

*Reading as Reasoning: A Study of
Mistakes in Paragraph Reading*

EDWARD L. THORNDIKE

It seems to be a common opinion that reading (understanding the meaning of printed words) is a rather simple compounding of habits. Each word or phrase is supposed, if known to the reader, to call up its sound and meaning and the series of word or phrase meanings is supposed to be, or be easily transmuted into, the total thought. It is perhaps more exact to say that little attention has been paid to the dynamics whereby a series of words whose meanings are known singly produces knowledge of the meaning of a sentence or paragraph.

It will be the aim of this article to show that reading is a very elaborate procedure, involving a weighing of each of many elements in a sentence, their organization in the proper relations one to another, the selection of certain of their connotations and the rejection of others, and the cooperation of many forces to determine final response. In fact we shall find that the act of answering simple questions about a simple paragraph like the one shown below includes all the features characteristic of typical reasonings.

J

Read this and then write the answers to 1, 2, 3, 4, 5, 6, and 7. Read it again as often as you need to.

In Franklin, attendance upon school is required of every child between the ages of seven and fourteen on every day when school is in session unless the child is so ill as to be unable to go to school or some person in his house is ill with a contagious disease, or the roads are impassable.

1. What is the general topic of the paragraph?
.....
2. On what day would a ten-year-old girl not be expected to attend school?
.....
3. Between what years is attendance upon school compulsory in Franklin?
.....

Reprinted from *The Journal of Educational Psychology*, Vol. VIII, No. 6, June 1917, pp. 323-332, by permission of the AMS Press, Inc.

From Reading & Research Quarterly
6 (1971) 425-442

4. How many causes are stated which make absence excusable?
5. What kind of illness may permit a boy to stay away from school, even though he is not sick himself?
6. What condition in a pupil would justify his non-attendance?
7. At what age may a boy leave school to go to work in Franklin?

Consider first the following responses which were found among those made to Questions 1, 2, 5 and 6 above by two hundred pupils in Grade 6. (All are quoted exactly save that capitals are used at the beginning here regardless of whether the pupils used them.)

	Percent	Number per thousand
J 1. Unanswered	18	180
Franklin	4½	45
In Franklin	1	10
Franklin attendance	1	10
Franklin School	1½	15
Franklin attending school	1	10
Days of Franklin	½	5
School days of Franklin	½	5
Doings at Franklin	1	10
Pupils in Franklin	½	5
Franklin attends to his school	½	5
It is about a boy going to Franklin	½	5
It was a great inventor	½	5
Because its a great invention	½	5
The attendance of the children	½	5
The attendance in Franklin	½	5
School	7½	75
To tell about school	½	5
About school	4	40
What the school did when the boy was ill	½	5
What the child should take	½	5
If the child is ill	2	20
How old a child should be	½	5
If the child is sick or contagious disease	½	5
Illness	1	10
On diseases	½	5
Very ill	3	30
An excuse	2	20
The roads are impassable	1	10
Even rods are impossible	½	5
A few sentences	½	5
Made of complete sentences	½	5
A sentence that made sense	½	5
A group of sentences making sense	½	5
A group of sentences	3	30
Subject and predicate	½	5

	Percent	Number per thousand
Subject	½	5
The sentence	½	5
A letter	½	5
Capital	5½	55
A capital letter	½	5
To begin with a capital	2	20
The first word	½	5
A general topic	½	5
Good topic	½	5
Leave half an inch space	2½	25
The heading	½	5
Period	½	5
An inch and a half	½	5
An inch and a half capital letter	½	5
The topic is civics	½	5
The answer	½	5
J 2. Unanswered	6	60
Unless the child is so ill as to be unable to go to school	41	410
Unless the child is unable to go to school	½	5
Unless she is ill or the roads are impassable	1	10
Roads are impassable	1	10
When his baby or brother have some kind of disease	1	10
When a parent is ill	½	5
If her father or mother died	½	5
On her birthday	6½	65
On her fourteenth birthday	½	5
On every day	4	40
On any day	½	5
Expected every day	1½	15
On Monday and for 5 days a week	½	5
On Monday	1	10
On Friday	1	10
When school is in session	1	10
The beginning of the term	½	5
Fourteen year	½	5
Age 11	½	5
She is allowed to go to school when 6 years	½	5
A very bad throat	½	5
When better	½	5
J 5. Unanswered	2	20
If mother is ill	5½	55
Headache, ill	½	5
A sore neck	½	5
Headache, toothache or earache	½	5
When a baby is sick	½	5
Playing sickness	½	5
Serious	½	5
When the roads cannot be used	½	5
Contagious disease, roads impassable	1½	15
He cannot pass the hall	½	5
A note	½	5

	Percent	Number per thousand
J 6. Unanswered	15	150
Ill with a contagious disease	5	50
Seven years old	1/2	5
By bringing a note	6	60
When going with his mother to his cousin	1/2	5
Is to go his mother	1/2	5
When he is well and strong	1/2	5
To have a certificate from a doctor that the disease is all over	1/2	5
Somebody else must have a bad disease	1/2	5
Torn shoes	1/2	5
Neat attendance	1/2	5
When he acts as if he is innocent	1/2	5
Being good	1/2	5
By being early	1/2	5
Get up early	1/2	5
Come to school	1 1/2	15
Be at school every day	1/2	5
If he lost his lessons	1/2	5
Illness lateness or truancy	1/2	5
A bad boy	1/2	5
By not going to school	1/2	5
None	1/2	5
Not sick no condition and mother not ill	1/2	5
Not very good	1/2	5
When you come you get your attendance marked	1/2	5
Of being absent	1/2	5
His attendance was fair	1/2	5
Truant	1	10
If some one at his house has a contagious disease	6 1/2	65
When roads	1/2	5
If he was excused	1/2	5
Not smart	1/2	5
If his father or mother died	1/2	5
By not staying home or playing hookey	1/2	5

In general in this and all similar tests of reading, the responses do not fall into a few clearly defined groups—correct, unanswered, error No. 1, error No. 2, and so on. On the contrary they show a variety that threatens to baffle any explanation. We can, however, progress toward an explanation, by using the following facts and principles:

In correct reading (1) each word produces a correct meaning, (2) each such element of meaning is given a correct weight in comparison with the others, and (3) the resulting ideas are examined and validated to make sure that they satisfy the mental set or adjustment or purpose for whose sake the reading was done. Reading may be wrong or inadequate (1) because of wrong connections with the words singly, (2) because of over-potency or under-potency

of elements, or (3) because of failure to treat the ideas produced by the reading as provisional, and so to inspect and welcome or reject them as they appear.

Everybody, of course, understands that (1) plays a part but it is not so clearly understood that a word may produce all degrees of erroneous meaning for a given context, from a slight inadequacy to an extreme perversion.

Thus *Franklin* in the paragraph quoted (J) varies from its exact meaning as a local unit through degrees of vagueness to meaning a man's name (as in "Franklin attends to his school" as a response to question 1), or to meaning a particular personage (as in "It was a great inventor" as a response to question 1). Thus *Contagious* in paragraph J permits responses to question 5 (What kind of illness may permit a boy to stay away from school, even though he is not sick himself?) ranging from "Scarlet fever, chicken pox, measles or diphtheria," through "Scarlet fever," "headache," "Serious," "Hay fever," "Pimple," to "Contagious or roads impassable," and "All kinds of disease." Thus *Paragraph* in J 1 when over-potent produces responses ranging from "A group of sentences making sense" through "A group of sentences," and "A few sentences," to "The sentence," "Subject and predicate," "Begin with a capital," "A letter," and "Commas and periods."

In particular, the relational words, such as pronouns, conjunctions and prepositions, have meanings of many degrees of exactitude. They also vary in different individuals in the amount of force they exert. A pupil may know exactly what *though* means, but he may treat a sentence containing it much as he would treat the same sentence with *and* or *or* or *if* in place of the *though*.

The importance of the correct weighting of each element is less appreciated. It is very great, a very large percentage of the mistakes made being due to the over-potency of certain elements or the under-potency of others.

Consider first the over-potency of elements in the questions. The first question about paragraph J was, "What is the general topic of the paragraph?" A large group of answers show over-potency of *paragraph*. Such are those quoted above to show variation in the understanding of the word. We also find an over-potency of *top* (in topic) combined with that of *paragraph*, resulting in such responses as: "Leave a half-inch space," "An inch and a half," "An inch and a half capital letter," "The topic of paragraph is one inch in."

The second question was: "On what day would a ten-year-old girl not be expected to attend school?" We find under-potency of *not* resulting in answers like "When school is in session" or "Five days a week." We find under-potency of *day* resulting in responses like "She is allowed to go to school when 6 years," "Age 11," and "Fourteen years."

We find over-potency of *day* shown by "Monday," "Wednesday," and "Friday"; of *ten-year-old girl* in "The ten-year-old girl will be 5 a."

Ten-year-old is over-potent in an interesting way, namely, in the very large number of responses of "On her birthday." Over-potency of *Attend school* seems to be one part of the causation of "To attendance with Franklin," "Ever morning at half past 8," "She should," and "Because he did learn."

Consider next over- and under-potency of the words or phrases in the paragraph. The following list of responses shows that each of ten words taken from the paragraph is over-potent so as to appear clearly influential in the response to each of the first three questions (and in seven of the cases to the fourth question as well). These occur within five hundred responses made by children within grades 5 to 8. Cases of under-potency would be still easier to collect.

The questions, I may remind the reader, were as follows:

1. What is the general topic of the paragraph?
2. On what day would a ten-year-old girl not be expected to attend school?
3. Between what years is attendance upon school compulsory in Franklin?
4. How many causes are stated which make absence excusable?

(The numbers refer to the question to which the words were the response.)

Franklin	1. Franklin. 1. Franklin and the diseases. 1. Franklin topic. 2. Franklin. 3. Because it is a small city. 3. Franklin was in school 141 years.
attendance	1. Attendance. 2. To attendance with Franklin. 3. In Franklin attendance upon school is required. Attending school 130 days.
school	1. School. 1. They must know their lessons. 2. In the beginning of school. 3. School in session. 3. In the years of school.
seven..	1. Seven and fourteen. 1. How old a child should be. 2. He should attend school at 7 years. 2. Between seven and fourteen. 3. Seven years. 4. Under seven.
fourteen	1. Every child between seven and fourteen. In Franklin how old they are.

	2. Fourteenth of every day. 2. Fourteen years. 3. Fourteen years. 3. Fourteen. 4. 7 to 14.
every	1. Every child. 2. Expected every day. 2. On every day. 3. Every year. 3. Every child between fourteen or thirteen. 4. Every day.
ill	1. Illness. 1. Very ill. 1. If the child is ill. 2. Ill. 2. A very bad throat. 3. He cannot go to school unless ill. 4. When child is ill. 4. Must be sick.
contagious	1. Contagious disease. 2. If she is sick or has a contagious disease. 3. Contagious disease. 4. Contagious disease.
disease	1. Fever. 1. About disease. 2. Often sick. 3. Unless ill or contagious disease. 3. Disease. 4. A terrible disease going out. 4. Because when a boy has disease.
impassable	1. The roads are impassable. 1. Snow. 2. When roads are impassable. 3. Seven to fourteen years or the roads are impassable. 4. Or the roads are impassable.

To make a long story short, inspection of the mistakes shows that the potency of any word or word group in a question may be far above or far below its proper amount in relation to the rest of the question. The same holds for any word or word group in the paragraph. Understanding a paragraph implies keeping these respective weights in proper proportion from the start or varying their proportions until they together evoke a response which satisfies the purpose of the reading.

Understanding a paragraph is like solving a problem in mathematics. It consists in selecting the right elements of the situation and putting them together in the right relations, and also with the right amount of weight or influence or force for each. The mind is assailed as it were by every word in the paragraph. It must select, repress, soften, emphasize, correlate and organize, all under the influence of the right mental set or purpose or demand.

Consider the complexity of the task in even a very simple case such as answering question 6 on paragraph D, in the case of children of grades 6, 7 and 8 who well understand the question itself.

John had two brothers who were both tall. Their names were Will and Fred. John's sister, who was short, was named Mary. John liked Fred better than either of the others. All of these children except Will had red hair. He had brown hair.

6. Who had red hair?

The mind has to suppress a strong tendency for *Will had red hair* to act irrespective of the *except* which precedes it. It has to suppress a tendency for *all these children . . . had red hair* to act irrespective of the *except Will*. It has to suppress weaker tendencies for *John, Fred, Mary, John and Fred, Mary and Fred, Mary and Will, Mary Fred and Will*, and every other combination that could be a "Who," to act irrespective of the satisfying of the requirement "had red hair according to the paragraph." It has to suppress tendencies for John and Will or brown and red to exchange places in memory, for irrelevant ideas like *nobody* or *brothers* or *children* to arise. That it has to suppress them is shown by the failures to do so which occur. The *Will had red hair* in fact causes one-fifth of children in grades 6, 7 and 8 to answer wrongly,* and about two-fifths of children in grades 3, 4 and 5. Insufficient potency of *except Will** makes about one child in twenty in grades 6, 7 and 8 answer wrongly with "all the children," "all," or "Will Fred Mary and John."

Reading may be wrong or inadequate because of failure to treat the responses made as provisional and to inspect, welcome and reject them as they appear. Many of the very pupils who gave wrong responses to the questions would respond correctly if confronted with them in the following form:

- Is this foolish or is it not?
 The day when a girl should *not* go to school is the day when school is in session.
 The day when a girl should *not* go to school is the beginning of the term.
 The day etc. . . . is Monday.
 The day is fourteen years.
 The day is age eleven.
 The day is a very bad throat.
 Impassable roads are a kind of illness.
 He cannot pass the ball is a kind of illness.

They do not, however, of their own accord test their responses by thinking out their subtler or more remote implications. Even very gross violations against common sense are occasionally passed, such as letting Mary give Tom a blue dog, or giving "Thought the man fat out" as an answer to I 1. Usually, however, the irrelevance or inconsistency concerns something in the question or the paragraph and the failure to heed it is closely akin to the underpotency of certain elements.

I.

Nearly fifteen thousand of the city's workers joined in the parade on September seventh, and passed before the hundred thousand cheering spectators.

There were workers of both sexes in the parade, though the men far outnumbered the women.

1. What is said about the number of persons who marched in the parade?
 * Some of these errors are due to essential ignorance of "except," though that should not be common in pupils of grade 6 or higher.

It thus appears that reading an explanatory or argumentative paragraph in his text-books on geography or history or civics, and (though to a less degree) reading a narrative or description, involves the same sort of *organization and analytic action of ideas as occur in thinking of supposedly higher sorts*. This view is supported by the high correlations between such reading and verbal completion tests, Binet-Simon tests, analogies tests and the like. These correlations, when corrected for attenuation, are probably, for children of the same age, as high as +.80.

It appears likely, therefore, that many children fail in certain features of these subjects not because they have understood and remembered the facts and principles but have been unable to organize and use them; or because they have understood them but have been unable to remember them; but because they never understood them.

It appears likely also that a pupil may read fluently and feel that the series of words are arousing appropriate thoughts without really understanding the paragraph. Many of the children who made notable mistakes would probably have said that they understood the paragraph and, upon reading the questions on it, would have said that they understood them. In such cases the reader finds satisfying solutions of those problems which he does raise and so feels mentally adequate; but he raises only a few of the problems which should be raised and makes only a few of the judgments which he should make. Thus one may read paragraph I with something like the following actual judgments:

Fifteen thousand did something—there was a parade—September seventh was the day—there were two hundred thousand something—there was cheering—workers were in the parade—both sexes in the parade—the men outnumbered the women.

Contrast these with the following which may be in the mind of the expert reader:

Nearly fifteen thousand—not quite, but nearly—of the city's workers—people who worked for a living—joined in the parade—a big parade of nearly 15,000—on September seventh—the parade was in the fall—they passed before two thousand hundred cheering spectators—two hundred thousand saw the parade—they cheered it—

there were workers of both sexes—there were men workers and women workers in the parade—the men far outnumbered the women. Many more men than women were in the parade.

In educational theory, then, we should not consider the reading of a text-book or reference as a mechanical, passive, undiscriminating task, on a totally different level from the task of evaluating or using what is read. While the work of judging and applying doubtless demands a more elaborate and inventive organization and control of mental connections, the demands of mere reading are also for the active selection which is typical of thought. It is not a small or unworthy task to learn "what the book says."

In school practice it appears likely that exercises in silent reading to find the answers to given questions, or to give a summary of the matter read, or to list the questions which it answers, should in large measure replace oral reading. The vice of the poor reader is to say the words to himself without actively making judgments concerning what they reveal. Reading aloud or listening to one reading aloud may leave this vice unaltered or even encouraged. Perhaps it is in their outside reading of stories and in their study of geography, history, and the like, that many school children really learn to read.

Thorndike's "Reading as reasoning": influence and impact

WAYNE OTTO
University of Wisconsin

Edward L. Thorndike announced and elaborated his theory of learning around the turn of the century (Thorndike, 1898; 1911). Often referred to as "bond" psychology or "connectionism," the system he described was the original stimulus-response learning theory and it dominated the field for many years. Hilgard acknowledged the pre-eminence of Thorndike's work in the 1956 edition of his *Theories of Learning* with a quote from Tolman (1938, p. 11):

The psychology of animal learning—not to mention that of child learning—has been and still is primarily a matter of agreeing or disagreeing with Thorndike, or trying in minor ways to improve upon him. Gestalt psychologists, conditioned-reflex psychologists, sign-gestalt psychologists—all of us here in America seem to have taken Thorndike, overtly or covertly, as our starting point.

Few psychologists would quarrel with Tolman's assessment. Whatever the attacks or the rivals or the modifications that followed, Thorndike provided the starting point. Furthermore, his work is truly classic in the area of learning theory, for it has both recognized value and enduring appeal.

Thorndike's theoretical formulations have unquestionably affected much of the work that relates to the teaching and learning of reading in many subtle ways. But the effect of his article on reading as reasoning (Thorndike, 1917) has been quite explicit and unmistakably profound. The 1917 article is still cited in most discussions of "what reading is." Perhaps it is no exaggeration to say—as Tolman suggested with regard to learning theory—that attempts to define reading are largely a matter of agreeing or disagreeing with Thorndike.

Downing (1969/1970) offered some support for the latter point in a recent article. Having observed that linguists and psycholo-

gists come up with different definitions of reading, he offered two examples. One excludes comprehension and places emphasis on the association of graphemes with phonemes:

Reading is a reconstruction of the sound forms of a word on the basis of its graphic representation. Understanding, which is often considered as the basic content of the process of reading, arises as a result of correct recreation of the sound forms of words. He who, independently of the level of understanding of words, can correctly recreate their sound form is able to read (Elkonin, 1963).

The other avoids any mention of speech sounds and places the emphasis on comprehension:

Reading involves the recognition of printed or written symbols which serve as stimuli for the recall of meanings built up through past experience, and the construction of new meanings through manipulation of concepts already possessed by the reader. The resulting meanings are organized into thought processes according to the purposes adopted by the reader. Such an organization leads to modified thought and or behavior, or else leads to new behavior which takes its place, either in personal or in social development (Tinker and McCullough, 1962).

Downing noted that the ". . . emphasis on meaning has been particularly strong in American definitions of reading since the influential statement of Edward L. Thorndike" (1917) . . . and that Thorndike's influence led to a ". . . kind of description of reading with the emphasis on meaning and the omission of specific references to the phoneme (sound)—grapheme (written symbol) connections which has been popular for the past forty years."

There is, of course, no denying that disagreements have been registered, particularly by certain linguists. Nor is there any intent to suggest that extensions and modifications of Thorndike's 1917 article have not been made. To the contrary, efforts to modify and extend are the best evidence of its influence. One purpose of the present paper, then, is to examine some specific evidence of that influence. A second purpose is to consider the practical impact of Thorndike's conception of reading as reasoning.

Influence of the Article

As already indicated, attempts to define reading amount, at least on the face of the matter, to agreeing or disagreeing with Thorn-

dike's perception of reading as reasoning. Workers who claim that the essence of reading is the transformation of graphemes to phonemes are clearly in disagreement with Thorndike's position. They see reading as a simple, straightforward process that involves the translation of symbols into sounds. Workers who insist that reading must involve the understanding of what is read are in general agreement with Thorndike's position. They see reading as a complex process that goes considerably beyond simple decoding. While there is not complete agreement among the latter on the ultimate scope of their definition, most of them readily acknowledge Thorndike's influence.

There is yet another point of view to be considered. Some workers would argue that the decoding-meaning hassle is in truth a false issue when it is confined to reading education. Moffett (1968, p. 16), for example, has made a most legitimate point: "A child who fails to understand a text either cannot decode letters, or else cannot understand the text for reasons having nothing to do with printed words; he would not understand even if the text were read aloud to him. In other words, reading comprehension is merely comprehension." Clearly, comprehension is not something that belongs exclusively to readers or to teachers of reading. That view is totally consistent with Thorndike's. He considered reading as reasoning, not reasoning as reading.

Reduced to essentials, Thorndike's position was that "correct" reading involves (a) attaching the *correct* meaning to each word encountered (note that decoding is subsumed here); (b) giving each word a proper weight in relation to other words encountered; and (c) examining the resultant ideas in order to validate them in terms of the given context. The same process—sans decoding—would be needed for "correct" listening. If Thorndike thought about the matter at all—and it may be too trivial to have troubled him—he apparently made a decision to avoid the decoding-meaning issue. He assumed that if reading is to be a worthwhile activity it must yield meaning; that if children fail to read successfully it is because they fail to understand what they read; and that ". . . the demands of mere reading are also for the active selection which is typical of thought." The poor reader, he said, may be content to say the words to himself without engaging in the work required to discover their collective meaning.

Thorndike's essentials have continued to recur in subsequent discussions of the reading process. No attempt is made here to recite the dozens of instances. Three fairly recent examples will suffice.

In a 1960 review for the *Encyclopedia of Educational Research*, William S. Gray (1960, pp. 1100-1103) began his discussion of the apprehension and interpretation of meaning by citing Thorndike's 1917 article. Gray's entire discussion amounts to an elaboration of Thorndike's main points. Interpretation in reading, he said, comprises three broad aspects: (a) word knowledge, (b) apprehending the meaning of the passages, and (c) thoughtful reaction to and the use or application of ideas read. The three broad aspects are very similar to the three identified by Thorndike. The process starts with attaching appropriate meanings to printed symbols; it continues through literal comprehension; and, when the reader's purpose and/or the situation require, goes beyond to any or all relevant aspects of critical reaction.

In the 1963 *Handbook of Research on Teaching*, Russell and Fea (1963, pp. 865-928) focused on two aspects of teaching reading: (a) teaching the identification and recognition of symbols, and (b) teaching meaning. "Word recognition," they said, "is a prerequisite to reading, but it does not guarantee understanding" (p. 883). They, too, pointed out three aspects of comprehension quite similar to Thorndike's: (a) knowledge of the meaning of words, (b) knowledge of the relationships of words in sentences, paragraphs and longer passages, and (c) understanding of literal meaning, the intent of the author, and—when appropriate—the hidden meanings or implications. But Russell and Fea added a certain, very worthwhile bit of elegance to Thorndike's gutsy stuff. They considered the multisensory nature of the exploration of meaning, and they discussed the acquisition of meaning in reading in terms of (a) percepts (sensations and images), (b) concepts (symbolization of meaning), (c) verbals (standardization of symbols), and (d) relationships of verbalized concepts (multiple meanings, denotation-connotation, figurative language, grammar-syntax).

In the current edition of the *Encyclopedia of Educational Research*, Theodore L. Harris (1969) identified three views of the reading process, but he said that they ". . . differ more in emphasis than in the components involved" (p. 1075). In the first, reading is viewed as the visual perception of word forms and their meaning; the second view is that reading is essentially a process of thinking or elaborating meaning in relation to printed symbols; and the third is that reading is a two-stage process that comprises both decoding printed symbols and comprehending the written messages once they

are decoded. Thus, Harris demonstrates his point, for meaning as well as decoding is inherent in each view. While Harris acknowledges the direct influence of Thorndike in the second view, the concession to meaning in each of the other two can be attributed at least to some degree to the influence of Thorndike. One needs only to examine the references cited by proponents of the latter to see that influence acknowledged.

Among the dictionary definitions of a classic are "having recognized or permanent value," and "of enduring interest and appeal," and "standard or recognized, especially because of great frequency or consistency of occurrence." By any of these definitions, Thorndike's 1917 article is clearly a classic. Its influence is readily acknowledged by a host of writers and that influence continues to the present.

Practical Impact of the Article

While the influence of Thorndike's article is undeniable, its practical impact is questionable at best. Not only did the basic study reported fail to provide a viable model for subsequent research, but also the subsequent work has not yielded anything that has been very useful in eliminating the kinds of mistakes Thorndike found in children's paragraph reading over a half century ago.

Although the ideas expressed in Thorndike's article have been given pre-eminence, data are in fact reported and discussed. The article is presented primarily as a research report. As such, it has severe limitations. There is only the most cursory description of the methods employed. Little or nothing is said about the characteristics of the subjects, the full range of materials used, the construction of the materials, the reliability of the test items, or the testing conditions. Literal replication of the study would be impossible. There is only partial reporting of the data. Incorrect responses are tallied and categorized, but there is no indication of what were considered correct responses. Foremost among the questions that present themselves are these: Were the subjects chosen at random? Did they represent a cross section of sixth graders? Did the directions the subjects received adequately prepare them for the task? What, exactly, is a "paragraph"? Couldn't the "paragraphs" have been written in a more readable style? *Shouldn't* they have been written in a more readable style? Are the questions reasonable (valid)? Are they reliable? How were the correct answers stated? Were degrees of "correctness" ac-

ceptable? Answers to or, at least, consideration of any or all of these questions would have made the study more credible and, probably as a consequence, more heuristic in terms of empirical study.

The fact is, of course, that by present day standards the research study would never have been published in any journal, much less the rigorous *Journal of Educational Psychology*. But present standards did not prevail in 1917, nor did present practices and beliefs regarding reading instruction prevail. The context was different; and out of context, criticism can become stricture without good reason. Nevertheless, there is little doubt that had the basic study been more soundly planned and adequately reported it might have had a greater impact on subsequent research.

Unfortunately, many of the very questions Thorndike left unanswered in his report remain unanswered—or unanswerable in any definitive way—to this day. That this is so is evidence that, despite the lip service to the ideas expressed, the practical impact of Thorndike's work is extremely limited. Furthermore, it seems safe to assume that if it were possible to replicate Thorndike's 1917 study with 1971 children, the results would not be very different. Bits of evidence from a variety of sources (Woody, 1923; Keneally, 1939; McCullough, 1957) support this gloomy assumption, but the present writer is most familiar with the evidence derived from his own experience with attempts to study children's ability to formulate and state a main idea in reading (Otto & Barrett, 1968; Otto & Koenke, 1970).

The primary intent in this work was to examine children's approaches to and success in deriving a literal main idea from paragraphs in which a main idea is implicit but not stated. Thus, the concern was not different from Thorndike's in that the focus was on the basic understandings derived from reading. The research task was, however, greatly complicated by the fact that existing studies did not provide adequate methodological guidelines or systematic descriptive data that were relevant in setting up the study. Consequently, it was necessary to focus simultaneously upon the development of an operational approach—e.g., operational definition of *main idea*, appropriate reading materials, directions to subjects, a method for evaluating responses—and the collection of descriptive data. Thus, more than fifty years after Thorndike's influential classic appeared little or nothing had been provided to expedite closely related research efforts.

Also relevant in the present context are the results of the two studies that were completed (Otto & Barrett, 1968). In Study I

pupils in Grades 1 through 6 were asked to formulate and state the main idea for brief, carefully constructed paragraphs with one specific but unstated main idea. The salient finding was that although the children's age/grade placement and the readability of the paragraphs were critical factors in determining response quality, their main idea responses were generally of low quality as evaluated by a scale and rating procedure developed for use in the study. In Study II children were asked to formulate hypotheses about the main idea after each successive sentence in a paragraph was presented. As expected, increasingly more adequate main idea statements were given as more information became available, but the number of children to arrive at a completely adequate statement was not great. A major implication, in line with Thorndike's suggestions, was that children might profit from being encouraged to formulate a hypothesis about the main idea of a selection very early in the reading sequence and to continue to revise the hypothesis so long as additional information is forthcoming. But again, more than fifty years after Thorndike's influential classic appeared, children were still making mistakes in paragraph reading. And, most significantly, the lacks had to do not with remembering and/or organizing facts and principles but with *understanding* them.

Influence and Impact

The present review of Thorndike's article on reading as reasoning yields a paradoxical summary statement: The article has exerted considerable influence, but it has had little practical impact. While its influence on present conceptions of what reading is has been profound and unequivocal, its impact on subsequent research and/or practice has been minimal. Despite general agreement that the outcome of the reading act ought to be understanding, the means for moving efficiently toward that end are not yet very well understood.

REFERENCES

- DOWNING, J. Functional literacy: future needs and current progress. *Symposium*, 1969/1970, 9-15.
- ELKONIN, D. B. The psychology of mastering the elements of reading. In Simon, B. and J. (Eds.) *Educational Psychology in the U.S.S.R.* London: Routledge & Kegan Paul, 1963.
- GRAY, W. S. Reading. In Harris, C. W. (Ed.) *Encyclopedia of Educational Research*, (3rd ed.) New York: Macmillan, 1960.
- HARRIS, T. L. Reading. In Ebel, R. L. (Ed.) *Encyclopedia of Educational Research*, (4th ed.) New York: Macmillan, 1969.
- HILGARD, E. R. *Theories of Learning*, (2nd ed.) New York: Appleton, Century, Crofts, 1956.
- KENEALLY, K. C. A study of the relative order of difficulty of several types of study skills. Master's thesis, Boston University, 1939.
- MCCULLOUGH, CONSTANCE. Response of elementary school children to common types of reading comprehension questions. *Journal of Educational Research*, September, 1957, 51, 65-70.
- MOFFETT, J. *A student-centered language arts curriculum, grades k-13: a handbook for teachers*. Boston: Houghton Mifflin, 1968.
- OTTO, W., & BARRETT, T. C. *Two studies of children's ability to formulate and state a main idea in reading*. Technical Report No. 57. Madison, Wisconsin: Wisconsin Research and Development Center for Cognitive Learning, 1968.
- OTTO, W., & KOENKE, K. *Scaling children's statements of the main idea in reading*. Working Paper No. 31. Madison, Wisconsin: Wisconsin Research and Development Center for Cognitive Learning, 1970.
- RUSSELL, D. H., & FEA, H. R. Research on teaching reading. In Gage, N. L. (Ed.) *Handbook of Research on Teaching*. Chicago: Rand McNally, 1963.
- THORNDIKE, E. L. Animal intelligence. *Experimental Studies*. New York: Macmillan, 1911.
- THORNDIKE, E. L. Animal intelligence: an experimental study of the associative processes in animals. *Psychological Review, Monograph Supplements*, 1898, 2, No. 4 (whole No. 8).
- THORNDIKE, E. L. Reading as reasoning: a study of mistakes in paragraph reading. *Journal of Educational Psychology*, 1917, 8, 323-332.
- TINKER, MILES A., & MCCULLOUGH, CONSTANCE M. *Teaching Elementary Reading*. New York: Appleton, Century, Crofts, 1962.
- TOLMAN, E. C. The determiners of behavior at a choice point. *Psychological Review*, 1938, 45, 1-41.
- WOODY, C. Measurement of a new phase of reading. *Journal of Educational Research*, 1923, 8, 315-326.