to any particular type of school or class. A university professor some years ago made drudgery of a whole term's work in college algebra for his students. His assignments took the form of "Take the next — problems." The recitation took the form of "You may go to the board." Problems were given out and conscientiously worked, or copied from the books which some students surreptitiously carried under their coats. The professor adjusted his glasses and wrote 0's or 5's or 10's in his class work. Not once during the whole term did he try to lift the task of learning algebra from dull drudgery to enthusiastic and spirited work. Yet, I suppose he received his check regularly at the end of each month. If the students could have had their way, he would have received a different kind of a check.

4. Superstitions. Sometimes we speak as if superstition were a characteristic of the ancient and middle ages only. We fail to recognize our own superstitions or those of the group to which we belong because they appear to us to be entirely sane and well-founded beliefs. Professor Dresslar 1 secured from eight hundred and seventy-five normal-school students in California statements of 3225 beliefs that were distinctly superstitious. When young people of the intelligence represented by normal-school students entertain so many superstitions, it is not surprising to find that children coming from homes of the less intelligent are dominated by all sorts of curious and unfounded beliefs and notions. Children in the grades come to school with weird tales of warnings of sickness or death. They tell of signs and wonders in the sky, of strange lights. There is implicit faith in fortune tellers, luck, mascots, mediums, clairvoyants, quacks, patent medicines, water witching and the like.

Even the most intelligent and well-educated persons are affected by many curious beliefs. They may be careful and critical students in their own field and at the same time be exceedingly gullible in other fields. A person, who works in a laboratory with machines that never exercise any intention to deceive him, may get into a general attitude of childlike trust toward his environ-

¹ Dresslar.—Superstition and Education.

ment to such an extent that he becomes an "easy mark" for the sellers of "gold bricks." He assumes that agents are as honest as laboratory machinery.

- 5. Customs and traditions. A custom is a certain established way of doing a thing, and a tradition is a certain established way of thinking about something. They both represent the domination over a generation by its ancestors. Practically all our social ceremonies have been impressed on us by our parents, and accepted by us without question as to why they should be retained. Now, while it is true that customs and traditions are absolutely necessary for the continuity and stability of civilization and culture, it is equally true that blind subserviance to customs and traditions constitutes a repressing slavery for the individual.
- 6. Conventionality. The uncritical imitation of contemporaries produces conventionality. Here the same thing may be said that was stated with regard to customs and traditions. The individual who is to attain the largest amount of freedom and self-expression must take due cognizance of the conventionalities of the group to which he belongs; but he must not be a slave to them. He must master them and use them in order to accomplish the work which he wishes to perform.
- 7. The slavery to rules, sayings, and proverbs. It seems very convenient whenever anything a little unusual happens to be able to quote some appropriate rule or saying, but this indicates, nevertheless, a certain bondage of the mind. The citing of rules is a method of avoiding direct personal reaction to a situation. It is an attempt to have the experience of someone else take the place of

one's own. It means that we attempt to settle questions of to-day by the rules of yesterday, when the real issue may be caused by the changed conditions which make old rules obsolete. The enslaving nature of rules and sayings is clearly noticed when one meets a person who has become an expert in the practice and who attempts to settle all problems by memorized rules. The custom stifles initiative and thought.

8. The subjection to authority and to books. The uncritical acceptance of authority shows itself most clearly in cases where a person has gained a reputation in some special field, or has become noted by some public service. Thoughtless people at once accept such a one as an authority in all fields and on all problems. If the person concerned loves the limelight, he will proceed to issue interviews and statements on any question brought to his mind and thus, himself, become a slave to the belief in his own authority. Noted politicians issue opinions concerning questions in education or religion, preachers lecture on problems in biology, and schoolmasters express their opinions on any matter whatever that may be brought to their attention. When a person has adopted a certain authority as his special favorite, it prevents him from giving due weight to the opinions of other investigators and, what is still worse, it prevents him from thinking for himself. He becomes nothing but the echo of his authority.

The slavery to books is but another form of the slavery to authority. It shows itself in the belief that all learning or education necessarily comes from books, and in a distrust of, and a lack of appreciation for, all learning that has sprung from direct experience with things. Scholarship to the great majority of people means the ability to repeat what is found in books. With some it is so narrow as to mean the ability to read or repeat what is found in certain books or parts of books. It is not long ago that it was believed by many—and it is believed at the present time by some—that to be educated meant the ability to read portions of certain Greek and Latin authors in the original, and that persons who were unable to do this could not be said to be educated, no matter how wide their experience or how efficient their work. Valuable as books are for extending one's information, the chief danger in their use lies in the fact that they tend to make the reader satisfied with information that is second-hand, and that they make it possible, whenever a problem arises, for him to "read up on it" in place of giving it vigorous personal thought.

9. The slavery to details. This is caused by the lack of ability to organize and systematize one's work and to delegate it to others. It may be found in all vocations and among all classes of people. Men and women run to and fro, distracted by the large number of things which demand their attention. If it is suggested to them that some of their work might very well be done by hired help, they wring their hands in despair and claim that no one else knows, as they themselves do, exactly what needs to be done, and that no one else can do the work as it ought to be done, forgetting that some day they will be dead and that their work, if it is worth doing, must then be cared for by others.

A considerable number of teachers suffer under this

form of slavery. They are as a rule exceedingly conscientious about their work—too conscientious in fact. They are so concerned about having everything done "just so," that it never occurs to them to let the pupils do things. The result is that the pupils fail to get the training which they are entitled to, and the teachers get nervous prostration.

Once in a while pupils suffer from this slavery. A conscientious child-usually a girl-comes home excited and nervous, complaining that she has too much to do. The teachers have assigned "awful" lessons; there is to be a quiz; furthermore she is to play or read at the general assembly to-morrow, and in addition she has to find a frog and a centipede.

We have all had more or less of this experience. We have felt our nerves give way under excitement and irritation, because of the many demands upon us. The word slavery is too mild a term. It is tyranny, this distracting multitudinousness of things and duties.

How common are these forms of slavery in ordinary daily life? Do you know of any business men who have been only partially successful, or who have failed in their business because they fell into a rut of their own habits, were blind followers of custom and conventionality, depended too much or too little on others, failed to organize and master their business and thus lost their own power of initiative and creativeness? Do you know of any teachers who have failed to attain the success for which their friends and neighbors, who knew their talents, had hoped? To what forms of slavery did they fall as victims? Did they lose their self-confidence and capitulate

to the fear of failure? Did they become the servants of rules and precedents? Did they turn into book-worms and citers of authorities and so lose the soul of education, the first-hand contact with real problems? Call the roll of the common vocations of men and women. Why is it that so many of those who possess excellent native ability remain in the obscurity of mediocrity and fail to make any notable contributions to the welfare of their fellowmen?

This is the answer. He who is unable to think independently, and who lacks initiative and creativeness, cannot overcome the forces and conditions which tend to enslave him and can never achieve anything more than mediocrity. Leadership requires the attainment of personal freedom and the ability to think and act, not only differently than others, but also better.

This brings us face to face with a very important problem. How can initiative be developed? What can we do to cultivate it in our pupils?

First let us recall the fundamental principle that it can be accomplished only through practice on the part of the pupils. We must begin by letting them think for themselves and by allowing them to initiate things. This is a trite saying, but every teacher who is anxious to promote the welfare of his pupils is so often tempted to try to do it by thinking and doing things for them, that he must continually remind himself that his purpose cannot be accomplished in that way.

The second rule or principle is even more commonplace. Let the pupils begin by practicing those forms of initiative which they naturally incline to and like. Are there any such? Curiosity is perhaps the earliest form of initiative to manifest itself in the individual. Little children are naturally full of curiosity and wonder, and as a result ask innumerable questions. Why not begin by utilizing this important instinct or talent?

"But," someone may say, "that would mean to let the pupils have entire freedom to ask all the silly questions they please, and the result would be that they would waste time and that they would try to get their information by asking questions in place of studying their lessons. Children come to school for the purpose of learning to answer questions, not to ask them." Let it be granted that there will be some silly questions asked. That does not imply, however, that the pupils shall be allowed to continue asking such questions. They must develop the ability to distinguish between useless and useful questions. How can that be done?

If the task was merely that of taking a thousand questions and separating them into two or more groups according to their amount of sense or degree of usefulness, it could be done very readily by the teacher. But that is not the task at all. The real problem is so to develop our pupils that they will be able to determine the values of questions when there is no teacher to guide them. Let us suggest one or two practical methods, bearing in mind that there are two chief purposes to be accomplished: (1) Pupils must be trained to ask questions freely. (2) They must be trained to evaluate their questions.

Suppose a class in geography has had a brief introductory lesson on the Erie Canal, with the principal purpose of motivating questions and further study. Suppose further that the next assignment is made by suggesting that each pupil shall bring to the next recitation period as many questions as he can think of about the canal. If competition is desired in order to stimulate greater effort, a simple record can be provided to show the achievement of each pupil. The object is to get questions, wise or foolish. A foolish question is much better than no question at all. Pupils whose minds refuse to work should be aided by suggestions which will enable them to get started. Get *every* pupil to ask some questions.

When the class meets again a record is made of the number of questions presented by each pupil, preferably in the form of a table on the blackboard. Care should be taken to commend the efforts of the less successful and to stimulate them with ambition to improve. A profitable discussion may be secured by getting the pupils who thought of many questions to tell how they did it, and by letting the class enter into a committee session on how to think of questions about the Erie Canal.

The next problem is that of evaluating the questions that have been presented. The easiest method would be for the teacher to grade them. The better way is to let the pupils evaluate the questions. How? First make a list of all the questions that have been asked and, by a checkmark, indicate how many pupils asked each question. This will produce an excellent exercise in interpretation. Two questions may be worded quite differently and yet mean the same thing.

When the questions have been listed, the number of checkmarks after each one will serve as a rough measure

of the importance of that question. Those questions which have been asked by the largest number of pupils may be assumed to be, for the pupils in that class, the most important; that is, they represent the consensus of "common sense" of the class. Any pupil should have the right to propose a rearrangement in the ranking of the questions by suggesting that some specific question be considered of more significance than some other. This will naturally lead to a spirited debate which, if guided, should result in some insight into the purposes of questions and their general characteristics. If a pupil is able to convince the class, the ranking of the questions is changed according to his suggestion. Final judgment concerning the quality of the questions should be reserved until their answers have been found.

The next assignment should consist in finding answers to the questions that have been asked. These answers and a general discussion will constitute the next recitation, at the end of which the questions are given another rating. It may now appear that some question, which was not rated very highly the first time, has proven a very profitable one by bringing out valuable and interesting information. It may happen that a question which was rated highly turned out to be quite unimportant. It may be that valuable information has been presented about which no question had been asked. A guided general discussion should bring out any such points before the final vote is taken as to which questions really proved the most valuable in regard to the topic at hand.

When the study of a topic has been completed, the lists of questions which have been submitted on the various subtopics should be examined by the pupils, and a selection made for a final review of the whole topic. This gives opportunity for a new evaluation by bringing out the importance of questions that call for reorganization of the material, comparisons, and applications.

What are some of the specific values which may be claimed for this general method of stimulating and evaluating questions? (1) It calls for initiative on the part of every pupil. (2) It makes it possible for the teacher to study each pupil and to give him such individual attention as he needs. (3) It furnishes materials and motives for vigorous class discussion, because each pupil will feel an interest in defending his own questions. (4) It affords excellent opportunity for the cultivation of analysis and interpretation, as well as in classification of the questions. (5) It requires the exercise of judgment of relative values of the questions. (6) It gives practice in the suspension of judgment and in revision of one's first impression. (7) It gives practice in group thinking and in the producing of a consensus of opinion, in influencing such opinion and in submitting to it when formed. (8) It gives the pupils an opportunity to determine for themselves whether a given fact is relevant or irrelevant, valuable or simply a matter of idle curiosity.

The method proposed may be varied in a great many ways. The assignment may call for a definite number of questions from each pupil, thus compelling those with less initiative to exert themselves. Those who cannot think of questions readily should be encouraged to come to the teacher for suggestions, and the teacher should show them how to get started. The individual reports

of questions may be turned over to a committee to be tabulated and reported upon at the time of the recitation. This gives opportunity for committee work, of which there should be much more than there is in the ordinary school. A score card for questions can be developed and the questions evaluated accordingly.

With the training in asking and evaluating questions should go some instruction in best ways and means for finding answers to the questions. The lists of questions, or a selected number, may be used for the general review of a topic or of a whole subject. Recitations may occasionally be conducted in the form of a group quiz, in which some pupil selected for the purpose puts the questions to the other pupils. In this way a recitation can secure some of the good results obtained by students who come together and quiz each other before the examination. A simple score can easily be kept to show the record of each participant.

Do not require that a pupil who asks a question shall himself know the answer. The main purpose of questions in school should be, as it is outside of school, to gain information. It should not be to find out whether another person knows what we know. In one way it is probably one of the severest criticisms that can be passed on our teaching and on the management of our schools, that real questions for information are so rare and that the inquisitive cross-questioning to find out whether someone else knows what we know is so common. What a stimulating thing it would be if the teacher did not know before asking what the answer should be but really asked a pupil for information. Just imagine for a moment a school in which the teacher does not know very much but has a fine ability to ask for information and to arouse genuine questions in the minds of the pupils so that it keeps both him and the pupils busy trying to find out what they want to know. I suppose the reader will feel, as I do, that "It can't be done," but it should be possible occasionally in any school, especially at the opening of school in the fall, when even the teachers have forgotten something of all that they know.

Somewhere I have heard it suggested, that to retain the sense of curiosity and wonder is the best antidote for mental old age. It appeals to me as a very reasonable idea. I have seen fine old grandpas and grandmas who were genuinely curious about the new and important developments in the world about them. They seemed to me youngsters compared with other people that I have seen, who are ready to lecture on any topic that may be suggested and whose students fill notebooks with information about which they care not a fig—after the term examinations have been passed.

But is there not some danger that in developing the ability to ask questions we may foster an attitude of general skepticism which is essentially negative and non-productive? Decidedly not, provided we keep to our first aim, that of developing the ability to ask for information and to evaluate the questions. The skeptic does not, as a rule, ask for information, neither does he stop to consider whether his questions are profitable. What I have had in mind is the attitude of the scientific inquirer after reliable and important information.

It is true, however, that it may at times be embarrass-

ing for us grown-ups to have the children feel free to ask questions about anything that they wish to know. We all seem to know so much that is not so, that we are in constant danger of being caught bluffing. Then, too, we hate to admit that we do not know a very great deal indeed. Of course, if we stop to consider the number of fields of information about which we are wholly ignorant, it should not embarrass us very much to say in response to a question, "I do not know, but I should like to find out." And it would not embarrass us at all, if it were not for the fact that, in our youth, we had some teachers who made us feel ashamed whenever we did not succeed in hiding our ignorance when they asked us questions or whenever we became ventursome enough to ask about things that we did not understand. Now we do to our pupils what our teachers did to us; do it because we are the slaves of custom and tradition and are unable to break the bonds that hold us. Yet we agree that in a first class school no child should ever feel ashamed to ask for information or of admitting his ignorance whenever he lacks information.

If I could start as a boy again and have everything that I would like, I should want to have among my teachers one who was delightfully ignorant of everything and intensely curious to learn.

This discussion has emphasized the development of genuine curiosity and the ability to ask intelligent questions, because they constitute the basis of initiative. The reader will understand that exercises, such as those which have been described, are intended merely as suggestions of the type of work which should be done whenever suitable occasions present themselves. There are other forms of initiative; such as imagination, problem solving, organization and development of plans. These will be discussed in succeeding chapters.

#### THOUGHT EXERCISES

1. Make a list of the things of which your pupils are afraid. Classify the fears as helpful or objectionable. How can you remove or change the objectionable fears?

2. Make a list of situations or conditions that you regard as monotonous. What remedies have you against monotony?

What remedies do you use in your school?

3. Make a list of what you consider cases of drudgery?

How could they be relieved?

4. Make a list of the methods which you are employing for teaching a specific subject. How many of them have been adopted through uncritical imitation and without any evaluation of their practical utility as compared with other methods that might be used?

5. Make a list of things usually done by the teacher which in your school could well be done by the pupils, provided they

received some training for such work.

6. On a convenient score sheet keep a record of the number of questions asked by the pupils of your school during one day. What classes are productive of the largest number of

questions? The smallest? Why?

7. Professor Swift 1 reports that in a study of eminent men and women he discovered more than fifty who were considered stupid by their teachers. Do you think teachers would make such mistakes if they encouraged and valued questions by the pupils?

8. In what ways do the Boy Scout activities tend to liberate

the minds of boys?

9. Make a list of the questions that have been started by the World War. How do such questions tend to liberate the minds of people?

¹ Swift.—Mind in the Making, Ch. I.

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10. Do you think, from your knowledge of history, that this would be a true statement: Progress in any activity begins through the occurrence and formulation of new questions in regard to that activity?

#### VII

# THE DEVELOPMENT OF IMAGINATIVE THINKING

In the preceding chapter I attempted to show that one of the purposes of education is to liberate the individual mind from the various forms of slavery which hold it. The development of ability to ask profitable questions is the first step in this liberation. Imaginative thinking constitutes another important step, and to the consideration of this topic we shall now devote ourselves. What do we mean by imaginative thinking? Of what importance is such thinking in daily life? What place, if any, has it had or does it have in our schools? How may such thinking be developed? These are some of the questions to be answered.

First, what do we mean by imaginative thinking? Textbooks in psychology written some years ago had separate chapters on memory and on imagination. Recently there appears to be a tendency to merge the two topics into one and to account for the processes involved by the same explanation; namely, that they are brought about according to the laws of association.

From the standpoint of thinking there is a distinct difference between the two processes. If a person tries to recall the events of yesterday's automobile ride, the chief interest is turned toward the past and an effort is made to recall the events as they actually happened. In other words, the reliability of a person's memory is demonstrated by his ability to tell "the whole truth and nothing but the truth." Suppose, now, that we try to imagine a new sort of a ride. It will be true that the materials used consist of previous experiences or bits of experiences. but the chief aim will not be to reproduce the past; on the contrary, it will be to avoid reproducing the past. The ability of an individual to exercise imagination is shown, not by reproducing the past, but by producing new combinations and reconstructions to satisfy some present or future want or aim. Because of this forward look, imagination is here regarded as a form of thinking. If it differs from some other types of thinking, it is merely in the specific purpose which is sought or in the amount of careful verification employed.

An exercise or two will make more clear what I have been trying to say. Take pencil and paper and in two minutes write as many words as you can to rhyme with the word tarry. You will find it interesting to compare your results with the following lists produced by two college students: A. Tarry, ferry, airy, berry, bury, Cary, dairy, fairy, Gary, Gerry, Harry, hairy, Jerry, Larry, Sary, very, wary, Rosemary, Tipperary, alimentary, elementary, fragmentary. B. Harry, carry, bury, dairy, quarry, scary, flarry, dare he, care he (square it, dare it). This exercise so closely resembles that of trying to recall names of persons or places or the equivalents of words in a foreign language that one may, at the first thought, conclude that they are identical. On closer examination, however, the difference becomes quite clear.

The exercise called for no reproduction of a past experience. It did call for the use of bits of past experience in a new way, and the excellence of the performance cannot be measured by any reference to the past. A person might conceivably produce a series of words that would make very imperfect rhymes or no rhymes at all. The process of recall according to the laws of association would be the same as in all recall of past experiences, and, as far as the past is concerned, might be entirely trustworthy. The point is, that what may be perfectly good recall, in so far as the past is concerned, may be very poor imagination, in so far as satisfying present needs is concerned. Incidentally, it is interesting to note how differently the minds of the two students worked. After recalling the word ferry, student A evidently went through the alphabet in a systematic search for suitable words. Student B went hit or miss. The number of words produced by each individual indicates sufficiently the relative merits of the two methods.

Now try this exercise: Take your pencil and paper and in three minutes write as many similes as you can for "Two friends walking together." To illustrate: They are like a well-matched team, They are like Jonathan and David. Here, too, it will be noticed that the aim is not that of reproducing part or all of any previous experience. It is rather that of using bits of past experience in a new combination. The main difference between this exercise and the former one is that in this one the associations or bonds by which recall is made are more vague and uncertain and, consequently, one has to wait longer for each idea to occur.

Next try this exercise, which I am sure you will enjoy very much: Draw a picture of an animal such as no person has ever seen. Figure 3 gives samples of some of the best drawings that I have secured from college students.

Two things stand out quite clearly as a result of these exercises. First, that imaginative thinking depends for its content on memory material and that recall operates according to the laws of association. A person's ability to imagine things is therefore dependent on his fund of available memories, and the productions of different individuals will differ according to the previous experiences of those individuals. Second, that imaginative thinking also depends on a want to be satisfied or an aim to be attained. Since this aim is the production of something new and not a reproduction of a past experience, the process is essentially one of thought rather than of memory.

Newspaper and magazine cartoons make fine material for the study of imaginative thinking. If one gathers a number of them and studies them for the purpose of discovering what the cartoonist really has done, some of the more common forms of imaginative thinking will stand out very clearly. One notices, first of all, the rather common method of magnifying or minifying things or parts of things. There are figures with enlarged heads, noses, mouths, teeth, hands, feet, and chests. There are diminutive bodies with large heads or diminutive heads with large bodies. There are small animals with large riders. There are tiny vehicles drawn by diminutive mice and containing diminutive princes and princesses.



Another method consists in separating things into parts and combining the parts into new wholes. Cartoonists are evidently very skillful in concentrating their attention on specific aspects of things or situations and in disregarding all the rest. This enables them to picture with a few strokes what they want to convey. This ability to separate and re-combine produces an endless variety of cartoons. Heads of persons appear on the bodies of animals, or branches of trees, or stalks of corn. A new racing animal is made up of the forepart of a horse and the tail of a rooster. New kinds of faces are constructed by using the beak of an eagle for a nose, or weeds for hair.

Whether these processes are due to a tendency of memories to fuse, disintegrate, or lose their original spatial and time relations, and whether such changes occur naturally to a larger extent in the minds of imaginative persons than in the minds of others is of little consequence to the teacher. The main question is whether the ability to do imaginative thinking can be developed by practice and whether the results are such as to be worth the practice. This raises the problem concerning the value of such thinking in the affairs of daily life.

Perhaps the first thought which occurs to us as we consider this problem is that of fairy stories and myths such as we learned in our childhood. We are inclined to regard these as having merely an entertainment value not to be compared with the real and substantial things of life. But myths and fairy stories were once the only explanations which people had for the various phenomena of nature and served the same purpose as science and philosophy do for us. To believe that the winds were the breath of giants, no doubt satisfied the minds of people in primitive times quite as well as the chapter on winds in our modern geographies satisfies the minds of our pupils. Perhaps many of the explanations which now appear entirely satisfactory to us will seem like fairy stories and myths to people who will go to school a thousand years from now.

Then perhaps we shall think of all the literature in all languages, distinguished from other printed matter mainly by the elements of imaginative thought which it contains and through which it interprets and reconstructs human life and pictures its ideals. Also there are all the productions of fine art which are distinguished from other productions by the same elements.

Next we think of all the inventions and discoveries that have been made because men had the ability to break away from mere reproduction of the past and to picture to themselves places and conditions different from those which they had seen before. Then, too, there are all the scientific discoveries that have been made possible by the ability of investigators to formulate hypotheses, or tentative explanations, many of which at first seemed as fanciful as fairy stories and myths.

We must also consider all the plans and forms of organization and operation in the industrial and commercial world, all of which have been developed bit by bit through the ability of individuals to break up and reconstruct their previous experience into forms differing from the things and methods of the past.

Last, but not least, let us think of the hosts of men and women on farms, in stores, in shops, in professions,

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and in occupations of unskilled labor, who are struggling with all manner of inconveniences in the ordinary drudgery of everyday life. Some are able to picture to themselves new and more convenient arrangements to save labor and diminish the annoyances of their work. The majority can think of to-morrow merely as a repetition of to-day. For them whatever was and is, forever shall be. Who has not seen families living under conditions so inconvenient and annoying that it is a marvel to behold, where just a little imaginative thought and reconstruction would have transformed the situation altogether.

In thinking of these various phases of life, we do well to bear in mind that the advance made in any department of life, while in a measure due to the genius of certain individuals, does represent, too, the contributions of a multitude of ordinary men and women who, each in their own place, conceived new aims and ideals and thought out ways and means not previously known.

Summing it all up, it looks as if this world would be a lonesome and troublous place if it were not for the ability which we have to think of new things and to tell the story of life, not according to the formula: "the truth and nothing but the truth," but rather to this,—"the old things are passed away; behold they are become new."

Imaginative thinking seems to play a very important part in the affairs of everyday life. Does it occupy an equally important place in the work of our schools? If we were to make a tour of visits to a number of ordinary rural and city schools, and if we were to spend one hundred hours in actual observation of school work, how much of that time could we expect to find devoted to the

development of imaginative thought? If the teachers whose rooms we might visit wished to have their pupils make a good showing—and they ought to wish that—what would they do? Would not the majority of them show us how well the pupils had mastered something or other which had been memorized?

Now we must be fair in this matter. We should no doubt come to some schools where the teacher and the pupils would be anxious to show us some project on which they were working, something which they had thought out and planned and in the accomplishment of which they were intensely interested. We should find inventions and schemes revealing the talents of genius. In the majority of schools, however, we should find the humdrum of memorizing and drill, of preparation for recitations and quizzes and examinations in which practically every question would be a memory question.

However, conditions might not be quite so dull as they seem. Even in the most prosy school we should find a good deal of imaginative thinking. Pupils who apparently are studying their lessons very seriously may be busily engaged in thinking out plans and schemes for a fishing trip, for harnessing the dog or the goat to the express wagon, for putting a yoke on two calves, for making a ski jump, or for a new method of playing a joke on the teacher. Notes keep diplomatic relations alive between the creative minds, and the sparkling eyes reveal to the experienced observer that, although the school looks prosy in its outward demeanor, there is much of the creative joy of the true artist inside some of the heads.

Now, some visitors would call such things the signs

of mischief and suggest that reproof should be administered. Not so. Mischief in school is merely a symptom which shows that the children have active minds and creative talent, and that the teacher has been unable to interest them in the real work of the school.

Should the teachers in such schools be reproved? No. They may be as anxious to escape the humdrum of the school as their pupils, and they would escape if they knew how. Some of them would quit teaching if they could think of something else that they would like to do. They are to be pitied rather than reproved, for they have been taught as they now teach. If their minds ever had wings for vigorous flight, they were clipped by the deadening influence of routine, and now they are unable to rise above the commonplace drudgery of their work.

Well, then, let us give them a few suggestions to show what they might do in their schools. Have you ever tried to suggest projects to a person who can think only of what has been and is, and not of what might be? What will such a teacher do? When you have gone he may, even if he seemed quite enthusiastic about your idea, gradually lose that enthusiasm and decide to let the suggestion go, as it would upset things to put it into operation. Or, and this is more likely to happen, he may decide to follow the suggestion, but he will do nothing more than follow. He will try to use the suggestion as if it were a prescription, and as soon as something happens which was not mentioned in the original suggestion, he will be unable to think of what to do next and conclude that the whole plan was impracticable.

The difficulty in which such teachers are is not so much

the present lack of plans for something to do; it is rather the lack of ability to conceive plans. To make suggestions to them is like hanging apples on a tree that does not bear apples. This is the principal reason why superintendents make so few suggestions to their teachers.

At times there is another reason. The superintendent may himself be suffering from the results of his training and he may find it hard work to think of something to suggest.

What I have been trying to say, but am afraid I have not yet made clear, is that we should blame no individual for this lack of ingenuity or inventiveness on the part of teachers or pupils. It is a condition which we have received from those who were before us and which they in turn received from their forbears. That does not mean, however, that we should now be satisfied with things as they are. The situation, if we meet it properly, can itself be our opportunity for exercising ingenuity. In other words, the lack of imaginative thought in our schools is itself a real problem for imaginative thinking.

What can be done to give imaginative thinking the prominent place in our schools which it requires for success in daily life? First of all we must become thoroughly aware of its real importance. More than that, we must become so enthusiastic and zealous about this thing that we shall insist on promoting it. How can we attain such an enthusiasm? By a deeper and more appreciative study of real life. We must read and think more about the creative minds which have made possible the great achievements of the race in inventions and discoveries, in science, literature, art, and religion, in in-

stitutions and government. We must consider more than we have the importance of the smaller successes in our immediate surroundings. It must become a hobby with us to look for successful creative work, and to study the means and methods by which it is achieved.

In the next place we must cultivate more enthusiasm for the imaginative thinking which our pupils do outside the regular work of the school. We must secure their confidence to such an extent that whenever anyone of them thinks of something to do or of some scheme for accomplishing something, he will have no hesitation about telling it to the teacher, knowing that the teacher will understand and be interested. Progressive factories and business establishments have systems by which they offer prizes for suggestions from their employees. Schools ought to have plans for encouraging suggestions from their pupils. Part of the credit in any subject might well be earned by thinking of useful things to do and of wavs and means for accomplishing them. If a pupil happens to think of a plan or a scheme which does not seem to be profitable at the time, he should not be discouraged but should be aided to think more carefully and to amend his plan so as to make it fit the needs of the school.

Would this include schemes for mischief? Yes, why not? Mischief is entertainment. The main difficulty with it is that it does not fit into the regular routine of the school. But entertainment in the form of harmless enjoyment is a very important element of life. The biggest salaries paid to-day go to those who are clever at inventing entertainment. Some of the most popular books are stories of mischief and fun—and observe—

people of all classes enjoy reading them. Look at the man who has just bought a newspaper. First he glances at the headlines on the front page, then he turns to the last page to look at the cartoons and to read the things that are funny.

If fun is of such importance in daily life, should it not have a place in our schools? We have made no provision for it in the ordinary school program; consequently, whenever a pupil gets an idea of some good fun, an idea so vigorous that he must tell it to somebody and promote it, he can do so only by becoming a culprit in the eyes of the teacher. If a pupil has real genius for inventing fun he is expelled from school and later may earn a salary of several hundred thousand dollars a year just by thinking of funny things.

What I am driving at is this. Our school program should give recognition to harmless enjoyment as an essential part of education, and encourage the pupils to think of ways and means for having a good time. Some schools are already doing this very thing by dividing the school day between study, work with the hands, and play; all recognized as essential elements in a child's education.

It may be claimed that children have always played during recess and noon intermissions. Anyone who has seen children at play on the school ground must admit, however, that such play represents only a part of the skill which children should develop for having good wholesome fun. There is little or no opportunity for inventiveness for the simple reason that there is nothing to work with. And some of the modern apparatus for playgrounds isn't much of an improvement. There are

swings and poles and ladders; but they are all fixed and complete and one cannot "do anything" with them. They are like the multiplication table to be accepted as they are. A plaything or play apparatus to develop ingenuity and creativeness must be such that the child can manipulate it and change it to suit the needs of the moment.

I have never seen, but I should like to see, a recitation -no, it hardly seems proper to call it a recitation-I should like to see a "period of fun" on the program of our schools. It should be a period when all schemes for enjoyment would be welcomed, tried, evaluated, adapted, improved. Ability to invent good fun should be valued as highly as ability to recite in the school subjects.

Fifteen or twenty years ago institute conductors had much to say about observation and sense training. Such questions as "How many upper teeth has a cow?" "On what side of the horns are the ears?" "Does a cow get up with her front feet first?" greatly embarrassed the teachers. They did not think of asking questions in return; but if they had inquired of the professor as to the number of evelets in his shoes, buttonholes on his vest, buttons on his coat, or length of his necktie, their humiliation would have vanished. We used to think that the inability to answer such trivial questions was evidence of a defect in our "power of observation," whatever that might be. We also thought that by going about and trying to see and hear things our "power of observation" would be improved.

Since that time things have changed very much. Eye and ear tests, as well as tests of some of the other senses, have become common in our schools. Observation work is conducted, not for the purpose of strengthening some "power of observation," but for the sake of supplying experience concerning things of vital interest. Granting the possession of a reasonably good eye, the ability to see depends on the fund of experience which one possesses concerning the thing seen. Seeing is interpreting.

A girl who had been blind from birth and who had been educated in the State School for the Blind and there received a high school education, obtained her sight by a successful operation when she was twenty-one years old. Three years later she was examined by Professor Miner.¹ He found that she had not yet learned to translate successfully her visual images into terms of movement. She did not identify people by their faces, but recognized them mainly by the sound of their voices. New things were explained by reference to her sightless experience. Shadows seemed like real objects to her. She could not perceive distances correctly and frequently upset dishes on the table. In other words, while her eyes could see, she could not interpret or understand what she saw because she lacked the required experience.

Training in observation means getting interested in some problem or project, letting one's curiosity have free play, getting direct information in answer to the questions in mind, and weaving the information together into a group of ideas, so that, whenever similar problems arise, the whole experience tends to be recalled. Such problems as, How do soils differ in their capacity to hold moisture?

¹ Miner.—"A Case of Vision Acquired in Adult Size," Psychological Review Monograph, 1905.

What are the effects of freezing on the structure of soils? What are the factors which influence the germination of seeds? show how teachers can guide observation work so as to produce valuable groups of ideas which will constitute much better material for imaginative thinking than a large number of isolated facts.

What I have been trying to say is this. The information which will make the most valuable raw material for imaginative thinking can best be secured through exercises which themselves involve such thinking. Too much of our information is encyclopedic in its nature and does not have even an alphabetical arrangement by which we can pass from one idea to another when we wish to. No amount of information in the form of unrelated facts committed to memory is likely to develop a person into an efficient and creative thinker.

To illustrate how information can profitably be gathered by means of projects or problems which involve the exercise of imaginative thinking on the part of the pupils, I give the following list of exercises selected from *The Motivation of School Work* by Wilson and Wilson: ¹

Reading: (a) Learning to read words and statements in order to understand the directions given for games played in the primary grade. (b) Learning to read in order to understand little notes, invitations, etc., sent from pupil to pupil. (c) Learning to read in order to entertain the class or the school or invited guests.

Language and composition: (a) Writing to papers in competition for prizes. (b) Competing for prizes offered by local people. (c) Problems in communication such as invitations, requests for information, letters of thanks, letters written to please people, etc. (d) Descriptions and narratives of inter-

¹ Wilson and Wilson.—The Motivation of School Work; 1916.

esting things and events for the benefit of others. (e) Preparation of programs. (f) Preservation of records by means of school papers, bound notebooks on file in the library, etc. One teacher is reported as having taught all the language work of a sixth grade through the means of thirty-eight pieces of motivated work.

History: (a) Reliving the past by reconstructing it through dramatizing (for example, the Constitutional Convention), or by means of pageants. (b) Searching for information by which to understand or solve modern problems. (c) Making

contributions to the work of the class.

Geography: (a) Information related to everyday affairs; as, for example, to articles of food, clothing, etc. (b) Information needed to understand current events. (c) Information needed to understand books of travel, biography, romance, etc. (d) Geography games.

Arithmetic: (a) Competition, games, etc. (b) Practical problems in Manual Training, Domestic Science, and Agriculture. (c) Practical problems from the homes of the pupils.

(d) Imaginary problems.

Writing: (a) Projects in correspondence either in or out of school. (b) Pupils constructing learning curves to show their own progress as measured by a handwriting scale. (c) Construction of curves to show the improvement of the class.

Spelling: Projects similar to those mentioned for writing. Music: Class and school programs. Programs for special days. Correlation of musical programs with literature, history, geography, etc.

Drawing: Exhibits, competition for prizes, etc.

Home Economics: Correlation with history. Construction

of articles of use in the home.

Manual Training: Repairing or making things for people in the community. Inventing new things.

The method of teaching by means of projects will be dead and formal, or vital and stimulating, in proportion to the amount of imaginative thinking done by the pupils. If the teacher does all the planning, the outward results of the work may be very fine for a school exhibit while the inner results for the pupils are worthless. If the teacher knows how to lead the pupils to hit upon worthy projects, to think of practical ways and means for reaching the aim set, and for evaluating their own work. this method is most dynamic for developing skill in imaginative thinking.

A number of simple and interesting tests have been devised for measuring the ability of pupils to do imaginative thinking. The following are some of those most commonly used:

- 1. The interpretation of ink blots. Pieces of paper, usually twenty, with ink blots made by pressing a drop of ink between two sheets of paper are used. The pupil takes each sheet in turn and writes what the blot suggests to him. The score consists of the number of ideas, or responses, made in a given time or else in the time required for responding to the entire series. Young pupils are said to do better with this than older pupils or adults.
- 2. The word-building test. A number of letters, such as a, e, i, r, l, p, are given and the pupils are to make as many words as they can in a given time by combining the letters. No letter must be used twice in the same word, and no other letters than those given must be used.

The following scores were made by two classes of college juniors and seniors¹:

¹ Samples of lists that were produced:

⁽Boy)—Real, rip, I, lip, ail, ear (2 min.); rap (4 min.). (Girl)—Ale, air, bar, bale, rob (2 min.); rib, lie, roe, earl (4 min.). (Boy)—Air, are, lair, pair, pare, lap, pale, pail, rail, rale, leap, peal, lire, liar, pie, ripe, rip, lip, pea, per, reap, real, ale, ail, lie (2 min.);

ape (4 min.).

(Girl)—A, I, are, ear, pail, rail, rip, lip, pea, pie, pear, lair, pearl (2 min.); ape, real, peal, earl, lea, lie, ripe (4 min.).

Median number of words during the first two minutes: 24 boys 12.0 42 girls 11.4

Median number of words during the second two-minute period:

24 boys 5.5 42 girls 5.0

3. The sentence-building test. The task consists in making as many sentences as possible in a given time, each sentence to contain certain specific words and any other words that the worker may choose. The following are samples of series of words used: (1) Cup, fraction, money; (2) Bell, ground, owner; (3) See, find, throw; (4) Remember, put, depart.

A simple method for scoring consists in allowing two points for every correct sentence and one point for every sentence which contains the specified words but which has minor defects.

The following scores were made by two classes of college juniors and seniors ¹:

Median number of points made during the first two minutes:

 Series 1 ......
 19 boys 7.4
 36 girls 6.6

 Series 3 ......
 10 boys 6.5
 23 girls 7.0

 Series 4 ......
 8 boys 7.5
 14 girls 8.0

Median number of points made during the following two minutes:

 Series 1 ......
 19 boys
 5.4
 36 girls
 4.9

 Series 3 ......
 10 boys
 7.0
 23 girls
 6.0

 Series 4 ......
 8 boys
 6.0
 14 girls
 4.0

The lowest score was two points for each two-minute period; the highest was twelve points for the first period and ten points for the second.

- 4. The making of similes or metaphors by combining any two of a given series of words. Miss Gordon 1 used the following words: Air, bell, Bible, bird, bread, carpet, child, city, coin, dog, eye, fire, fish, fruit, grass, home, judge, light, lion, man, mother, pen, pillow, servant, ship, star, tongue, tree, water. Half an hour was allowed for the work.
- 5. The completion of mutilated sentences. The material consists of sentences or paragraphs from which a number of words have been omitted. The pupil is to insert the missing words, and the score consists of the time used and the correctness of the results. This method has been used by Trabue as a general school test. The following samples illustrate the Trabue tests: ²

Children . . . are rude . . . not easily win friends.

In . . . to maintain . . . health, one should have nourishing . . .

... happiness cannot be ... with money.

Many people . . . their health because . . . do not . . . of hygiene.

The . . . seems . . . and dreary . . . a discouraged . . .

6. The painted cube test. This may be given in two ways. (1) Imagine a three-inch cube made up of one-inch cubes. Suppose this cube to be painted red all around. How many of the small cubes would have no paint on them? How many would have paint on one side? Two sides? etc. (2) Take such a cube and distribute small blocks on the table. Let the pupil see how quickly he can construct the big cube so that it will be

Gordon.—Educational Psychology, 147.

² Trabue.—Completion Test Language Scales, Teachers College, 1916.

red all around. This test, given in the first way to a group of 44 college juniors and seniors, brought the following results: Minimum time 20 seconds, maximum time 150 seconds, median time 100 seconds. The fast workers were slightly the more accurate. The test may be made of any difficulty desired by imagining a four, five, or sixinch cube; or by supposing it painted with different colors on different sides.

- 7. The imaginary journey test. Examples: (1) If a cream driver went ½ mile west from his home, then 1 mile south, then 1 mile east, then 2 miles north, then ½ mile west, in what direction and how far away would his home be? (2) A man in an airship flies west 10 miles and up 2 miles, then north 5 miles and down 1 mile, then east 15 miles, then south 5 miles. Where should he look for his starting place? These tests given to 49 college juniors and seniors brought the following results: (1) Minimum time 15 seconds, maximum 80 seconds, median 50 seconds, with as many errors by those who took more than the median time as by those who took less. (2) Minimum time 20 seconds, maximum 85 seconds, median 50 seconds. Errors were as frequent in answers of the slow workers as in those of the fast.
- 8. The production of rhymes. For example, write as many words as you can in two minutes to rhyme with the word name. Other words may be used, such as sing, though, rough.

By using these tests or others suggested by them, a teacher can easily discover the individual difference in his pupils with respect to their ability to do the imaginative thinking required for each task. He can also gain

valuable insight into the processes of such thinking and become enabled to adjust his teaching so as to give the pupils more opportunity for its development.

Professor Dearborn makes mention of a type of imaginative thinking which seems to deserve more notice from teachers than it has received. He calls it organic imagination, by which he means the influence of the mind over the body. As education should help people to be both well and happy, this looks like an important topic. We have paid very little attention to it in our schools. I have never seen, but I should very much like to see, a school exercise in which the main problem would be something like this: Can anyone suggest something for us to think about that will make us feel well and happy to-day? Or, on a cloudy day: Can anyone suggest something for us to think about to make us feel cheerful to-day?

#### THOUGHT EXERCISES

1. Resolved: That imaginative thinking should be forbidden in our schools and that the pupils should be taught always to stick to facts and the truth. You are the first speaker. What view do you take and what are your main arguments?

2. Can you give any examples of statements which are literally true but not valuable? Can you cite other statements which are not literally true but which are very valuable?

uable?

- 3. What are the results when people become too matter-of-fact and think of things only as they have been or are? What are the results when people become too imaginative?
- 4. There can be no imaginative thinking without sense material. There can be no gathering of sense material with-

out imagination. Are both, only one, or none of these statements true?

5. Says C. W. Eliot:

"The fundamental trades—such as those of the carpenter, mason, blacksmith, wheelwright, painter, hand leatherworker, and shoemaker, have provided immensely valuable education for the human race, and have, indeed, been the chief means of raising barbarous peoples to a condition of approximate civilization." Is it probably true that the educative influence of these trades was due to the opportunities which they afforded the workers for imaginative or creative thinking?

6. In the paper already quoted Eliot says that "the secondary schools are giving not more than from one-tenth to one-sixth of their force to observational, sense-training subjects." Do you think that more imaginative thinking is

needed in the high schools?

7. Make a list of the vocations into which the majority of your pupils are likely to enter. Indicate the relative importance of imaginative thinking, as compared with matter-of-fact thinking, required for becoming successful in each vocation. Are you maintaining the same proportions in your school work?

8. Occasionally pupils become too imaginative. How can

such a condition be remedied?

9. Resolved: That it is worth more to learn twenty-five facts in connection with a worthy project than fifty isolated

facts. What is your opinion?

10. Suppose a teacher has made no use of the project method in his work. How could he make the adoption of the project method a project for himself? What suggestions would you give him?

11. Resolved: That it is not the business of the schools to teach pupils to entertain themselves, but to teach them to work; since children learn to play without being taught. Dis-

cuss this statement.

12. Says Eliot in the paper already mentioned: "As a rule, the young men admitted to American colleges can neither draw

¹ Eliot.—Changes Needed in American Secondary Education, 4.

nor sing; and they possess no other skill of eye, ear, or hand." What does this statement suggest?

13. Prepare a scheme for a coöperative project for classes in geography and history. For classes in general history and

literature.

14. Professor Judd 1 reports seeing a teacher who taught geometry without the use of any drawings, by requiring the students to keep the figure in mind after it had been drawn in the air by a movement of the hand. What advantages and disadvantages might such a method have? What suggestions

does it give?

15. New methods or devices for teaching are frequently made from old ones by very simple processes. The teacher calls the name of the pupil, then states the question or topic. Simply reverse the procedure, and behold, a much better method. Conduct a drill by asking a series of snappy review questions in quick succession. Reverse by requiring the children to ask the questions. Assign the new lesson at the beginning of the period, then take up the lesson for the day, and finally devote a few minutes to review of the previous lesson. Simply reverse and you have a procedure that is still better.

16. Make a list of methods and devices for teaching. How were they produced? What other methods or devices can you make from them by reversing parts or all of each, by enlarging or diminishing some aspects of each, or by combining

parts of various methods into one?

17. How would it do to have a period occasionally in the

school program to be known as "the scheming period"?

18. Up-to-date housekeepers have card files for recipes. Have you ever thought of making a card file of school projects, methods, and devices.

19. Devise a new way of conducting a class recitation.

20. Invent a new type of school. Now do not say you can't do it. Think of some of the new types of schools that have been advertised. Think of how they were produced. Then apply similar methods to some other aspect of the ordinary school. Before you know it, you may be famous.

¹ Judd.—Psychology of High School Subjects, 44.

### VIII

# THINKING AND THE SOLUTION OF EVERYDAY PROBLEMS

Schools must ever be tested by their direct and practical relationship to everyday life. Teachers are in constant danger of becoming so absorbed in the questions of school management, methods, and courses of study that they will neglect to keep in vital touch with the conditions and problems of life outside the school from which all school subjects find their origin and by which all principles of management and methods will finally be justified or condemned. How can a teacher escape this danger? Not by secluding himself in his study. He must from time to time deliberately leave his books and go "at large" to observe the real troubles of his people. What is the nature of their everyday problems? Why do so many fail to overcome their difficulties? What can the school do to enable the growing generation to live more richly and efficiently?

There is not much need of saying anything about the general nature of problems. We have all sufficiently experienced what it feels like to meet them. Perhaps you have gone blithely on your way and then suddenly discovered that something was wrong; that you have

forgotten your handkerchief or your pocketbook, or that you have lost the address to which you were directed, or that you have entirely forgotten your errand. Perhaps you have rolled along in your car—if a school teacher's auto can be called a car—and have heard one of the tires explode into what seemed at the time an awful profanity as it broke in upon the blissful state of your mind and as you realized that you had not provided an extra tire. Perhaps you have awakened at night with the feeling that vou have heard a peculiar sound. Perhaps you seemed to hear it again and became thoroughly alarmed but were unable to decide what to do. Yes, we all know what it is to meet a problem, to be perplexed. It means a situation in which doing the customary things will not avail. It means hesitation and excitement. It means calling for help and trying to do many things in the hope that one of them may solve the difficulty. It means a feeling of relief when the problem is adjusted.

What are the difficulties most frequently met in every-day life?

First, and nearest to us all, are our pains. Think for a moment about childhood. There were stomach aches, toothaches, earaches, cinders in the eyes, blisters on the heels, sore throat, frozen fingertips, ears, and nose. There was hunger, and craving for fruits and candies when there was no money with which to buy. As we advance in life the pains and aches change somewhat in their nature. Our heartaches last longer. Our sorrows and disappointments are more difficult to cure. Our worries cling more tenaciously.

Then there are a large number of very real problems

in connection with earning a living. Perhaps we have difficulty in finding a suitable job. Then, perhaps, we have difficulty in holding it and in so improving ourselves that we shall merit promotion.

Our relations to other people create a host of problems. There are the fights and friendships of childhood, the scoldings and spankings at home and in school. Later come the perplexities of dress and etiquette. Then come problems of courtship, marriage, building a home, and living peaceably with one's neighbors. All these situations bristle with real perplexities, some humorous, most of them serious.

Another set of problems spring from the fact that we grow tired of our work, of ourselves, and of everybody and everything, and that we must have recreation in order to live. When people get weary and disgusted and do not know what to do in order to regain their good cheer, there is a perplexity that is a very real one both for them and for those about them. No less serious is the difficulty when they think of something to do which turns out to be the wrong thing.

Not so insistent, but none the less important, are the questions in connection with citizenship. To cast one's ballot every other year seems an easy thing to do. However, as soon as one begins to search for unbiased and reliable information concerning the issues or the candidates to be voted upon, one realizes that he faces a real perplexity. Then, too, there are times when issues of vital importance arise, and when the problems of rightly serving one's country loom up as more important than anything else.

Religion causes a number of problems. First of all, there is the question of the relationship between the individual and his God. While some apparently have no difficulty in this matter, others are very much perplexed. Then there is the task of being tolerant toward those who hold religious views and observe customs and ceremonies differing from one's own. History reveals abundantly how serious and far reaching have been the perplexities connected with the religious life.

What are the general characteristics of our problems and perplexities? Without attempting to make an exhaustive list, the following enumeration may serve to indicate the characteristics which are the most prominent:

- 1. Our problems depend for their insistence upon original satisfiers and annoyers. Thorndike ¹ gives the following samples of each of these:
- (a) "Original satisfiers or instinctive likes are:—To be with other human beings rather than alone, To be with familiar human beings rather than with strange ones, To move when refreshed, To rest when tired, To be 'not altogether unenclosed' when resting and at night."

(b) "Original annoyers or instinctive aversions are:—Bitter substances in the mouth, Being checked in locomotion by an obstacle, Being hungry, Being looked at with scorn by other men, The sight and smell of 'excrementitious and putrid things,

blood, pus, entrails."

The general law concerning satisfiers and annoyers is stated as follows: "When any original behavior-series is started and operates successfully, its activities are satisfying and the situations which they produce are satis-

¹ Thorndike.—Educational Psychology, Vol. I, 123-4.

fying. . . . When any original behavior-series is started, any failure of it to operate successfully is annoying."

- 2. Problems affect persons variously on account of individual differences. Note how a given perplexity affects differently persons who are sensitive, phlegmatic, impulsive, contemplative and philosophical, or calculating. A grade of C, when A is highest, perplexes and annoys one student, mildly satisfies another, rejoices a third.
- 3. Problems affect persons differently according to their acquired habits. An automobile accident may be an entirely different problem for the policeman, lawyer, physician, auto repair man, business man, laborer, or member of the W. C. T. U. who happens to see it.
- 4. Problems affect persons differently according to the previous knowledge of or preparedness for such situations. Shadows in the cemetery cause quite different reactions in one who has been "prepared" for them by a series of hair raising ghost stories than they cause in one who has been "prepared" by doing a great deal of night work and who has learned to distrust all ghost stories.
- 5. Perplexities may be obscure or clear. The former type results in such questions as, What is it? What does it mean? What is the trouble? Perplexities of the other type arouse such questions as, What are the causes of this difficulty? What are the available means for remedying the situation? Which of the means available is the best one?
- 6. Problems may be essentially individual or social; that is, they may affect us personally or they may affect the group to which we belong.

- 7. Our minds may be especially open or sensitive to certain perplexities on account of the "spirit of the times"; that is, on account of the influence of our environment.
- 8. Reliance on authority opens the mind to certain problems and closes it to others.
- 9. The adoption or favoring of certain beliefs, hypotheses, or theories produces closed-mindedness toward propositions not in harmony with such beliefs or theories, and open-mindedness toward statements that seem to corroborate them.
- 10. The insistence or weight of a problem subjectively may be wholly different from its importance objectively. Whether one should wear an extra handkerchief showing out of the coat breast pocket and just how it should look, what style of necktie to wear, whether the young man should walk on the inner or outer side of the sidewalk, whether he should carry the girl's parasol or not, how the spoon should be dipped into the soup, what particular ceremonies should be observed when a candidate is initiated may loom up for the individual as matters on a par with the Decalogue.
- 11. The probability of meeting perplexities increases with the growth and complexity of civilization. The truth of this statement becomes evident when we think of the problems which have arisen in the various fields of human endeavor.

The invention of machinery and the consequent development of industrial life created a multitude of new conditions and difficulties which had to be met. Some of these had to do with the production and transportation

of raw materials. Others had to do with the processes of manufacture, the organization of labor, the housing of labor, with wages, the development of efficiency, the maintenance of morale, and with methods of coöperation. Still others had to do with selling the finished product, with advertising, and with the development of salesmanship, or with problems of tariff and world competition.

In commercial life the development of large corporations and trusts has created new problems not only for the producer and the consumer; but for the state, as well as for the federal government.

Our social life generally has been transformed by the increasing density of the population, the growth of large cities, and the development of means of communication. The average citizen of to-day comes in daily contact with a large number of persons. He must meet and adapt himself to a hundred situations where the pioneer had only one. The result is a social strain to which many find it difficult to adjust themselves.

The growth of morality depends on the one hand upon the intensification of loyalty to the principles of right conduct already established and on the other upon the development of new varieties of virtue. The discovery and definition of each new virtue means also the discovery and the definition of a corresponding vice. This again calls for new adjustment in our conduct, in our moral conventions, and in our laws and institutions. As the world grows better through the appearance of new virtues, so it grows correspondingly more perplexing through the discovery of corresponding vices.

12. Progress in any field depends directly on the ap-

pearance of perplexities, which become so insistent that "something must be done." Persons who are interested in progress welcome problems and perplexities as real opportunities. Persons interested in keeping everything as it is regard the appearance of problems and perplexities as a misfortune.

- 13. Within the group, difficulties at first appear as an indefinite annoyance. Those individuals who are most sensitive to the annoyance and who can raise it to the level of consciousness, formulate it, and state it so that it enters the consciousness of the group, become the leaders.
- 14. The creative or constructive efficiency of an individual varies directly as his ability to become conscious of and cope with real perplexities.
- 15. The value of a school or of a subject as a training for constructive efficiency probably varies directly with the opportunity which it affords the student for coming in contact with, and for successfully attacking, problems similar to or identical with those which are most important in actual life.

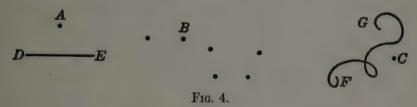
A study of language is rather suggestive in revealing the characteristics of our most common problems. The period is a sign that we are perplexed by having things go on without a break or any let-up. The question mark is a symbol of a host of what's, when's, why's, how's, and where's. The exclamation point tells of our emotional perplexities for which no mere analysis or declaration would suffice, but which call for love or hate or celebration. Figures of speech are witnesses to our constant seeking to be understood. Common nouns and abstract terms tell of the struggle against being overcome by a

multitude of specific things. Scientific terms bear evidence of difficulties in which men attempted to establish system and order in situations that were too chaotic to be endured.

If we seek to discover the causes of our perplexities, we shall find the following to be some of the most important:

- 1. Obscurity of the sensations; that is, we fail to see, hear, smell, taste, or sense clearly the objects before us. This may be due to the condition of the stimulus, as when one tries to recognize an object through a thick fog, or at too great a distance, or when one tries to identify a specific flavor in a food which contains many flavors well blended. It may also be due to a defect of the sense organ, such as color blindness, near-sightedness, obstructed nasal passages. Or it may be due to emotional excitement or nervous conditions of various sorts.
- 2. Difficulties in recognition or comprehension, due to lack of information about the thing observed; as, for example, when one is to meet a total stranger in a crowd and has no mark for recognition, or when one discovers a substance or thing differing from anything seen before. In the majority of cases the difficulty is due to the fact that we discover at once both similarities and dissimilarities between the new object and things previously seen, and that as a result we are unable to classify the experience as "either this or that."
- 3. A number of difficulties spring from the lack of suitable words or expressions with which to describe an experience. These difficulties may be purely individual and represent a person's ignorance of terms used by those who are well informed, or they may be due to the fact

that there are no words available in the language which one speaks. Figure 4 illustrates three degrees of language difficulty. The problem consists in describing the location of points A, B, and C with respect to the adjoining lines or points. A person not familiar with geometry may experience some difficulty in describing the position of point A. However, if he can think in terms of an isosceles triangle having DE for its base and point A for its vertex, or if he can think of a perpendicular erected at the middle point of line DE, he will have no difficulty in describing the situation. Geometry gives no help for locating point B, but if the observer has noticed the form of the constellation, the Dipper, he will have no trouble in describing the situation. To describe the location of point C with respect to line FG presents a real difficulty, because no terms seem to be available. In such a situation, one must forsake the language of words and resort to drawing or showing pictures.



Examples of thought difficulties due to language are very common in daily life. Names of many colors, smells, sensations of touch, and organic sensations are vague or altogether lacking in the vocabulary of the ordinary person. Terms descriptive of traits of character are indefinite and open to many interpretations. Many words have become so general in their meaning that they

may signify almost anything. Some words have sixty or more shades of meaning.

Professor Kramar ¹ holds that the ability to perceive likenesses and to use similes and metaphors is the chief requisite for overcoming language difficulties.

4. Closely connected with the language factors in a problem are the difficulties frequently experienced in the attempts to make an analysis or, in other words, to separate a large problem into smaller problems. Figure 5, adapted from Kramar, illustrates two degrees of these difficulties. There is but little trouble in separating diagram A into a spiral, an inverted d, and a capital R. Diagram B seems impossible of analysis.

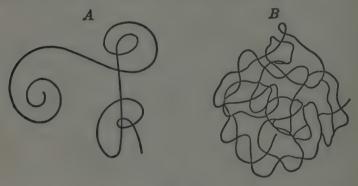


Fig. 5.

Professor Muensterberg ² held that "Every thought is psychologically a prolonged attention process," by which we attempt to get more of the situation. Now since it is impossible to attend for any length of time to a situation that does not change or lend itself to analysis so that we

¹ Kramar.—Neue Grundlagen zur Psychologie des Denkens (1914). ² Muensterberg.—Psychology, General and Applied, 192.

can focus upon different and definite aspects of it in turn, it becomes easy to understand why pupils tire so quickly of problems which they do not grasp, and why all of us "give it up" so easily when we meet a difficulty which will not "fall apart."

A common illustration of this aspect of our difficulties may be noticed when one listens to a conversation in an unfamiliar language. The sounds run together so that it is impossible to distinguish words or phrases, and the usual request made is, "Please speak more slowly." When this is done, the confusing stream of sounds begins to break up into parts or periods which can be recognized.

5. Another reason why we experience difficulties in solving our problems is found in the lack of skill in discovering, clearly stating, and retaining in mind a specific objective to be attained in a given situation. If we bear in mind that thinking is a form of behavior, an inner reaction, toward an object or group of objects, it becomes clear that to be effective it must have a specific aim or direction. The selection of an aim creates an attitude favorable to accomplishment, because it furnishes a basis upon which the ideas that come to our mind or any information that is gathered may be sifted. Muddled thinking is caused by our inability to eliminate that which is irrelevant and immaterial.

Many of our arguments and quarrels would immediately cease, if each participant could be compelled to state definitely what he is trying to attain. Just imagine the result if the party of the first part should state honestly that he is really trying to prove his point because he has held a certain view for a long time and hates to go to

the trouble of revising it, or that he feels that his position demands that he shall not let a subordinate be victorious in the debate, or that he wishes to win the debate for the glory of his team and his school, or that he wants to win the case in order to strengthen his reputation as a lawyer. Or suppose the party of the second part should state honestly and frankly that he wishes to prove his point in order to show the party of the first part that said party cannot always have his own way, or because he personally dislikes people who hold the opposite view, or because he is trying to build up a new party or organization, or because he loves to argue. Suppose on the other hand that all those who are concerned about discovering a remedy for a certain difficulty could first agree to put away all unworthy aims, center their attention upon an objective needed for the common good, and then like a united army make their attack; might we not expect to overcome the perplexities of life more effectively than we are, when our thinking is controlled by all sorts of unworthy aims?

6. Many of the troubles which we experience in trying to solve our everyday problems are due to lack of reliable and accurate information. The best illustration of this may be found in the trial of a case before a court. Witnesses promise on oath that they will tell the truth and nothing but the truth, and yet the testimony may prove to be very contradictory. Inaccurate observation, unreliable memory and recall, incorrect use of words—all increased by the unconscious bias of the witness and the suggestions of the lawyers—unite to make the story of the simplest event a puzzle to the jury. In order to deal with this difficulty courts require that testimony shall be

competent, relevant, and material; that is, that the witness must have had the opportunity, the ability, and the disposition to know and state the facts, the testimony must have a bearing upon the case at issue, and finally that it must have weight or make a difference. It would save us from much unprofitable thinking in connection with our daily problems, if we could have an opposing lawyer always ready to challenge our ideas as "incompetent, irrelevant, and wholly immaterial."

7. Another, and perhaps the most serious, cause of our difficulties in solving the problems which meet us in the affairs of daily life is lack of imagination and inventiveness. Given a certain perplexity, a vision of what we want to accomplish, and sufficient information, the difficulty will not be overcome unless we actually use the information available; that is, make it work toward the end to be attained. One must begin by formulating tentative solutions about which the facts at hand may be grouped and for the verification or disproval of which new information may be sought. Perhaps the most common criticism of school people is that they know a great deal but have very little ability or skill in using what they know. Nothing else reveals fertility or pliability of mind so well as readiness and skill in forming hypotheses or tentative explanations and a willingness to modify them as the conditions seem to require. In describing the methods of Darwin, Cramer 1 says that Darwin made a hypothesis as soon as possible and then modified it or replaced it by a different one as the case seemed to require.

¹ Cramer.—The Method of Darwin.

Hypotheses may roughly be classed in different groups representing stages in development of thinking. In the primitive type of hypothesis, facts are arranged according to a sequence of time so that they may be regarded as an orderly series of first, second, third; and many people are quite satisfied when they can establish order to that extent among the things which they know.

According to another, and somewhat more advanced type, facts are explained by showing their relation to a larger whole. A piece of machinery is satisfactorily disposed of by discovering the kind of machine to which it belongs. Facts are grouped under "laws" or principles. To persons in this stage of thinking anything is satisfactorily explained when they feel assured that it is a part of something else. If any of their relatives are sick, they are alarmed until the sickness has been named or classified, when they promptly feel composed. Has somebody committed a foolish or criminal act? Get it classified as a case of youthful foolishness, original sin, general depravity, pride, selfishness, or some other large group of behavior, and the case has been satisfactorily disposed of. This type of explanation has been and is very useful in securing an orderly classification of things, and in producing system where before was chaos.

The most recent and best type of hypothesis attempts to relate facts as causes and effects. This is the method which has proven most fruitful in the natural sciences. The reason for its effectiveness is that it reveals the means of controlling events. When the causes of a certain event have been discovered, that event may be produced, changed, or suppressed by controlling the causes which

produce it. When the effects of a given situation are known, it becomes possible to predict with certainty what is going to happen. The scientist who arranges his apparatus for an experiment can tell exactly what will take place. The enormous progress of chemistry and medicine during recent years has been due to the discovery of definite relationships of cause and effect. The inventions of machinery are due to the same mode of thinking. The development of the social sciences, psychology, and the science of education are products of this type of thinking. The most serious limitation of the thinking which seeks merely to classify facts is that it gives no real control over them. While it may produce a certain satisfaction to know that nothing in this world is detached, but that everything is a part of everything else, such knowledge gives no real control over the situations of life in the sense of ability to alter them.

The men and women who are the most efficient are the ones who are wise concerning the causes and effects of things. Those of us who are deficient in this kind of insight stand as spectators and wonder how anyone could know beforehand that things would turn out as they do, or how others can make things happen as they want them to happen. Then, what do we do? We try to classify such people as "lucky," "shrewd," "long-headed"; and having made our classification, we are satisfied. Thus we demonstrate our lack of ability to be anything more than spectators.

8. Lack of critical ability is a cause of failure to solve effectively some of our difficulties. We jump at conclusions. By accepting that which seems good we fail to

reach the better or the best. In its more primitive form this means accepting anything which catches the attention. Most persons are somewhat attracted by that which seems marvelous. Indeed, in some cases it seems as if the more mysterious and wonderful a story is, the more readily is it accepted. Again, we accept readily that which we would like to believe and reject without sufficient reason that which we dislike. We accept without evidence those statements which have been frequently repeated and which have become habitual thoughts.

In order to realize the necessity for cultivating a critical attitude in our thinking, we need but consider the large number of ideas which clamor for acceptance by the average person of to-day compared with five hundred years ago. They come through books, papers, magazines, and pamphlets; over telegraph and telephone, from graphophones, and by means of lecture courses. Then there is the almost limitless range of social contact brought about by the automobile and other modes of travel, as well as by mail. It is safe to say that for every idea that claimed acceptance by a person five hundred years ago there are hundreds of ideas that claim acceptance now. The world has become so full of ideas and facts that it is utterly impossible for the individual to use them all.

This does not imply that the ideas which come to us are less reliable or important than those which were available in the past. On the whole they are probably much more reliable and also more important. At times we regard newspaper articles as being more or less unreliable; but compared with mere rumor—and before

there were any newspapers people had to be satisfied mainly with rumor—they are like Gibraltars of reliability.

While the critical attitude of mind is necessary in order to distinguish truth from error, it is even more necessary in order to distinguish that which is relevant and material from that which is irrelevant and immaterial. Efficient thinking to-day implies that there are many opinions, but that few are chosen.

9. Lack of efficient coöperation is the cause of many of the failures in dealing with the problems of daily life. It is true that in some occupations cooperation has developed to a considerable extent; however, much yet remains to be done. In some activities cooperation is practically unknown. In others it is in the stage of "trial and error" and has not reached any satisfactory degree of efficiency. In a few it has taken undesirable forms and become the tool of greed and class strife. It is a safe prediction that cooperation will be developed during the next fifty years to an extent that we cannot now conceive. If this development is to be wholesome, one that will redound to the welfare of our people, it must be intelligently directed. This means that every teacher has a call to make a study of the nature and conditions of helpful coöperation in order that he may promote it in his school.

Suppose now that a schoolmaster who has been "at large" and has looked upon the troubles of his fellow men returns; what may we expect him to do about it when he enters his schoolroom? First of all, and perhaps most important of all, it seems to me that we should expect him to leave the door of his schoolroom open when

he enters. In other words, he should insist upon a constant free and vital reaction between his own work and the activities of real life. He is ever to remember that he is to be a real man among men and that he is to live a full normal life, deep in its insight and rich in its appreciation of, and sympathy for, the struggles, successes, and failures of his fellow men.

We shall expect him always to insist on putting "first things first"; not on the basis of their age in the curriculum or their rank in the traditions of school literature, nor on the basis of his own fondness for them or their advertising value for the school, but solely according to their life value for his pupils. This means that he is willing to discard all those facts, methods, and devices which have outlived their usefulness, no matter how important they may have been in the past. He meets everything that seeks a place in his program with the question: "Will it make any difference to my pupils in their struggles with the perplexities of life?"

It will be his constant aim to give the pupils insight into the problems of real life, understanding and appreciation of values, wisdom in choosing the good. He will welcome problems and difficulties as opportunities and will teach his pupils to meet them gladly in place of avoiding them. In his school no one will be chided for having made honest attempts that were unsuccessful. Failure to "try again" is the only cause for censure that is recognized.

He will seek for clearness in all his thinking and insist upon it in the work of his pupils, for clearness in sense impressions, for definiteness in interpretation, and for accuracy in the use of language. He will develop the conscious attitude which always seeks to analyze a situation into comprehensible elements and insists on basing an argument on that which is definitely known and understood.

He will foster enthusiasm for accurate and reliable information about those things which are worth while. He will show very little respect for information obtained merely for its own sake or for the sake of passing examinations. He will constantly aim to give his pupils points of contact with the best sources of information about the most important things in life. He has seen how many fail because they seek information where none is found. He knows that life is too short to spend any part of it in pursuit of information which does not give insight.

He will seek to develop ability in himself and in his pupils to make plans and to project hypotheses. Especially will he cultivate a practical creative imagination which can grasp relationships of cause and effect and lead to definite control of those factors which cause our perplexities. He will show scant respect for "explanations" or for theories or speculations which "make no difference" in the struggles of life.

He will exercise and foster in his pupils a wholesome critical attitude toward everything that seeks admission to the mind. He values the short span of school life too highly to spend any of it in consideration of propositions which can neither be proven nor disproven. He regards the ability to select with discrimination and to choose wisely as the highest aim of scholarship, and he does not esteem very highly the ability to recall and repeat on request a miscellaneous collection of propositions without the exercise of any judgment as to their relative importance.

We may expect this schoolmaster to become an enthusiastic promoter and supporter of coöperation. He will develop it in his pupils by their actual use of it in the various activities of his school. He will regard good will as being more than sentiment; it is to be a fine art to be perfected by careful practice.

Are we expecting too much of this schoolmaster? By no means. It is true that it would be easier for him to teach as he has been taught and to follow the customs and conventions of ordinary schools. But he is not to take the easy path. He is to take the upper trail. He is to establish customs and conventions rather than to follow those established by others. He is to be a prophet, a man of vision, a leader. That is the reason why he must constantly, like the famous leader of old, not only look upon, but actually share in, the troubles of his people.

#### THOUGHT EXERCISES

1. Compare the problems or perplexities of the following:—
(1) Children and adults. (2) Men and women. (3) Those

who live in town and those who live in the country. (4) The poor and the rich. (5) The educated and the uneducated. (6) Civilized peoples and those which are uncivilized. (7)

Early settlers with people of to-day.

Make the comparisons by asking yourself questions like these: (1) What seems to be the general nature of the problems of each group? (2) How do the perplexities compare with respect to their apparent importance to the individual? (3) What influence are the perplexities likely to exert over the lives of the individuals? (4) What are the most common causes of the troubles? (5) How does each group try to evade or meet its troubles?

2. How do you explain that a well-to-do person may worry about his future financially while a poor man may be without such worries?

3. Does education tend to diminish the number of one's

problems or lessen their perplexity?

4. Make a list of the most insistent problems with which you have had to contend. Is it true that each one of them would have been a real opportunity if it had been properly met?

5. What is the cause of the perplexity which one experiences in trying to select a suit or piece of wearing apparel by

lamplight?

6. Why is a person who merely visits a room better qualified to deal with the problem of its ventilation than one who stays in the room? Would it be a good rule, whenever a person is in trouble and does not know what to do, to leave it for a while in order to come back to it from the outside, as it were?

7. Make a list of the perplexities of your daily work. How have you tried to meet them? Might some of them be solved by your going for a stroll in the woods, or resting a bit, or going to a good friend for a chat? If some troubles can be overcome by such pleasant means, why not make use of these

means?

8. When anyone grows nervous or irritable, would it be sensible for him to get up and walk around the house once or twice? Or to sing or hum or whistle a good tune? Or to take some calisthenic exercises?

9. Think of examples to show how troubles have been remedied by discovering and removing their causes. Think of other examples to show how people have vainly tried to meet their difficulties by attempting to remove the effects rather than the cause.

10. How can a teacher help his pupils to look upon prob-

lems and difficulties as opportunities?

11. What are the problems about which your pupils seem to be most concerned? Are all problems equally rich in opportunity? How can pupils be led to select the most promising ones?

12. Which would you prefer, to have a student leave school

with an interest in many vital problems and questions to be settled or with the attitude of having settled them and knowing it all? Which attitude would you prefer in a teacher? In a superintendent? In a neighbor? In a preacher?

## IX

## THE DEVELOPMENT OF SKILL IN PROBLEM-SOLVING

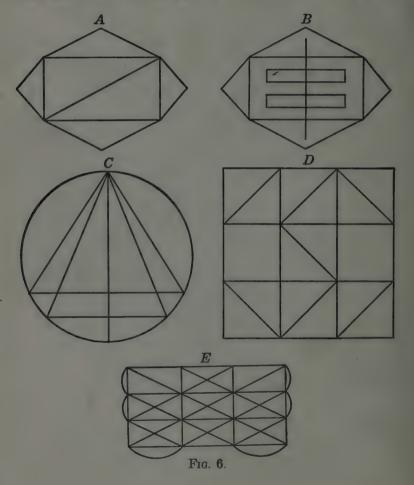
In the previous chapter we discussed the nature and causes of the perplexities of everyday life. That discussion yielded a number of general suggestions applicable in teaching. The task now before us must be to inquire somewhat more in detail into the nature of the problem-solving process in order to arrive at more specific information in regard to the ways and means by which our pupils can acquire efficiency in this type of thinking.

Let us first attempt to gain some direct insight into the psychological aspects of problem-solving. This means that we must proceed to get some immediate experience concerning the matter in question. In other words, the best method for beginning the study of problem-solving is actually to solve some problems and to observe how it is done. We shall then be in position profitably to compare our own experiences with those of others who have made investigations in the same field.

For the exercises to be worked I have selected a number of puzzles. They have been chosen for the following reasons: They have a sufficient "holding-power," so that it requires no effort to "keep on trying" even if the solu-

tion may be difficult to get. They are sufficiently concrete, most of them being drawing puzzles, to make it easy for the worker and the observers to make a record of the various attempts and steps by which the solution is obtained. In this respect these puzzles have a distinct advantage over mechanical puzzles of the sort which some investigators have used.

First exercise: Take pencil and paper and try to draw



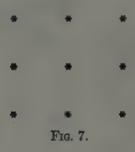
each of the diagrams shown in Figure 6 with one continuous stroke of the pencil and without retracing any of the lines. Number each attempt so that you can go back and trace your progress toward the solution.

At this point I am much tempted to describe what I think happened while you tried to trace the figures, but to do that would be poor pedagogy. Rather let me ask some questions to which the exercise may have furnished answers of one kind or another.

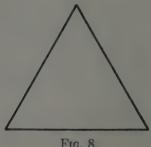
- (1) What was your feeling toward the puzzles when your first saw what they were and knew what was to be done?
- (2) Did you at once begin to draw, or did you hesitate and try to figure out how the puzzle could be solved?
- (3) If your first attempt proved a failure, what did you do next? In what respect was the second attempt different from the first? Did you profit by the first mistake or was the second attempt as poor as the first?
- (4) If you "almost made it," how did you change the next attempt so as to succeed?
- (5) Did the solution of one puzzle aid you in solving any of the others? If so, how?
- (6) Did previous experience with some of the puzzles aid or hinder your work?
- (7) On the basis of your experience, what rules or suggestions, if any, would you give for the solving of puzzles of this type?
- (8) Which of these rules or suggestions do you consider the most important?

Second exercise: Try to pierce each one of the nine stars shown in Figure 7 by drawing four, and only four,

straight connecting lines. If you do not succeed in a reasonable amount of time, read the suggestion at the end of the chapter. Is the making of this suggestion typical of what a teacher should do when a pupil feels like quitting his work on a problem?



Third exercise: Take six matches. Place three of them on the table in such a way as to make an equilateral triangle as shown in Figure 8. Now arrange the other matches in such a way as to make four equilateral triangles in all, each one equal in size to the first one. If you do not accomplish this in a reasonable time, read the suggestion at the end of the chapter and note the result. What does this exercise illustrate concerning the instructions to be given to pupils in connection with certain types of problems?



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Fourth exercise: Take five squares of paper of equal size, say four inches. Cut each square from the middle of one side to the opposite corner as shown in Figure 9. Now try to arrange the ten pieces thus produced on the table in such a manner as to produce one complete square having no gaps in it. Read the suggestion at the end of the chapter, if you feel like "giving it up."

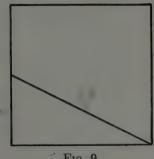
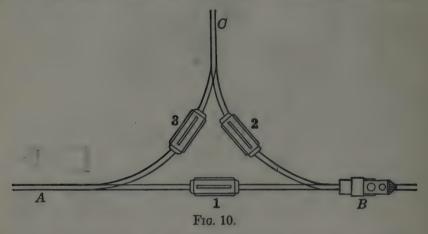


Fig. 9.

Fifth exercise: Try the railway puzzle shown in Figure 10. The drawing represents the Y-track of a railway. A-B is the main line. The spur at C is just long enough to hold one car and the locomotive. There are cars at points 1, 2, and 3. The locomotive is at point B, headed east. Turn the locomotive around so that it will be headed west. When it pulls out at A the three cars must each be in the positions first occupied. No flying switches are to be made.

Sixth exercise: Change one word into another word of the same number of letters by changing one letter at a time, always making English words. Example: Black, blank, blink, clink, chink, think, thine, white. Change the word cold into the word warm. Change brown to green. That solution is best which is accomplished in the least amount of time and with the fewest intervening steps.

The solving of puzzles is so interesting that we might be tempted to introduce other exercises of the types



already presented or of other types and to forget our original purpose, which was to gain insight into the thought processes involved. Now, insight is gained not by multiplying experiences indefinitely but only by thinking about them. A person might continue to solve puzzle after puzzle, as pupils sometimes work problem after problem in mathematics, without gaining any clear understanding of the real nature of the work or of the methods and conditions by which it can be accomplished more efficiently. In place of trying to solve other puzzles it will be wiser for us now to stop and think about the experiences so far obtained. The following questions are presented for the purpose of facilitating our thinking:

(1) Review the questions following the first exercise.

Which of the conclusions then formulated have been confirmed? What amendments can you suggest to the tentative statements then made?

- (2) Was the method of "trial and error" equally prominent in your working of each of the puzzles? If not, what explanation can you find for the difference?
- (3) Was there any difference in the relative amount of "inner" and "outer" behavior; that is, of effort to solve the puzzles by sitting still and thinking or by using pencil and paper or other manipulation? Do we solve puzzles by the use of our brains only or do we "work" them, at least partly, by our hands?
- (4) As you tried each succeeding puzzle, what use, if any, did you make of any previous experience with puzzles?
- (5) Did you find any similarities between the puzzles? If so, did it help or hinder you in your work?
- (6) Which of the puzzles, if any, would you group together so that the same method of attack could be used for each of them?
- (7) How was your work affected by the different attitudes which you took; such as, "Now I am going to succeed this time," "Pshaw, I don't think I can get it," or "What's the use? This isn't worth doing at all."
- (8) How was your work affected by having someone watch your progress?
- (9) How was it affected by trying to hurry, especially if you were competing with someone else to see who could first get the solution?
- (10) Did you notice any transfer of training in your work with the different puzzles? Did any of your experi-

ence carry over from one diagram to the other in the first exercise? From the first exercise to the second? If so, did it help you or hinder you? Would it be right to say that there was a "negative transfer" from plane geometry and a "positive transfer" from solid geometry in the case of the third exercise? Did your more intimate knowledge of plane geometry prevent the less intimate knowledge of solid geometry from functioning? Was there any transfer from square root in arithmetic in the fourth exercise? Did your experience with the other puzzles give you any help in the fifth exercise? In the sixth? Formulate a statement to cover your experiences with the different puzzles which expresses your opinion as to transfer in regard to whether it is general or specific, whether it may be positive or negative, whether it depends on identical characteristics in the experiences met, and whether such transfer is dependent on suggestions, for its ability to function.

We have now had some direct experience in trying to solve puzzles of various types. We have also tried to gain some insight into the thought processes involved by recalling these experiences and thinking about them. It will therefore be in order to compare our own experiences and opinions with those of others who have worked with the same general problem in which we are interested.

The most suggestive experimental investigation bearing on the nature of problem-solving is Ruger's study of the solution of mechanical puzzles. The materials used in this investigation consisted of thirty-seven puzzles, nearly all common wire puzzles, in which the problem was

to take them apart. There were twenty-seven subjects in all; four boys, one mechanician, seven students of psychology, two instructors, and thirteen graduate students. The main conclusions are based upon the observations which the experimenter made while the subjects singly attempted to solve the puzzles, and upon the introspections of the subjects. The following is a brief summary of the results obtained by Ruger:

1. Two main types of learning were noticed. One involved the making of a large number of more or less random attempts and movements. "Acts which made no change in the situation whatever were at times repeated indefinitely and without modification. In successive trials of a series, after an essential step toward a solution had been performed correctly, it was reversed and done over several times with irrelevant movements interspersed before the subject passed out to the next step. . . . In practically all of the cases random manipulation played some part and, in many cases, a very considerable part in the gaining of success." The other type involves the "analysis" or understanding of the task to be performed. This understanding varied greatly in its explicitness. It might be merely a vague feeling of familiarity with a recurring attempt. It might mean the explicit recognition of it. Again, it might mean the ability partly to image an attempt or to image it completely. It might mean the ability to describe verbally or even to reduce one's experience to a general formula to be used under varying conditions. The "analysis" varied greatly in extent. It might be only partial, consisting in picking out the point of attack. It might be schematic, involving some insight into the main line of attack and the general plan of solution. Again, it might be total, covering all the steps to be taken. In some cases the random movements came first, in others the movements and the "analysis" were simultaneous, while in some the "analysis" came first. As to its material the

¹ Ruger.—"The Psychology of Efficiency"; Archives of Psychology, No. 15, 1910.

"analysis" might be perceptual or ideational. It seemed rela-

tively independent of imagery.

2. The following were the principal "conditions of efficiency": (1) "Success in getting the most appropriate methods of technique." (2) Consciousness of the variations. Improvement was "coincident with consciously adopted variations rather than with 'unconscious' ones." (3) The main conditions favoring improvement were (a) Physical well-being and high level of attention. (b) An objective or problem attitude as opposed to one of self-attention or attention to others. In the case of self-attention the subject is thinking of what showing he is making rather than of the task to be performed; in the other type he is watching the person or persons who are supposed to know the answer to the puzzle or problem. (c) Suitable assumptions or hypotheses which were not allowed to become fixed but were consciously modified or changed

when found to be unprofitable.

3. The conclusions regarding transfer of training are: (1) That there is no transfer of specialized skill unless it is generalized; that is, unless the subject is able to formulate his learning into a general principle or rule. Whenever the procedure followed in a successful solution could be generalized it could and would be used in solving other puzzles. (2) "The mere presence of imagery, although vivid and of closely related puzzles, was no guaranty of its efficiency." (3) Method or attitude was carried over from one puzzle to another so directly as to seem "almost reflexly accomplished." "A change in the subject's idea of himself, from that of one incapable of solving such a problem to one capable of doing so, probably played a part in the change of mood. A similar but less decided change of mood was at times accomplished, in the absence of success, by the suggestion that the subject was doing as well as others. An attitude of self-confidence was at times self-induced through an idea of its value, and subjects were able by this means to avoid a state of confusion when in difficulty, to which state they had previously fallen victims." (4) As to transfer of ideals of method, "efficiency as a goal to be reached, the ideals of scientific method, and the ideal of an optimum personal attitude were among the most important."

- 4. There was a tendency to depend on memories of former solutions in place of a direct study of the puzzle at hand. Occasionally this would become a positive hindrance to a successful analysis of the puzzle. The best work was done by using memories of previous work as mere suggestions to be rejected, adapted, or accepted according to the needs of the moment.
- 5. Plateaus, or stages in which no progress was made, appeared when there was a shifting back and forth between rival methods more or less consistently used.

An excellent discussion of problem-solving, as based on the facts of general experience and on the psychology of learning is given by Parker.¹ He summarizes his discussion in the following practical suggestions:—

"To stimulate and assist pupils in carrying on reflective thinking the teacher should

"1. Get them to define the problem at issue and keep it

clearly in mind.

"2. Get them to recall as many related ideas as possible by encouraging them (1) To analyze the situation and (2) To formulate definite hypotheses and to recall general rules or

principles that may apply.

"3. Get them to evaluate carefully each suggestion by encouraging them (1) To maintain an attitude of unbiased, suspended judgment or conclusion, (2) To criticize each suggestion. (3) To be systematic in selecting and rejecting

suggestions, and (4) To verify conclusions.

"4. Get them to organize their material so as to aid in the process of thinking by encouraging them (1) To 'take stock' from time to time, (2) To use methods of tabulation and graphic expression, and (3) To express concisely the tentative conclusions reached from time to time during the inquiry."

It seems necessary at this time to devote a few moments to certain questions in regard to problem-solving,

¹ Parker.—Methods of Teaching in High Schools, Ch. IX; 1915.

about which there has been a great deal of discussion and concerning which there have been pronounced differences of opinion and more or less confusion.

One of these questions has to do with the inductive and deductive methods of reasoning. Many writers and this is particularly true of those who have been influenced by the study of formal logic-have insisted that there are two distinct and practically opposite types of thinking. One is supposed to consist in attacking a problem by first making a study of individual facts. The other is supposed to consist in making the attack by seeking for some generally accepted law or principle. Each method has had its enthusiastic supporters among teachers as well as among educational writers. Some school subjects have been thought to be essentially inductive, others deductive. Some teachers have acquired considerable skill in teaching this or that subject by the inductive method, while others have claimed equal success in teaching the same subjects by the deductive method.

Of late, attention has turned more toward the points of similarity and less toward the points of difference between the two methods. This tendency is clearly shown in the following statement of a general formula to cover both deductive and inductive thinking:

"When a new fact is presented, or any situation exists that is in any way novel, there is a tendency on the part of the human individual to treat this new fact, or react to this novel situation in terms of past experience,—which experience assumes the function of a general principle of procedure in all similar cases. On the other hand, when a principle of procedure is presented, the human individual has a tendency to

envisage this general principle in terms of concrete examples. In other words, it is a tendency of the human mind to find the general in the particular and the particular in the general." 1

Let us attempt to make this general formula somewhat more specific and applicable to teaching. According to the Herbartians the complete inductive lesson should consist of the following steps: (1) Preparation, with statement of the aim, (2) Presentation, (3) Comparison and abstraction, (4) Generalization, and (5) Application. The steps of the deductive lesson as given by Bagley ² are (1) Data, (2) Principles, (3) Inferences or conclusions, and (4) Verification.

These two series can readily be combined into the following, which will cover both the inductive and the deductive method: (1) Problem, an individual fact or a general principle to be explained by relating it to one's experience. (2) Recall of information bearing on the problem. If an isolated fact is to be explained, this will take the form of recall of experiences with other similar facts or of a general principle embodying an extended experience with similar facts. If a general principle is to be explained, it will be done by recalling individual facts to illustrate it or by recalling other general principles of a wider scope. (3) Assimilation or apperception, by which the fact or principle in question takes its place as a part of our conscious experience so that we can live with it without feeling annoyed. This step may take a long time and may require adjustments, not only in the

² Colvin.—Introduction to High School Teaching, 288. ² Bagley.—The Educative Process, Ch. XX.

fact or principle considered, but also in the views and beliefs previously held. (4) Application, by which the values of the new information are established through our becoming conscious of its practical utility in the general affairs of life, or through the satisfaction which comes with the clearing up of vagueness and obscurity or the removal of contradictions with which one has been annoyed.

All new experiences are rationalized by reference to previous experiences, and these may be available either in the form of ideas about individual cases or of concepts embodying a number of cases. It is well to bear in mind also that there is no hard and fast distinction between a single fact and a general principle. One refers to a limited experience, the other refers to a wider experience, but no one can tell where one ends and the other begins.

As a matter of economy in thinking about any question, it is generally advisable to relate the problem at once to those concepts which represent the widest and longest experience in regard to similar problems, bearing in mind that even our widest generalizations are subject to amendment.

Another question which has received considerable attention, especially in recent years, has arisen in connection with the rather general criticism of so-called "unreal" problems, especially in mathematics. Every teacher needs to have some criterion by which useless problems can be eliminated from schoolwork. What shall that criterion be?

Education through the means of a school is better than education through ordinary experience only in so far as

the school is able to select, sift, organize, present, and interpret actual experience in such a way that the pupil will gain knowledge, insight, and wisdom more rapidly and of a better quality than he could have gained from life outside the school. The presentation and interpretation of experience can frequently be done more effectively through the use of type examples and problems so arranged as to illustrate and impress those things which the teacher wants the pupil to notice, than it can be accomplished by examples which represent actual happenings. The value of a problem calling for the cost of a certain number of pounds at so much per pound does not depend upon whether a certain merchant on such and such a date sold that number of pounds of a specific commodity at that particular price to a customer by such and such a name, living at such and such an address.

The values of problems, like the values of literature. depend not so much upon whether they present things and situations as they have actually happened but rather upon whether they present things and situations which are typical of real life. There are teachers who are such extreme "realists" that they will accept as valuable only that which has actually happened. They do not seem to realize that hopes and ideals as to what has never happened, but ought to happen, may be of vastly more consequence than the literal narration of events that have taken place.

In our inquiry we have so far proceeded by doing the following things: (1) Gaining some immediate experience concerning the problem in question, (2) Thinking about this experience in order to discover its meaning and in order to arrive at some definite opinions of our own, and (3) Amplifying, clarifying, and correcting our own opinions by comparing them with the opinions of persons who have made special investigations or who have canvassed the general literature on the subject. Our next step must be to reduce the knowledge and the insight which we have gained to principles or practical rules which can be applied in teaching. The following list is intended to be suggestive rather than exhaustive:

- 1. Rules concerning attitudes favorable for the efficient solving of problems:
- (1) Select the most lucid moments for the most important and difficult problems. Individuals differ widely as to the occurrences of such moments, which depend on personal habits of working, resting, eating, and on the environment generally. Most of us have certain moments when our minds work better than at other times, but such moments are rare and, consequently, should be devoted to our most important problems.
- (2) Concentrate. Shut out distractions of all sorts. This is generally secured by such means as comparative quietness, a flat-top desk from which everything foreign to the matter in hand is removed, absence of pictures, bric-a-brac, and possibly of books also; in short, by removing from our immediate vicinity everything which tends to make us think of things foreign to the problem to be solved.
- (3) Be optimistic. Assume that the problem can be solved. The principal virtue of this attitude is that the person who has it keeps on making new attempts. The

THE DEVELOPMENT OF SKILL IN PROBLEM-SOLVING 171 chief danger in pessimism or lack of faith is that they make a person give up too easily.

- (4) Cultivate the problem attitude. Do not worry about what others think or say about your ability, your methods, or about the impossibility of the problem. Think only of the object to be reached and of ways and means for accomplishing the task.
  - 2. Rules concerning procedure:
- (1) Make very sure that you understand exactly what is to be accomplished. Ruger tells of one subject who worked ten hours on a puzzle, trying to do something which was impossible, because of failure to find out just what was to be done.
- (2) Analyze the problem. Break it up into smaller problems. Attack the easiest one of these first.
- (3) Plan a method of attack; that is, canvass the possible methods of solution and select the one which seems most direct and feasible.
- (4) Take stock of the available means for dealing with the problem. Recall previous experiences with similar problems.
- (5) Speculate. Make tentative guesses as to possible answers. Try to work backward in order to discover what the conditions would have to be in order to produce such answers.
  - (6) Look for further information.
- (7) If you are puzzled let the matter rest awhile. If possible take it up at your next "lucid moment." This may enable you to make a vigorous attack from a new direction and the solution may come easily.
- (8) When the answer has been found, check it for possible errors.

- 3. Rules concerning transfer:—
- (1) Review the solution in order to discover those elements which the problem in question has in common with other problems.
- (2) Formulate rules which will express the method of solution applicable to problems of a similar kind.
- (3) Formulate rules to insure the accuracy necessary for arriving at a correct solution.

4. Rules or principles concerning the educational values of problem-solving:—

- (1) The educational value of solving a problem in the ordinary subjects does not consist primarily in finding the answer, but rather in the development of the following types of insight and skill: (a) Ability to read and understand problems, (b) The habit of insisting upon knowing very definitely what is to be accomplished, (c) Skill in planning a direct attack, (d) The habit of accuracy and verification in all work, (e) Development of ingenuity in meeting original problems, and (f) Ability to review a solution or a series of solutions and to generalize the experience gained.
- (2) The educational values of problems are not only specific but also individual in their nature. One pupil may need extensive drill in the reading and interpretation of problems, another may need practice in verifying his work, another may need practice in planning attacks. The actual value of problem-solving for each pupil depends upon whether he receives practice in that phase of the work in which he needs it most. This means that problem-solving, like spelling and language work, must consist largely in individual training.

### NOTES ON PUZZLES

(1) Piercing nine stars with four connecting straight lines. Suggestion: Do the directions place any limit upon the length of the lines? Incidentally, it may be interesting to ask yourself whence that idea came to you.

(2) The triangle puzzle. Suggestion: Have you been

thinking only in terms of plane figures?

(3) The square puzzle. Suggestion: In how many ways can the two pieces of one of the small squares be fitted together? How long must one of the sides of the big square be?

### THOUGHT EXERCISES

1. What is the key to success in solving the "trace-with-one-stroke" type of puzzle? The triangle puzzle? The railway puzzle?

2. If a person did not know square root, what suggestion would you give him for attacking the puzzle of the five

squares?

3. Did your experiences in solving puzzles agree with those summarized from Ruger? Which of his conclusions do you consider the most important?

4. What type of problem is illustrated by the following expressions: "Live according to Nature"; "All men have

natural rights"; "All men are created free and equal"?

5. Make a list of ten problems in each of the common branches. Classify them into groups or types. Suggest the general procedure best adapted for dealing with each group.

6. Resolved: That the problems presented in geography are

more valuable than those in history. Discuss them.

8. What, if any, is the problem value of the "scrambled sentence" or the "scrambled paragraph"? The former is produced by mixing the words of a sentence; the latter by mixing the sentences of a paragraph. What, if any, would be the

value of "scrambled problems" in arithmetic; that is, of presenting the facts of a problem in a jumbled form and requiring the pupils to state the problem?

9. What, if any, is the value of the type of problem illus-

trated by the following examples?

(1) A man buys a certain number of pecks of apples. How

do you find how many bushels he buys?

(2) If you know the number of hours per day that a man works, the number of days he works during the week, and his wages per hour, how do you find the amount he has earned at the end of the week?

10. What, if any, is the value of problems like the one fol-

lowing?

Supply the missing figures:

$$\begin{array}{r}
 -3 + \\
 -2 - \\
 \hline
 -4 - \\
 -7 - \\
 \hline
 3 - \\
 \hline
 2 - 3 - 8
 \end{array}$$

11. The following problem was given to a sophomore class in college: If 3 cats catch 3 rats in 3 minutes, how many cats can catch 100 rats in 100 minutes. The answers obtained from 126 students were as follows: No answer (11), one cat (12), three cats (16), 24 cats (1), 30 cats (1), 33½ cats (7), 34 cats (1), 100 cats (71), 300 cats (5), 333 cats (1). Why do you suppose the answers were so different? What is the correct answer?

12. Try this problem on someone. A wagon is driven toward the east at the rate of six miles an hour. How fast does the top of the wagon wheel move toward the east? The

hub? The lowest part?

13. A man hires a cab to take him to a city 12 miles away and back for \$4. Six miles out from where he started he takes on a passenger, carries him to the city and back to where he met him. What should the passenger pay as his just share?

14. Are any or all the problems given in 10-13 catch questions or not? Are they valuable or worthless problems?

15. Which of the two parallel rulers in Figure 11 is the

more practical, A or B? Why?

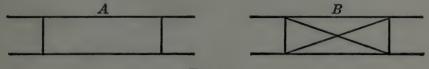
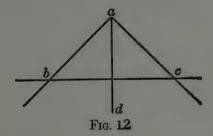
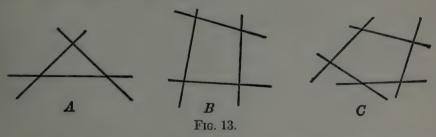


Fig. 11.

16. In the diagram in Figure 12, triangle a-b-c is made of strips of wood; a-d is a cord to which a weight is attached. How can this contrivance be used as a level?



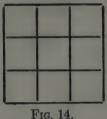
17. The following diagrams (Figure 13) represent strips of wood fastened together by one nail at each intersection. Which of the forms will change shape if pressed on opposite sides or at opposite vertices?



18. Are any or all of the problems above, 15-17, catch problems? Describe a pupil for whom one of them might be a catch problem.

19. Would you expect any transfer of training from working a series of puzzles like the following "Match Puzzle" to the working of one like the "Clock Puzzle"? Why?

Match Puzzle. Take 24 matches and arrange them as shown in the diagram (Figure 14). Then remove 8 matches in such a way as to leave just two complete squares and no more.



Match Puzzle.

Clock Puzzle. A certain clock dial, which was made of glass and which had upon it the hours indicated in Roman numerals, broke into four pieces. It was discovered that the figures on each piece made exactly the number twenty. Make a diagram of the pieces into which the dial broke.

# THE DEVELOPMENT OF SKILL IN SOLVING LONG PROBLEMS

School problems, as a rule, have a decided "shortness" about them. They may with propriety be called "minute problems," a designation equally appropriate whichever way the word "minute" is pronounced. Occasionally a pupil may be studying a problem for half an hour or even for a whole hour; very rarely for any longer period. Now, if school is to be a preparation for life by being a good sample of real life, it must present problems typical of those which appear in life. Are we to understand that a person's life work will be made up almost entirely of short problems and that his success will depend mainly on his ability to solve little difficulties? Daily life does present to every individual a large number of minor difficulties. There are little pains and pleasures, little joys and sorrows, little rights and duties. But that is not all. There are also big perplexities, long problems, great achievements, and our real success or failure will depend on our ability and determination to "stay by" these long problems until they have been solved, even if it takes "all summer" or a whole lifetime to do it.

Consider for a moment some of the problems of one of our most important occupations, farming. In order to

produce the kind of goods which will find a ready market a farmer must be well informed about supply and demand, a matter which involves problems extending over one or more years. The soil must be prepared for the kind of crop which is to be raised, a problem which, for proper rotation, requires three or four years. Stockraising demands the selection of suitable breeds and constant attention to the improvement of the stock. It takes a long time to build up a first-class herd. To plan and build up a farm place requires ten to twenty years or even more. When a long-headed young farmer wishes to buy a farm on which to live and raise his family, he must consider many things which lie years in the future. Will his children have a chance to get the education that they ought to have? Will they as they grow up have the proper social surroundings? Will he be able to work out his ambitions regarding an ideal farm home?

It is true that a very large part of the success of a farmer depends on his ability to deal with the small difficulties which present themselves from hour to hour in his work. It is true also that considerable success can be attained by those who think about their work only from season to season. However, it must be borne in mind that such a success is largely vicarious in its real nature. The "short-headed" man may attain a measure of success because he imitates his long-headed neighbor.

As it is in farming so it is in other vocations. The proportion of long problems is not the same in all occupations; but each one has its share, and upon the solution of such problems hinge the big successes to be attained.

The pupils in some schools get considerable training in dealing with long problems through the various student activities which are permitted or fostered. The organizing of an athletic team, securing the proper training, arranging a schedule for contests, playing the games, and taking the victories and defeats in sportsmanlike fashion is a good long problem for those who take part in it with their heads as well as their bodies. Organizing a literary society, adopting a constitution and by-laws, electing efficient officers, making plans for a series of programs, contests, and "doings," is a problem of no mean dimensions. Publishing a school paper, maintaining a glee club, an orchestra, or a band, or organizing a system of self-government to take charge of some phase of student life are matters to be successfully achieved only by sustained attention and effort for several months or years. Then there are a number of projects or organizations any of which may last for a comparatively short time. Committee assignments, temporary clubs, and associations for the achievement of this or that end require thinking and planning for several days or weeks.

Curiously enough many teachers have looked upon such student activities as more or less necessary evils, to be tolerated mainly for the purpose of supplying an outlet for the exuberant spirits of the students who otherwise would be likely to cause disturbances in the life of the school. Many teachers have been blind with respect to the kind of training that life really demands. They have failed to understand that their pupils more or less instinctively have been trying to play with long problems in order to balance the work of the classroom. When an upper classman in college gives this advice to a new student: "Don't let your studies interfere with your getting an education," it is difficult for the teacher to see any wisdom in it. The interpretation of such advice is, "Don't spend so much time on the short and unreal problems of the classroom that you fail to get any training in dealing with the long problems that lie close to life."

There has been some reason for such rather uncomplimentary advice as was given by the upper classman. Much of the work in elementary and secondary schools, as well as in colleges, has been too petty. It has dealt with problems concerning which it made little or no difference whether they ever were solved or not. It has emphasized duties and virtues which are of little account in ordinary life.

A decided change has appeared, however, during the last few years. Through the influence of Dewey, Mc-Murry, and others, the wide-awake teachers in all classes of schools have made strenuous efforts to organize the subject matter in their courses into large problems directly related to life. Many of the problems have, no doubt, been purely formal and have failed to grip the pupils; but excellent beginnings have been made in many schools, as shown by the outlines of courses which have been published. Yet many teachers and schools are still following the old methods. The big task now before supervisors and superintendents is to get the average teacher to do what the leading teachers are doing. How can this be accomplished? Mainly by arousing a thoughtful attitude of mind which will result in attempts, not to

copy what others have done, but to organize the work into problems which shall be vital to teachers and pupils alike

This will require first of all a liberation from the old conceptions of a course of study. Many courses of study which have required the covering of a specified number of pages in given text-books must be scrapped; it makes no difference how carefully and painstakingly they have been worked out to the smallest detail. They are useless for the purpose of getting teachers and pupils to think. They are, as a matter of fact, preventive of thinking. They represent the efforts of superintendent or supervisors to think for the teachers and pupils.

Problems in school work in order to be real and gripping must spring from the experience of the pupils and teachers. Some of the best problems spring from the various activities of the school and cannot possibly be outlined in any course of study. The teacher must be alert and interested in the thought life of the pupils. He must be able to sense their perplexities. He must see to it that these perplexities, often dimly felt by the pupils themselves, are raised into consciousness and expressed in questions and problems. He must take these questions and problems and use them as nuclei for facts and ideas which are thus to be woven together into usable idea groups.

This means that the courses of study must aim to be developmental and not merely informational. It means that knowledge shall not be valued for itself, but that facts, ideas, and principles are to be regarded as tools with which the pupils and the teacher learn to solve

their perplexities. By this I do not mean that the orderly and systematic curriculum of the past is to be superseded by a chaos of childish questions and fancies, or that we are to cultivate a disregard for knowledge. I do mean that it is to be the business of the school to present such an environment and to so stimulate the pupils that the perplexities and problems which arise will be typical of those which the pupils will be likely to encounter in their later life, or, as Cubberley has expressed it:

"The purpose of instruction is changed from the memorization of facts, to the fitting of pupils for personal responsibilities; from that of accumulating information, to that of training young people to stand on their own feet; from that of transmitting to them the inherited knowledge of the past, to that of preparing them for social efficiency in the life of to-morrow." ¹

The developmental course of study is dynamic rather than static. While it contains those constants which all pupils should master, it seeks also to meet the changing needs. This requires that teachers and principals shall coöperate in outlining the curriculum, and that they must ever be on the lookout for improvements and new adjustments to the life of the community in which the school is located. It requires the development of the problem attitude of mind and a constant study of life conditions.

In order to cultivate the problem attitude, a teacher will find it an excellent practice, from time to time, to group the main facts relating to a subject about a few large problems stated in such a way as to seem of vital

¹ Cubberley.—Public School Administration, 284; (1916).

importance in the present-day life of the pupils. However, such a series of problems should be presented only tentatively, never as part of a fixed routine that must be completed. I have seen many sets of such problems that were no better and were no more vital than the ordinary chapter headings of old textbooks. The main value of preparing a series of problems is that it sets the teacher free from slavery to the textbook and gives him mastery over the subject through his using the information for purposes of interest to himself and his pupils. If to the freedom thus acquired is added some ingenuity and skill in presenting the problems that have been prepared, it will be safe to expect that the pupils will become vitally interested in some of the questions, either as they are stated by the teacher or as they may be remodeled by the pupils and teacher working together. Some problems are likely to prove worthless so far as having any power to grip the pupils is concerned. However, they may suggest other questions and thus contribute to the work of the class.

Suppose, for the sake of illustration, that a teacher groups the main facts in a course in United States history around eight problems which seem to be thoroughly worth while and of vital interest in present-day thinking. Suppose these problems to be presented as a course during the next school year. It may happen that two of the problems fail to arouse any genuine interest in the pupils. One may be lost in the shuffle of other discussions, and two others may survive by being amended and remodeled in the class. Let us suppose that two of the problems stimulate a great deal of interest and that they result in

much discussion and investigation by the pupils. If the teacher is very fortunate, one of the problems may grip the pupils in such a way that they cannot let go of it. It develops into a whole series of other problems and results in a number of discussions, both in school and out of school. It brings about the organization of committees to investigate questions at issue through collateral reading or by consulting people who may be supposed to possess information of value. This last may be done either through personal interviews or through correspondence. In short, it turns out to be a real problem, occupying the attention of the class during a large portion of the school year.

Now let us suppose that the teacher who has given a course with the results we have just described, feels a desire to give a still better course the succeeding year. The first thing for him to do would be to get all the possible profit out of his previous experience. Why did some problems fail to interest the pupils? Was it due to the nature of the problems or was it due to the way in which they were presented? Why was the amended statement of some of the problems better than the original? What was there about the "big" problem that gripped the class so strongly? Could the same factors have been used in any of the other problems? What methods were most efficient for stimulating thought and freedom of expression on the part of the pupils? How could more valuable "by-products" have been obtained for the class and the community? These and other questions will confront the teacher as he thinks over his experience and attempts to interpret it.

The preparation of the "better course" will consist in making a revised set of problems and in planning how to interest the pupils in each one. Those problems which did not arouse the interest of the pupils and which do not readily yield to amendment will be omitted, others will be remodeled. Questions suggested by the pupils will be included as an important part of the course. It may be worth while to organize the whole course around the "big" problem as a nucleus. There will be one tendency to counteract. A teacher is likely to regard such an improved course as quite perfect and to insist that the class shall accept it as such, with the result that the work may become as perfunctory as if based upon a formal outline of the old type, which we all used to follow so conscientiously.

Any series of problems must be presented tentatively and must find justification, not in the past success of the problems, but solely in the success with which they stimulate vigorous thinking by the pupils to whom they are presented. It may happen, for example, that the problem which proved such a big success one year will fail to arouse any special interest when presented to a class the next year, while a problem of apparently lesser interest may become the gripping one. The wise teacher is not discouraged by any such results. He knows that the reaction to any given problem depends quite as much upon the pupils as upon the problem, and that it is perfeetly natural that separate classes respond differently to the questions that are put to them. He knows, too, that if he is really and truly to be more successful, the secret of that success will be found in a more ready understanding of his pupils and a willingness to adapt the course to their needs as the work advances, in order that the problems may be *their* problems rather than *his*.

What has been said about history can readily be applied to other subjects, such as geography, civics, hygiene, agriculture, and general science. All of these courses tend to disintegrate into a large number of what Bacon called "vermiculate" questions. They ought to be pulsating, stimulating centers of vigorous thought about problems vital to the happiness and welfare of the pupils.

Good teaching will present all school subjects in such a manner that the pupils will get training in efficient individual thinking as well as in coöperative thinking about long problems, perplexities that last sometimes for weeks or even months. It will do more than that. It will attempt to arouse interest and develop skill in attacking problems which it may take years to solve.

One of the most important of these problems is that of choosing a vocation. That this is important for the pupil, anyone can discover by observing the many unhappy and unsuccessful misfits in all walks of life. It is also important for the efficiency of the school, as any teacher can testify if he has had in his classes students who had a definite life work before them and were anxious to get as much and as effective training as possible to prepare them for such a work, and if he also has had students who were merely drifting along, not knowing and not caring whither they were going. It is important for democracy that the formation of set classes or castes shall be prevented, and that every youth shall discover what his talents are and how he can best serve his country.

The vocational guidance movement started about ten years ago in this country. So rapidly has it developed that a recent bulletin¹ published by the Bureau of Education in Washington contains a bibliography of thirty pages on this subject. Roughly speaking, one may classify the various attempts that have been made in this field as (1) Attempts to solve the problem *for* each pupil, and (2) Attempts to aid and stimulate each pupil to solve his problem for himself.

To the first class belongs all the work of experts who examine individuals and, on the basis of such examination, suggest the vocation for which each individual is supposed to be fitted. Here, too, belong placement bureaus and all similar agencies, whose aim is to provide a person, who does not know what he can do or where he can find anything to do, with a suitable job. Such agencies usually make a more or less thorough investigation about each candidate and give him a rating based upon personal examination and upon testimony obtained from others. While these agencies are of great social and economic importance, they do not directly concern the teacher in his function as a "promoter of efficient thinking" on the part of his pupils.

To the second class belong all the activities and efforts needed for arousing each pupil to a realization of the necessity of intelligently choosing a vocation, for aiding him to make a true estimate of his talents, for giving him information which will make it possible to evaluate the different vocations with respect to their requirements and

¹ Ryan.—"Vocational Guidance and the Public Schools," Bureau of Education Bulletin, 1918, No. 24.

advantages, and finally to provide him with information about institutions in which he can obtain suitable training for the vocation that he may select; all supplied in such a manner that it shall stimulate him to vigorous thinking and firm conviction.

In these activities, the teacher must of necessity be intensely interested; nay, more, he must use them as opportunities for developing the pupils' ability to think about a "really long problem."

"Two facts, strike one forcibly as one considers the need of vocational guidance in our schools. One is that never before in the world's history have fourteen- or fifteen-year-old children had it so much in their own hands to make some of the most momentous decisions of life; such decisions as the sort of school or course they will enter, how long they will stay, the work they will leave school for, and how long they will stay in this work. The other fact is that never as much as now have we needed a constructive policy on the part of the schools to make up to these children what an industrial age has taken from them in the way of home influence, normal surroundings, and the vocationally directive value of their daily experiences." ¹

What can be done to interest pupils in the problem of choosing a vocation and to aid them to think efficiently so as to arrive at an intelligent conclusion? One of the leaders in vocational guidance, Jesse B. Davis,² has suggested that it can be done in connection with English Composition by means of a series of themes covering the years of the Junior and Senior high school course. The special phases of the problem to be taken up in each year have been summarized in the following table:

² Davis.—Vocational and Moral Guidance: 1914.

¹ Bloomfield.—Vocational Guidance and the High School.

## TABLE III.

Grade	Semester	Aim	Suggested Themes
Seventh	Both	Vocational ambition.	My favorite books, hero or heroine, games; the kind of man (or woman) I wish to be; what I should like to do; etc.
Eighth	Both	Value of an education.	Hunting a job; "Blind alley" jobs; what adults say about the need of an education; advantages of going to high school; money value of education; satisfactions obtained through education; etc.
Ninth	First	Character, self-analysis.	How I prepare my lesson; read a book; use my memory; my health; my habits; my inheri- tance; things I can do to strengthen my character; etc.
	Second	Character analysis through biography.	Brief character sketches; when is a man (or woman) successful? value of a fixed purpose; overcoming handicaps; etc.
Tenth	First	The world's work.	Systematic study of the general nature of a vocation and the preparation needed to meet its requirements; also the opportunities for entering it; etc.
	Second	Choosing a vocation.	My natural abilities; vocational experiences; the preferences of my family; the need of choosing a vocation; the vocation I should like to enter; etc.
Eleventh	First	Preparation for my vocation.	(1) Education required—what school to select, subjects to take, length of training needed, etc. (2) Character—traits important for success, how developed, etc.
	Second	Vocational ethics.	Moral problems of the various professions; such as journalism, law, medicine, manufacturing, etc.

Twelfth First Social

Social ethics.

Social responsibilities, methods and agencies for social welfare, etc.

Second Civic ethics.

The relations of the various vocations to local and state government, etc.

It will be noticed that the plan suggested by Mr. Davis calls for a systematic thought study under the guidance of the teachers of English and covering a period of several years. What can be done in small schools where such an extensive plan would be impracticable? Consider for a moment the factors involved in an intelligent selection of a vocation.

There must clearly enough be the following:

- 1. A knowledge of a number of typical vocations, in order that there may be a fair number among which to select. This knowledge can best be obtained in a good practical study of geography, in which the different vocations are made prominent. There should be frequent debates concerning the relative advantages of the various vocations and the natural resources needed for each.
- 2. A knowledge of the natural abilities required and the possibilities of overcoming individual handicaps. This can be secured through well-directed reading of biographies and should result in contributions to the classes in history and English, each pupil presenting the results of his reading to the class and the class discussing the report and making comparisons between the conclusions presented in different reports.
- 3. A knowledge of the education and special training needed for a successful pursuit of the vocations considered desirable. This can be obtained by means of general

reading and through study of recently published manuals and bulletins about the principal occupations. Much stimulating work can be done by interviewing men and women in the home community and by correspondence with others who may be presumed to have the information desired, this latter giving real practice in letter writing and composition.

4. An analysis of the pupil's native talents and likes and dislikes. Is the pupil primarily a hand worker or a head worker? Which type of work gives him the deepest satisfaction? Is he physically robust or delicate? Does he prefer outdoor or indoor life? Does he prefer to follow his own plans or to follow directions given by others? Is he sociable or naturally reticent? Is he rapid or slow? Does he prefer to work with big things or with little things? Is he naturally accurate or inaccurate? These and other questions which will suggest themselves will help to decide, at least roughly, whether a person has the native talents for a given vocation or not. Of course, it must be borne in mind that almost any natural handicap can be overcome, provided there is sufficient ambition and determination to make the necessary effort.

The importance of a person's early likes and dislikes, as indicators for vocational selection, is stated by Thorndike in the following words:

"Interests are shown to be symptomatic, to a very great extent, of present and future ability. Either because one likes what he can do well, or because one gives zeal and effort to what he likes, or because interest and ability are both symptoms of some fundamental feature of the individual's original nature, or because of the combined action of all three of these

factors, interests and ability are bound very close together. The bond is so close that either may be used as a symptom for the other almost as well as for itself. The importance of these facts for the whole field of practice with respect to early diagnosis, vocational guidance, the work of social secretaries, deans, advisers, and others who direct students' choices of schools, studies, and careers is obvious. They should be taken account of in such practice until they are verified or modified by data obtained by a better method; and such data should soon be collected. The better method is, of course, to get the measurements of relative interests and of relative ability, not from memory, but at the time, and not from the individual's reports alone, but by objective tests." ¹

5. An investigation of opportunities for getting the best training for the vocation that may be selected. This will call for considerable letter writing, not only in sending for catalogs and bulletins but in making inquiries of men and women who may be presumed to know the relative merits of the various types of training that are offered. Before any person enters an institution or a class he has the right, and it is his duty, to inquire concerning the results that he may expect from his attendance. As there are "blind alley" vocations, so there are "blind alley" courses and institutions. Probably the majority of pupils in the high schools have no definite idea as to where their course is leading them or what specific benefits they may expect to derive from a given subject.

Some people will undoubtedly object to any attempts to influence pupils in the elementary or secondary schools to consider the question of the selection of a vocation and will claim that such pupils are entirely too immature

¹Secondary quotation from Hollingworth's *Vocational Psychology*, 191-2. Location of original not stated.

to think effectively about such a problem. If the purpose of the consideration of such a problem by immature pupils were that of arriving as speedily as possible at a conclusion which could not later be changed, the objection would be a valid one. However, that is not the purpose. Rather it is to give the pupils such training as will develop in them ability to think effectively about choosing a vocation when the proper time comes. It must be granted that as things are, very many young people give no thought whatever to the selection of a vocation, but drift into those positions that happen to be open. Others attempt to do some thinking; but as they have never been trained to think about a long problem, they are unable to keep their minds in suspense. Such a thinker will jump at the first conclusion which comes to his mind, in order to "get it settled one way or another." It is because we have not permitted children to think about this problem, since we were afraid that they could not think so wisely as adults, that we have so many adults who think about it as if they were children.

What are the chief values to be realized by stimulating children to think about a long problem such as the one which has been advocated?

- 1. Children gain first-hand experience with a long problem in such a manner as to realize its nature, and thereby may be saved from attempting, later in life, to deal with long tasks as if they were like the little school tasks set from day to day.
- 2. They learn the art of breaking up a big problem into smaller problems by asking questions and analysing it into its elements.

- 3. They learn to suspend their judgment until all the evidence is in and to keep it suspended if sufficient information is not available.
- 4. The most important benefit of considering such a problem is that it gives the pupils an opportunity for coöperative thinking, demonstrates the value of such thinking, and shows ways and means for doing it. As citizens we realize that practically all our big problems, in order to be solved rightly, must be solved by coöperative thinking. Why not then display a little enthusiasm over any school that gives its pupils a chance to become skilled in this kind of coöperation? If all our public and private schools would begin to train their pupils in thinking coöperatively, no one would need to be alarmed about the "safety of democracy."
- 5. The problem will serve as a nucleus for much valuable information which will be likely to remain with the pupils because the problem to which it is related will remain.
- 6. It will afford a splendid opportunity for gathering material under conditions that are quite similar to those of everyday life, in which our perplexities come to us without formal assignments into topics and sub-topics and without detailed information as to what books and pages to read. A wise teacher will let the pupils ask their own questions, develop their own topics, find their own material, present it in their own way, and receive the judgments of approval or disapproval from a "jury of their peers."
- 7. It will give real practice in oral and written composition, because every pupil in the group will be ex-

pected to gather information by oral interviews, or else by correspondence, with persons who may be presumed to know something worth while about the matter in question. When reports are presented to the class they will be real contributions.

8. It will give opportunity for the conflict of opinions, for debates in which the purpose is that of discovering the truth, for having one's opinion prevail without humiliating the other fellow, and for "giving in" without getting sore. Note what the following excerpt from a committee report on a project in coöperative thinking reveals:

"This volume is the product of Group Thinking. Although the constituent parts were written by separate authors, yet no one division of the contributions made in the construction of this work can be said to have sprung from the cerebrum of any single individual. It is a composite piece of work.

"In first attacking the problem . . . our conferences were medleys of heated arguments and discussions. Gradually the problem began to take form and divide itself into logical divisions so that we could begin to do individual work on the various phases which it presented. Our conferences from now on consisted of a report from each member which was attacked by the others to detect any flaws which it may have contained.

"Each member would then, acting upon the suggestions and criticisms of his colleagues, continue the study of his own phase of the problem. Whenever differences of opinion occurred, and they were by no means infrequent, the question was always argued out to a definite, unanimous decision of the group." 1

¹This quotation is taken from the preface of an unpublished thesis, A Practical Plan for Establishing a System of Vocational Guidance at St. Olaf College, by Oscar Fylling, Ludvig Rice, Enoch Norem, and George Sime.

9. It gives practice in organizing the information obtained into a systematic whole, evaluating the various parts and assigning to them their proportionate amount of space.

The chief functions of the teacher who wishes to train his pupils to think about long problems are the following:

1. To advertise enthusiastically the value of thinking about long problems and of thinking coöperatively.

2. To ask intelligent and stimulating questions and offer suggestions about ways and means for further work whenever the pupils begin to lose interest.

3. To insist on organization and division of labor in such a way as to prevent a situation in which a few do all the work while the others loaf.

4. To act as the enthusiastic "fan" who is ready to cheer whenever good results are achieved.

5. Whenever possible to provide some competition, the greatest stimulus known for securing intense effort.

- 6. To be zealous about accuracy, reliability, and excellence to such a degree that the feeling will be contagious.
- 7. Always to think with the pupils rather than for them; that is, to practice coöperative thinking as well as to preach it.

### THOUGHT EXERCISES

1. What was your school experience? How many long problems did you and your schoolmates work out in connection with regular class work?

2. If you were asked to plan a course in United States

history in the form of six or eight vital problems, which ones

would you select?

3. In order to think effectively about the choice of vocations, many persons must first get rid of some of their prejudices and false notions of value. Illustrate.

4. Inglis 1 says that from the standpoint of the school, vocational, moral, social, and avocational guidance are to be regarded as phases of educational guidance. What do you

suppose is the basis for this view?

5. Inglis also says that the older conception of educational guidance meant primarily the giving of advice or telling the pupil what to select, and that the more recent conception means that the pupil shall be given opportunities to become acquainted with the privileges, demands, and responsibilities of life by actual contact in such a way that he discovers his own capacities and preferences. In what respects is the latter a more truly educational guidance?

6. In a recently published report 2 the aim of education is

stated as follows:

"Education in a democracy, both within and without the school, should develop in each individual the knowledge, interest, ideals, habits, and powers whereby he will find his place and use that place to shape both himself and society toward ever nobler ends."

How would you define "powers" as here used, if the defini-

tion as a whole were your own?

7. The same report enumerates the following as the "main objectives of education": (1) Health. (2) Command of fundamental processes. (3) Worthy home membership. (4) Vocation. (5) Citizenship. (6) Worthy use of leisure. (7) Ethical character. What place do you think a school ought to give to the development of coöperative thinking if it wishes to attain these objectives?

8. The intelligent selection of electives in a high school implies that the pupils have already chosen the general field

¹ Inglis.—Principles of Secondary Education, 717-8.

² Cardinal Principles of Secondary Education; a report of the Commission on the Reorganization of Secondary Education, appointed by the National Educational Association. (Bureau of Education Bulletin, 1918, No. 35.)

of their vocations. Resolved: That electives should be abolished because the pupils have not the necessary knowledge or experience to give them any basis for selecting their courses. Discuss the resolution.

9. Investigations show that pupils who obtain high marks in the last four years of the grades usually obtain good grades in the high school, and that those who do well in the high school usually do well in college. What bearing does this have on educational guidance?

10. Can you name a course or subject that might properly

be designated as an "educational blind alley"?

11. Professor Colvin makes this statement:—

"Effective reasoning, then, does not consist so much in following logical norms as they have been elaborated in great detail in various texts, as it does in having certain correct attitudes of mind, and a genius to select those particular elements in the situation that bear upon the problem."1

What do you suppose he means by "certain correct attitudes of mind"? What would they be in effective cooperative thinking about a long problem?

12. Rapeer makes the following statement:

"We have yet to live up to the expectations of our nation's founders. Poverty, crime, political injustice, an enormous preventable death-and-illness rate, industrial oppression and lack of vocational preparation, immorality, selfishness, greed, graft, political indifference, lack of citizenship, inability of citizens to coöperate, to take the initiative, or to lead in public causes, insufficient and poorly used leisure, indifference to the higher esthetic, and intellectual activities which made Greece the pride of the ages-all these forms of serious maladjustment which mean widespread failure to realize any reasonable goal of life, are still with us, contrary to the sanguine expectations of our forefathers for this glorious new country." 2

Are the problems named short or long? What will they demand most, individual or cooperative thought? Resolved: That the schools must Complete the statement.

13. As a corporation is to efficiency in business so

¹ Colvin.—The Learning Process, 318. ² Rapeer.—Teaching Elementary School Subjects, 9.

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is coöperative thinking to efficiency in thinking. Do you agree?

14. How has the George Junior Republic illustrated the

value of training in coöperative thinking?

15. Freeman 1 enumerates the following requirements of correct scientific thinking: a. Suspension of judgment. b. Systematic procedure. c. Freedom from prejudice. d. Adequate information. e. Familiarity with good models of reasoning. Resolved: That all of these can best be developed through cooperative thinking about long problems. Outline an argument for the affirmative or the negative.

¹ Freeman.—How Children Learn, 226-9.

## XI

# THE DEVELOPMENT OF SKILL IN CRITICAL THINKING

What is the real nature of criticism and what is its function in life?

Criticism is often regarded as being merely an academic process found mainly in institutions of higher learning and carried on by so-called "critics." Criticism is more than an academic process. It has its source and justification in the general struggle for existence and is an operation through which the process of selection is lifted to the plane of consciousness and becomes an act of intellectual analysis and judgment.

Selection depends on two main conditions. The first one is that there must be an overproduction, a profusion of wealth of materials. The second one is that there must be a variety in the materials, so that those things which are most fit to survive will tend to crowd out those which are less fit. It is a process which operates in all spheres of life, in nature as well as in the activities of man. Wherever it appears, it is an evidence of vitality and abundance on the one hand and of growth and development on the other. Where this selective process does not appear or where it is resisted, the fact is evidence of poverty and of the absence of progress.

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If we bear in mind this fundamental and general selective function of criticism, it becomes easy to discover its importance in the affairs of everyday life. The success of an individual in any vocation is clearly dependent on his ability to exercise critical selection; that is, to select the "better" and to discard that which is merely "good," and to be ready and willing to abandon the "better" as soon as he discovers the "best." The development of any trade, vocation, industry, art, or branch of knowledge is directly dependent on the elimination of "good" things in favor of those which are "better." Ideas, methods, and appliances which have been of great service and which actually may be of much value are crowded out because other ideas, methods, or appliances are developed which are recognized to have a higher value. The development of civilization generally can be estimated by the growth of the "scrapheap" of discarded "goods." Similarly, the backwardness, whether it be of a group or a nation, can be estimated by the slowness with which relatively good things are discarded in favor of those which are better.

As civilization advances the selective process tends to become more and more intellectual in its nature. Blind "trial and error" methods give way to forethought, to the weighing of evidence, and to the comparing of values. This change does not diminish the importance or force of the process. Rather it enlarges its scope and makes possible progress at an increased speed. It is with this intellectual aspect of selection that teachers must be especially concerned.

What has been the place of critical thinking in our

schools? During my experience I have never seen a recitation in which the primary aim was to develop in the pupils the ability to exercise intelligent criticism. To be sure, pupils have always indulged in considerable criticism; not only of their subjects and their books, but of the teachers and their methods, and even of the superintendent and the whole school system. However, such criticism has not been regarded with favor. And this attitude on the part of teachers can be justified. Criticism by pupils is generally quite primitive. It may be mere faultfinding, and consequently does not deserve any credit.

But why is it that the critical thinking of pupils, and of a large number of adults too, is so crude? According to the dictionary criticism is the "act or art of judging by some standard." Note that the dictionary calls it an "art." If the criticisms made by our pupils are crude, would it not be well for us to help them to develop their endeavors into a real art? If they begin by mere fault-finding and continue practicing that until they are grown up, they will become just as expert grouches and fault-finders as some of the adults whom we know, and who make life a burden for their neighbors.

At this point I must forestall an objection which is likely to arise in the minds of some. Is it really well to develop in children this critical attitude of mind? Would it not be better to allow them to grow up in childlike trustfulness, believing all things, hoping all things? This seems at first sight to be a reasonable objection. There are two answers to it. The first one is, that whatever the teacher may or may not do, every normal child will

sooner or later learn to distrust things in his environment, and his hopes will become mixed with fears. As a matter of fact, most children are quite disillusioned before they enter school and usually come to believe in the teacher more thoroughly than they believe in anyone else. The other answer is, that schools do not exist for the purpose of keeping their pupils from changing; quite the contrary. The fundamental purpose of all education is to produce changes. The attitude of childlike simplicity, while it may have a certain charm when found in little children, is very far from being desirable in an adult. The real danger does not consist in the development of an intelligently critical attitude of mind, but rather in the lack of such development, the result of which may be that children become so disillusioned by their environment that they grow into adults who believe in no one and hope for nothing.

It is sometimes claimed that the critical attitude of mind is destructive of the ability to act with promptness and efficiency. This claim has some truth in it. Imagine two auto drivers passing through a town on a highway. Let us suppose that one of them has formed the habit of carefully examining the signposts and reading the directions before he proceeds, while the other one is a strong believer in immediate action and speed. The latter may be out of town sooner than the former, but the former will be more likely to be on the right road. There are situations in life in which promptness and speed of action is of more importance than accuracy or correctness, but they do not occur very frequently. As for me, I prefer a driver who critically examines the guideposts. However, I do not want him to camp by a guidepost in a state of endless uncertainty, and I do not want him to come with a report that "I am inclined to believe that this probably may be the road which we might take according to what the directions seem to say."

One other idea calls for a few words. As there is no such thing as judgment in general so there is no such thing as criticism in general. If criticism is a judgment of values, it is necessarily a specific act in which the relative merits of specific things, ideas, persons, institutions, or situations are compared. So then a school cannot develop criticism as a general power or ability but it can give its pupils skill in the critical evaluation of specific things. This leads us to the practical question, what can the school do to develop skill in critical thinking in its pupils?

What are those specific things in which pupils should be trained to exercise criticism? Clearly, it must be in those problems which demand critical thinking in ordinary life.

1. Most of us meet so many people that we cannot possibly be on intimate terms of friendship with them all. We must select our friends and co-workers. This selection calls for a critical judgment regarding the desirable and undesirable qualities in individuals. Can a school do anything to develop in its pupils a reasonable efficiency in the judging of men? The study of biography and history affords splendid opportunity for such development. A considerable portion of the time devoted to these subjects should be given to answering such questions as: What made this man successful? Which of the

men studied was really the most important? What were the plus and minus traits in their characters? Are the prominent traits found in these men also found in other noted men? Are these traits operative to-day in making men famous? How do men acquire such traits? Can such traits be cultivated in school? What are the best methods for developing them?

Every political campaign and election is an invitation to the teacher to introduce into his class work a number of discussions dealing with the proper selection of candidates for an office. Given a certain office, what qualifications are needed in a candidate for that office? Do the candidates have these qualifications? How can we obtain reliable information about the various candidates so as to judge them impartially and truthfully? If people disagree in their estimation of two candidates, and if the pupils also disagree, what is the cause of the disagreement? Are they judging by different standards? If so, which is the best standard?

If the pupils have received sufficient training in judging historical characters, they should be able to discuss the merits of candidates for office without bias and without getting excited, provided the teacher works with them and guides the discussion by constantly insisting on facts that have real importance. Every exercise should be a coöperative one in which all the pupils of the group take an active part by asking questions, furnishing information, suggesting methods and means for obtaining further information, offering objections or calling attention to difficulties to be met, offering resolutions for expressing the consensus of opinion, or by insisting

that the discussion must be kept free from emotional excitement.

Can these things be done in school? They can without doubt, if the teacher has had the proper training for guiding the pupils rightly. The main difficulty is that so few teachers have had any training for this type of work. And they are not to blame for this lack of training. The fact is that comparatively few adults know anything about properly selecting a candidate for office. They do not know enough even to ask important questions and to seek for reliable information. Campaign "literature," as it used to be written, would have been classed as fiction, if it had been admitted as literature at all. Much of it even to-day is so contradictory, as presented by the different sides, that all of it cannot possibly be true. Ask any ordinary man on the morning of election day why he intends to vote for this or that candidate. Wouldn't almost any class of eighth grade children, under the guidance of a competent teacher, be able to give more satisfactory reasons for their choice? This is no reflection on the ordinary voter, either; for, bear in mind, he has never had any training in thinking efficiently about the relative merits of different candidates. The safety of the ballot demands that schools begin to take this matter seriously and actually do something about it.

2. We hear so many things that we cannot possibly pay attention to them all. In other words, there is need of selection with respect to things that people say. Note that I did not say that people tell us lies. Most of what we hear is true enough. The main objection is that a large part of it is irrelevant or immaterial; and life is so

short that it is wrong to spend any time discussing unimportant matters. Just wait until you catch your next "cold" and try to follow all the advices given by all your good friends. Or, as a teacher, try to do all those things which well-meaning people, who are interested in your welfare, suggest. It cannot be done. Time will not permit

Almost every class recitation affords excellent opportunity for developing ability to judge the practical merits of what people say. Our mistake in the past has been that the teacher and not the pupil has received the chief benefit of these opportunities. Pupils have always passed some judgments more or less silently; such as, "That was a bluff," "Good recitation; best he has made so far," "All balled up," "Didn't know what he was talking about; had not studied the lesson," "Wish he could talk better," "Fooled the teacher that time." Such judgments have generally been regarded as too immature to deserve consideration, and if any pupil ventured to express his opinion so that it could be heard, he was frowned upon as an undesirable citizen of the class. Now, is there any reason why recitations should be conducted as a hearing before a judge with the teacher taking the part of the judge? An inexperienced teacher no doubt receives a great deal of valuable practice by such procedure, but is it fair to the pupils that the teacher get all the practice?

Pupils can easily be taught to evaluate class recitations according to the formula used by lawyers, requiring that testimony shall be competent, relevant, and material; which by interpretation means, that a witness must know what he is talking about, that his testimony must relate to the case, and that it must be of sufficient importance to make some difference. A recitation should be like a conference, and the contribution of every pupil should be subject to the judgment of the other members of the class. Pupils should learn to think and talk about a recitation without being personal. To say that a certain recitation was irrelevant should be understood as casting no reflection on the individual who recited. When a report is given by a pupil, it will at times be convenient to have the other pupils write their estimates of the good and weak points in the report on slips of paper which should be handed to the pupil after the recitation. The teacher as a member of the group, may hand in his slip with the pupils. When the pupil has examined the criticisms which he has received, a conference with the teacher will be helpful.

3. People invent so many plans, devise so many schemes, and promote so many organizations that we cannot possibly take an active interest in all of them. In fact, we must refuse to have anything to do with most of them in order to find some time to attend to our own business. If a school gives its pupils a fair training in initiative and in imaginative thinking, as suggested in Chapters VI and VII, there will be no lack of material for critical evaluation. Any task can be accomplished in a number of ways. Efficiency and success depend on a person's ability to exercise criticism and discover the best way. I remember when capital H was written with an initial circle followed by a series of curves and loops. Gradually it has been simplified into three straight lines,

two vertical and one horizontal. We may see the day when it will be written by making two vertical lines or one vertical and one horizontal. Life is constantly urging us to "cut out" the nonessentials. It puts a high premium on those methods which effectually accomplish things in the least amount of time and with the least amount of energy and annoyance.

Why should not every school carefully train its pupils to be good judges of methods of work? It can be done by requiring them to think critically about everything done in the school, from the writing of an H to the conducting of a final examination or the planning of the graduation exercises. Some people think that it would be objectionable to let pupils express their opinions about things that are done and the manner of doing them. They maintain that children's minds are immature and therefore their criticisms will be childish and worthless. All of which is granted, and all of which constitutes a very good reason for having such criticisms expressed in school, where they will do no harm and where they can, through suitable training, gradually be improved. Let me mention something which is really objectionable. It is to have grown people express childish criticisms about organizations and institutions and methods of work, because they have never received the training which they should have had.

There is nothing mysterious or miraculous in training children to think critically about methods of work, or about plans and projects, or institutions. Get the pupils into the habit of asking these simple questions: Is the thing produced what we want? Is it produced with the least amount of work, expense, annoyance, and time, and without sacrifice of principles or lowering of standards? If another method requires more work, time, or money, are the results obtained sufficient to warrant the extra outlay? Suppose that the athletic team of a school goes to an adjoining town and wins a victory by allowing a pupil to play although he should have been barred. The question then is whether that is the kind of victory that the school really wants. What is the actual cost of such a victory? Is it worth the cost?

If pupils are allowed and encouraged to think in this way, it is quite possible that some embarrassing questions will be put to the teacher. Is the result that we are getting out of this subject really what we want? Is the method which we are using the best one? Such questions are embarrassing, especially when we know within ourselves that our methods and results are not as good as they ought to be. But I also know something which is vastly more embarrassing for anyone who aspires to become an efficient teacher, and that is to continue using poor methods and getting poor results because one is afraid to face honest criticism from the pupils, who are the sufferers on account of one's inefficiency.

4. There are, according to estimate, about five million books in the world. This means that if a person read one new book every two weeks, or twenty-six in one year, he would in fifty years be able to read only one book out of every three thousand eight hundred in the world's bookcase. There are in the United States alone more than twenty-two thousand periodicals of all classes, including daily papers. All of which means that the biggest

problem before a reader, who does not want to read himself into dreamy stupidity, is that of selecting wisely what to read. Yet there are schools which continue the practice of requiring their pupils to read what the teacher sets before them, and which do little or nothing to develop in the pupils any skill in the selection of what to read, so that they will be able to read with discrimination after they have left school.

What can be done to develop efficiency in reading through intelligent discrimination, not only with respect to what books to read but also in regard to the contents of the books which one does read? Consider first the various types of reading. There is reading for inspiration, for information, for enjoyment, and for pastime. There is reading for the purpose of memorizing passages, rules, or formulas. The important aim in any reading is to master the thought of the author.

During the last five years supervised study has become a part of the regular program in many of the best schools. Such supervision may have many different aims and may take a large variety of forms. In so far as it attempts to aid the pupil to attain mastery in reading, it must be directed principally toward developing skill in critical thinking; for efficiency in the mastery over the thoughts of others, as they are expressed in books, involves first of all ability to select. Why is one author to be preferred to another in the same field? What kind of book is it preferable to read; one that presents a general survey of the main facts or one that gives a detailed account? What confidence can be placed in the presentation by a given author? What style of presentation conveys the



thought most effectively and easily to the reader's mind? Should the book be read from cover to cover, or will it be more profitable to read only certain chapters or portions? How can one determine which parts of a book to read? In actual reading, every paragraph may be presumed to contain a central thought. How can the reader develop skill in finding and retaining that thought without burdening his mind with the details, which are given merely for the sake of elucidating the main idea? These and similar questions the supervisor of book study must seek to answer, not merely in words, but through a training which will result in the forming of proper habits by the pupils.

The following types of exercises for pupils are mentioned to suggest some specific things that can be done to develop critical mastery in reading:

- (1) Paraphrase difficult sentences or paragraphs into simple direct statements. An inspector put the following question to a class in geography: "If you were to dig a hole thousands and thousands of feet deep, would it be cooler near the bottom or near the top, and why?" Not a child answered. Finally the teacher said that she was sure they knew the answer and taking the book she asked, "In what state is the center of the earth?" In a chorus came the reply, "The center of the earth is in a state of igneous fusion."
  - (2) Illustrate abstract ideas by concrete examples.
  - (3) Condense long discussions into brief summaries.
- (4) Make ideas stand out clearly by stating the negative of positive propositions and vice versa.
  - (5) By using a simple scheme of symbols indicate in

DEVELOPMENT OF SKILL IN CRITICAL THINKING 213 the margin the relative importance of the ideas presented.

(6) Write topic sentences for the important para-

graphs.

(7) Write marginal summaries of important paragraphs.

(8) Write chapter or topic summaries.

(9) Reduce arguments to briefs.

- (10) Prepare outlines and diagrams for conveying the gist of the ideas presented in an article or in a book. Later give an oral or written review of the article or book selected based on the outline.
- (11) By using the table of contents, and after a preliminary survey of a book, prepare a set of problems or questions to be used as a guide in the reading.
  - (12) Try to anticipate the answers to be found.
- (13) Make a list of the most valuable ideas contained in a book.
- (14) Demonstrate the value of these ideas by showing what can be done with them.

The type of skill in critical thinking to be developed will naturally depend upon the subject studied. Penmanship calls for criticism of handwriting and of methods of work. Arithmetic demands critical interpretation of problems and evaluation of methods of work and of solutions. Geography gives opportunity for comparison of living conditions in different localities, for evaluation of different vocations, and for critical estimation of the relative contributions to humanity of the various races or peoples. History calls for verification of statements, comparisons of persons and events, and interpretation of past movements as related to present-day problems. Litera-

ture gives opportunity for criticism of form as well as of thought. Other things could be mentioned for each subject, and the list of subjects might be continued to include all the work of the school.

5. Ability to exercise self-criticism is not the least of our needs. The injunction to every man "not to think of himself more highly than he ought to think; but to think soberly," calls for practice and training.

What can the school do to develop self-criticism in its pupils? There is but one thing to suggest. Give the pupils practice in self-criticism. Suppose a pupil has given an oral report. Why not let him be the first one to offer a criticism of that report? And why not give him credit for his self-criticism as well as for the report? Suppose a pupil has broken a rule or otherwise caused some difficulty. Why not let him be the first one to pass judgment on the act and suggest what should be done? Don't we adults frequently wish that people would wait a little before they "butt in" on us, and that they would give us time to straighten out our affairs? Why not give pupils a chance to straighten out their affairs? Why not demand it of them? Why shall we continue to do for our pupils those things which it would give them a splendid training to do for themselves? The only method for avoiding constant criticism by others is to become an expert in self-criticism. Where can such training be obtained more easily than in school? But one needs to bear in mind that criticism is not the same as faultfinding. A pupil should be expected to note and evaluate the good points as well as the defects in what he does. He is to be trained to think soberly and truly about him-

self, and to regard as a weakness any tendency to allow his judgment to be influenced by purely personal feeling.

When all things have been considered, critical thinking is found to make three important demands. It insists on clearness. The critical thinker is always asking such questions as: Just what did we see? Just what were the sounds we heard? What were the exact words used? What did he really mean to say? What did he do? What did he mean to do? Critical thinking makes a persistent demand for all the actual facts in the case. It has no patience with merely alleged facts. It rebels against all reports which are "made to order" and "fixed" to suit the supposed needs of the hearer. Finally, critical thinking is effective thinking; it demands results. It is opposed to speculations which lead nowhere. It objects to everything that is irrelevant and immaterial. To some people critical thinking has meant merely the type of thinking that demands clearness and truth. It means more than that. It insists that the particular truth which we hold shall be one that has value in reaching a conclusion.

It has been estimated that "fifteen minutes a day or a half hour three days a week devoted to a particular study will make one a master in that field in a dozen years." 1 That evidently implies a different type of reading than most of us are doing. It means that we cannot continue to read "a little of everything," or to read anything that we may happen to pick up. It demands concentration, which is but another word for elimination of everything that is irrelevant and immaterial. Then why not yield to the demand and become a master in some field?

¹ Griggs.—The Use of the Margin.

#### THOUGHT EXERCISES

1. Resolved: That critical thinking is not an essential requirement for real success in the ordinary vocations. Prepare a brief for the side that you prefer.

2. What is the weakness in the thinking of persons who

become excessively cautious and unable to act?

3. Prepare five debate questions based on comparisons of historical characters and suitable for pupils in the eighth grade.

4. Prepare five questions for debate based on comparisons of historical characters and suitable for pupils in the twelfth

grade.

- 5. Suppose the pupils in a certain school become unpleasantly excited in their discussion of political candidates, what course would you advise? Would such excitement show the need of stopping discussions or of introducing more discussions?
- 6. Prepare a simple blank to be used by pupils in writing their criticisms of oral recitations and reports. Make the blank so that it will call for a statement of the good points as well as the defects. Provide a space for objections by the pupil receiving the criticisms.

7. Prepare a simple blank for criticisms of their composi-

tions by the pupils.

8. Prepare a blank for getting the opinions of the pupils about the parts of a textbook or of a course which had interested and benefited them the most, seemed the most difficult, etc. Call for the information which you think a teacher should be interested in securing after teaching a given course. Be careful to make the blank as impersonal as possible.

9. Keep a record of all your reading for one week. What

do you conclude as to the quality of your selections?

10. How can pupils use school marks as a basis for self-criticism?

11. Is excessive self-depreciation a symptom of lack of proper self-criticism?

12. Prepare a simple blank to be used by pupils for cooperative criticism of notebooks.

## XII

# SIZE OF VOCABULARY AS A MEASURE OF THINKING ABILITY

What is the relationship, if any, between a person's ability as a thinker and his mastery of a vocabulary? Is there a correlation such that those individuals who are the best thinkers also know and use the largest number of words to express their thoughts? Is the converse also true, that the size of one's vocabulary is indicative of his thought efficiency? Or, perhaps it is true, as many old sayings indicate, that there is a certain opposition between the number of words used and the amount of wisdom which they contain. Perhaps silence or the fewness of words used is indicative of depth of thought so that "Even a fool when he holdeth his peace is considered wise." Perhaps it is true that "Empty barrels rattle the most."

Possibly none of the suppositions which have been mentioned express the truth. Perhaps there is no relationship between the number and importance of the thoughts which an individual has and the number or size of the words which he uses to express them. Perhaps some thoughtful individuals use few words while others use many, and perhaps the same is true of thoughtless people.

¹ Proverbs, 17:28.

In order to find an approach to our problem, it will be necessary to digress for a few moments to recall some of our general experiences which seem to have a bearing on the question at hand.

The railroad maps of two of the states in the Union look somewhat like the diagrams in Figure 15. Would it be safe on the basis of these maps to conclude anything as to the amount of commerce in these two states?

Suppose we count the number of miles of good roads in two counties of equal size and find that one county has ten times as many miles of such roads as the other; what could we reasonably conclude as to the activities of the people in these two counties?

Is it generally true that the commercial activity of a city, county, state, or country is directly proportional to the number of roads, railway lines, and other means of communication it may have?

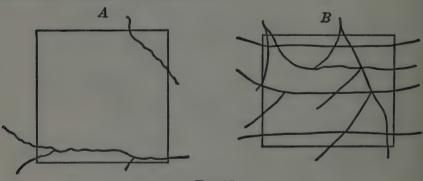


Fig. 15.

Suppose we should find two stores dealing in the same kind of goods, but one of them having four times as much stock on its shelves as the other; could we conclude anything about the amount of business done in the two establishments? Perhaps not. But if we were to select one hundred stores that have only a small stock of goods and another hundred that carry a large stock, could we not then conclude that, as a rule, those stores which carry the large stock are doing the more prosperous business?

Suppose we were to make a comparison of various colleges. It would be true, would it not, that generally and in the long run those colleges which have the largest number of buildings and the best equipment and which offer the largest number of courses are also doing the most vigorous work and enjoying the most prosperity intellectually? If a small college was found to be doing excellent work or if a large college was found to be lacking in prosperity, we should recognize it as an exception to the general rule.

If two debating teams were to show us the cards of notes which they had prepared for a debate and if one of the teams had twice as many notes as the other, we should predict, that, other things being equal, the team with the larger number of cards will win. If the other team should win, we should feel that an explanation was necessary.

How is it that such apparently external aspects can be used as measures of the inward conditions of the activities or situations mentioned? The roads do not produce the commerce of a city or state, the goods on the shelves do not make the business prosper, the buildings and equipment or the number of courses announced in a school catalog do not teach, the cards do not argue. If the things which we have mentioned are not to be regarded as the causes of the prosperity in each case, they may, however, be the effects of such prosperity, or they may

be part cause and part effect. If there is much commerce in a city or state, the roads will be built, and the roads will in turn make possible an enlarged commercial prosperity. If a store finds a vigorous demand for its goods and if it has the right kind of management, it will increase its stock so as to meet the demand. If people want an education and if a school satisfies such a want, it will prosper in the number of students, buildings, equipment, and variety of courses. If a debating team has the ability and will to win, they will prepare themselves thoroughly for the debate and as a result have more cards than the other team. In other words, we have been taking the effects or the concomitants of various activities rather than the activities themselves as indications of their prosperity.

What is the application of this digression to the problem with which we started? Thinking is an inward activity. Its stock in trade consists of ideas, and these ideas are represented more or less accurately by words. Given two men H and L. If H has a vocabulary of 60,000 words while L has a vocabulary of only 40,000 words, we conclude that, other things being equal, H is doing more thinking than L. This does not mean that the words or ideas produce thoughts any more than that the goods on the shelves produce trade. It does mean, however, that generally and in the long run those individuals who do the most varied and vigorous thinking are compelled to seek most diligently for information, and consequently become masters of the largest number of ideas. Even if ideas were but the bubbles produced by the process of thinking, like the bubbles in a coffee pot their number may

be a very good measure of the activity within. But ideas are more than effects of thinking. They are both effects and causes. When an individual is met by an experience which compels him to think, his thinking compels him to search for ideas. The ideas in turn enable him to think more.

At this point we must take note of an objection which it is entirely proper to raise. Even if the size of a person's vocabulary may be indicative in a general way of the amount or extent of his thinking, it may not reveal anything about the quality of his thoughts unless there should happen to be a positive correlation between the number and the quality of the thoughts which people have, so that those who have the greatest number of thoughts also have the best ones.

Experiments bearing on this problem can easily be arranged. If a number of persons are asked to state as many arguments as they can for or against a certain proposition, there will be very marked individual differences in the number of arguments that will be stated. In one experiment, some of the individuals participating gave only three arguments while others gave twelve. When the arguments were analysed, it was found that those persons who had given the largest number had also given the best ones.

"Other things being equal, the man with the best stock of ideas can reason the best. His life will be fuller and more complete and he will be able to perceive relations and formulate laws impossible for the man whose native retentiveness is poor." 1

¹ Lyon.—Memory and the Learning Process, 11.

The size of a person's vocabulary has come to be accepted as a very reliable indication of his general intelligence. According to Terman

"The vocabulary test has a far higher value than any other single test of the scale. Used with children of English-speaking parents (with children whose home language is not English it is of course unreliable), it probably has a higher value than any three other tests in the scale. Our statistics show that in a large majority of cases the vocabulary test alone will give us an intelligence quotient within ten per cent of that secured by the entire scale. Out of hundreds of English-speaking children we have not found one testing significantly above age who has a significantly low vocabulary; and correspondingly, those who test much below age never have a high vocabulary." ¹

The bearing of this statement on our problem becomes manifest when we call to mind that general intelligence means the speed and success with which an individual adapts himself to a relatively novel situation; in other words, it means ability to think.

How can a person's vocabulary be measured? The dictionary test is, on the whole, the most satisfactory for measuring one's comprehension vocabulary. This test consists in selecting at random from the dictionary a number of words, usually one hundred, finding out the percentage of these words which one knows and multiplying this percentage by the total number of words in the dictionary. Let us illustrate by a concrete example. Webster's New International Dictionary (1910 edition) contains 2373 pages. If we take the first word on every twenty-third page we shall get a list of one hundred words which will constitute a fair sampling of all the

¹ Terman.—The Measurement of Intelligence, 230.

words in the book, not counting the words in the footnotes or in the appendix. Let us suppose that we know seventy out of the one hundred words. By an actual count of one hundred and seventy-nine columns the average number of words per column in the dictionary is 14.63. This means that the total number of words defined, not counting those in the footnotes or in the appendix, is about 104,000. If we know seventy per cent of these words, we have a comprehension vocabulary of 72,800 words.

The method just described was used by Starch in the preparation of his English Vocabulary Test. He selected two lists, each containing one hundred words. The appended scores ¹ represent the approximate percentage of words comprehended by an average individual for each grade of schooling from the fourth to the senior year in the university.

 ELEMENTARY
 HIGH SCHOOL
 UNIVERSITY

 Grades
 4
 5
 6
 7
 8 | I
 II
 III
 IV
 F.
 So.
 Jr.
 Sr.

 Scores
 30
 33
 36
 39
 42 | 45
 47.5
 50
 53 | 56
 58.5
 61
 63

In order to secure an accurate measurement, one should test himself by two or three lists and take the average score obtained.

In order to get a complete measurement of one's comprehension vocabulary, the dictionary test, as we have described it, must be supplemented by various other tests, for a person is really acquainted with many more words than this test will indicate. By turning to the "Pronouncing Gazetteer" in the "Appendix" of the New

¹ Starch.—Educational Measurements, 38.

International Dictionary, a person will find that he knows a considerable percentage of the 21,000 terms there listed. The same thing will be true regarding the 11,000 names listed in the "pronouncing Biographical Dictionary," also in the "Appendix." Then there are about 100,000 words in the footnotes, of which a small percentage will be recognized. By making these corrections it will be found that a person who knows about seventy per cent of the words in the dictionary test proper, which means a vocabulary of 72,800 words, really has a total comprehension vocabulary of about 80,000 words. And this does not include any account of the 26,000 words in black type mentioned in the definitions themselves, or of the different meanings listed under each word, which, if counted, will be found to average more than twice as many meanings as there are words.

If the dictionary test is made on the basis of the New Standard Dictionary, it will be found that the total number of words recognized is somewhat larger than indicated by the test as based on the New International, even when such a test is corrected by means of the "Appendix" and the footnotes. The New Standard Dictionary contains about 185,000 words not counting the variants; that is, words in black-faced type occurring in the definitions. A person who knows about seventy per cent of the regular words in the New International, and consequently has a comprehension vocabulary of about 80,000 words, will know about fifty per cent of the words in the New Standard, which would mean that he has a vocabulary of about 92,500 words by that measure.

A number of investigations have been made in regard

## VOCABULARY AS A MEASURE OF THINKING ABILITY 225

to the vocabularies of school children. Kirkpatrick 1 used a list selected from the Webster's Academic Dictionary, which contains about 28,000 words. On this basis he found the recognition vocabulary of children in each grade to be as follows:

GRADE 2	Vocabulary 4,480	Grade High School I	Vocabulary 15,640
3	6,620	II	16,020
4 5	7,020 7,860	III	$17,600 \\ 18,720$
6 7	8,700 10,660	Normal School College	19,000 20,120
8 9	12,000 13,400		

In a later investigation, using the same test in the Spever School of Teachers' College, Columbia University, it was found that the vocabularies were considerably higher as shown in the following:

GRADE	Vocabulary	GRADE	VOCABULARY
4	10,886	7	17,052
5	13,216	8	18,704
6	17,038		,

The larger vocabularies of the pupils in the Speyer School are accounted for, as the investigator thinks, by the fact that the curriculum of this school is more vitally related to everyday life and calls for more initiative on the part of the pupils than is the case in the average school.

Both of these investigations show clearly enough the

¹ Kirkpatrick.—"A Vocabulary Test," Popular Science Monthly;

LXX, 157-164, 1907.

Bonser.—"Vocabulary Tests as Measures of School Efficiency,"

School and Society, November, 1915.

gradual increase of the vocabulary of school children with their progress through the grades, or, in other words, with their growth in intelligence. As measures of the total recognition vocabulary of the pupils, these investigations are wholly misleading, because the test was based upon a dictionary which contains a very limited number of words. As shown by the Starch standards, children have recognition vocabularies that are three to five times as large as those indicated by Kirkpatrick.

An interesting type of vocabulary test is reported by Gerlach.¹ He used one thousand words selected from the Standard Dictionary. For each word four definitions are given; one correct, the others wrong. The test consists in placing a check mark opposite the correct definition for each word. The results are about forty per cent higher than those given by Starch. The limitation of this set of words or any similar set is that the test cannot be repeated with the same pupils without finally vitiating the results. The dictionary test can be repeated as often as one may wish it, by making new series of words. This makes it possible to verify a test and to take periodic tests, in order to ascertain the actual growth of vocabulary in the same individual or group of individuals.

As it is possible to measure, with a fair degree of accuracy, the general recognition vocabulary of an individual, so is it also possible to measure his recognition vocabulary in a specific field of thought. To illustrate. The index of the ordinary textbook in United States history for the upper grades contains from 1300 to 1900

¹ Gerlach.—Vocabulary Studies, Colorado College.

items. If one hundred of these were selected at random, and if the individual to be tested showed a familiarity with forty per cent of the words or items so selected, it would be safe to conclude that he would show a similar familiarity with the items in the entire index. If another person showed that he knew sixty per cent of the words or items, we would conclude that he could think more efficiently about the problems of United States history than the individual who had the lower score.

A similar procedure can be used for measuring a person's recognition vocabulary in other subjects. A complete, well-selected index is a very convenient tool for measuring familiarity with a subject.

The active vocabulary, or number of words which an individual actually can and does use in his speech or writing, is evidently very much smaller than his comprehension vocabulary. It would be very desirable to have tests by which the size of a person's active vocabulary could be measured; but no such tests are available, and it would be a very tedious and laborious task to undertake any such measurement. It is possible, however, to arrange tests by which the number of words under command by one individual or group can be compared with that of other individuals or groups. To illustrate. Take a book of synonyms. Select a list of words which have at least four synonyms each, being careful to avoid words that overlap in meaning. Put these words in sentences so constructed that the synonyms can be used in place of the test words without destroying the meaning or the form of the sentences. The test consists in taking such a list of sentences and writing after each

sentence as many synonyms as one can for the test word, which is indicated by italics. A sample of such a test with tentative scores is given in the Appendix of this book.

Similar tests can be arranged calling for antonyms. Other tests may call for words expressive of sounds, colors, smells, tastes, touch, temperature, and other groups of qualities or characteristics.

Is it worth while for a teacher to take the trouble of measuring the vocabularies of the pupils?

First, let me say that it need take very little work on the part of the teacher to give the tests which have been described. It takes only a few minutes to select a list of test words. One of the older pupils can easily do it under the direction of the teacher. By using carbon paper and thin writing paper, several copies of the test can be made with one writing. If there is sufficient space the test can be placed on the blackboard. When a test has been taken, the checking can be done by having the pupils exchange papers and mark them under the teacher's supervision, or else by letting a committee of the older pupils mark all the papers. The figuring and tabulating of results will form a practical exercise for the class in arithmetic.

Now let us consider briefly some of the advantages which a school may derive from taking such tests.

"Taking stock" is as necessary in school work as in other activities or occupations, if one is to know whether the work is prospering or not, and it should be regarded as a part of the regular duties of all teachers and superintendents. The board of directors of a school should from time to time call upon the teacher, who is the general manager of the business of their corporation, to give a statement showing the conditions of the business. Perhaps it would be well, too, if the reëmployment of the teacher and his chances for a raise of salary were more dependent upon the amount of actual profit which his management and teaching could show. It would be a tremendously stimulating experience for most of us; and if it were sprung on us without previous warning, we should probably become very much confused. There are few teachers who can give a ready statement of facts about the results of their work. In the case of a large number of us, the statements would consist mainly of expressions of faith and hope with a silent prayer for charity. However, if definite statements of results were to be demanded, I have no doubt that we should quite readily adjust ourselves to the new demands. Nor have I any doubt that we should think more highly of our profession from so doing.

By the use of standardized tests and measurements it is now entirely feasible for a teacher to measure the attainments of the pupils at the beginning and at the end of a term's work, and to tell definitely and accurately just what progress has been made in the various school subjects. Suppose that by the use of vocabulary tests a teacher could also tell how many ideas the pupils are familiar with at the beginning and at the end of the term. Suppose further that he could state quite definitely the number of ideas that had been acquired in the different fields of thought. He would then be able to render a very definite account of his work. If a taxpayer should want to know just what returns were obtained for

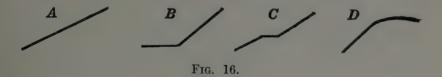
the money spent in the support of the school, he would receive a very specific answer.

The vocabulary test is valuable in showing the individual differences between the pupils in the school. When applied to college students, for example, it shows that some have an acquaintance with 30,000 words more than others in the same class. If a certain pupil appears to have an unusually small vocabulary, it at once raises questions as to what the cause of such a deficiency may be and stimulates the teacher to investigate and to seek for remedies. In other words, such tests reveal practical teaching problems and stimulate initiative. The result is growth and improvement in the teacher as well as in the school.

The vocabulary tests will stimulate interest on the part of the pupils. Watch any game or activity in which there is manifested a lively interest. What is the center of the interest? The score. How much interest would there be in running, jumping, throwing, or shooting if no scores were kept? Suppose, now, that five pupils in the seventh grade start out in September with the following vocabularies: A 40,000; B 39,000; C 38,500; D 38,000, and E 37,500. Suppose they are told that they will be tested again in January and in May. The game consists in trying to gain the largest number of new ideas so as to be the master of the largest vocabulary. If D should gain 3,000 while A gained only 2,000, D would win over A. What would be the result of such competition? There would develop a strong demand for information. Ideas would go above par in value. The pupils

would be asking questions at home and in school, jotting down information, making drawings and diagrams, in short, storing up general information. It would put a premium on the correct understanding of words, for guess work is not to count in the tests. Some pupils might invent schemes for keeping accounts of the ideas which they acquire. The plan bristles with possibilities.

The value of the vocabulary test for the teacher as a measure of his own intellectual growth is well worth considering. How interesting it would be to have some record of the expansion of one's thought life from year to year. Suppose the diagrams in Figure 16 were the representations for a period of ten years of the Recognition Vocabularies of four individuals. The first one shows a steady mental growth. The second indicates a period of dormant mental life followed by a very satisfactory growth. The third presents a record of interrupted growth. The fourth shows a period of growth followed by stagnation and this means "Beware, the receiver will get you!"



Suppose a person could hold an "Annual Meeting" to consider the status of his thought business. If the year had been a prosperous one, a part of his annual statement might look like this:

DEPARTMENT OF STOCK OF IDEAS		
Stock on hand at beginning of year	65,000	ideas
Received by development of department of his-	,	
tory	1,000	"
Received by cultivating literature	500	"
Received from miscellaneous sources		"
Stock on hand at end of year		66

Recommended to open a department in science.

How can a large vocabulary be acquired? Recall for a moment our digression at the beginning of this discussion. The roads, the stock of goods on the shelves, the buildings, equipment, and courses of study, the number of arguments listed by the debating teams, do not by themselves constitute the goals to be attained. They are means which have been sought or developed in order to accomplish other and specific purposes. It would be foolish to develop them for their own sakes. Ideas are tools by which thinking is accomplished. Information grows best when it is sought in order to meet the real problems of life. The best rule, therefore, to be followed in securing a larger stock of information and a larger vocabulary is this: Face difficulties bravely; they are the opportunities for thought; and thought is the opportunity for getting real information.

#### THOUGHT EXERCISES

1. How large a recognition vocabulary do you have according to the Starch Test? Verify it by other tests based on the use of the New International Dictionary.

2. Test your pupils by the Starch Test, letting them write a phrase or short statement in explanation of each word that they know. Have them exchange papers and check the mistakes by using the dictionary. Then let them figure the results. If the pupils verify the first result by taking other tests, what valuable attitude of mind may be cultivated? If some of the pupils in defining the words have been guessing wildly instead of stating what they knew, would it be worth while to follow the test with a general discussion about the meanings of the words?

3. Take a textbook in some subject that is new to you and glance through the index. Does it really measure your lack

of acquaintance with the subject?

4. Think of some plan for a dictionary drill.

5. How can catalogs be used for enlarging a person's stock of ideas and words? What kinds of catalogs seem the best

for this purpose? Could they be used in school?

6. All ideas are not equally important for yourself or for your pupils. What makes any particular idea important for yourself? Would you be willing to have the same rule apply in the case of the pupils?

7. Professor Dewey says that the maxim, "Teach things before words," would, if taken literally, tend to destroy educa-

tion. What do you think he means by that?

8. Which do you think, from your own experience, are the more valuable for the enrichment of one's stock of ideas and vocabulary, the language studies or the sciences? Why?

9. How can a teacher promote the discrimination of meanings of words? Do you recommend the memorizing of defini-

tions? Why?

10. As you think of the dictionary work ordinarily done in schools, what do you consider its chief values and defects?

11. One author has this to say about nature study:—

"There must always be a question to be settled if contact with nature is to be worth while. . . . 'How can we set up instruments so as to telegraph to the seventh grade room?' 'How does the ice-cream freezer work?' 'Where do dragonflies come from?'—these and similar problems set the pupils to observing because they need the facts in their thinking. Just ambling about in the out-of-doors is about as profitable as studying literature out of the dictionary; we go to the latter to find out something and then it functions." i

Downing, in the chapter on "Nature Study," in Teaching Elementary School Subjects. (Edited by Louis W. Rapeer.)

Reduce this statement to a rule for increasing one's stock of ideas.

12. What are the merits and limitations of examinations or tests made up of a series of words after which the pupils are to write whatever those words call to their minds?

13. How can a teacher who tries to enlarge the stock of ideas and the vocabulary of his pupils prevent the danger of juggling with words that have no real meaning in the experience of the pupils?

14. Devise a plan for coöperative work to enlarge and

improve the stock of ideas of your pupils.

15. Resolved: That school work as ordinarily done tends too much to produce the accumulation of miscellaneous ideas, which are regarded as ends rather than as means or tools for thought. Shall this resolution be adopted?

16. Resolved: That the salaries of teachers should depend upon the amount of actual results which they can show from

their work. Discuss this resolution.

17. Resolved: That the quality of ideas and their relative importance is of more consequence than their number and that, as a consequence, all results from vocabulary tests should be accepted with caution. Shall this resolution be adopted as stated?

#### XIII

## MENTAL ALERTNESS AS A MEASURE OF EFFICIENCY IN THINKING

Vocabulary tests are undoubtedly valuable for disclosing the number of ideas that individuals have and thereby indicating their ability to think. Such tests, however, have some important limitations and should, consequently, always be supplemented by other types of measurement. The present discussion will deal with one or two of these.

Let us approach our problem by recalling a few common experiences.

We have all seen establishments in which there was an abundance of stock on hand, but in which the goods were so poorly arranged as to be inaccessible when wanted or were of unsatisfactory quality.

We have visited two stores that have carried practically the same kind and amount of goods and have found that it took twice as much time to complete a transaction in one store as it did in the other.

We have observed that it takes some men a long time to decide matters of detail or to dictate an ordinary letter, while other men work very expeditiously.

We have listened to speakers who required a whole hour in order to present a proposition and to impress it upon their hearers. We have listened to others who could accomplish the same thing in twenty minutes.

We have seen teachers assign a lesson so well in ten minutes that every pupil became interested in the topic to be studied, knew exactly what he was to do, where to find the needed materials, and how to proceed; and we have seen other teachers use an entire recitation period to make a similar assignment.

Perhaps we can now agree upon a general proposition or rule as a summary of our experiences. Other things, such as amount of effort and quality of work, being equal, efficiency in any case is directly proportional to the speed with which transactions or operations are completed. If this proposition is true then it must follow that the mental speed of an individual is indicative of his ability to think.

At this point someone will no doubt remark that there are some good sayings; such as, "Slow but sure" and "Haste makes waste," which do not agree with the proposition just stated. Also there is the fable about the hare and the tortoise.

To which may be replied it wasn't the speed of the hare that caused him to lose, nor did the tortoise win because of his slowness. The hare forgot to attend to the business at hand, or rather at foot. You will please note that our rule did not say that efficiency is proportional to the speed with which work foreign to the business at hand is completed.

Speed is quite a different thing from hurry. Speed is attained through self-control, calmness, and skill. It implies a clear conception of the objective to be attained,

knowledge of the best ways and means to be used, and the avoidance of everything that is irrelevant or immaterial. Hurry means excitement, running to and fro, and lack of skill. It means confusion of aims, poor selection of methods and means, and the doing of much unnecessary work. Speed is a synonym for mastery, for efficiency. Hurry is a synonym for confusion and inefficiency.

Slowness is a characteristic mark of feeble-mindedness. This is clearly brought out in the following statement by Holmes:

"Probably the best way to come at the peculiarities of the feeble mentality is to point out the first and greatest defect. It is slowness. . . . Therefore, the mental growth of a permanently retarded person has been likened to that of a normal child except that the growth does not proceed so rapidly and does not proceed so far." ¹

The term *laggards*, which has been applied to pupils who fail of normal promotion in school, is significant of the general recognition that a certain amount of speed is necessary for mental efficiency.

One of the maxims for efficient learning is that a person shall work with some speed. Lyon 2 summarizes the results obtained by various investigators, who experimented to discover the relationship between speed of learning and retentiveness, in the following words:

"They have found, in the main, and other things being equal, the individuals who learn the quickest to remember the longest, i.e., to be the best retainers." His own experiments

¹ Holmes.—Backward Children, 182-3.

² Lyon.—Memory and the Learning Process, 96, 152.

led him to the following similar conclusion: "As to the relation of quickness of learning to retentiveness, the most general statement which can be made is that those who learn quickly remember longest if the material is logical in character."

A year ago I gave a study exercise to two sections of college students. The work consisted in finding, as quickly as possible, the answers to ten questions on the contents of a certain pamphlet. Each question called for a definite brief answer, and only the correct answers were counted in the score. A time record was kept for each student. The results which are relevant to our present inquiry were as follows:

Section A Section B (16 students) (16 students)

Average number of errors made by those who were above the median in speed	2.37	2.37
Average number of errors made by		2.51
those who were below the median in speed	3 25	3.00
Average number of errors by the four	0.20	3.00
slowest workers	3.50	3.75

The Cleveland Education Survey showed that, in respect to speed and quality of silent reading, ten per cent of the pupils were both rapid in speed and good in quality as compared with four per cent that were slow in speed and good in quality. On the other hand only four per cent were rapid and poor, while nine per cent were both slow and poor. Judd states: "These figures serve to emphasize the fact that good readers are usually not slow and poor readers usually not fast." ¹

¹ Judd.—Measuring the Work of the Public Schools, 155.

In all these cases it is well to remember that there are many exceptions to the rule. There are some persons who are speedy and inefficient, and there are some who are slow and efficient; but if there were one thousand fast workers in one group and one thousand slow workers in another group, and if we were directed to seek for accurate and efficient workers, we should without any hesitation go to the former group.

How can mental speed be measured? Several methods have been tried by psychologists. The simplest and most commonly used is known as the Association Test. One form of this test is called the Free Association Test and may be given with the following instructions: "I wish to know how many words you can think of and write in three minutes. I shall name a word, you may write it down and then write all the other words that come to your mind. Work as fast as you can." Some word, for example, play, is pronounced, and the pupils are allowed to work exactly three minutes, after which the papers are collected. Other starting words that have been suggested are cloud, dog, car, book, mother, ball. The papers are graded by counting the number of words written. Professor Pyle gives the following norms for this test:

Age 18 Adults Boys Girls 

The score will be considerably higher and will also form a truer measure if the pupils are told to write simply the first letter or letters of each word that comes to their

¹ Pyle.—The Examination of School Children, 26.

mind, and are given time to complete the words after the three minutes are up. As given according to Professor Pyle's directions, the test is probably one of speed of writing rather than of speed of thinking. The pupil who happens to think of long words will be distinctly at a disadvantage. By following the suggestion for abbreviations, this can be avoided.

There are several forms of Controlled Association Tests. One of them, the Opposites Test, is given by placing before the pupils, face down, a list of twenty words and then giving the following directions: "You have on these slips twenty words. I wish you to write after each word, another word that has the opposite meaning. For example, if one word were far, you could write as its opposite near." When every pupil knows what is to be done, the signal is given for turning the papers and starting. Sixty seconds are allowed for grades 2-4 and forty-five seconds for the grades above. The following is the list of words for this test as given by Pyle: long. soft, cheap, far, up, smooth, early, dead, hot, asleep, lost, wet, high, dirty, east, day, yes, wrong, empty, top. He gives the following norms of speed, all reduced to number of words per minute:

Age 12 18 Adults 13 14 15 16 17 Boys 12 11 15 15 16 19 20 Girls 11 11 14 15 17 17 19 21 23 23

The following may be used as supplementary lists for Opposites Tests: I. north, out, sour, weak, after, guilty, clean, slow, large, true, dark, front, love, ugly, open, sum-

¹ Pyle.—The Examination of School Children, 28.

mer. new. come. male, failure. II. (Difficult) best, weary, cloudy, patient, careful, stale, tender, ignorant, doubtful, serious, reckless, join, advance, honest, gay, forget, calm, rare, dim, difficult.

By allowing the pupils to use abbreviations in place of writing the words in full, the score may be considerably

higher than the one given by Pyle.

The directions for the Part-Whole Test are as follows: "The slip before you contains 20 words, each of which names a part of something. I wish you to write after each word a word which names the whole of the thing. For example, if one word were wheel, you might write engine. If one word were toe, you might write foot." 1 Allow the same amount of time as for the Opposites Test. The following list of words may be used: window, leaf, pillow, button, nose, smokestack, cogwheel, cover, letter, petal, page, cob axle, lever, blade, sail coach, cylinder, beak, stamen.2

The normal score per minute is given as follows:

These tests all show that mental speed generally increases with the age of the pupils. They also will show that there are very great individual differences in the mental speed of pupils of the same age, and the question naturally arises as to the causes of such differences.

¹ Pyle.—The Examination of School Children, 32. ² Additional words for Part-Whole Test: elbow, hinge, page, finger, wing, morning, blade, mattress, chimney, cent, sleeve, brick, deck, France, pint, fin, steeple, month, hub, chin.

Some pupils are by nature mentally slower than others, just as some are slower physically. Training will not take away these differences. On the contrary, it will tend to make them more apparent. However, the important fact is that everybody, whether naturally slow or quick, can be trained to increased speed.

How can mental speed be developed?

The best general rule is to set a time limit for all tasks that are to be performed or to introduce a speed competition by keeping a time score. In ordinary school work this is now frequently done. In penmanship, excellence is measured by the number of letters written per minute as well as by the quality of the writing. In the elementary operations in arithmetic it is indicated by the number of problems done correctly in a given time. In reading it is easy to measure the speed as so many words per minute, and to indicate the quality of oral reading by the number of errors per hundred words or of silent reading by testing the pupil's ability to state the thoughts expressed in what he has read. For silent reading, a combination score could be made by dividing the number of ideas gathered in a given time by the time stated in minutes.

The following are some suggestions for developing mental speed in various school activities:

1. Speed in studying. Prepare a series of specific questions calling for brief answers on the lesson to be studied. The questions may be placed on the blackboard and covered until the time when they are needed, or they may be duplicated by hectograph or mimeograph. When

the procedure has been explained so that every pupil knows exactly what he is expected to do; namely, to find and write the answers to the questions as quickly as possible, the work begins. The time score may be kept by either of the following methods: (1) Allow a specific time for the task. This can most conveniently be the time taken by the swiftest pupil for completing the work. In other words, when the first pupil has finished, everybody is told to stop. The score will then consist in the number of questions answered in the allotted time. (2) Let every pupil complete the whole task and note the time taken by each one. The score will then consist in the number of minutes or seconds required by each pupil for completing the task. This method requires more attention by the teacher and takes a longer time than the former method, but has the advantage that every pupil is tested on the same amount of work.

In schools where time scores are frequently recorded, the pupils should be so trained that, whenever such a score is to be noted, one of them can act as timekeeper and recorder. Committees of pupils, acting under the general direction of the teacher or of some pupil competent to act as general auditor, should be elected to check the results and present them in suitable form to the school. Such work will furnish excellent problems for the classes in arithmetic, one of its chief merits being that the pupils will demand correct results.

Whenever a report is presented to the school, there should be a free discussion of the causes which produced slow work and the methods which were most useful for

attaining the highest speed, in order that the pupils may become aware of the factors and methods which result in efficient work.

The competitive aspect of such an exercise can easily be increased by dividing a class into two or more groups which will compete with each other. This will stimulate interest in group scores as well as in individual scores.

2. Silent reading. Another method for developing speed in studying consists in asking the pupils to find the ten (or any other number) most important points or thoughts in an assigned lesson. In addition to developing speed, such work is valuable as an exercise in developing judgment of values. This will be especially true if there is a free-for-all discussion following the exercise, and if every pupil feels at liberty to defend his selection of points.

3. Speed in locating places on maps. Here, as in the other exercises, much of the value of the drill is to be realized by general discussions of the methods which re-

sult in speedy or slow work.

4. Speed in language work. This may be developed by such methods as the following: (1) Write as many sentences as you can in five minutes, using the following words: man, house, the, in, old, big, fell, made, for, and. (2) Express the following thought in as many ways as you can in five minutes: Many people ruin their health because they do not obey the laws of hygiene.

5. Speed in arithmetic. This is of two general types. One is produced by drill on the fundamental combinations, and is a matter of rote memory in which the bonds, or associations, are fixed by vivid impressions and nu-

merous repetitions under concentrated attention. The other consists in the ability to analyse a problem quickly and to discover the procedure for its solution. This latter type can be developed by exercises like the following: Place a number of arithmetic problems on the blackboard or have them duplicated on paper so that each pupil in the contest may have a copy. The task consists in stating for each problem (a) What is wanted, and (b) The method of solution. The time record and competitive score will stimulate speedy work.

Tests and examinations should generally have a time limit. Suppose an examination is given without a time record, and suppose pupil A completes the work in fifteen minutes while pupil B takes thirty minutes. If the papers are equally well done, should the pupils receive the same marks? Is it not generally true that, in life outside of the school, speed, or the amount of time used, is counted as an important element in every accomplishment? Perhaps we ought to use an examination formula like the following: Number of facts stated or problems solved divided by the time consumed equals the pupil's examination efficiency.

Every school should have some conveniences for making time records. If a stop watch cannot be secured, the pupils should be trained to note the time accurately by watching the minute hand and the second hand of any watch available. For convenience in making records in seconds, a pendulum can easily be provided by suspending a small weight by a string of such a length as to make it swing once every second.

Considerable attention has recently been given to super-

vised study in schools. It is interesting to note how many of the practical suggestions that have been offered along this line have the developing of speed as their chief aim. Note the following illustrations taken from Whipple's valuable little book: ¹

"Begin work promptly. Work intensely while you work: concentrate. Before beginning the advance work, review rapidly the previous lesson. Next make a rapid preliminary survey of the assigned lesson. Make the duration of your periods of study long enough to utilize 'warming up,' but not so long as to suffer from weariness or fatigue. When you interrupt work, not only stop as a natural break, but also leave a cue for its quick resumption."

Professor Dearborn's discussion of *Economy in Study* ² is aimed quite as much at the securing of greater speed as at the securing of better quality in the work.

In developing the ability to gather thoughts rapidly from the printed page, one must get away from the habit of reading every syllable or every word. Insistence upon the syllable or word method in the early grades may prove a hindrance in later life. I have seen many college students who, when reading even light literature, moved their lips in pronunciation of every letter. I used to read that way myself, thanks to the conscientious but mistaken efforts of my childhood teachers, to whom I owe the wasting of perhaps one-fourth or one-half of all the time I have given to reading. The object of silent reading is not to see or pronounce silently every letter or word; it is to grasp as quickly as possible the thoughts expressed on the printed page.

¹ Whipple.—How to Study Effectively.
² Dearborn, G.V.N.—How to Learn Easily.

Ideas and thoughts occur in different units, represented by words, phrases, clauses, sentences, and paragraphs. Reading may be measured by the size of thought units which one is able to comprehend at a glance. He who reads single words is conducting a sort of peanut business in the thought world and handles only small change. The ideal is to become a paragraph reader, to take in at a single glance the essential thought in a whole paragraph. There are many readers who can do this. They are conducting "big business" and, as a rule, handle nothing smaller than bank notes. Most of us never get farther than the clause or sentence unit, a sort of quarter and half-dollar business.

How can a person develop skill as a paragraph reader? Very little is known experimentally about this question. Whipple and Curtis, who made a study of skimming in reading by college students, have gathered a number of observations, of which the following are the most significant: (1) There were great individual differences, one student being able to skim three times as fast as another. (2) While normal silent reading proceeded at the rate of .26 second per word, skimming took only .14 second per word. (3) The slowest reader was also the poorest reproducer. (4) There were a number of different varieties or types of skimming, the following being the most prominent: (a) Reading only the first sentence of each paragraph. (b) Reading only the first part of every sentence. (c) Skipping several sentences after the first one in each paragraph. (d) Looking only for significant

Whipple and Curtis.—"Preliminary Investigation of Skimming in Reading," Journal of Educational Psychology, 8:333-349, 1917.

words. (e) Skipping after an important point had been noted. (f) Skipping examples, illustrations, quotations, and all "filling." (g) Glancing back at catch-phrases, and italicized words.

If the paragraphs in a book are properly constructed, they should each center about a single thought unit. Suppose now that a person wishes to become a paragraph reader. Would it not be a good plan to practice reading by looking for only one thought in each paragraph—the central thought—and skipping all the rest? It would at least be practicing what one wishes to learn; and we have every reason and evidence to believe that a person can learn what he attentively practices.

The speediest reader that I have found among college students could read ten ordinary pages in about three minutes and could give the gist of what he had read quite as well as those who read more slowly. The ordinary reader will do very well if he reads ten pages in ten minutes. Now, if a considerable number of those who are slow readers could, by proper training, have been speeded up to a more rapid rate without losing any of the quality of their work, and if their slowness is due to our work as teachers—well, there is but one plea that we can enter: we did not know any better. But, however many sins of our past this plea may cover, it will soon cease to be accepted.

A person who desires to become a paragraph reader must also attempt to become a paragraph thinker. This means that he must resist all tendencies toward a mere accumulation of miscellaneous information. He must constantly endeavor to organize his ideas into large clusters centering about problems of vital importance. According to Charles McMurry: 1

"The peculiar problem of our time is furnished by an overaccumulation of miscellaneous materials which now await the fashioning mind of the organizer who realizes the full value of a few ideas as centers of organization, or better, of growing ideas as furnishing the main lines of organization."

One other condition of mental speed and of efficiency in thinking should be mentioned. Not every idea, nor every problem is worth while; and to spend time on them means loss of speed in real accomplishment. Ordinarily it would seem that people might be classified according to the following scheme:

Persons \begin{cases} \text{Who think very little.} \\ \text{Who think } \begin{cases} \text{About useless things.} \\ \text{About useful things.} \end{cases}

Perhaps it is unjust to say that some people always think about useless things, but there are some who show a marked talent for it.

Then there is the matter of "watered stock" in ideas, best expressed in the saying of one of our humorists that "It would be better not to know so much than to know so much that is not so." There is as urgent a need for a Blue Sky Law in thinking as there is in commerce.

#### THOUGHT EXERCISES

1. Does the saying, "Stop and think," mean that we must "slow down" in order to think effectively? At what time do thoughts come most freely and easily, when we are sluggish

² Charles McMurry.—Conflicting Principles in Teaching, 54.

or when we are alert? Suppose a teacher were to say, "We shall want to do some real thinking for a little while. Let us begin by taking a few vigorous calisthenic exercises." Would that be a wise or foolish procedure?

2. How does your own mental speed compare with that of other persons in your line of work? How would it be to ask some competent person to give you a rating? Good business people do not hesitate to do that. If you should be rated as "Slow," what could you do about it?

3. How fast can you read and gather the thoughts from a book? How would it be to measure your speed of reading for various types of material, jot down the results in your mem-

orandum, and compare with results a year from now?

4. Is there any dawdling over lessons in your school?

What can be done about it?

5. Think of some typically slow pupil or person that you know. What help, if any, have they received toward speeding up? What factors, if any, have tended to keep them slow?

6. If a slow child fails to be promoted and has to repeat his grade, will that tend to speed him up or slow him down

still more?

7. What, if any, is the effect upon speedy pupils of being in the same class with, and having the same lesson assignments as, slow pupils?

8. What are the values of making "maximum" and "mini-

mum" assignments?

9. Suppose a farmer wants to be sure to turn his cream separator a certain number of times per minute, how can he fix up a pendulum to swing at the rate that he wants?

10. Think of as many speeding up exercises as you can in

ten minutes.

11. Did you know exactly what you wanted to accomplish to-day? What was the result?

12. How would you amend the statement, "Practice makes

perfect"?

13. What are the advantages of remembering facts by thinking of them collectively in a related group, rather than by rote memory?

14. Should the students who are the most rapid workers be allowed to complete their course in less time than others, or should they spend the same amount of time as others but be

required to do more work?

15. In five minutes make a list of as many things as you can which were learned in an order or sequence different from that in which they occur in daily life.

16. Bagley speaks of idea groups as "condensed experi-

ences." How is the "condensation" produced?

17. Make a list of antiquated stock in your knowledge of geography, or arithmetic, or physiology, or other subjects.

18. Suggest a few thought exercises to bring this list up to

twenty-five in number.

#### XIV

# METHODS AND TOOLS FOR IMPROVING THE TEACHER'S EFFICIENCY IN THINKING

How can a teacher develop skill in thinking about his own work?

It will be the purpose of our present discussion to summarize the principles which have been elaborated in the previous chapters, and to show how they may be practically applied by any teacher who is ambitious to think more effectively about the problems of his profession.

1. Active thought is most vigorously stimulated by real problems and perplexities. A teacher who wants to develop skill in thinking about his work must, therefore, welcome all the difficulties of that work as real opportunities. So fundamental and important is this principle, that any teacher, who grasps it thoroughly and orders his conduct in accordance with it, must of necessity become a more thoughtful person. It will compel him to meet his difficulties squarely rather than to evade them. Many of the attempts which he will make to find solutions for his problems will prove fruitless; but every such failure will in turn become a new perplexity which will compel him to continue to think. After a time, he will find that he makes fewer random attempts, and that he is gaining in power to deal with difficult situations.

There are some corollaries to this proposition.

- (1) A person does not improve in ability to think for himself by depending on others. He may ask for information and advice, but he must think before he asks and he must think afterwards. He must not expect to acquire skill by having others do all the practicing. To sit listening patiently to elaborate discourses at teachers' meetings and institutes is no doubt a very excellent practice. But, unless the listener critically reacts to what he hears, it may produce nothing more than a certain skill in sitting still and listening.
- (2) Reading may become a substitute for thinking. Except for pastime and enjoyment, a thoughtful person will not read unless he finds that it helps him to think.
- (3) A thinker is not afraid of making mistakes. He knows that random attempts play an important part in all progress. He is afraid of repeating mistakes.
- 2. Thinking is a form of behavior and is closely associated with action. When a person is beset with some difficulty and does not know how to meet it, he can stimulate his thinking by doing something. Let him take a pencil and paper and attempt to make diagrams or drawings of the situation and of some plan of action. If no plan comes to his mind, let him write anything that does come. It will give him a start. What appears on the paper may seem to be mere foolishness, but it will be vastly better than nothing; and the very fact that it seems to be foolish is evidence that one has begun to think sensibly. Passivity must be avoided if one wishes to think.

A preacher related this experience to me a few years ago.

He had been sitting in his study trying to prepare a sermon for the coming Sunday. For some reason he was unable to make any headway. He had a topic but could find no satisfactory method of attacking it. He picked up his hat and went over to one of his neighbors, with whom he deliberately started a discussion about the topic which he had in mind. This gave him the clue he wanted, and he went home and wrote the sermon. And that sermon was a true expression of his own thoughts and was not borrowed from the neighbor, who had merely served as a whetstone for his mind, as the neighbor discovered on the following Sunday.

3. Thinking, like other behavior, is made up of specific reactions or responses. The climbing of a mountain does not constitute one general act. It is accomplished by taking a large number of relatively small and easy steps. To master a difficulty one must break up that difficulty into parts which can be handled. The outlining of a course of study in a given subject seems like a formidable undertaking, until one discovers that it can be divided into a number of smaller problems or tasks. If one thinks of writing an essay or a book, the undertaking at first appears to be impossible of accomplishment. As soon as the general topic or problem has been analysed into chapter or paragraph topics, the difficulty seems very much lessened.

I suppose that we teachers, at some time or other, all have an ambition to do something very much worth while, something big. We fail to realize our ambitions because we look too long at the mountainside to be climbed and forget to take the first short step. Most of us would like

to become experts in something. We fail, not because of lack of ability, nor for lack of time or opportunity, but because we think of the large amount of information to be gathered, and this makes us so discouraged that we never even attempt to make a start. All that is required to become an expert in some line is fifteen minutes of thoughtful reading to-day, then the same amount to-morrow, and so on for a few years and the goal will be reached.

The corollary to this proposition is, of course, that one will not arrive by taking any number of steps unless the steps all go in the same direction.

4. The validity of all thinking depends directly on the mastery of facts. The teacher who wants to think effectively about any problem in teaching must insist on knowing the exact facts in the case. Let us illustrate by mentioning some problems which are likely to be met.

One of the questions which most persistently troubles the conscientious teacher is whether the pupils are really learning anything. A careless teacher will dispose of this question by recalling a few incidents and concluding in a general way that the work is satisfactory or unsatisfactory. If a parent inquires about the progress of his child, the answer is "Oh, he is doing very nicely," or some other non-committal expression. Many of the ordinary statements on reports to parents have little or no exact meaning. What does it really signify to find on a report card that a child has received "Good" in spelling or "Fair" in penmanship or 89 in geography?

No one can tell whether pupils are making progress, or learning, unless he is able to measure the exact attainments of those pupils both before and after they receive a given training. Similarly, no one can tell whether one method is better than another method unless the exact progress of the pupils by each method can be ascertained.

Fortunately for the teacher who wants to obtain accurate information regarding the attainments of his pupils, there has, during the last decade, been devised and constructed a large number of standardized scales and tests by which the information content or skill of pupils can be measured with a fair degree of exactness. If a teacher wants to know what progress his pupils have made in penmanship during a given term, he can now very easily find it. At three different times during the first week and during the last week of school, he requires the pupils to write some well-known sentence or stanza as a sample of their handwriting, directing them always to write as fast and as well as they can. He calculates the number of letters written per minute by each pupil and takes the average of the three samples submitted by a pupil as the speed score for that pupil. By the use of a standard measure of quality, such as the Thorndike or the Ayres handwriting scale, he determines the quality of each sample and again takes the average of the three samples as the final score. By comparing the scores of each pupil for the first week with the scores for the last week, that teacher will know exactly what he has accomplished in each case.

Such a teacher would be able to tell very definitely the attainments and the progress of the pupils, and his school records and reports might become statements of real and significant information instead of being, as many records and reports have been, merely impressionistic literature.

A report that a pupil can write seventy letters per minute, with a rating of sixty by the Ayres scale, conveys specific information to anyone familiar with the standards for handwriting, just as a statement that a pupil is fifty-six inches in height and weighs seventy-nine pounds conveys definite information to anyone who is familiar with these scales of measurement and who knows what a child of a given age should measure and weigh.

As a teacher can measure the speed and quality of a pupil's handwriting, so he can, by the use of other scales and tests, measure the speed and quality of reading, both oral and silent. Speed and accuracy in arithmetic, as well as acquired attainments in spelling, geography, history, grammar, and other school subjects, can be determined with a fair degree of reliability. During the next few years there will no doubt appear a large number of new scales and tests for all kinds of school work. As teachers become more and more proficient in their use, we may expect mere theories about educational methods to be replaced by scientific information. No teacher who wants to gain a reputation for efficiency in his profession can afford to neglect these tools.

In addition to using standard scales and tests for measuring the attainments of pupils, careful teachers are adapting to their needs some of the methods now used in business for obtaining detailed information. Merchants still continue the practice of taking the annual or semi-annual invoice, which corresponds, to some extent, to school examinations at stated periods. However, the most up-to-date establishments cannot afford to wait for the periodical invoicing in order to discover whether the

business is prospering or not. The officers of a bank know every day the status of their institution. Merchants are adopting systems of accounting by which they can tell, at any moment, the status of any of their customers, of any department of their business, or of their business as a whole. Many teachers are devising means by which they can tell, from day to day or week to week, the exact progress of every one of their pupils. In spelling, for example, each pupil keeps a personal account showing what words he has misspelled and what words he has learned to spell from day to day. Teachers of language are using similar means for keeping informed about the language errors made by their pupils in both oral and written work.

When such a system is first mentioned teachers are likely to raise just the same objections that merchants made to modern methods of accounting; namely, that it will take altogether too much time, or that the system proposed will not fit their specific needs. These objections have been met in business by the invention of a large number of labor saving devices and short cuts, and by making specific adaptations for particular needs. School work at the present time constitutes an attractive field for inventiveness in this line. Convenient individual records of achievement and progress are needed for the pupils. Practically all methods for making school records are in need of radical revision. Labor-saving score sheets and methods of tabulating and presenting results, both for individuals and groups, need to be invented. Adaptations must be made for the specific needs of schools, subjects, and for individual pupils. Always the aim should be to devise a system such that the pupils can keep the accounts and thus gain the educational value which such work supplies.

To illustrate what this new type of school accounting will do. I will mention two examples.

Under the direction of Professor Charters. the teachers in the schools of Kansas City listed the mistakes in oral and written language made by their pupils during a period of one week. The tabulated results showed that 71 per cent of all the mistakes in oral language were included in the following five groups: (a) Confusion of past tense and past participle, 24 per cent; (b) Failure of the verb to agree with its subject in number and person, 14 per cent; (c) Wrong verb, 12 per cent; (d) Double negative, 11 per cent; (e) Syntactical redundance, 10 per cent. It was found that the wrong form of noun or pronoun occurred much more frequently in written language than in oral, and that the same was true in respect to the confusion of tenses. Oral language showed a larger percentage of errors due to the confusion of the past tense with the past participle, the use of wrong verbs, and of double negatives.

According to an investigation by Sears and Diebel,² made in 1916, and based upon the oral errors of 1,378 children of grades three to eight in the Cincinnati schools, the following were the most common errors; they are listed in order of frequency:

1.	haven't no	for	hav	<i>r</i> en	ľŧ	an	y			٠.		• •					233
2.	seen-had	saw	7														180

¹ Charters —A Course of Study in Grammar; University of Missouri.

² Sears and Diebel.—"A Study of Common Mistakes in Pupils' Oral English," Elementary School Journal, 17:44.

### TEACHING TO THINK

3.	ain't for am not, isn't, aren't	124
4.	done	113
5.	got, ain't got, haven't got	112
6.	I and my brother	96
7.	kin, jist, git, kitch	91
8.	ain't for haven't, hasn't	89
9.	Frank and me	80
10.	is for are	76
11.	them for those	75
12.	learn for teach	71
13.	can for may	60
14.	my mother, she	58
15.	got for receive, become, grow, is	53
16.	that there	38
17.	don't for doesn't	<b>3</b> 6
18.	it was me	36
19.	leave for let	34
20.	went for gone	32
21.	come for came	31
22.	never gave	30
23.	by my aunt's	28
24.	drawed, throwed, growed, knowed	27
25.	somepin for something	25
<b>26</b> .	broke for broken	<b>2</b> 2
27.	lay for lie	21
28.	make dinner for prepare, get	21
29.	says for said	20
30.	all two, all both	19
31.	readin, nothin	18
32.	by us for near us	16
33.	he does it like she does	15
34.	why, and, so at the beginning or in the middle of	
	sentence	15
35.	that, which for who and whose	14
36.	onet	12
37.	in back of	12
38.	funny, lots, etc., for queer, many	11
39.	et for ate	11
40.	run for ran	11
41.	set for sit	10

If the teachers in a school can obtain information of this sort about their pupils by a few days' observation aided by some simple bookkeeping, there is no excuse for doing such random work in the teaching of language as we used to do a few years ago and as many are doing yet.

Think for a moment of the beginners' course in a foreign language. At the beginning of the year's work there is practically nothing on the credit side of a pupil's account. On the debit side there are a number of words, about fifteen hundred, to be learned. There is also a certain number of idioms to be mastered. Finally there is a definite amount of grammatical knowledge to be acquired and applied. The pupils can easily be taught to keep lists of the various things to be learned for each week and to test themselves by such lists, so that they may know exactly how they stand by means of their accounts. From time to time class tests can be given by taking items at random from the lists of words, idioms, and grammatical facts which have been mastered by the pupils. Such tests will enable the teacher to know how well his work is progressing, and will enable each pupil to compare his own work with that of the other members of the class. Let us suppose that a class has covered six hundred words, fifty idioms, and fifty grammatical facts. By selecting fifty words at random from the list of words and ten items from each of the other lists, the teacher will have a very definite measure of what the pupils have mastered. Examinations conducted according to such a plan can be purely objective in their character; so much so, that the pupils can be taught to examine themselves just as thoroughly as if the teacher selected the questions

and marked the papers. When one considers the matter somewhat closely there appears to be a certain imperfection about an examination in which the teacher has to prepare the question and grade the papers. The implication is that there is a subjective element in such an examination.

The problem of adjusting school work to the individual differences of pupils demands the thoughtful consideration of every teacher. It means that every teacher must discover the exact facts as to the individual differences in his school. Two types of measurement test are especially useful for this purpose.

By means of intelligence tests, such as, the National Intelligence Test ¹ for the examination of groups of pupils, or by the Binet Tests ² for the examination of individuals, the general ability of the pupils can be measured. Any wide-awake teacher can easily learn to give these tests sufficiently well for ordinary purposes. A physical examination by a competent nurse or physician will furnish added information.

The other type of test consists in the giving of sample or probation lessons in the subject which is to be studied, requiring all the members of the class to study under the teacher's supervision and carefully measuring the results obtained by each pupil. By this method any teacher can tell, after a few lessons, whether the pupils have the ability and the preparation required for the profitable pursuance of a given subject. Care must be exercised so that no pupil will be excluded on account of faulty methods of

¹ National Intelligence Tests; World Book Company.
² Terman.—The Measurement of Intelligence.

work which a reasonable amount of supervised study will correct.

Such sample lessons or probationary study will be found to have another value in revealing to the teacher the amount of work which can be given as a reasonable assignment, and in showing which pupils should be expected to meet the minimum or maximum requirements of each assignment.

Fairness in school management no longer means to treat all the pupils alike. Rather it means to deal with each pupil according to his capacities and needs. But this type of management calls for a more adequate system of bookkeeping than we have been using. It is by no means sufficient to record only the number of absences and the standings in the monthly tests. A pupil's record in the school files should show all the significant facts about his heredity and home environment. It should describe his physical and mental condition and the changes which take place in his condition from time to time. It should indicate his special talents and interests and what is being done to meet them. It should give information about his achievements outside of school, not only in pupil activities, but in the home and in the community. In short, it should be a real life record.

Let me digress for a moment to say that, when we come to have school records of the type indicated, we shall probably also think enough of them to provide fireproof cabinets or safes in which to keep them. The absence of provision for the safe-keeping of school records in the schools at the present time is a significant testimony as to how little we think they are worth.

A teacher who has been captivated by the excellence of accurately determined facts will seek to ascertain the exact value of every subject that he teaches. He will not be satisfied until he has discovered what should be the specific objectives of every course, and until the work has been so planned that he and the pupils can know definitely whether these objectives are being attained or not. If he is a teacher of Latin, he may set, as one of the objectives in a given course, the etymological mastery of a certain number of English words. He will then so conduct the work that every pupil can test himself at any time and know how far he has advanced toward the goal set before him. Such a teacher does not make general and unfounded claims about the wonderful values of his subject. He knows just what values he wants to realize and to what extent they are attained by each member of the class.

Have I been describing ideals rather than realities? Perhaps. I know full well that most of us would become very much embarrassed if the father of one of our pupils should ask us to tell him exactly what we are aiming to accomplish, and we should be still more embarrassed if he should ask whether we were accomplishing our aim. Teachers show their weakness in this respect by the attitude of hostility or scorn which they frequently take toward pupils who raise questions about the value of a subject or any part of that subject. However, it is also true that all thoughtful teachers are endeavoring to become more and more informed as to the specific objectives of all their teaching.

A teacher needs to obtain exact information if he is to think correctly about himself and about his teach-

ing. One thing which he can do is to make an inquiry to discover what those traits are by which pupils rate their teachers. The following table gives a list of the most prominent traits mentioned by one hundred and thirty-two college students who were asked to think of the two best and the two poorest teachers whom they had ever had, and to mention the outstanding characteristics of each. The figures in the column headed "Best" show the number of times the respective traits were mentioned as being possessed by the best teachers. The figures in the column headed "Poorest" show the number of times a lack of, or defect in, the respective traits was mentioned as being noticed in the poorest teachers.

TABLE IV
TRAITS OF BEST AND POOREST TEACHERS AS GIVEN BY STUDENTS

	TRAIT	BEST	POOREST	TOTAL
1.	Personality, health, voice, etc.	191	74	265
2.	Management, discipline	69	70	139
3.	Interesting	95	40	135
4.	Sympathy, tact, etc. (vs. Sar-			
	casm, etc.)	65	53	118
5.	Scholarship	73	33	106
6.	Impartiality	36	68	104
7.	Teaching skill, methods	59	39	98
8.	Self-control	14	61	<b>7</b> 5
9.	Energy, ambition	40	26	66
10.	Interest and enthusiasm in af-			
	fairs of the pupils	53	3	56
11.	Sense of humor	38	3	41
<b>12</b> .	Leadership	24	9	33
13.	Accuracy	14	15	29
14.	Optimism	27	2	29
15.	Participation in community af-			
	fairs	14	14	28

It is evident that in the estimation of pupils the possession or lack of certain traits is of very great importance. The order of preference is significant and should enable teachers to correct themselves, if they have attached too much weight to qualities which do not count with the pupils. It is evident also that the possession of certain good traits is much more noticeable than the absence of the corresponding bad traits. Notice how many times scholarship, teaching skill, interest in the affairs of the pupils, sense of humor, leadership, and optimism are mentioned. Notice, too, how the negative traits of partiality and lack of self-control are noticed much more frequently than the corresponding good traits.

Detailed score cards for the rating of teachers are used by many superintendents and supervisors. On pages 267-8 is a score card used by the department of education in the University of Chicago. While it is intended primarily for the rating of teachers by their superiors, it can very easily be used by any teacher for rating himself. In using it one should bear in mind that a mark of *Medium* is to signify that one possesses the trait in question to the degree that it is found in the average teacher

5. Efficiency in thinking is directly proportional to the amount of imagination and initiative which the thinker exercises. A teacher who is ambitious to become more efficient in his thinking along professional lines must be continually on guard against becoming a slave to routine or to set opinions or methods. He must develop his capacity to feel curious and to wonder and inquire about new things, new inventions, new subjects, new methods, and new ideas. He must be bold in under-

### EFFICIENCY RECORD

	VERY	POOR	MEDIUM	GOOD	EXCEL
I. PERSONAL EQUIPMENT—				-	
1. General appearance					
2. Health					
3. Voice					
4. Intellectual capacity					
5. Initiative and self-reliance					
6. Adaptability and resourceful- ness					
7. Accuracy					
8. Industry					
9. Enthusiasm and optimism					
10. Integrity and sincerity					
11. Self-control					
12. Promptness					
13. Tact					
14. Sense of justice					
II. SOCIAL AND PROFESSIONAL EQUIP-					
MENT-					
15. Academic preparation					
16. Professional preparation					
17. Grasp of subject matter					
18. Understanding of children					
19. Interest in the life of the school					
20. Interest in the life of the community					
21. Ability to meet and interest patrons					
22. Interest in the lives of the					
pupils					
23. Cooperation and loyalty					
24. Professional interest and growth					
25. Daily preparation					
26. Use of English				1	
III. School Management—					
27. Care of light, heat, and venti-					
28. Neatness of room					
29. Care of routine					
30. Discipline (governing skill)					

General Rating

IV. TECHNIQUE OF TEACHING-	
31. Definiteness and clearness of	
aim	
32. Skill in habit formation	
33. Skill in stimulating thought	
34. Skill in teaching how to study	
35. Skill in questioning	
36. Choice of subject matter	
37. Organization of subject matter	
38. Skill and care in assignment	
39. Skill in motivating work	
40. Attention to individual needs	
V. Results—	
41. Attention and response of the class	
42. Growth of pupils in subject	
43. General development of pupils	
44. Stimulation of community	
45. Moral influence	
100 Maria Maria	

taking to do things in new ways. He must deliberately change his methods from time to time, even if they appear to be fairly successful; for he will discover, if he investigates, that the practices of "fogyism" are made up mostly of efficient methods that have become set and stale.

6. Efficiency in thinking depends directly on a person's ability to exercise critical judgment. A teacher who wants to think correctly about his work must practice assiduously to develop skill in judging persons, books, methods, subjects, organizations, institutions, and other things. Thus, if he wants to become a good judge of handwriting, he must collect samples of handwriting and train himself to rate them by the best scale or score card available. He must, from time to time, measure the re-

liability of his own judgment by the certainty with which he assigns the same value to a given sample at different times, and by comparing his own ratings with those which are made by other teachers. If he wishes to become an expert judge of recitations, he develops a system for rating them and modifies it as his ability to discriminate develops. When he reads educational literature or listens to lectures he evaluates what he reads or hears, and he tests his own opinions by comparing them with the opinions of competent people of all professions. This saves him from becoming pedantic and opinionated.

7. Efficiency in thinking is directly proportional to the amount of coöperation which it produces. A teacher who seeks to become an expert in his calling can succeed only in so far as he adjusts his own thoughts to those of other teachers, and as he stimulates coöperative thinking about the most important problems of his profession. Most of us have, unfortunately, been educated in such a way that we have become excessively individualistic. We labor strenuously, each in our own place, trying to solve problems too difficult for any individual to master by himself, when a little skillful coöperation would easily find the solution.

Just suppose, for example, that fifteen or twenty teachers of reading should begin to think coöperatively about some problem in the teaching of reading. Suppose they should want to find out the best methods for training pupils to grasp the thought of what they read. They might hold a preliminary conference for the purpose of defining their aim and of agreeing on a proper division of the tasks to be undertaken in gathering materials,

planning and performing experiments, and measuring the results. I think I know what many teachers would say if such a scheme were proposed. They would say, "It can't be carried out"; and I suppose they would be right. But suppose it could be. Might not such a group of teachers, after working on their problem for a year, or two years, or five years, be expected to answer some of the questions about the teaching of silent reading which have remained unsolved after several hundred years of individual effort?

Haltingly and blindly we are beginning to learn the lesson of coöperative thinking; but we who now teach shall not be able to show much skill, because our early training is against us. Some day, and already we see the dawn of that day, there will be teachers who, from childhood, have been trained in the finest of arts, that of thinking coöperatively. They will set themselves problems so vast and so intricate that no one would ever have had the courage to attack them individually. There will be organizations consisting of large or small groups, according to the nature of the tasks to be undertaken. There will be investigations and compilations of information more thorough and far reaching than we have ever thought possible. There will be experimental research with, in place of one experimenter, hundreds or thousands; and in which the work will be continued for ten, twenty, or fifty years. Some of the investigations will be state-wide in their scope, some will be nationwide, and some may be world-wide.

In that day, the name of Socrates will be revered even

more than it is to-day, for teachers will then realize, better than we do, what a wonderful thing it is to be able to think.

#### THOUGHT EXERCISES

1. Prepare a Teachers' Efficiency Program for one week. Provide for a reasonable number of hours to devote to school work. Provide also for recreation, rest, social life, and for self-improvement through study and thought.

2. Map out a course of professional progress for yourself to cover the next ten years. Define the objectives to be attained. State the best means and methods that appear to be available. What can be done in case the methods and

means in sight do not prove satisfactory?

3. Map out a plan for coöperation with other teachers for the purpose of, (a) Securing educational papers and magazines, (b) Securing books on educational topics, (c) Exchange of materials and suggestions regarding methods and devices, (d) Coöperative reading and thinking concerning some topic of mutual interest, (e) Coöperative collection of materials for certain types of work, (f) Duplicating and exchanging of notes on subjects or special topics through the use of similar systems of notes and the use of hectograph or mimeograph or carbon paper, (g) Securing information about positions or opportunities for promotion.

4. Which one of the following constitutes the most serious obstacle to the professional progress of teachers? (a) Insufficient salary, (b) Uncertainty of tenure, (c) Lack of supervision, (d) Inadequate preparation, (e) Lack of ambition and planning, (f) Lack of skill in coöperation. Prepare an argu-

ment to defend your opinion.

5. According to an investigation by Sherman Littler the following are the principal causes of failure among elementary school teachers as reported by two hundred and thirteen school officers: (a) Lack of discipline, 16%; (b) Lack of proper personality, 15%; (c) Lack of interest in the work,

11%; (d) Lack of scholarship, 8%; (e) Laziness—lack of preparation, 7%; (f) Lack of professional training, 4%; (g) Lack of skill in teaching, 4%; (h) Lack of pedagogical training, 4%.

Compare this list with the list of traits enumerated by students. Are there any striking differences? Does the

comparison suggest any questions or any conclusions?
6. According to an investigation by Gleda Virginia Moses, the following are the principal causes of failure in high school teachers according to replies from seventy-six school officers: (a) Poor instruction, 21%; (b) Weak personality, 17%; (c) Lack of interest in the work, 15%; (d) Weakness in discipline, 13%; (e) Lack of sympathy, 10%; (f) Inability to coöperate, 7%; (g) Unprofessional attitude and lack of information, 6%; (h) Disloyalty, 3%.

Compare this list with the one for elementary teachers.

What is to be concluded?

7. A few years ago I came across the following question: "Which kind of teacher would you prefer—an anemic, dyspeptic, neurasthenic bookworm with 90 in Education and 95 in his special subject, or a hale, hearty, sympathetic, normal person with a scholastic average of 70?" What, if any, is the need for asking such a question?

8. Make a list of the ten most stimulating books or articles with which you are familiar. If the list is unsatisfac-

tory, what could be done about it?

9. If a teacher stimulates his pupils to think for themselves, individually and coöperatively, will that tend to increase or diminish the opportunities for thinking on the part of the

teacher? Why?

10. Resolved: That the most important step any teacher can take in the outlining of a course or the preparation of a lesson is to state definitely and specifically the purpose to be accomplished. Prepare a brief for an argument for or against this statement.

11. Resolved: That a teacher will get more information and help from reading general books and magazines than from reading pedagogical literature. Comment upon this.

12. How can a teacher establish contacts with agencies

that will be a constant stimulus to his thinking ability and his progress? Name some such agencies.

13. Devise an efficient system for keeping notes and clip-

pings.

14. Resolved: That children get more real education in thinking outside of the school room than inside. Shall the

resolution be passed?

- 15. Resolved: That the Law of Diminishing Returns applies to all school work. Explain the meaning of the Law of Diminishing Returns. Shall the resolution as proposed be amended?
- 16. If you were asked to name the one most important service that we teachers can render to a democracy like ours, what would you say?



# APPENDIX A

## SCORE CARD FOR SEED WHEAT

I. Will it yield?	Maxim	um	
	Point	ts Rating	
1. Weight per bushel	25		
2. Uniformity and size of gra	ins 5		
	30		
II. Will it grow?			
3. Plumpness	15		
4. Odor	7		
5. Luster			
6. Germ large and well filled	d 3		
	30		
III. Will it sell?			
7. Absence of weed seed			
8. Condition of bran, or se	eed		
coat	$\dots$ 5		
9. Absence of smut, scab, etc			
10. Absence of dirt and dust.			
11. Absence of injured kernels	s 2		
	25		
IV. Does it show improvement?	23		
	-l		
12. Kernels of the same varie			
type	of		
color			
14. Uniformity of kernel shape	e 2		
	15		
		Total	

## APPENDIX B

### ENGLISH VOCABULARY TEST

(Prepared by D. Starch)

Make a check mark ( $\sqrt{}$ ) after each word whose meaning you are sure of and which you can use correctly. Write the meaning after such other words as you are familiar with but

of whose meaning you are not quite sure.

Then you will be asked by the examiner to write the meaning after any of the difficult words that you may have checked, so as to make sure that you did not check any that you did not know. If you cannot give a meaning cross the check mark off. Words which are similar to common words but which have entirely different meanings will especially be called for; such as, belleric, canon, to cree, Mut, peavey, etc.

robate

ental ce

30. dysodile

276

### LIST I

`1.	acta	16.	chancroid
	agriculture	17.	to chop
	ambulacrum	18.	clearness
4.	abnormal	19.	collar
<b>5</b> .	Araneida	<b>2</b> 0.	to compro
6.	assegai	21.	constructi
<b>\7.</b>	awaft	22.	correal
<b>\8</b> .	barker	23.	to cree
<b>9</b> .	belleric	24.	currency
10.	bizarre	<b>25</b> .	death
11.	bonmot	26.	departmen
12.	bridle	27.	difference
	buttercup	28.	displayed
	canon	29.	to dow

15. Catananche

### APPENDIX B

31. eloquence 32. epicene 33. evaporative 34. faction 35, to flat 36. forest 37. fubby 38. to gazette 39. glonoin 40. gyral 41. hautboy 42. heterogony 43. hordeaceous 44. hyperkeratosis 45. to implore 46. to infatuate 47. to interlay 48. Italianate 49. Jupiter 50. knowledgeable 51. Latin 52. lewis 53. loam 54. Lycoperdon 55. mange 56. mayonnaise 57. mesotasis 58. miscue 59. moon 60. musk 61. neovolcanic 62. to notate 63. off-shore 64. organdie

66. parallel 67. to peal 68. personable 69. to piece 70. Pleurotoma 71. portrait 72. prevailing 73. proveditor 74. quadruple 75. rapt 76. reformer 77. respectful 78. river 79, rutter 80. sawmill 81. secessionist 82. sex 83. sigmoid 84. to sluice 85. spadroon 86. spur 87. stipulator 88. subregion 89. sweet 90. tarsus 91. Theatin 92. tipburn 93. to transfer 94. to trump 95. unbeseem 96. upholsterer 97. vernier 98. waldgrave 99. wharf

## LIST II

action
 aigret

65. owlet

3. amentia

100. zelotypia

4. antagonism

#### TEACHING TO THINK

5. arbustive
6. assent
7. awry
8. barometer
9. belonging
10. black
11. book
12. brighten

12. brighten13. buttress14. cantharis15. to catch

16. change17. Choripetalæ18. collectivity19. conational

20. consumptive 21. corresponding 22. crenate

23. curtain
24. debentured
25. to deplore

26. diffluence27. disputable28. downright

29. eaglet

30. emancipationist 31. epigastrium 32. evergreen 33. faddy

34. ferret 35. flaw

36. to forgather37. fulgurous38. Gelasimus

39. glossopharyngeal

40. grass

41. Habenaria 42. hawk

43. heterotopism

44. horner

45. hypnotherapy 46. imposture

47. infidelity 48. intermissive

49. iva 50. jusi

51. laudanine52. libellary

53. local

54. lymphoma55. manifest

56. meadow-sweet

57. metabasis 58. misgive 59. moorland 60. Mut

61. Neptune62. noticeable

63. oil 64. orgy

65. oxidizable66. paranephritis

67. peavey 68. perspicuous

69. piety
70. Plotinism

71. positive 72. to prick 73. to provoke

74. qualifier75. rasorial76. to refuse

77. rest 78. to roast

79. sabbatism80. scabbed81. secretarial

82. to shackle 83. to signify

84. small

### APPENDIX B

85. Spanish	93. transire
86. square	94. trunnion
87. to stock	95. uncharged
88. subspecific	96. upthrow
89. to swerve	97. vertebra
90. to taste	98. walled
91. then	99. wheat
92. tissue	100. Zibet

### APPENDIX C

#### TEST FOR ACTIVE VOCABULARY

Directions:—Read the following sentences and, in the space after or under each sentence, write as many words as you can think of that mean the same and can be used in place of the italicized word of that sentence.

Example: He irritated me. Excited, teased, vexed, angered,

provoked.

1. An athlete must be quick.

2. We will excuse him.

3. The tall man was awkward.

4. A village is a small city.

5. The man was paid well for his labor.

6. She was prudent as a housewife.

7. He entered the temple.

8. Petroleum is an oily substance.

9. Erase the mark.

10. He was a slow person.

11. She was weary.

12. She was very handsome.

13. I intend to retain it.

14. The explanation was clear.

15. The gown was dainty.16. The fox is a sly animal.

17. She was a simple child.

18. She had a love for beautiful clothes.

19. I request that you be quiet.

20. The government will give him a large tract of land.

#### TENTATIVE SCORES

High School				College			
Ι	II	III	IV	Fr.	So.	Jr.	Sr.
13	15	17	18	21	22	23	24

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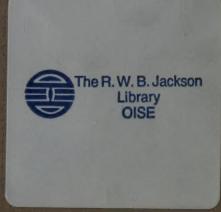
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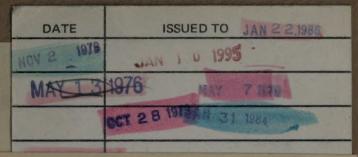
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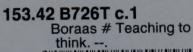








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