

READING COMPREHENSION TO 1970: ITS THEORETICAL AND
EMPIRICAL BASES, AND ITS IMPLEMENTATION IN
SECONDARY PROFESSIONAL TEXTBOOKS,
INSTRUCTIONAL MATERIALS
AND TESTS

by

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ABSTRACT

The purpose of this study was twofold: (1) to determine current concepts of reading comprehension deriving from experimental investigations and theoretical statements, and (2) to establish whether these concepts are represented consistently in currently available secondary professional reading textbooks, instructional materials, and published tests.

An extensive search of research and non-research literature pertaining to reading comprehension was undertaken. Current knowledge regarding the nature of reading comprehension was found to derive from three principal sources: experimental investigations, verbal descriptions, and models. Experimental investigations have been of three main types: statistical analyses, studies of the specificity of comprehension, and introspective-retrospective case studies. Statistical analyses, most of which have involved factorial procedures, have been equivocal in their findings. Some indicate comprehension to be a unitary mental ability, while others reveal comprehension as a composite of several specific abilities. Studies of the specificity of

comprehension show that the ability to comprehend is to a greater or lesser extent specific to the content area from which the reading material is taken. Introspective-retrospective case studies indicate that the cognitive activity associated with comprehension is characterized by ideational fluency, linguistic fluency, manipulation, variety and flexibility, and objectivity.

Verbal definitions of comprehension are of two types, skills-based and cognitive-based. Skills-based definitions conceive comprehension in terms of the specific skills which it is considered a reader must possess in order to understand what he reads. These skills are usually organized hierarchically although some authorities question this organization. When critical and creative reading are discussed as separate types of high-level comprehension, they are described in terms of their associated skills. Cognitive-based definitions have produced widely-diverse explanations of comprehension in terms of the cognitive operations thought to be involved.

Various definitions of comprehension have been provided by models. Included are definitions in terms of separate overt skills, hierarchical organizations of educational outcomes, external factors influencing the attainment

of comprehension, cognitive operations, and psycholinguistic activity.

Concepts of comprehension represented in secondary professional reading textbooks, instructional materials, and published reading tests are generally consistent. The concepts of comprehension represented in secondary professional textbooks are expressed by verbally defined skills-based hierarchies. Instructional materials and published tests generally embody concepts of comprehension represented by verbal non-hierarchical definitions. Many of the difficulties generally associated with verbal definitions of comprehension are apparent in the verbal definitions represented in current secondary professional reading textbooks, instructional materials, and published tests.

The conclusion reached by this study was that a basic dichotomy exists between those concepts of comprehension expressed in terms of overt behavior and those described in terms of covert behavior. It is the failure of experimenters and theorists to establish the relationship between the covert psychological process accounting for comprehension and the overt behaviors by which readers exhibit their understanding of what they read that is responsible for much of the current confusion surrounding comprehension. It would

seem that a clearer understanding of comprehension depends upon a fuller understanding of its psychological nature. This understanding would, in turn, provide needed precision and consistency in verbal definitions of comprehension.

Further research into the psychological nature of comprehension is needed. This research should be coordinated into a program involving the experimental testing of hypotheses suggested by current and future models. The findings of these investigations could then provide the basis for developing materials and procedures for teaching and measuring comprehension.

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Chapter 1

INTRODUCTION

MAJOR ASSUMPTIONS AND IMPORTANCE OF THE STUDY

The purpose of this study was twofold. The first objective was to establish current concepts of reading comprehension deriving from experimental investigations and theoretical statements. The second objective was to determine whether current concepts of reading comprehension are consistently represented in presently-available secondary professional reading textbooks, instructional materials, and published reading tests.

A major assumption of this study was that the ultimate objective of reading is the attainment of meaning. Reading may be described as a communication process between the writer and the reader. The extent of the reader's success is determined by the degree to which he obtains the meaning intended by the writer. Hence it is the gaining of understanding from what is read that constitutes the central purpose of the reading act. This understanding is usually referred to as comprehension. It is a measure of the importance of comprehension that

the terms comprehension and reading are often used synonymously. The significance of comprehension in the total reading process has been emphasized by Carroll who contends that "the essential skill in reading is getting meaning from the written page" (3:296).

Despite the importance of comprehension, it remains one of the least understood aspects of reading. Research and non-research investigations of comprehension are highly equivocal in their conclusions. And when attempts are made to compare conclusions in order to establish some degree of cohesion among them, little success is encountered.

Jenkinson has recently examined current knowledge regarding comprehension and has concluded that "our ignorance of reading comprehension is pervasive and abysmal" (6:190).

The value of gathering and organizing existing experimental knowledge in order to illuminate the nature of reading comprehension was recognized by Schoeller twenty years ago (10). He examined and categorized 211 experimental investigations of comprehension made between 1900 and 1948. Schoeller justified his study by pointing to the need for surveys of "the ever-increasing number of educational problems which have been poured onto the already overloaded desks of educators" (10:4). The value of studies like Schoeller's has been recognized

recently by Kingston who maintains:

We need reading specialists who can sum up the evidence, as it were. Such scholars should classify what is known at present, what is suspected but unproved, and hopefully to help [sic] us all recognize what still is to be learned. (8:116)

The increase in knowledge about reading comprehension since 1948 can be inferred from Summers's recent study of the growth of published research in reading. In 1948, seventy-eight articles in reading research were published in thirty-nine journals bringing the total number of published research studies in reading to 2,010. In 1966, the last year for which Summers provided information, 262 articles were published in sixty-five journals bringing the total number of published research reports to 4,159 (11:18-19). If only a small portion of this increase in published reading research is concerned directly with comprehension, then Schoeller's study is already dwarfed by the volume of more recent information available. This hypothesis is strengthened further when one considers that many doctoral dissertations and non-research discussions concerned with reading comprehension have appeared since 1948.

Hence, in summary, although comprehension is recognized as central to the reading process, it remains poorly understood. Further, though the value of gathering and

organizing knowledge relating to comprehension for the purpose of understanding it is recognized, this task was last performed over twenty years ago. Since that time, the amount of published research and non-research literature relating to reading has increased enormously.

For these reasons, there is a need for a study such as the present one which would draw together and analyze the findings of experimental and theoretical investigations of reading comprehension. Such a study could provide an inclusive description of present knowledge relating to comprehension and the prevailing concepts by which it is described. This study could further point to specific problems requiring subsequent investigation while providing a comprehensive framework within which these investigations might be conducted. Moreover, the concepts of comprehension determined from the review of experimental and theoretical investigations were thought to provide a basis for the second part of this particular investigation. Here, the prevailing concepts of comprehension embodied in secondary professional textbooks, instructional materials, and standardized tests were compared in order to establish the extent of agreement among them.

A second major assumption of this investigation was that the ultimate purpose of educational research is the

improvement of educational practice. Educational practice relating directly to teaching may be divided generally into three stages. These are the establishment of educational objectives, the development and implementation of instructional procedures to attain these objectives, and the use of measuring devices to determine success in attaining these objectives and to provide information for the modification of future instructional procedures. In discussing reading research, Levin has placed it in proper relation to educational practice by contending:

The prior question is What is the process of reading? rather than, What is the optimal teaching procedure? Definitive answers to the second wait on the first (9:145)

The question raised by Levin's point is the extent to which current concepts of reading comprehension derived from experimental research and authoritative opinion are actually reflected in educational practice. Specifically, to what extent are the instructional objectives set for teachers in professional textbooks consistent with the objectives emphasized in the instructional materials teachers have available to them or the tests they use to assess their success in achieving their objectives.

In the secondary grades, the last decade has witnessed a growing emphasis on the place of reading in the curriculum.

Artley, in commenting on the development of reading programs in secondary schools, has stated:

When the history of reading instruction is written, it will be shown that one of the major points of emphasis of the 1960's will be the organized extension of the developmental reading program into the secondary grades. (1:1)

As might be expected, a recent survey (12) of resources available to secondary reading teachers indicates a growing number of professional textbooks have become available during the last decade. In addition, Devine (4) has provided an overview of the wide range of instructional materials from which secondary reading teachers may choose. And Farr (5), in a comprehensive review of published standardized reading tests, illustrates the number of tests applicable to the secondary grades.

In this climate of growing interest in secondary reading, a need was recognized for a study of the degree of consistency with which current concepts of comprehension were represented in educational practice. It was felt that inconsistencies among the objectives set for teachers in professional textbooks, the materials available for teachers to carry out these objectives, and the tests used to measure the achievement of these objectives were unavoidable if the fundamental concepts of comprehension upon which these three

aspects of teaching are based were themselves inconsistent.

STATEMENT OF THE PROBLEM

The major questions which this study sought to answer were the following:

1. What are the current concepts of reading comprehension which derive from experimental investigations and verbal statements?
2. Which current concepts of reading comprehension are represented in professional textbooks intended for secondary teachers?
3. Which current concepts of reading comprehension are represented in instructional materials intended for teaching reading in the secondary grades?
4. Which current concepts of reading comprehension are represented in published reading tests designed for the secondary grades?
5. Does agreement exist among the concepts of comprehension represented in secondary reading professional textbooks, instructional materials, and published standardized reading tests?

DEFINITION OF TERMS

The terms indicated were used in this study as defined below:

1. Experimental definition is any definition or description stated by an author that is derived directly from the testing of a hypothesis by the collection and analysis of data. For example, an experimental definition would be provided by a factor analysis study undertaken to test the hypothesis that reading comprehension can be accounted for by a single factor. If this hypothesis was confirmed, an experimental definition of reading comprehension would be provided by the interpretation given to the single factor isolated.

2. Verbal definition is any definition or description stated by an author that is not directly supported by experimental evidence. For example, a verbal definition would be given by the statement that reading comprehension results from the mental processing of language, provided that this statement was not directly supported by the findings of an experimental investigation. If the statement was directly supported by the findings of an experimental investigation, it would be an experimental definition.

3. Professional textbook is a unified and

comprehensive treatment of the major issues involved in reading instruction written for the consumption of classroom teachers.

4. Instructional materials are materials designed and developed to facilitate the teaching of reading in the secondary grades.

5. Published reading tests are reading tests designed and published to measure the general or specific reading performance of students in a group situation.

6. Secondary grades are considered to include grades eight through twelve.

METHODS AND MATERIALS USED IN THE STUDY

The first phase of the study involved an intensive search of both the experimental and theoretical literature relevant to comprehension. The experimental literature was searched through the ERIC/CRIER system. In addition, the annual summaries of research in reading initiated by Gary in 1925 and appearing yearly since that date were searched as a check on selections made from the ERIC/CRIER system. The pertinent non-research material was not so easily identified. Because no comprehensive retrospective bibliography of non-research literature in reading exists, numerous

individual published bibliographies were searched in order to identify articles relating to comprehension. This was done with successive bibliographies until it was found that no new articles were being unearthed by reference to additional bibliographies. On this basis, it was considered that the major corpus of non-research literature pertaining to this subject had been identified. It should be noted that the ERIC system is presently monitoring non-research literature in education including reading thereby making the somewhat ad hoc approach adopted here unnecessary for published material appearing since 1970.

The second phase of this study was concerned with an analysis of secondary reading professional textbooks, instructional materials, and published tests. Pertinent professional textbooks were determined from a recent extensive compilation of resources currently available to secondary reading teachers (12). The instructional materials analyzed were those applicable to the secondary grades contained in the collection of instructional reading materials located in the University of British Columbia Reading Resources Centre. This collection has been developed over a number of years by faculty members in the Department of Reading Education in order to give student and practising teachers a broad cross-

section of available elementary and secondary instructional materials in reading. The collection does not contain every piece of instructional material in print, but the basis and manner of its development makes it representative of materials available and in current use including those intended for the secondary grades. Hence, this collection provides a suitable source of currently available and used secondary reading instructional materials. Finally, published reading tests intended for the secondary grades were determined from the recent comprehensive listing provided by Farr (5). Since this study was concerned with an analysis of currently available tests, only those published or revised since 1955 were selected. In a few instances, tests listed by Farr were unavailable from publishers and were therefore omitted. These omissions were made in the belief that such tests were not readily obtainable from publishers and therefore probably do not fall into the category of currently available tests. In a few additional cases, tests listed by Farr as being revised since 1955 were found to be unrevised reissues of tests developed and published before 1955. These tests were determined by consulting Buros (2) and by examining the tests themselves. Tests of this type were excluded from the study. Other amendments to

Farr's compilation were made when errors were discovered.

The study was organized into ten chapters. The introductory chapter is followed by a chapter concerned with establishing comprehension within the framework of the total reading process as it has emerged over the past seventy years. The third chapter reviews experimental investigations of reading comprehension, while the fourth chapter examines verbal descriptions of comprehension. Models of comprehension are discussed and analyzed in chapter five. Chapter six provides the pivot of the study in that it gathers together the concepts of comprehension derived from the previous three chapters. This is done in order to provide the basis for the analysis and comparison of notions of comprehension underlying professional textbooks, instructional materials, and standardized tests which is the concern of chapters seven, eight, and nine. The final chapter provides a summary, general conclusions, and recommendations for further research.

LIMITATIONS OF THE STUDY

A number of limitations have been imposed upon this study which restrict its applicability. In the first instance, this investigation is basically concerned with

the reading comprehension of accomplished readers in the secondary grades. An accomplished reader is considered to be one who has acquired the basic reading skills such as word recognition and phonetics. The learning process which is responsible for the acquisition of these skills is beyond the scope of this discussion. The necessity for distinguishing between "the skills and activities involved as the child acquires reading skills" and "the skills of the accomplished reader" has been recently indicated by Jenkinson (6:187). In another place, Jenkinson states that "the intellectual, dynamic activity of the reading process has been confused by linking this with the techniques and skills which need to be acquired in the 'learning to read' process" (7:58). In a similar manner, Wiener and Cromer distinguish between "the behavior occurring during the acquisition of skills" and "the behavior manifest after these 'skills' have been achieved." Like Jenkinson, Wiener and Cromer contend that confusion in understanding the reading process results from "the failure to distinguish between acquisition and accomplished reading" (14:622-23). Also excluded from this study is a consideration of reading disability. This study is not concerned with elucidating the causes for the inability to comprehend among secondary school

students. It is concerned only with determining the nature of comprehension in the accomplished reader.

The literature search undertaken for this investigation covered the period from 1900 to June 30, 1969. This latter date was selected since it is the termination of the last annual summary of investigations relating to reading available at the time the writer began his study (13). Where pertinent material appearing after this date was located and was obtainable, it was included. But no claim for completeness is made after June 30, 1969. Moreover, although the necessity for maintaining an historical perspective was constantly recognized, the general emphasis was on the inclusion of more recent material since the focus of the investigation was on current concepts of comprehension. This is particularly true of the non-research material.

Despite the fact that the literature search was highly comprehensive in nature, it is possible that some pertinent material was not detected and therefore has been inadvertently overlooked. This is particularly likely in the case of non-research material since this source of information has been monitored only recently by the ERIC system, and complete retrospective listings are not available.

Since comprehensive sources of professional textbooks

and published tests were consulted, it is thought that the analysis of them includes the major ones available. The instructional materials analyzed were determined from a representative collection of those available. Hence, not all materials in print were included in the analysis and it is conceivable that another investigator would have analyzed other materials if he had them available to him. But it is maintained that, since the materials analyzed here were drawn from a collection that has been developed by reading experts to represent those materials presently available and currently in use, another analysis involving another representative collection of materials would not have produced fundamentally different findings from the ones reported here.

Finally, the very nature of this study makes it an essentially subjective undertaking. For this reason, the limitations of the writer in organizing, analyzing, and discussing the literature and materials concerned must be kept in mind. It is maintained, however, that the findings and conclusions are supported by careful argument and analysis, and that they are revealed in sufficient detail to allow for their evaluation by the reader.

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Chapter 2

READING AND COMPREHENSION: THE PAST SEVENTY YEARS

The process by which a reader comprehends the meaning of a printed or written communication is itself part of a more extensive process encompassing the entire reading act. It follows that, in order to examine the nature of reading comprehension, it is helpful to assess the place of comprehension within the total reading process. This problem may be approached in a number of ways. The method adopted in this chapter is to examine the gradual emergence of a concept of the reading process over the past seventy years, and to identify the place and importance ascribed to comprehension within this process. In turn, this examination provides a basis for studying current knowledge of comprehension within the context of the reading process as it is generally understood at the present time.

EARLY CONCEPTS OF THE READING PROCESS

As Mathews (22:194), Smith (28:158-65) and Spache (29) have noted, one of the pivotal periods in the history of

reading instruction occurred during the second decade of this century. Until about 1910, there existed an emphasis on oral reading in the schools. Moreover, both oral and silent reading were viewed as perceptual activities, mechanically executed, essentially involving word recognition. Typical of this view is a statement by Otis:

It would seem then that reading ability to be defined logically, must be considered as embodying in essence only those mental processes which are concerned directly with the specific visual symbols as such. Other mental activities in the total reading complex may be spoken of as "supra-reading" activities or accompaniments of reading per se. (23:534)

During the second decade of this century, however, this concept of reading gradually was superseded by a growing awareness of the importance of silent reading and the understanding of what was read.

In anticipation of the widening range of problems reading experts would face as they sought to understand the broadening concept of reading which began to emerge, Huey asked, "Just what, indeed, do we do, with eye and mind and brain and nerves, when we read?" (17:152) Huey's question served to focus attention on the need to understand the reading process, a process which he compared to a miracle and the analysis of which he described as "the acme of a psychologist's achievement" (17:5-6). In considering the reading

process, Huey also asked, "How do we get the meaning of our reading, and in what does this meaning consist?" He considered that this question focused on the "vital part of the reading process" (17:52).

THE DEVELOPMENT OF A CONCEPT OF READING

In response to questions such as those raised by Huey early in the century, educational literature came to reflect a growing concern with the nature of reading. For the purpose of this discussion, the various Yearbooks of the National Society for the Study of Education will be taken as representative of authoritative opinion during the period under review.

The growing emphasis on silent reading and reading for meaning can be seen clearly in the early Yearbooks. In elucidating the theoretical bases of sound instruction in 1919, Gray was at pains to point out that "the results of practically every [experimental] investigation...indicate the appropriateness of emphasizing the content of what is read, persistently and consistently throughout the grades" (13:29). Five years later, a note of exasperation may be detected in the Yearbook Committee's remark that "teachers are particularly ready just now to undertake any new method which

goes under the name of 'silent reading'" (35:vii). This comment is probably indicative of the somewhat uncritical enthusiasm with which teachers were beginning to accept the idea of silent reading by the 1920's (28:163). But such an acceptance did not prevent Whipple and the Yearbook Committee in 1925 from recommending "vigorous emphasis from the beginning on reading as a thought-getting process and the subordination of the mechanics of reading to thoughtful interpretation" (32:305). It is clear that by the mid twenties, the cognitive aspects of the reading process were being stressed even if their exact nature was not understood.

The concept of reading continued to develop and expand as the century progressed. An additional facet was provided by Gray's discussion in 1937. While including in his definition of reading "the process of recognizing printed or written symbols" and "the recognition of the important elements of meaning in their essential relationships, including accuracy and thoroughness in comprehension," Gray went on to add:

The Yearbook Committee believes that any conception of reading that fails to include reflection, critical evaluation, and clarification of meanings is inadequate. It recognizes that this broad use of the term includes much that psychologists and educators have commonly called thinking. (12:26)

A further amplification of this concept of reading is

apparent eleven years later when, in discussing the nature of the reading process, the Yearbook Committee stated:

It is no longer conceived...as a unique mental process nor as a single activity involving many mental processes. It is rather a series of complex activities, the nature of which varies with the ends or values to be attained. (36:32)

In an attempt to describe "those understandings and skills involved in the self-reliant interpretation of what is read," the Yearbook Committee set out four headings under which they discussed "The Major Aspects of Reading":

1. Grasping the literal meaning of what is read.
 2. Securing the broader meaning inherent in a passage.
 3. Reacting to what is read.
 4. Fusing the ideas acquired with previous experience.
- (36:33-5)

While outlining the reading act in these terms, the Committee was careful to emphasize that these aspects all "function more or less as a unit in the act of reading." Furthermore, in their discussion of the reading process, the Committee stressed "the need for vigorous training that aims to promote the depth of understanding and the critical reactions and judgments that are requisite to free, open inquiry and good scholarship" (4:2). Continued discussion of reading is exemplified by Gates' comment one year later:

Reading is not a simple mechanical skill; nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thoughtful process. However, to say that reading is a "thought-getting process" is to give it too

restricted a description. It should be developed as a complex organization of patterns of higher mental processes. It can and should embrace all types of thinking, evaluating, judging, imagining, reasoning, and problem-solving. (8:3)

Attention to the reading process in the 1950's appears to have been largely concerned with consolidating and applying previous theoretical discussion. Gray, for example, in the middle of the decade, commented that "reading is conceived today as a complex activity of four dimensions: the perception of words, a clear grasp of meaning, thoughtful reaction, and interpretation" (11:33-4). In looking back over the period from 1950 to 1960, Witty noted the adoption by teachers of a "broader concept of the reading process." He remarked further:

Teachers generally have come to show a greater concern for meaningful reading experience at every level. Critical reading, too, has been stressed in both elementary and secondary schools. (34:5)

So it was that by the 1960's, the prevailing concept of reading had developed from an emphasis on word recognition alone to the inclusion of understanding, interpretation, critical reaction, evaluation, and integration. A generalized representation of reading keyed to the dates of the pertinent Yearbooks cited above is provided in Figure 1.

Two related observations emerge from this review. The first is that the concept of reading which developed became

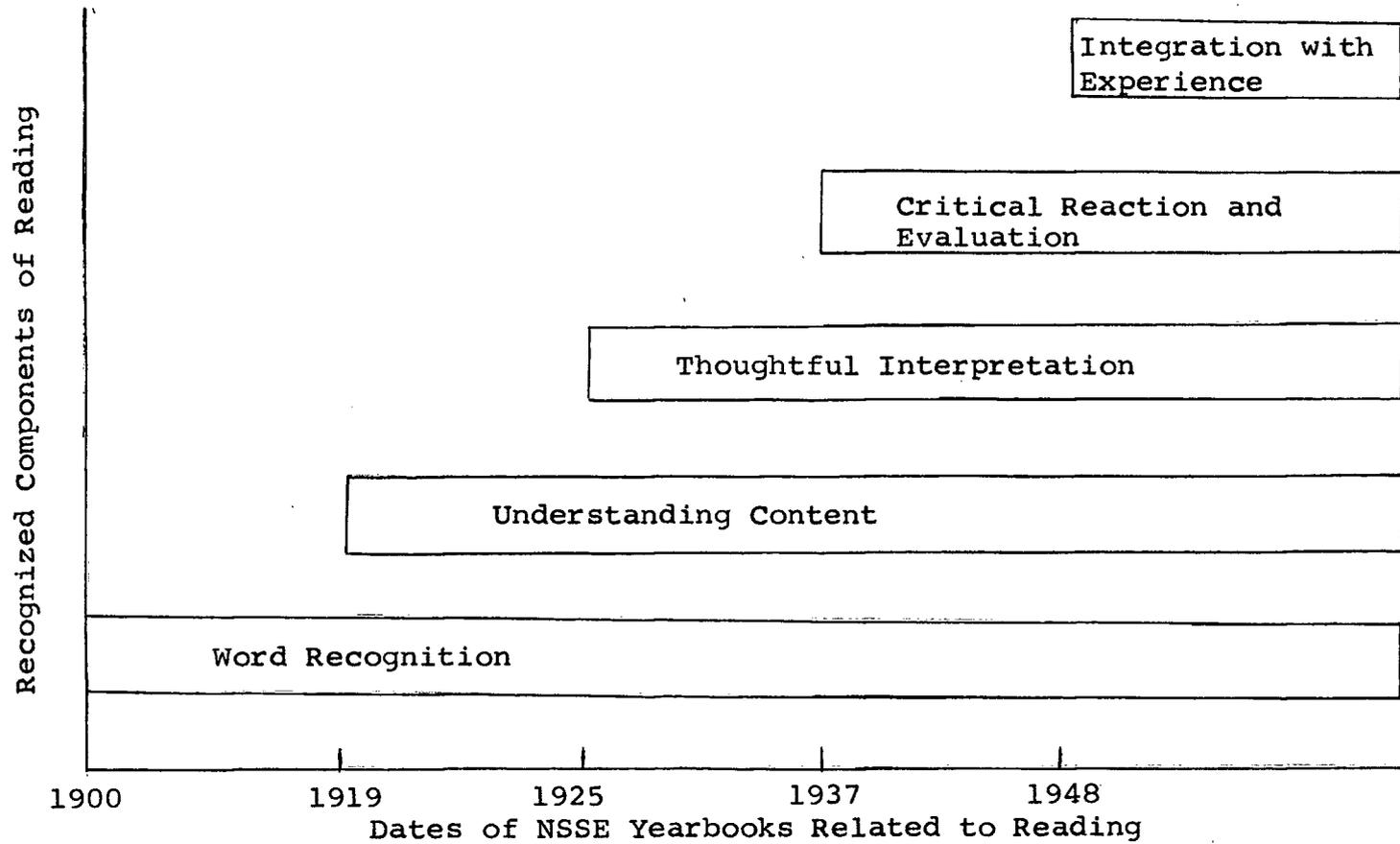


FIGURE 1

THE EMERGING CONCEPT OF THE READING PROCESS

broader as it encompassed an increasing number of educational objectives for reading instruction. The role of reading can be seen to develop from emphasis on simple word recognition to stress on the value of reading in developing the reader's critical acumen and experiential background. However, an understanding of the process responsible for the development of these different educational objectives is not provided. For example, while "interpretation" is cited as an objective for reading instruction, the process employed by the reader during interpretation is not explained. It has been only recently that the difference between the educational objectives for reading instruction and the process mobilized by the reader to realize these objectives has been clearly distinguished (25:32; 19:58).

A second observation relates to the place of comprehension within the total reading process. While it is clear that the importance of comprehension was stressed constantly, it is also clear that the definition of comprehension became less precise. In the early decades of the century, when it seemed possible to differentiate clearly the understanding of what was read from the physical perceptual activity involved in reading, comprehension appeared to be a relatively simple concept. But with the development of a broader

understanding of reading, the questions of whether to include within a definition of comprehension such matters as the recognition of words, the reader's critical evaluation of the content of his reading, and the integration of this content into his experiential background were ones which remained unresolved. Clymer (3:28) has recently made a similar observation with regard to definitions of reading in general.

CURRENT EMPHASIS ON READING AND COMPREHENSION

The questions asked about reading in the last decade have been many and varied. The fundamental question appears in the most recent Yearbook devoted to reading, where Clymer asks, "What is reading?" (3:7-29) The basic nature of this question reflects a shift in the emphasis of attention focused on the reading process. As has been noted above, up to about 1960, explanations of reading were for the most part stated in terms of the educational objectives. Since that time, however, more emphasis has been placed on attempts to understand the basic process of reading. Clymer's own review outlines some of the more recent attempts in this regard. Similar reviews have been made by Wiener and Cromer (33), Jenkinson (19), and Harris (16:1075-6).

This interest in the reading process is further exemplified by two collections of expert opinion, one edited by Gunderson (15), and the other by Singer and Ruddell (27). A further example of the emphasis presently being placed on the understanding of reading comes from the publication of Gephart's report on the proposed application of the convergence technique to come to an understanding of the reading process. The degree of complexity presently ascribed to the reading process is illustrated by the definition presented in Gephart's report:

THE READING PROCESS--The interrelated series of steps, operations or activities of a linguistic, physiological, cognitive, perceptual, and psychological nature that come into play when the organism engages in reading behaviors defined as covert responses to verbal written language. Covert responses are indicated by overt performances which could not have occurred without the covert responses to the written language. (9:100)

Despite this profusion of activity over the past decade, authorities in reading still despair at the lack of any firm understanding of the process which they study. Carroll contends that, "despite the large amount of research and expository writing in the field of reading, the nature of reading as behavior has still not been accurately described..." (2:336). Gibson and Levin contend that "the process of communicating from written materials, in spite of

its ubiquity, is not well understood, either in terms of the acquisition of the skill or its characteristics in the mature reader" (10:ix). Kingston maintains that "there is ...no systematic psychology of reading, nor is there an adequate theory of reading" (20:425). And Jenkinson appears to speak for most authorities when she asks why, "after seventy-five years of research and investigation, there has not emerged a coherent construct within which we can examine reading" (19:55).

Notwithstanding the confusion surrounding the nature of reading, authorities have detected some general lines of demarcation in their attempts to analyze the process. Clymer points to the difficulties encountered in establishing the conceptual boundaries within which reading is to be defined when he identifies as "one of the real controversies in the field of reading" the question, "Does reading involve only the translation of printed symbols to the spoken word, or does reading involve understanding of those words as well?" (3:8) Gephart answers this question by providing a broad framework within which he considers reading:

Reading can be described as a continuum from simple decoding of a message through literal comprehension of that message to and including critical comprehension of that message. (9:164)

Other authorities take narrower views of reading which may be located at various points along the continuum proposed by Gephart. Weaver, for example, maintains that, "by the psychology of reading I mean the scientific study of graphic decoding operations in the human organism" (31:67). At the other end of this continuum is Stauffer who states that "...reading is a complex phenomenon of mental activity akin to thinking" (30:10).

There is ample evidence to suggest, however, that most authorities include both translating written symbols into spoken words and the understanding of words in their conceptions of the reading process. Hence, the importance of comprehension is generally stressed. Typical of this emphasis is the statement of Russell and Fea:

In essence, the reading act is divisible into two processes: (1) identifying the symbol, and (2) obtaining meanings from the recognized word. Without both processes, the reading act is impossible. (26:868)

Similarly, Piekarz advocates a dichotomous conception of the reading process when she identifies "perceptual abilities as well as conceptual abilities" (24:137-8). Levin suggests that "reading may be broken down into two broad sub-skills," the first being "the skill of decoding the writing system into its associated language," and the second involving "the use of the code," including "comprehension and reading for

different levels of meaning" (21:140). Carroll states simply that "the behavior we call reading may be described as the perception and comprehension of written messages..." (2:337). Wiener and Cromer, in their analysis of "the diversity of definitions of reading," suggest that a distinction can be made between "identification, the distinguishing characteristic of which is "the correct 'saying' of the word," and "comprehension" which "implies the derivation of some form of meaning and the relating of this meaning to other experiences or ideas" (33:621). Finally, Jenkinson emphasizes the dichotomy which she finds inherent in the reading process by stating that "though word recognition is a prerequisite of reading, it does not guarantee understanding" (18:545).

Comparing the opinions of authorities regarding the components of the reading process and the relationship among them is a dangerous practice since the terms used to describe the components are themselves lacking in precise definition. Despite this imprecision, however, a general concern with the understanding of what is read is reflected in each of the opinions cited above. And when reading authorities discuss this understanding in isolation, their concern becomes even more apparent. Davis stresses that

"reading is essentially a process of getting meaning" (6:185). Similarly, Gray maintains that "the good reader does more than recall appropriate meanings. He also fuses these meanings into the sequence or pattern of ideas intended by the author" (14:149). Dechant contends that "reading is essentially a process of interpretation" (7:101), while Cushenbery comments that "getting meaning from the printed page is the end product of the reading act" (5:102). Currently, Carroll stresses that "the essential skill in reading is getting meaning from a printed or written message" (2:296).

SUMMARY

This chapter has been concerned with placing comprehension within the framework of an emerging concept of the reading process. Early conceptions of reading were characterized by an emphasis upon physiology and word recognition. In the second decade of this century, however, emphasis came to be placed on the importance of silent reading and the need for understanding what was read. This concept of reading grew until it included such educational objectives as the improvement of the reader's critical ability and the development of his experiential background.

Current interest in reading focuses on the nature of the reading process as well as educational objectives for reading instruction. Despite this interest, however, at the present time there is no universally accepted definition of reading. And since the nature of the reading process is still a subject of speculation, the place of comprehension within this process has been described in only general terms although its importance has been constantly recognized.

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Chapter 3

EXPERIMENTAL INVESTIGATIONS OF READING COMPREHENSION

The purpose of this chapter is to review experimental investigations into the nature of reading comprehension from approximately 1900 to the present. The chapter is divided into six major parts. The first part is intended to provide a very brief historical sketch of the development of the experimental study of reading. The second part provides a review of the early experimental investigations of reading comprehension and a commentary on them. Later statistical investigations of comprehension are included in the third part of the chapter. They are reviewed, summarized, and evaluated in terms of their contribution to knowledge regarding the nature of comprehension. In the fourth part of the chapter, investigations of the specificity of comprehension in relation to different content areas are reviewed, summarized and evaluated. This same procedure is adopted in the fifth part of the chapter with respect to introspective verbalization studies. The findings emerging from these various investigations are summarized in the sixth part of

the chapter and their significance is commented upon.

THE EARLY DEVELOPMENT OF THE EXPERIMENTAL STUDY OF READING

Early experimental investigations of reading tended to concentrate on the physiology of reading rather than on more complex psychological processes. There appear to be two principal reasons for this emphasis. First, as has been discussed in the previous chapter, before about 1915 the prevailing concept of the reading process was essentially one of a mechanical, perceptual activity involving word recognition. This concept of reading formed the context in which experimental investigations into the nature of reading were executed. A second reason for the physiological emphasis of initial reading research lies in its beginnings in the psychological laboratories of Europe, where the emphasis was on sensori-motor processes. As Gray (17:2-6) has indicated, the first experimental studies of reading were conducted in Germany and France, and the focus of these studies was on visual perception. The early studies of Valentius, beginning in 1844, followed by those of Cattell, Erdmann, Dodge and others investigated the nature of the perception of different reading material. These studies were followed by a second group initiated by Javal's

discovery in 1879 of saccadic eye movements during reading. The nature and function of these movements held the attention of a large number of investigators including Javal, Lamare, and Ahrens in Europe, and Delabarre, Dodge, Dearborn, Judd, Schmidt and Buswell in the United States.

A salutary effect of these studies of visual perception and eye movements was the emergence of a climate conducive to the further scientific investigation of reading. This climate was enhanced during what Gray (17:6) views as a transitional period in reading research occurring in the second decade of this century. At this time, more sophisticated techniques and instruments for the scientific investigation of reading were developed. An additional benefit derived from earlier studies of perception was the revelation of new problems for investigation. Spache argues that it was only after perceptual studies revealed that eye movements were influenced by the varying content and difficulty of reading material that the nature of comprehension was identified as a concern for reading research. Spache maintains that "the mechanical analysis of the act of reading led directly to a broader interpretation of the psychological nature of reading" (46:11).

An example of one of these early studies will serve

to illustrate Spache's point. Judd and Buswell investigated "the mental processes which are involved in reading" (25:7) using eye movement photography. During the silent reading of intermediate grade and high school students Judd and Buswell found that eye movements vary according to the type of difficulty of the material read and the reader's purpose for reading. They also found differences between normal reading and "analytical study" including such activities as paraphrasing. On the basis that "eye movements are but external manifestations of an inner condition which is set up on the central nervous system" (25:21) these early investigators concluded that:

A printed page turns out to be, as shown by this study, a source of a mass of impressions which the active mind begins to organize and arrange with reference to some pattern which it is trained to work out. (25:14)

Though their study did not go beyond the measurement of eye movements, Judd and Buswell's conclusion suggests a developing awareness of the more intricate psychological processes at work during the act of reading. It was suggestions such as these which provoked further studies of reading beyond those dealing with visual perception and the physiological mechanics of reading.

EARLY EXPERIMENTAL STUDIES OF READING COMPREHENSION

Review of the Studies

Among the early studies of reading comprehension, one of the best known was conducted by Thorndike (55). Reacting against the idea that "reading...is a rather simple compound of habits" involving the combination of sounds and meanings of individual words and phrases, Thorndike sought to understand "the dynamics whereby a series of words whose meanings are known singly produces knowledge of the meaning of a sentence or paragraph" (55:323). Two hundred sixth grade pupils were asked to read a short paragraph on school attendance and then to answer a series of questions in their own words with the paragraph before them. Thorndike then inspected and analyzed the errors committed by the pupils in their answers and drew the following conclusion:

In correct reading (1) each word produces a correct meaning, (2) each 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. (55:326)

Thorndike maintained that errors in comprehension were caused by readers making inaccurate connections between words by

assigning "over potency" or "under potency" to the meanings of words or phrases, and by failing to remain critically sensitive to the ideas encountered during reading so as to treat them as "provisional" rather than accepting them uncritically. In his final conclusion, Thorndike drew an analogy between the reading act and mathematical thinking:

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. (55:329)

Thorndike conducted two further studies in this manner (54; 55) and similarly concluded that "understanding is 'thinking things together'":

Understanding a spoken or printed paragraph is then a matter of habits, connections, mental bonds, but these have to be selected from so many others, and give relative weights so delicately, and used together in so elaborate an organization that "to read" means "to think", as truly as does "to evaluate" or "to invent" or "to demonstrate" or "to verify". (56:114)

In a study stimulated in part by Thorndike's findings, Ritter and Lofland used standardized tests to determine the relationship between "general reading ability" and "that ability required in reading and

understanding printed matter in which a special type of reasoning is necessary" (39:529). Pupils in grades five through seven in Kansas City schools were given the Monroe Silent Reading Test II, Form 2, the Burgess Silent Reading Scale I, and the Thorndike-McCall Reading Scale, Form 2 in order to determine their general reading ability. Measures of the pupils' reasoning ability were obtained from the Stone Reasoning Test, the Otis Intelligence Scale, test three of the National Intelligence Test, and test five of the Otis Group Intelligence Test. Pearson product moment correlation coefficients were computed between each reading test and each reasoning test score. On the basis of these correlations (ranging between .22 and .51), Ritter and Lofland concluded that a "close" relationship exists between reading ability and reasoning ability.

It should be noted, however, that the highest correlation found by Ritter and Lofland shows only slightly more than 25 percent of the variance in pupils' reading scores accounted for by differences in their reasoning ability as measured in this study. Hence, the extent to which Ritter and Lofland's claim that the relationship between reading and reasoning ability is "close" may be questioned since the highest correlation between these

two abilities leaves approximately 75 percent of the variance in reading dependent on factors other than reasoning. Despite the somewhat limited nature of their findings, Ritter and Lofland compared them with those of Thorndike, and further concluded that "...language is a series of relations and...reading requires the evaluation of such relations" (39:538).

A number of early studies were similar to Thorndike's in that they attempted to clarify the nature of the reading process and how understanding is gained through reading. Huey employed the introspective verbalization technique with male university students in order to examine "the interpretive processes in reading" (21:292). Prose passages were selected, typed, and the lines cut out and pasted end-to-end so as to form a continuous line of print. Other passages were typed, dissected, and each word was mounted singly on a card. Words were then exposed singly to subjects for four seconds, randomly in the case of dissected passages, and in order of their original appearance in the case of continuous passages. Subjects gave introspective verbal responses describing their interpretations of the words as they appeared. Huey found "characteristic differences" between the associations subjects

reported from isolated words and from words given in context. Words presented in isolation produced a greater variety of associational responses than did words presented in context although the quantity of responses to single words was less than for words in context. Huey explained this phenomenon in the following manner:

The mere statement that the word to be exposed is part of a reading passage limits the trend of association when no context has been given. The limitation extends when the subject has caught the general topic discussed in the passage, and still further when the exposed word is given upon a verbal and ideational background formed by the preceding context. (21:305)

On the basis of his study, Huey characterized the nature of interpretive reading as follows:

The newly exposed word was usually mentally pronounced...and "fitted into the preceding" as was very often remarked by one subject; the new word contributing apparently toward a notion of sentence unity, to which each additional element added a needed part. Immediately following this there was in a majority of cases a filling out of the sentence or phrase so as to make sense with the preceding context, and when this did not occur there was usually a "forward push", "forward tendency", "tendency to fill out", as it has been very frequently described by the subjects. (21:305-306)

Like Thorndike, Huey tended to depreciate the role of word recognition in reading by maintaining that "much of the translating seems to come not from words singly perceived, but from the perception of phrases and sentences as wholes; the words acting as 'counters' until blended thus." For

this reason, Huey warned that "words, except as they are correctly and intelligently convertible, are certainly most deceptive and dangerous symbols for the reader as for the thinker" (21:309).

To illustrate "the place and function of anticipation of meaning in the obtaining of meaning in the reading process" was the purpose of a study by Gray (16:614). Gray postulated that readers anticipated meaning through knowledge of language relations, context, and marginal impressions on the retina of the eye. Marginal impressions were described as "preconceptions which initiate the process of interpretation" (16:625). Three short-exposure experiments were conducted using eye-movement photography of single subjects ranging from the sixth grade to adult. These experiments revealed that the rate of recognition and the span of perception of isolated words were slower and shorter, respectively, than of words read in context. Gray concluded that the factor causing this difference is the anticipation of meaning generated in the reader during the reading process. Hence, according to Gray, marginal impressions during reading are of a dual nature involving "both sensory material and the evaluation of such material in the light of context, experience of the reader, etc." On this basis,

Gray maintained:

Such results show clearly that one or more factors operate to make the recognition of words in context a very different process from the recognition of isolated words. Recognition in reading is not a matter of synthesizing the full meaning of isolated words or phrases. It can probably be better described as synthesizing and completing half-meanings or shadows of meanings or partial meanings of considerable portions of reading matter. Another way to express the same idea is to say that there is anticipation of meaning due to the forging ahead of the attention while the reading is under way. (16:618)

The anticipation of meaning during reading also interested Lowi who investigated "those psychological conditions which permit the reader to integrate words into a sentence" and "the psychological factors which bring about this process of comprehending" (28:129). Forty college women were presented with short typewritten sentences exposed for .01 seconds by a slide projector. This method removed the usual characteristics of printed language which, according to Lowi, prevent "a more adequate accounting of comprehending," "since the usual word-sequence is partially marked, and the words may appear jumbled" (28:129). Once the sentences were exposed, the subject was asked to reconstruct the sentence orally. Sentences were exposed as often as was needed for accurate reconstruction. Lowi found that subjects employed a variety of techniques to gain meaning from the sentence. In general, "the most noteworthy

issue" to emerge from the investigation pointed to the "many anticipatory and corrective means" readers utilized to gain meaning as opposed to "ready perceptive and memorial functioning." On the basis of this general finding, Lowi concluded that, "under our conditions and procedures, comprehending typically calls for anticipatory forecast and corrective scrutiny" (28:133).

The tendency towards synthesis in reading detected by Thorndike, Gray and Huey was specifically investigated by Pickford (35). To eight adult subjects, Pickford presented short prose passages of three types: (1) those composed of single units, (2) those composed of double units, each half taken from a different source, and (3) those composed of triple units created by inserting an unrelated section from a different source into a continuous prose passage. The introspective verbalizations of subjects were recorded as they were asked to read the different types of passages aloud and to report the process that they employed in reading. Pickford found that all subjects demonstrated a strong tendency to treat both simple and compound passages as coherent wholes. He reported "many forms of image-synthesis, rationalizations, and hypothetical explanations of incongruities" (35:64) even though such meaning could

only be highly artificial and arbitrary. Even when subjects detected incongruities, they persisted in treating such passages as coherent units of meaning. Pickford concluded that the tendency towards synthesis is highly important in comprehension and, further, "it is a primary function in reading and is the normal basis of the process of reading" (35:65).

Besides investigating the process of comprehension, early experimenters also explored the kinds of comprehension demanded by different tasks. Tyler (59) described the development of an elementary zoology test for college students. A series of test items based on descriptions of zoological research was developed and two tests were constructed. One test required students to draw their own inferences from facts presented to them while the other test provided the correct inferences and the students had to select the correct one from a number of alternatives. From the correlation between scores on the two tests (.38), Tyler decided that the multiple choice test could not be used as a measure of inference. He concluded that "the ability to select the most reasonable inference from a given list is not the same as the ability to propose an original inference" (59:477-478). Further, in a second study, Tyler

found the correlation coefficient between a test of factual zoological information and a test of proposing inferences to be .29, "entirely too low to justify the use of the information test alone as a measure of both objectives" (59:480). Hence, according to Tyler's findings, the ability to secure facts in college-level zoological reading is not the same as the ability to draw inferences from the same materials.

In a similar investigation, Dewey (13) studied 140 public school pupils to determine the relationship between the ability to achieve factual comprehension of historical material and the ability to draw inferences from this material. Dewey defined inferential thinking in reading as "the ability to evaluate, to read between the lines, and to understand the significance of what is read" (13:346). Correlations between tests of these two kinds of comprehension ranged between .38 and .65. Dewey concluded that "when we measure children's ability to secure facts from material read in history, we are not measuring the ability to do accurate inferential thinking regarding the material read" (13:348).

Following on the findings of Tyler and Dewey, Gans conducted an investigation designed to test the hypothesis

that "the critical type of reading required in the selection-rejection of reference materials for use in solving a problem" was not identical to "the type of reading usually measured by standardized reading tests" (15:13). Gans constructed and validated a test designed to measure the reference reading of material taken from a variety of content areas included in the curriculum of the intermediate grades. Her subjects were 417 students from grades four, five, and six, in two New York public schools. Gans' test required subjects to read seventy short paragraphs equally divided among five different types of reference reading, and to indicate the relevance of each type for solving a specific problem. The five types of paragraph were the following: directly relevant to solving the problem, remotely relevant, fanciful, encyclopedic on the general topic but irrelevant to the problem, and totally irrelevant. Gans also administered a group of standardized reading tests selected to establish an acceptable and reliable criterion of reading comprehension. The tests included the following: The Thorndike-McCall Reading Scale, Form 5; The Gates Silent Reading Test, Type A--Reading to Appreciate General Significance, Form 2; The Gates Silent Reading Tests, Type B--Reading to Predict the Outcome of Given Events,

Form 2; The Gates Silent Reading Test, Type D--Reading to Note Details, Form 2; The California Test of Mental Maturity, Elementary Series. Despite the superficially varied content of these tests, Gans justified this choice as a composite measure of general reading comprehension on the grounds that the intercorrelations among the components approached their respective reliabilities. Correlations (corrected for attenuation) between the composite measure of general comprehension and each of the five types of reference reading measured by Gans' test were the following: directly relevant, .48; remotely relevant, .09; fanciful, .31; encyclopedic, .45; irrelevant, .51. On the basis of these findings, Gans concluded:

The abilities measured by the standardized tests composing the reading criterion are not the same as those measured by the experimental tests of reference reading, and the variance between the two functions of reading is too great to permit the use of scores made by pupils on tests of reading as an indication of these pupils' degree of ability to do reference reading. (15:92)

Irion developed and validated a test of "literary comprehension" which he conceived as including "reading comprehension" and "interpretative ability" (23). Reading comprehension as conceived by Irion was measured by questions designed to assess the following four abilities: (1) understanding "pivotal words used," (2) understanding

"the more unusual expressions found in reading," (3) obtaining "specific and detailed facts from the printed page," and (4) reacting "to the passage as a whole" and being able to state "important points made by the author and the important conclusions which he would have the reader form" (23:8). Interpretative ability was defined as "the ability to take the main points presented by an author and the conclusions which he draws, and, on the basis of one's own experiences, to make wider interpretations and application" (23:8). Four forms of the test were built by Irion each one based on a different literary genre: a passage of conversational narrative prose, a poem, an excerpt from a play, and a piece of expository prose. These selections were chosen after an examination of the syllabi of high school literature courses showed that they were representative of ninth grade material.

The test was administered to 170 subjects who constituted an entire grade nine class in a New York high school. Intelligence scores for the subjects were determined to be normally distributed as measured by the Otis Self-Administering Test of Mental Ability, Higher Examination, Form A. Reading achievement was typical for the grade level as measured by the Thorndike-McCall Reading Scales.

Pearson product moment correlations among the tests of four different kinds of literary selections ranged from .65 to .72. Word Knowledge, Expression Comprehension, and Fact Comprehension were found to correlate with reading comprehension between .85 and .90. When the three components were correlated against each other, Word Knowledge and Expression Comprehension correlated .71, and Fact Comprehension and Expression Comprehension correlated .66. From these findings, Irion concluded that "there is a considerable intercorrelation of the literary comprehension of various kinds of literature here measured" (23:71). He went on to contend that, based on his findings, the intercorrelations of the various elements of reading comprehension as he defined it "are of considerable magnitude," and that Word Knowledge "seems to stand out as a very significant item in reading comprehension" (23:72).

Traxler (58) undertook an analysis of the Van Wagenen-Dvorak Diagnostic Examination of Silent Reading Abilities in order to determine the intercorrelations of scores on the various subtests. The test was administered to sixty-five ninth grade pupils and 116 tenth grade pupils in independent schools. Traxler wished to assess whether the ten separate subtests were sufficiently independent "to

warrant their separate measurement and use as a basis of diagnosis and remedial work" (58:34). Traxler found the intercorrelations among subtest scores "to cluster in the neighborhood of .50" thereby revealing only "a certain amount of positive relationship" (58:36). In order to determine whether these rather low intercorrelations could be accounted for by the low reliabilities (below .80) of eight of the ten short subtests, Traxler corrected for attenuation using Spearman's formula. "Significantly higher" intercorrelations were produced thereby indicating that longer subtests would have resulted in higher correlations. On this basis, Traxler concluded that subtests of Central Thought, Clearly Stated Details, Interpretation, Integration of Dispersed Ideas, and Ability to Draw Inferences appeared to measure "closely related reading abilities." For this reason, he maintained that "the 'true' correlations...are so high that the value of the separate scores provided may be reasonably questioned." In this manner, Traxler found that, though the disattenuated subtest scores correlated low and therefore appeared to measure relatively independent abilities, these low intercorrelations were in fact due to low subtest reliabilities and, in fact, the abilities which some subtests purported to measure were by no means

independent. However, Traxler did find that correlations among subtests of Rate of Comprehension, Perception of Relationships, General Information, and Reading Level (a composite of the closely-related subtests) were sufficiently low to warrant their separate measurement. Therefore, Traxler concluded that there was "at least reasonable doubt" whether or not scores on tests of Central Thought, Clearly Stated Details, Interpretation, Integration of Dispersed Ideas, and Ability to Draw Inferences "contribute anything greatly different from the Reading Level Score" (58:41).

In another study which sought to distinguish among different types of comprehension, Katona (26) explored the distinction between what he termed "verbatim learning" and "substance learning". Volunteer college students and teachers were first tested to eliminate the possibility of foreknowledge. Then they were randomly assigned two different types of reading material. The first type of text was constructed so that specific items of information were related to an explicit predominant principle which gave the passage unity. The second type of material was taken from another source and organized in such a way that the principle which gave unity to the specific items of information contained in the passage was itself enumerated in succession

with the items thereby obscuring the unifying influence of the principle. The learning resulting from reading these two kinds of passage was measured by "application questions" which were defined as questions demanding the application of learning derived from the reading to new situations.

Katona found that subjects answering questions based on the first kind of text were more successful than were subjects answering questions based on the second kind of text. From this finding, Katona concluded that "acquisition of specific information is a distinct category of learning by reading, to be contrasted with the realization of the full implication of the text" (26:351). Katona further concluded that one form of learning by reading is "not essentially different from mechanical memorization" whereas learning by reading which involves the understanding of a principle and its implications results in "the acquisition of flexible whole-qualities by means of organizing the learning material in a way appropriate to it" (26:352). Like other investigators, therefore, Katona surmised that reading comprehension is of different kinds depending upon the kind of reading tasks being demanded. However, it is not clear from Katona's report whether his design and procedures were adequate to exclude rival hypotheses. Since

the reading tasks differed in content as well as in the manner by which the unifying principle was incorporated, Katona's conclusions may not be soundly based. It is possible to speculate that the superior learning resulting from the reading of the first kind of text resulted from intrinsically easier reading material rather than from different organization. If Katona had used the same reading material organized into his two different patterns of presentation, this criticism could have been avoided.

In a study involving seventy-seven boys in the fourth year of a Scottish secondary school, Bell (4) analyzed errors made on two tests of silent reading in order to explore "the problem of comprehension." Bell classified the errors made into six types arranged from most frequent to least frequent: (1) difficult inferences where the demanded answer was not given in the test, (2) the misunderstanding of qualifying phrases, (3) reading in which the reader "supplies something not in the text", (4) inference where the answer is not given directly but can be easily inferred, (5) indirect reference, (6) and direct reference. On the basis of his analysis, Bell, like other investigators before him, concluded that "comprehension...ultimately includes thinking as well as memory" (4:55).

A later study similar in intent to Bell's was carried out by Black (5). He classified errors made by students in an English teachers' college in the silent reading of general prose material. Upon inspection, Black found that students' errors could be accounted for by eight categories: (1) failure to understand the intention of a writer, (2) failure to detect irony, (3) difficult vocabulary, (4) difficult allusions, (5) misunderstanding of metaphors, (6) inadequate background information, (7) insensitivity to contrast, and (8) readers' distracting preoccupations. Black maintained that the value of his classification lay in its illustration of the complexity of the comprehension process.

Summary and Evaluation

The common characteristic shared by all of these early experimental investigations of comprehension is their exploratory nature. They illustrate tentative efforts to understand the nature of comprehension and, conversely, a lessening emphasis on word recognition in the reading process. More particularly, these studies indicate a general movement away from viewing individual words as the sole determinants of meaning in reading to a conception of meaning as emanating from words in the context of larger

units of prose. Reading came to be approached as essentially a thinking process rather than a perceptual one. Concomitantly, interest in the specific psychological processes involved in reading comprehension became prevalent. Many early studies revealed reading processes involve synthesis and forward movement as the reader seeks to determine the meaning of what he reads. Comprehension was also found to involve the anticipation of meaning and the evaluation of this meaning as it unfolds during the reading act. Moreover, different kinds of comprehension were detected as readers face the demands of varying reading tasks and materials. Also, some investigators examined the errors made in silent reading in an attempt to determine the nature of comprehension.

It is quite easy to disparage the findings of these early investigators. Their sampling procedures were highly arbitrary leaving the applicability of their findings to other populations in doubt. They failed to statistically control many outside influences, notably intelligence, which might well have affected their findings. The differences they report are seldom tested for significance. The artificial presentation of reading material employed in a number of studies is in many instances naive in the light of current

knowledge. And the methods of determining the nature of readers' comprehension are of questionable accuracy. When errors in reading are examined and analyzed, this is almost always done from the subjective viewpoint of a single investigator. Conversely, when readers' introspective verbalizations are solicited, it is the subjective judgment of the reader which provides the raw data which in turn serves as the basis for the investigator's own subjective interpretation.

While all these criticisms are valid, they cannot be allowed to detract from the contribution of these early studies. These studies gave the impetus which propelled reading research away from a preoccupation with perception and word recognition to a basic concern with the nature of comprehension and the reading process as a whole. They also developed a scientific orientation to the study of reading and provided procedures some of which it will be seen have been recently re-adopted to answer still-unsolved questions about the nature of comprehension.

LATER STATISTICAL INVESTIGATIONS OF COMPREHENSION

As interest in comprehension continued among researchers, and as more refined statistical methods were

developed, an increasing number of quantitative analyses of comprehension appeared in the research literature. The majority of these investigations employed the statistical technique of factor analysis in an attempt to determine whether comprehension involves a number of distinct mental abilities, or whether it is unitary in nature. Therefore, it was the construct of comprehension which served as the focus of these investigations. The utility of factor analysis in the explication of psychological constructs has been expressed by Nunnally:

Since it usually is necessary to combine scores on a number of variables to obtain valid measures of constructs, some method is required for determining the legitimacy of particular methods of combining variables. Important in determining this legitimacy are the patterns of correlations among variables. Factor analysis is nothing more than a set of mathematical aids to the examination of patterns of correlations and for that purpose, it is indispensable. (34:371)

Hence, many of these later investigations of reading comprehension employed analytic procedures which were further refinements of the simple correlation analyses used in some of the earlier investigations discussed above.

Review of the Studies

In an early factor analysis of reading comprehension, Feder (14) investigated what he referred to as "comprehension maturity" among adults. He conceived comprehension

maturity as involving "the student's depth and breadth of understanding and integration of given material" (14:598). Using excerpts from the writings of Newman, Rousseau, and Schopenhauer, Feder developed two comprehension maturity tests designed to measure the comprehension of factual material, appreciation, and the ability to understand inferences. In the first test, each item had four response choices of varying degrees of suitability; subjects were expected to indicate the best and worst response to each item. The test was first administered to seven hundred college freshmen, revised, and administered to ninety-nine college sophomores taking a course in psychology at the University of Iowa. A second instrument was developed by substituting a subtest of understanding organization for the appreciation subtest. This second test was then administered to the same ninety-nine college sophomores and inter-correlations were calculated among scores on the six subtests contained in the two different comprehension tests. The correlation matrix was analyzed using Thurstone's method. Feder found three factors, two of which were clearly distinguished as relatively independent skills. These factors were identified as "reading for information" and "reading for inference."

A limitation of Feder's study derives from his failure to provide an authoritative rationale for the concept of comprehension upon which he based his tests. Moreover, the abilities which his tests were designed to measure represent a somewhat limited notion of the variables involved in comprehension. Also, the highly academic reading material Feder included in his tests seems to be too restricted to account for the full range of comprehension abilities which adults may demonstrate. It is possible that other factors would have emerged had more diverse reading tasks been demanded of subjects and been measured.

A battery of standardized tests was employed by Langsam to determine the factorial components of "reading ability" (27). Although Langsam maintained that the tests chosen were those considered by her to be best suited to "revealing the basic elements of which reading is composed," these "basic elements" were not identified. Hence, the concept of "reading ability" investigated remained undefined and the relevance of the variables measured to this concept was not clarified. The battery was administered to a rather small sample of one hundred first-year womens' college students. The tests used were appropriate forms of the

following: the Iowa Silent Reading Test, the Minnesota Reading Examination for College Students, the Nelson-Denny Reading Test, the Minnesota Speed of Reading Test, the Michigan Speed of Reading Test, the Inglis Test of English Vocabulary, the American Council on Education Psychological Examination of College Freshmen, and the Identical Forms Test from Thurstone's Primary Mental Abilities. Each subtest of the tests used was treated as a separate variable thereby providing twenty-one variables. The correlation matrix was then submitted to factor analysis employing Thurstone's centroid method, and the emerging five factors were interpreted.

Langsam described the first factor as a "verbal factor" "characterized primarily by its reference to ideas and the meanings of words." The second factor, one which appears infrequently in these studies, was identified as a "perceptual factor," a function that appears to be a facility in perceiving detail." A third factor was described as a "word factor" distinguishable from the first factor by having "as its principal characteristic a fluency in dealing with words" as opposed to ideas and meanings expressed by words. The fourth factor was a "number factor" clearly limited to the numerical tests in the battery. The

final factor, "seeing relationships," involves "seeing relationships among the elements of the problem confronting one in the light of the specialized knowledge summoned up for the solution required." From her findings, Langsam concluded that "it is clear that a single test may have significant loadings on one or more factors, indicating that the test is complex rather than simple" (27:61-63).

A test based on social studies materials was developed by Conant in a study undertaken to determine whether there is "a general reading comprehension" (6). The specific hypothesis tested was that "individuals differ in their abilities to use various reading techniques in a study-type of reading" (6:84). A significant strength of Conant's study is the clarity and precision with which she undertook to state the conceptual basis of her investigation, or, as she put it, her "blueprint of comprehension." She described her comprehension tests as being designed to measure (1) the ability "to get in detail the pattern of the author's thought" including main ideas and supporting details, cause-and-effect relations and words in context; and (2) the ability "to interpret and make a critical evaluation of material read" including the selection and organization of facts relating to a general idea and drawing inferences

(6:51-52). In this manner, Conant, in contrast with Langsam and other investigators, made a conscientious attempt to delineate the domain of her study.

This experimental test, along with the Nelson-Denny Reading Test and the American Council Psychological Examination, was administered to three home room groups in the tenth and eleventh grades respectively, and two homeroom groups, one psychology class, and two English classes in the twelfth grade. The tests were also given to sixty female first-year college freshmen. Correlation coefficients among scores on the subtests showed all but five about .50, leading Conant to conclude that her hypothesis was rejected. To further test her hypothesis, Conant analyzed the test scores of the high school students using Hotelling's principal components procedure. Her findings revealed that one component accounted for 71.06 percent of the total variance. Conant concluded that "this is largely a one-factor problem," the nature of the factor being "general comprehension" (6:89). Three other components were extracted which were tentatively identified as a quantitative factor, a linguistic factor, and a factor involving the comprehension and organization of specific facts. However, Conant concluded that these three factors were of such small magnitude in accounting

for total variance (6.18 percent, 5.60 percent and 5.02 percent respectively) that "any further conclusions concerning their nature are of doubtful validity" (6:89). Conant, unlike many investigators employing factorial techniques, cautioned that her conclusions were particular only to the tests used in the population to which they were administered. She thereby indicated her awareness that different variables applied to different populations may well have resulted in the emergence of different factors.

Perhaps the most well-known factor analysis of reading comprehension was carried out by Davis (9). Davis surveyed the relevant literature in order to identify those comprehension skills designated as the most important by reading authorities. From the resulting list of skills, the following nine groups of skills were isolated and labelled as "basic to comprehension in reading":

1. Knowledge of word meanings.
2. Ability to select the appropriate meaning for a word or phrase in the light of its particular contextual setting.
3. Ability to follow the organization of a passage and to identify antecedents and references in it.
4. Ability to select the main thought of a passage.
5. Ability to answer questions that are specifically answered in a passage.
6. Ability to answer questions that are answered in a passage but not in the words in which the question is asked.
7. Ability to draw inferences from a passage about its contents.

8. Ability to recognize the literary devices used in a passage and to determine its tone and mood.
9. Ability to determine a writer's purpose, intent, and point of view, ie., to draw inferences about a writer. (9:186)

These skills were measured by the construction of 240 multiple choice questions, each designed to focus on a single skill from the above list. In this way, Davis enhanced the significance of his study by insuring that the concept of comprehension upon which it was based conformed to authoritative opinion and that his test included the relevant variables. Davis recognized the importance of his study by stating:

The study reported here is the first to make use of tests especially constructed to measure the mental skills in reading comprehension that are considered of greatest importance by authorities in the field. (9:186)

The 240 multiple-choice items were administered to 421 freshmen in teachers' colleges. Factor analysis was carried out on the resulting nine-by-nine correlation matrix using Kelley's principal-axis method with orthogonal rotations. Nine factors were extracted, five of which were considered to represent non-chance variance. These five factors were interpreted as follows:

- Factor I: word knowledge.
 - Factor II: reasoning in reading.
 - Factor III: understanding a writer's explicit statements.
 - Factor IV: the ability to follow the organization of a passage.
 - Factor V: knowledge of literary devices and techniques.
- (9:191-193)

Of these five factors, word knowledge and reasoning in reading accounted for 89 percent of the variance and were the only ones for which "reasonably reliable" individual scores could be obtained. Davis noted that the other three factors probably could have been clarified provided more items measuring these abilities had been written.

In a study following upon the findings of his factor analysis of comprehension, Davis (8) administered a battery of fourteen short tests of reasoning and judgment along with the Word Knowledge and Reasoning in Reading tests developed from his original study (and reported in 1942 [11]) to 689 eleventh and twelfth grade boys in New York. Inter-correlations among tests were determined and a factor analysis of the resulting matrix was made. A "large proportion" of the variance in reading comprehension was accounted for by two of the eight emerging factors. These two factors bore a "striking similarity" to those of word knowledge and reasoning in reading originally reported.

What is significant about this later study by Davis is not so much the factors which he discovered since these essentially duplicate the findings of his original study, but rather the correlations between the two major factors and the individual tests. Here, word knowledge was found

to be positively correlated with the recognition-vocabulary and the inference-in-reading tests, and negatively correlated with the nonverbal reasoning and the mechanical movements tests. Little relationship was found between the word knowledge factor and other different kinds of reasoning and judgment tests which were expressed in verbal form. The reasoning in reading factor was found to be "strongly and positively" correlated with the inferences-in-reading test and negatively related to the recognition-vocabulary test and the arithmetical-reasoning test.

From these findings Davis concluded that the kind of reasoning ability demanded in reading is not identical to that required by other types of reasoning tests such as those made up of mathematical problems. He stated:

Reading seems to be primarily a process of associating word meanings, but it does require reasoning of a highly specialized type which can probably be developed only by training and experience in reading. Sophistication in formal logic, skill in solving mathematical problems and skill in syllogistic reasoning are often developed concurrently with ability to reason in reading, but there is no basis for believing that training in one of them will, by itself, improve an individual's ability to read with understanding. (8:484)

The significance of this conclusion for those who seek to interpret the relationship between cognition in general and that cognitive activity specifically associated with reading has often been overlooked.

A consideration of Davis's investigations, particularly his initial one (9), would be incomplete without mention of Thurstone's (57) reanalysis of Davis's original data. Thurstone conducted two factor analyses on the correlation data from Davis' original nine reading tests using Spearman's uni-dimensional method and his own centroid method. Thurstone contended that his alternative solution was "relatively simple in that the uni-dimensional method of Spearman seems to be applicable instead of the more elaborate multi-dimensional solution" used by Davis (57:183). Thurstone's findings showed that Davis' data could be accounted for by "a single common factor with remarkably small residuals" which Thurstone interpreted as "reading ability." Thurstone's application of the centroid method to Davis' data "gave the same single-factor solution to this problem." Thurstone maintained that this result was "outstanding" since Davis' tests were constructed to represent "nine supposedly different skills" (57:187-88). Based on his findings, Thurstone concluded:

Since these nine tests are shown to be measures of the same reading function, we have here no evidence about the components of the complex we call reading ability. The question still remains to be investigated by new tests in hope of identifying fundamental parameters of reading ability. (57:188)

It is important to note in Thurstone's conclusion that he

does not dismiss the possibility of multiple abilities in reading comprehension. Rather, he simply states that Davis' method and data are inadequate for the task of detecting these abilities.

Hall and Robinson (19) conducted a factor analysis study in order to determine the skills involved in reading different prose and non-prose materials and the components of these skills. The tests used were Robinson and Hall's three tests in geology, history, and art, Pressey's Dictionary Test, and a test on table reading from Robinson's Diagnostic and Remedial Techniques for Effective Study. Other standardized tests administered were three parts of Thurstone's Chicago Primary Abilities Test (verbal, spatial, and inductive), and five fields in the Michigan Vocabulary Tests. Together with these instruments, author-constructed tests of chart, diagram, and map reading were also administered. Despite this wide range of measuring instruments used, Hall and Robinson failed to provide a rationale for their selection of these tests. Such a rationale would have more specifically defined the domain which they sought to explore and would have thereby provided the basis for a better understanding of the significance of their findings.

The tests were administered to a rather small sample

of one hundred freshmen English students at Eastern Washington College. Correlation coefficients were computed and Thurstone's centroid method was employed for the factor analysis. Six factors emerged from the analysis, five of which were identifiable:

- Factor I: study attitude
- Factor II: inductive factor
- Factor III: verbal factor (the most strongly defined factor)
- Factor IV: not identifiable
- Factor V: rate
- Factor VI: chart-reading skill

Hall and Robinson concluded that different skills were involved in the reading of prose or non-prose material, and that each of these skills was in turn composed of different subskills. On the basis of their analysis, they concluded that prose reading involved Factors I, II, III, and V, while Factors III and VI were components of chart reading and Factor V and possibly Factor IV were coordinated in pattern reading. Since Factor III, the verbal factor, was the most strongly defined factor, a full description of its nature would seem to be warranted. Unfortunately, Hall and Robinson's report of their study lacks such a description.

A study to determine "the 'generality' of comprehension" as it applies to different literary content and different reactions demanded of the reader was undertaken by

Harris (20). A test was constructed by selecting from literature anthologies passages varying in form (prose and poetry, essay, narrative, and drama), in period (Elizabethan to modern), and in style. The reactions demanded of readers were determined by conceiving literary comprehension as encompassing four kinds of operations: (1) translating--"getting the literal meaning", (2) summarizing, (3) inferring tone, mood, intent, and (4) relating technique and meaning. From these four operations, seven skills were identified and used as a guide in the preparation of test items for the selected passages.

These seven skills were:

1. Recognition of symbols for uncommon words and groups of words.
2. Recognition of words or groups of words that are used figuratively.
3. Recognition of antecedents of pronouns, of subjects and predicates in loosely organized statements.
4. Recognition of ideas expressed or implied.
5. Recognition of summaries and characteristics of persons or characters.
6. Recognition of author's attitude toward his characters, of his mood or emotions and of his intent.
7. Recognition of relationship between technique and meaning.

Here it can be seen that, like Davis' study and unlike Hall and Robinson's, Harris' investigation was governed by a clearly articulated purpose which was established at the outset and which determined the variables measured. In this

manner, Harris provided a coherent framework within which his investigation proceeded and the significance of his findings can be considered.

Harris administered his test including fifty-seven items based on seven passages to 106 armed forces discharges. He hypothesized that only one common factor would account for observed correlations. The hypothesis was tested by using the Spearman two-factor analysis and it was found that for both content and reaction one factor accounted for the intercorrelations. Harris concluded that his hypothesis had been upheld with respect to both different content material in English and different reader reaction.

Two separate factor analysis studies conducted in Britain were reported by Anderson (2) and Richardson (38). Anderson randomly selected five hundred senior secondary students in Scotland and administered a battery of standardized tests including the Otis Group Intelligence Test, the Inglis Vocabulary Test, the Shepherd English Test, and the Co-Operative English Test. Two author-constructed "interpretation" tests were also administered. One test measured the ability to indicate facts and details from a passage in a fixed time while the other tested the ability

"to comprehend the ideas and vocabulary of a passage."

Intercorrelations among different tests scores were determined and the matrix was submitted to factor analysis using Thurstone's method. A limitation of Anderson's study lies in his failure to state the basis of his test selection. The nature of "reading" which he sought to study therefore remains unclear since the variables included in his test battery were not apparently selected in accordance with any previously determined concept of reading.

Three factors emerged from Anderson's analysis.

The first factor, accounting for 57.6 percent of the total variance, was interpreted as vocabulary ability. A factor identified as the ability to analyze and synthesize accounted for 29.2 percent of the variance, while intelligence accounted for 13.2 percent. The saturation for intelligence was discovered by first factoring the matrix, then partialling out intelligence and refactoring so that by comparing the two saturations the loadings for the factor of intelligence were discovered. In this way, Anderson attempted to distinguish the vocabulary ability and the analyzing and synthesizing ability which were associated with his intelligence factor from the vocabulary ability and the analyzing and synthesizing ability which he

interpreted as two additional factors not associated with intelligence. From his findings, Anderson drew the following conclusion:

The hypothesis is suggested that the important words of a sentence are its fundamentals, and its sentence structure is the relations given. Children learn the relations by using them with the known fundamentals. Thus adults know the essentials of sentence structure and find difficulty only in important words, to which their eyes will regress in a case of misunderstanding.
(2:221)

As will be seen in a subsequent chapter, these speculations of Anderson anticipate to a marked degree the more recent hypotheses of educational theorists with respect to comprehension.

Richardson (38) constructed and validated a test which he administered to 260 ten-year-old primary English school children. The measuring instruments consisted of two tests involving the silent reading of prose passages followed by questions based on the narrative, a visual and auditory discrimination test of words and word forms, and assessments of experiential background and attitudes towards reading. Hence, Richardson included a much wider range of variables than do most investigators whose studies are reviewed here.

Test scores were intercorrelated and the matrix factor analyzed by Thurstone's centroid method. Three

factors were extracted which Richardson described as general intelligence, an emotional factor relating to the school situation, and, tentatively, a factor involving "the mechanics of reading." Richardson concluded that intelligence and verbal ability are of primary importance in determining reading ability among primary school children. However, he failed to elaborate on the nature of the verbal ability involved.

In a doctoral dissertation, Derrick (12) investigated the nature of reading comprehension and the influence of differing lengths of reading selections on the measurement of comprehension. Findings relating to the first of these questions are of concern here. Derrick analyzed the pertinent literature and identified three aspects of reading comprehension: (1) "getting the literal meaning of what is read," (2) "securing the broader meaning inherent in the passage," and (3) "reacting critically to what is read". Each of seventeen reading skills was classified under one of the three aspects of comprehension and this classification was confirmed by expert opinion. Three tests were constructed each containing approximately fifty-five questions designed to measure the three aspects of comprehension postulated. The classification of test items under the

appropriate aspect of comprehension was authenticated by professional test constructors. In this manner, Derrick founded his study on a clearly-stated, well-authenticated concept of comprehension which provided the basis for the determination of the variables measured.

Derrick administered his tests to 457 freshmen in Chicago junior colleges. Intercorrelations among the nine subscores were computed revealing no significant cluster. The Spearman two-factor method of analysis was used to analyze the correlation matrix. Forty-six percent of the variance was attributed to a "general factor," 44 percent to unreliability factors, and 10 percent to undefined specific factors. From these findings, Derrick concluded that a general factor accounted for the correlations obtained and that this general factor could be interpreted as general reading ability. A further analysis using the bifactor method of factor analysis confirmed the findings and Derrick's conclusion.

Another doctoral dissertation involving a factor analysis of reading comprehension was completed by Mazurkiewicz (30). Mazurkiewicz sought to determine the relationship between reading comprehension and reasoning ability. He hypothesized that comprehension involved an

understanding of words and some kind of reasoning ability. An author-constructed test of reading comprehension was developed which included factual and inferential comprehension and vocabulary questions. Together with the comprehension test, the verbal and nonverbal subtests of the California Test of Mental Maturity and Cattell's Culture Free Test of Intelligence were administered to 154 grade five pupils in a Pennsylvania elementary school. Subtests of reasoning included tests of logical reasoning and number reasoning, along with such tests as verbal concepts, immediate and delayed recall, sensing right and left, and manipulation of ideas. Intelligence was measured by the Kuhlmann-Anderson Test of Intelligence and grade placement in reading was determined from the California Reading Test. The twenty-one intercorrelations among the test variables, intelligence, reading grade level, and total scores on the experimental comprehension tests were computed. These intercorrelations were then submitted to factor analysis.

Mazurkiewicz found that the intercorrelations among variables could be accounted for by the presence of two sources of common variance which he identified as general reasoning and verbal comprehension factors. Based upon these findings, Mazurkiewicz concluded that reading comprehension

is not a unitary activity. Besides involving the dual factors of general reasoning and verbal comprehension, Mazurkiewicz speculated that comprehension was also dependent upon the operation of as yet unidentified factors relating to the specific task demanded.

With respect to the loadings of numerical tests on the two comprehension factors identified, Mazurkiewicz's findings appear to vary from those of Langsam (27) and Davis (8). Langsam found that the numerical tests she administered loaded almost exclusively on the factor which she identified as a number factor. Davis found that tests of nonverbal reasoning and mechanical movement correlated negatively with the word recognition factor he identified, and tests of arithmetic reasoning correlated negatively with his reasoning in reading factor. Mazurkiewicz, however, found his Number Series test to correlate .47 with his verbal factor, and a Numerical Quantity test to correlate .61 with his general reasoning factor. Mazurkiewicz explained the loading of the Number Series test on his verbal factor as resulting from the nature of the test which required a knowledge of the meaning of words. However, the loading of the Numerical Quantity tests was cited as evidence of the general rather than specific nature of reasoning

associated with comprehension. Mazurkiewicz described the nature of this reasoning as "the general ability to solve problems." In this respect, he is in disagreement with Davis' conclusion that reading requires reasoning of a highly specialized type which is distinguishable from the type used in solving problems in logic and mathematics. One explanation of this apparent contradiction lies in the different ages of the subjects used by Mazurkiewicz and Davis. It is possible that the specific type of reasoning pertaining to comprehension which Davis' findings indicate only becomes differentiated from general reasoning at a later stage in a child's development. It would seem that this question of whether or not the type of reasoning employed in reading is specific to reading demands further experimental investigation since it is central to an understanding of the reading process.

In a study involving 585 college students, Hunt (22) sought to determine whether the factors identified by Davis (9) would reappear in an independent investigation of reading comprehension. Hunt exercised extreme care in determining the variables he measured. Test items were carefully selected in such a manner as to insure that they would be alike within each group but different from each of the other

groups. This was accomplished by having each test item individually classified by authorities with respect to one of the skills originally determined by Davis. Agreement among authorities regarding the ability of each item to measure the particular skill for which it was designated was required before the item was included in the test. Hence, the domain investigated by Hunt was carefully and clearly delineated.

When his test was constructed, Hunt administered it to his subjects and utilized differential item analysis in order to determine the differential measurement of his postulated specific comprehension skills. Hunt found that, except for vocabulary items, none of the mean differences in point biserial values was greater than .035, the mean difference values ranged from $-.037$ to $.035$, and the median value was $-.004$. From these findings, Hunt concluded that, aside from vocabulary, the point biserial values for each pair of skills measured were probably chance differences. He further concluded that the different groups of items were not measuring different abilities.

Hunt carried out further analyses of his data using factor analysis. The first analysis, using the method initially employed by Davis, revealed one major factor which

Hunt designated as "general comprehension." Two lesser factors accounting for an unreported amount of variance, were also extracted, but Hunt considered them to be of minor importance. A second factor analysis using Thurstone's method produced one common factor. Hunt concluded that the skills identified by Davis in 1944 are explainable by one or two factors. As a general conclusion to this very thorough study, Hunt stated:

The results of the differential item analysis and the analysis of the relationships among the initial skill measures support the view that each group of items, other than vocabulary items, is measuring a common factor of reading comprehension. (22:169)

A simple correlation analysis was conducted by McCullough to determine "whether we are testing essentially different things when we test for different types of comprehension" (32:65). Appropriate forms of the Ginn Reading Readiness Test were administered to 258 first, second, and fourth grade pupils. The types of comprehension measured included main idea, details, sequence, and creative reading (seeking relationships, drawing conclusions, passing judgments). Pearson product moment correlations were computed among the test scores on the four types of comprehension measured. Intercorrelations ranged from .26 to .63 leading McCullough to conclude that "there is a positive and perhaps

substantial relationship among these comprehension types, suggesting the possibility of a common factor pervading all." McCullough speculated that this common factor "would appear to arise from the reader's fact-getting ability" (32:70). One suspects that McCullough could have stated her conclusions with more certitude had she factor analyzed her correlation data. As it stands, her study contributes very little beyond what can be learned from early studies of comprehension employing simple correlation procedures.

Vernon (60) developed parallel forms of a number of tests designed to measure verbal comprehension. The thoroughness with which Vernon determined the variables which he considered to contribute to comprehension is evidenced by the extent of his test battery. It included the following measures: two tests of "vocabulary" demanding written and multiple-choice responses; two "sentence completion" tests requiring filling gaps in sentences and multiple-choice responses; two undefined "reading comprehension" tests to be answered in the subject's own words and by multiple-choice questions; two measures of "reading comprehension" involving questions of a factual and inferential nature; an unnamed published "reading comprehension" test; a multiple-choice test of "comprehension of tables and graphs;" the Nelson-Denny Reading Test; an English test

dealing with sentence structure, punctuation and spelling, vocabulary, and reading; and an "external criterion of intellectual competence" including students' grade point averages and scores on an essay examination. The test battery was administered to 108 British and seventy-five American college students. Scores on all the verbal tests were intercorrelated and then factor analysed using Thurstone's centroid method. A "strong comprehension factor orthogonal to the vocabulary factor" was revealed. No significant variance remained in the correlation matrix after the removal of these two factors. Vernon concluded that his findings represented a contradiction of Thurstone's reanalysis of Davis' data, and that "it would appear that functions in reading can be differentiated rather more readily than Derrick believed" (60:275).

Two hypotheses were tested in a study undertaken by Alshan (1). The first hypothesis was that, in a comprehension test, the test items define the number of factors operating. The second hypothesis was that those items written to measure one specific skill always have substantial loadings on the same factor. Alshan administered the Davis Reading Test since it met the criterion demanded in his study that the instrument used represent a conscientious

attempt to measure different comprehension skills and that this attempt be reflected in the test items. Alshan drew his subjects from the same population as the one used to norm the Davis Test. The sample included 525 eleventh grade students in twenty-four schools in fourteen states. Each school contributed a number of students proportionate to its representation in the original normative group. The study was restricted to the eleventh grade since Alshan's purpose was to focus on "the reasoning aspect of the reading comprehension process" and he therefore wished "to reduce the influence of vocabulary on individual differences by using individuals whose vocabulary would be adequate to the demands of the test" (1:14).

Alshan administered the Davis Test to his subjects. He then performed a principal components analysis of the initial forty-by-forty inter-item matrix of phi-coefficients. This procedure indicated a single factor accounting for most of the total variance which Alshan tentatively identified as "reading comprehension" or "verbal reasoning." The five largest factors were then rotated using Kaiser's normalized varimax criterion. The five orthogonal factors obtained in this fashion were found to be unidentifiable. Hence, when the loadings of items within each of the five Davis Test skill

categories were compared with the Davis classification, Alshan concluded that the empirical structure of the Davis Test does not conform to its a priori structure. No single factor appeared upon which all the items in a particular postulated category had significant loadings. Alshan contended that "the distribution of significant loadings on the five hypothesized factors seemed so haphazard as to make even tentative identification of these factors futile." He further noted that the rotated factors "do not even point toward the existence of a single common factor..." (1:133). It was only in the unrotated matrix of principal axis loadings where one factor accounted for most of the variance. Alshan speculated that this factor "might tentatively be identified" as a "reading comprehension" factor. For these reasons, Alshan, like Vernon, concluded that Thurstone's reanalysis of Davis' data represented a more legitimate interpretation of this data. And, since Alshan was at pains to eliminate the influence of vocabulary in his study, he further contended that his findings were consistent with those of Hunt.

Several questions are raised by Alshan's conclusions, however. First, he maintains that his findings support those of Thurstone with respect to Davis' study. Yet only in the unrotated matrix of principal axis loadings did a

single factor account for most of the total variance. When the five largest factors were rotated, the five orthogonal factors obtained were found to be unidentifiable. How these findings support those of Thurstone who extracted one factor accounting for almost all the variance remains unclear. Another consideration of Alshan's findings related to his deliberate elimination of the influence of vocabulary. In doing this, he prevented himself from finding a word knowledge factor. Moreover, by restricting his study to the eleventh grade, Alshan could well have eliminated other factors besides word knowledge similar to those interpreted by Davis. These factors might have appeared if Alshan had drawn his data from a sample of subjects representing a broader range of grade levels. For this reason, Alshan's findings do not necessarily contradict those of Davis nor do they necessarily support the findings of Thurstone and Hunt. The force of Thurstone's reinterpretation of Davis' findings derives primarily from the fact that Thurstone's analysis was carried out on Davis' data.

The factorial composition of standardized, group-administered survey reading tests was the object of a study undertaken by Sutherland (51). Sutherland administered a battery of these tests to 250 fifth grade public school

pupils in California. The tests used were the reading tests from appropriate forms of the California Achievement Tests, the SRA Achievement Series, and the Sequential Tests of Educational Progress. Intercorrelations among test scores were computed and factor analyzed using the principal axis method. The axes were then rotated analytically using the varimax criterion. Upon completion of this analysis, test items were reclassified according to the categories contained in Bloom's taxonomy. Items fell into eight categories, mostly "knowledge" and "comprehension." The tests were then rescored on this basis and were factor analyzed again. In order to further assess the nature of the factors, a second phase of Sutherland's study was undertaken. This involved administering certain reference tests from Guilford's "Structure of Intellect" battery to 250 seventh grade junior high school students. The California Reading Test was also administered as a representative of all reading tests. Sutherland did not explain this assumption of representativeness, however, The tests were scored and statistically analyzed using a principal-factor method with varimax rotation.

Sutherland's principal axis factor analysis revealed that 93 percent of the total variance was accounted for by

the first principal factor. From this evidence, he concluded that the tests were largely measuring one general factor. When three axes were rotated, three significant factors emerged. They were not sharply defined, however, and none was clearly vocabulary or comprehension. Sutherland found the degree of overlap between scores on the vocabulary and paragraph meaning subtests of the instruments used to be "greater than any degree of separation." When test items were regrouped in conformity to the categories of Bloom's taxonomy, factor analysis revealed no meaningful factors. In fact, Sutherland observed that items tended to cling together according to the test from which they came rather than according to the taxonomy category into which they fitted. With respect to the second part of his investigation, Sutherland found that the vocabulary subtests of the California Reading Test loaded exclusively on the factor cognition, semantic, units--in Guilford's terminology--which Sutherland identified as verbal comprehension. The comprehension subtest of the California Reading Test had a high loading on the Guilford-defined factor of cognition, semantic, units, and smaller loadings on the factors cognition, semantic, systems, and cognition, semantic, classes. The largest factor present in the

comprehension subtest, accounting for 47 percent of the total variance, was identified by Sutherland as "verbal comprehension." The second largest factor (21 percent of the total variance) was interpreted as "general reasoning," while the smallest factor (9 percent of the total variance) remained uninterpreted. Sutherland concluded that the importance of the two smaller factors was not great since error variance accounted for a greater portion of the total variance than did either one of them.

In brief, Sutherland's findings showed that, in a battery of standardized reading tests, one general factor accounted for almost all the measured variance. When the comprehension subtest was taken from the California Reading Test, one major factor was extracted which Sutherland called "verbal comprehension." Two other less significant factors also emerged.

In a recent and important investigation, Davis made relevant use of highly sophisticated statistical techniques in an attempt to provide "a definitive study of comprehension skills among mature readers" (10:510). Davis employed multiple-regression procedures in a cross-validated uniqueness analysis designed to identify the "small pockets of unique variance" he claimed previous statistical pro-

cedures had left undetected. Specifically, Davis described his purpose as "to obtain estimates of the percentage of non-chance variance in the reliable variance of each of the most important measurable skills of comprehension among mature readers" (10:510).

After reviewing experimental studies of comprehension, including his own of 1944 (9), Davis selected eight skills for measurement each of which he hypothesized was unique in comprehension:

1. Remembering word meanings.
2. Inferring word meanings from context.
3. Understanding content stated explicitly.
4. Weaving ideas in the context.
5. Making inferences about the context.
6. Recognizing the author's tone, mood, and purpose.
7. Identifying the author's literary technique.
8. Following the structure of the content.

A try-out test was developed including 320 multiple-choice items each based on a separate passage and equally distributed among the eight skills. Two parallel forms of the test were constructed and administered to 400 twelfth-grade students. A differential item analysis was carried out in such a way that each item on one form of the test was related to scores on the other form. In this manner, eight "uninflated" biserial correlation coefficients were obtained for each item between passing and failing the item and scores in the eight skills. From the forty items constructed to

measure each skill, twenty-four were selected that had higher average correlations with the total score on that skill than with the total scores on the other seven skills. Using these twenty-four items measuring each skill, two parallel forms of the final measuring instrument were constructed, each form incorporating twelve test items measuring each of the eight hypothesized unique skills. The revised tests were then administered to a new sample of 988 twelfth grade students in four high schools in Philadelphia. Davis then performed uniqueness analyses which were cross validated by items and, separately, by examinees.

The largest percentage (32 percent) of unique non-error variance was found in Skill 1, "memory for word meanings." The second largest percentage (20.5) occurred in Skill 5, "drawing inferences from content." Three other skills revealing "appreciable percentages" of unique variance were Skill 8, "following the structure of a passage," 13.5 percent; Skill 6, "recognizing a writer's purpose, attitude, tone and mood," 11 percent; and Skill 3, "finding answers to questions asked explicitly or in paraphrase," 10 percent. Based on these findings, Davis came to the following conclusion:

Comprehension among mature readers is not a unitary mental skill. The data summarized...leave no doubt that substantial parts of the mental abilities used in eight skills judged to be of importance in comprehension are independent of one another. (10:542)

Summary and Evaluation

A brief summary of the more recent statistical investigations of comprehension reviewed below is provided in Table I. Inspection of this table soon reveals the diverse nature of these investigations and the difficulties encountered when one attempts to draw from them firm conclusions about the nature of reading comprehension. Table I is organized according to the grade levels of the subjects involved in the studies. One might expect that this organization would indicate certain factors to be characteristic of subjects at various grade levels. Such an indication could help to explain, for example, the apparent disagreement discussed above between the respective findings and conclusions of Mazurkiewicz and Davis concerning the nature of the reasoning ability involved in the comprehension of fifth-grade and twelfth-grade subjects. However, an examination of the table soon indicates little consistency in the findings of studies based on similar groups of subjects, pursuing identically labelled topics, or employing the same analytic procedures. A number of reasons may account for

TABLE I

RECENT STATISTICAL INVESTIGATIONS OF COMPREHENSION

Study	Grade Level of Subjects	Topic Investigated	Measuring Instruments	Analytic Method	Factors Isolated
Richardson (1950)	primary	reading ability	battery of author- constructed tests	factor analysis: Thurstone's centroid method with oblique rotations	intelligence emotional mechanics of reading
McCullough (1957)	one two four	compre- hension	published reading test	simple correlation analysis	comprehen- sion
Mazurkie- wicz (1957)	five	compre- hension	battery of author- constructed and publish- ed tests	factor analysis: Thurstone's centroid method with oblique rotations	general reasoning verbal comprehen- sion
Sutherland (1966)	five	reading ability	battery of published reading tests	factor analysis: principal axis method with ortho- gonal rotation and varimax criterion	general factor three un- identified factors

TABLE I (CONTINUED)

Study	Grade Level of Subjects	Topic Investigated	Measuring Instruments	Analytic Method	Factors Isolated
	seven	compre- hension	published reading test	factor analysis: principal axis method with orth- ogonal rotation and varimax criterion	verbal com- prehension general reasoning
Conant (1942)	ten eleven twelve	comprehen- sion in social studies study type reading	author- constructed tests	factor analysis: Hotelling's prin- cipal components method with orth- ogonal rotations	general com- prehension
Alshan (1964)	eleven	compre- hension	published reading test	factor analysis: principal-axis method with orth- ogonal rotations and varimax criterion	none identi- fiable

TABLE I (CONTINUED)

Study	Grade Level of Subjects	Topic Investigated	Measuring Instruments	Analytic Method	Factors Isolated
Anderson (1949)	senior secondary	compre- hension	battery of author- constructed and published reading and intelligence tests	factor analysis: Thurstone's cen- troid method with oblique rotations	vocabulary analysis and synthesis intelligence
Davis (1968)	twelve	compre- hension	author- constructed test	multiple-regression procedures in a cross-validated uniqueness analysis	word meanings drawing infer- ences following the structure of the passage recognizing a writer's purpose, attitude, tone, and mood understanding explicit or implicit meaning

Study	Grade Level of Subjects	Topic Investigated
Derrick (1953)	junior college	compre- hension
Davis (1944)	college	compre- hension
Hall and Robinson (1945)	college	reading prose and non-prose

BLE I (CONTINUED)

Measuring Instruments	Analytic Method	Factors Isolated
author-constructed tests	factor analysis: Thurstone's centroid method with oblique rotations	general reading ability
author-constructed test	factor analysis: Kelley's principal-axis method with orthogonal rotations	word knowledge reasoning in reading understanding explicit statements following the organization of the passage knowledge of literary devices and techniques
author-constructed and published tests	factor analysis: Thurston's centroid method with oblique rotations	study attitude inductive verbal rate chart-reading

Study	Grade Level of Subjects	Topic Investigated
Feder (1938)	college	compre- hension
Hunt (1957)	college	compre- hension
Langsam (1941)	college	reading ability

LE I (CONTINUED)

Measuring Instruments	Analytic Method	Factors Isolated
author- constructed tests	factor analysis: Thurston's cen- troid method with oblique rotations	reading for information reading for inference
author- constructed tests	differential item analysis; factor analysis using Thurstone's cen- troid method with oblique rotations; factor analysis using Kelley's principal-axis method with orth- ogonal rotations	vocabulary reading comprehen- sion
battery of published reading and intelligence tests	factor analysis: Thurstone's cen- troid method with oblique rotations	verbal perceptual word number seeing rela- tionships

TABLE I (CONTINUED)

Study	Grade Level of Subjects	Topic Investigated	Measuring Instruments	Analytic Method	Factors Isolated
Vernon (1962)	college	compre- hension	author- constructed and published reading tests	factor analysis: Thurstone's cen- troid method with orthogonal rotations	comprehension vocabulary
Harris (1948)	armed forces dischargees	comprehen- sion of literature	author- constructed tests	factor analysis: two-factor method	comprehen- sion

this situation. What follows is a discussion of the studies based on five points of comparison: the subjects tested, the nature of the topic investigated, the measuring instruments used, the analytic methods used, and the factors isolated.

Subjects. The subjects used in these investigations range from primary school pupils to former armed forces personnel. Most investigators choose either secondary school or college students as subjects, apparently in the belief that these subjects represent "mature" readers whose comprehension ability is fully developed. But even in these cases, there is little or no attempt at sampling from a broad population. Most subjects are from intact classroom groups or grades contained in one or a few schools located in a particular locality. The only exception to this is Alshan's study, yet the only investigator to explicitly limit the relevance of her findings to the population measured is Conant. It may well be that the process of comprehension is identical among all mature readers and that the need for randomized sampling over a wide population is therefore unnecessary. This point could be supported by the findings of a number of studies parallel with respect to the subjects involved and the variables measured

carried out in different localities. But until such support is provided, the seeming lack of adequate sampling illustrated by these studies may restrict the applicability of their findings to the particular groups of subjects studied.

Topic investigated. A second difficulty encountered in drawing generalized conclusions from these studies derives from the somewhat different topics of investigation. To be sure, the majority of studies focus upon investigating "reading comprehension." But others pursue what one would expect to be the broader field of "reading ability" while seeming to be concerned with essentially the same thing as studies of comprehension. Other investigations, notably those of Conant and Harris, concentrate on the comprehension of material in a particular subject area. Comparisons across studies ostensibly investigating general "reading comprehension," "reading ability," and the comprehension of specific content material would seem to require extreme caution.

Measuring instruments. The measuring instruments used in these studies vary widely. This condition results in part from the previously-mentioned problem, ie. different

studies focus on slightly different subjects of investigation. But even among studies explicitly concerned with comprehension, different measuring instruments have been used to provide scores for analysis. In many studies, author-constructed measures have been developed and their reliability and validity established. In other studies, published standardized reading tests have been adopted along with tests of intelligence or other measures thought to be pertinent by the investigator.

The importance of the tests implemented in studies of the kind reviewed above has been put succinctly by Davis:

The most important step in a study that employs factorial procedures for the investigation of reading comprehension is the selection of the tests the scores of which are to be factored. Unless these tests provide reasonably valid measures of the most important mental skills that have to be performed during the process of reading, the application of the most rigorous statistical procedures can not yield meaningful and significant results. The importance of this point can hardly be overstated. (19:185)

The question which arises is, "What are 'the most important mental skills that have to be performed during the process of reading'?" This question apparently has been ignored by a number of investigators. Only Davis, Conant, Harris, Derrick, Hunt and Alshan have explicitly set out the "blueprint" (to use Conant's term) of what they mean by comprehension. The remaining investigators have either assumed

that their own tests implicitly define the domain they seek to explore, or they have taken commercially produced instruments as adequate measures of comprehension. Nowhere is their concept of comprehension clearly delineated nor is their justification for using the tests chosen set down.

The seriousness of this omission is underlined when the nature of factor analysis is considered. To some degree, as Davis intimates, these studies utilizing factorial methods determine their own outcomes. That is, the abilities demanded of the reader and which appear from the analysis must be included in the tests administered. Hence, if the tests do not represent a viable concept of comprehension, the factors which emerge (and which will be interpreted as the components of comprehension) will themselves be inadequate to account for comprehension. Thus, the concept of comprehension to emerge from factor analysis studies is dictated by the adequacy of the concept of comprehension which is embodied in the tests used. Within this context, factor analysis can only reveal whether or not the component abilities represented in the tests operate as more or less independent abilities. In the case of comprehension, since its very nature is a subject of controversy, different investigators hold different concepts of its nature. These

different concepts result in different tests being used and widely different factors emerging. Thus comparisons across studies become very tentative. Reading comprehension defined as a result of factor analysis must also be defined in terms of the tests used to conduct that analysis.

Analytic procedures. The analytic procedure employed in the majority of these studies is factor analysis. However, Hunt used differential item analysis, McCullough used a simple correlation analysis, and Davis developed his new form of cross-validated uniqueness analysis. Where factor analysis has been used, different methods have been employed, although the Thurstone centroid technique predominates. It is important to note, however, that when different methods of factor analysis are adopted, different factors can emerge. Thurstone's reanalysis of Davis' data illustrates this point as do the studies of Alshan and Sutherland. It should be noted, however, that Hunt applied two methods of factor analysis to his data and produced what he felt to be essentially the same results.

Factors isolated. The factors isolated by these studies are almost as various as the studies themselves. An obvious division is between those studies which have found only one factor to account for comprehension and those

which reveal multiple factors. The majority of studies resulted in findings which support a multidimensional concept of reading comprehension. Where multiple factors have been extracted, a factor associated with word knowledge almost always appears. A second factor to appear with some regularity relates to reasoning in reading, possibly involving seeing relationships, organizational patterns, implied meanings, etc. Beyond these tentative conclusions, any further summary becomes arbitrary. Many other factors have been identified in one or, at most, two or three studies. The reason for this disparity is almost certain to lie with the different tests used. As was discussed above, the tests used to gather data have great weight in determining the factors which appear when the data are analyzed. The principal question to emerge from these studies is whether or not comprehension is unitary in nature. It is obvious from the wide variety of findings which the studies display that a definitive answer to this question has yet to be provided.

STUDIES OF THE SPECIFICITY OF COMPREHENSION

Roughly paralleling the period of major emphasis on factor analysis studies, another series of investigations

was being conducted. The purpose of this second series of studies was to determine whether comprehension was indeed a generalized process functioning in the same manner with respect to different materials, or whether differences in the comprehension of different materials could be detected.

Review of Studies

Among the first of these studies was one conducted by Pressey and Pressey (37). Specifically, they wanted to determine whether either the form or the content of silent reading material was a factor in reading performance. Using material from the Monroe Reading Scales and the Illinois Examination, four reading scales were constructed containing poetry, scientific reading, and the general reading passages. Pressey and Pressey stated that the scales were of approximately equal difficulty since their distribution of scores and medians were "practically the same." The medians for the four scales were 6.1, 6.5, 6.6, and 6.4 (37:26). These scales were administered to 112 seventh grade pupils and correlations between the scales were computed. Correlations were found to range from .85 between the two tests of general reading to .31 between general reading and poetry. Based on these findings, Pressey and Pressey contended that effective reading in one subject area

did not guarantee effective reading in another. In their final conclusion, they stated that "there seems to be little evidence of any general factor of outstanding importance" in silent reading (37:30).

McCallister (31) undertook to determine the kinds of reading difficulties encountered in junior high school history, mathematics, and science by students in two seventh and eighth grade classes at the University of Chicago Laboratory School. Through classroom visitations and the analysis of instructional methods and materials, students' written reports, and study activities over a five month period, McCallister concluded that reading difficulties in the grades concerned were for the most part particular to the various content areas. However, McCallister did not take into consideration differences in teacher competence. Hence, since this was a small-scale study, and one in which teacher differences may have been confounded with content differences, its conclusions may not be dependable.

In a study of thirty students in each of grades seven, eight, and nine, Grim (18) administered the subtests of reading interpretation from the Progressive Achievement Test as a measure of general reading comprehension. He also

constructed and administered a test involving social studies materials which required the interpretation of data, the application of principles, and the analysis of propaganda. Correlations between the two tests were .66 in grade seven, .51 in grade eight, and .52 in grade nine. Since the reliabilities of the tests were "well above .90" (18:373), correcting for attenuation would have raised the observed correlations very little. Grim therefore seems justified in his conclusion that general reading comprehension and the interpretation of social studies material, while "somewhat related," are "not definitely enough to consider them the same behavior" (18:374).

Robinson and Hall (40) conducted a study involving 205 education undergraduates at Ohio State University. The investigators constructed five tests of reading representing four content fields (art, geology, fiction, and history) and two areas of one field (Canadian and Russian history). Correlations between the tests of different content areas ranged from .79 between art and fiction to .09 between Canadian history and fiction, the majority of correlations being below .50. A significant finding was the correlation of .96 between Canadian and Russian history. Robinson and Hall, like Pressey and Pressey, concluded that

it was unreliable to predict comprehension ability from one subject field to another. However, they did observe "a basic reading skill in history."

Swensen (53) sought to determine the relationship of scores on the Traxler Silent Reading Test and an author-constructed test based on science materials. These tests were considered to be representative of general reading material and science reading material. The tests were administered to eighty-two grade eight pupils matched for chronological and mental age. Swensen used "t" ratios to determine the probability of differences in student scores on the test of general reading ability and the test of science reading ability. Findings clearly showed that pupils making high scores on the test of general reading also made high scores on the science reading test. On this basis, Swensen concluded that "when one looks for evidence of relationship between the two types of reading materials, it becomes apparent that there is more evidence of similarity than of dissimilarity" (53:90).

The relationship among 380 ninth grade pupils between certain reading and study skills and reading comprehension of scientific and historical materials was the object of an investigation by Shores (43). A test battery

including the Iowa Every-Pupil Test of Basic Skills Test A: Silent Reading Comprehension and Basic Study Skills, Reading Scales in Literature, Science, and History; and the California Test of Mental Maturity was administered to the entire ninth-grade population of a Kansas City junior high school. From the results of these tests, four groups of students were selected composed of those students scoring in the upper and lower twenty-seven percent on tests of science and history materials. These students were compared for the significance of differences in mean ability in each of the skills measured by the tests. Subjects mental age and their ability to read literature were controlled. In general, Shores found that skills required to read science materials were not identical to those required to read history, and the reverse. He concluded:

The ability to read scientific and historical materials holds unique and different relationships to a number of reading skills. Ability to read effectively in the materials of science or history probably requires combinations of skills either not related to or not as closely related to ability to read literature as these skills are to ability to read science and history. The results of this study offer rather conclusive evidence in refutation of the concept of a general reading ability in the ninth grade. (43:590)

McMahon (33) constructed a test of comprehension

based on reading materials in arithmetic, literature, science, and social studies and administered it to 867 fifth grade pupils. High coefficients of alienation and low partial correlations between parts of the test based on different content material led McMahon to conclude that the different sections of the test measured partially distinct but related abilities. He further concluded that a reader's score on one type of material does not give an accurate indication of his ability to read other types of material.

Artley (3) designed a study to determine the relationship between comprehension of social studies material and general reading comprehension. General reading comprehension was measured by the Cooperative Test Service, English Test C 1: Reading Comprehension, Form Q. Reading comprehension in social studies was determined by the Progressive Education Association, Application of Principles in Social Studies, the Cooperative Test Service Tests of Social Studies Abilities, and Test of General Proficiency in the Field of Social Studies. Non-verbal intelligence was determined by the Chicago Non-Verbal Examination. Subjects were two hundred eleventh grade students in a Pennsylvania high school. When correlation coefficients

were computed, corrected for attenuation, and the effect of intelligence was partialled out, a relationship of .75 was determined between social studies comprehension and general comprehension. From these findings, Artley concluded that, while general comprehension ability is "associated" with the ability to comprehend social studies material, "the absence of a perfect correlation...provides evidence that there exists a high degree of specificity" in the understanding of reading materials in the social studies (3:471).

A test of problem solving in science was developed by Shores and Saupe (42) and administered to 182 fourth, fifth, and sixth grade pupils in six classroom groups. Multiple-choice questions followed two written passages of typical science material. The questions demanded the solution of problems by drawing appropriate inferences. The New California Short-Form Test of Mental Maturity (giving language and non-language mental age) and the Progressive Achievement Test (giving reading and arithmetic age) were also administered. Intercorrelations among all variables were found to be significantly positive. The correlation between problem solving in science and reading age, when attenuated, was .73. Shores and Saupe concluded that their

findings supported the hypothesis that the kind of reading needed for solving problems in science in the intermediate grades has "a large factor in common" with mental ability and general reading achievement, but at the same time is "somewhat unique in a manner which cannot be accounted for by the generalized factors" (42:157).

Cooper (7) undertook an investigation to determine whether tests of general reading ability and reading ability in English, social studies, and science measured the same or different abilities. His subjects were 161 grade eleven students in a Chicago high school. The tests used included the Kuhlmann-Finch Intelligence Test, the California Reading Test, the Iowa Tests of Educational Development, the Cooperative Vocabulary Test, and the Iowa Silent Reading Tests. The coefficients of correlation among general silent reading, literature reading, social studies reading, and science reading ranged from .71 to .77 with an average value of .75. Cooper concluded that though the four measures of reading studied were highly interrelated and therefore could not be considered as unique abilities, they were at the same time partially independent and "some minor degree of independence of specificity attaches to each." Cooper further interpreted his findings to mean

that "there were appreciable differences among these four reading tests, but that the differences were below the level of differential diagnosis" (7:182).

Maney (29) and Sochor (45) undertook two complementary studies using the same subjects. Their purpose was to determine the relationships among general reading ability and literal and critical reading in science (Maney) and social studies (Sochor). They developed and validated their own measures of literal and critical reading which they administered along with the Gates Reading Survey as a test of general reading comprehension. The Pinter General Ability Test was used as a measure of verbal intelligence. Literal reading was identically defined in both studies as "the ability to obtain a low-level type of interpretation by using only the information explicitly stated" (29:58). Critical reading was defined as "the ability to obtain a level of interpretation higher than that needed for literal interpretation including the ability to sense semantic variation, to detect central themes, to infer, to generalize, etc" (29:58).

The Pearson product moment correlations between general reading ability and literal reading in science and social studies were .75 and .76 respectively. With

intelligence held constant, these correlations were reduced to .35 and .41. Correlations between general reading and critical reading were determined to be .60 in science and .64 in social studies (and .11 and .17 when intelligence was partialled out). Correlations between literal reading and critical reading were .67 in science and .61 in social studies (reduced to .34 and .23 when intelligence was held constant). On the basis of these findings, Maney and Sochor concluded that there is a "high" relationship between general reading ability and literal reading in science and social studies, and a "substantial" relationship between general reading and critical reading in science and social studies. They further concluded that there was a "substantial" relationship between literal and critical reading in both science and social studies. Despite these relationships, however, both investigators recognized that the relationships between reading in their respective subjects and general reading were not perfect and hence these abilities were not identical.

Summary and Evaluation

The studies summarized in Table II are organized in ascending order of the grade levels of the subjects involved. As was the case with factor analysis studies, subjects range

TABLE II

STUDIES OF THE SPECIFICITY OF COMPREHENSION

Study	Grade Level of Subjects	Topic Investigated	Measuring Instruments	Conclusions
Shores and Saupe (1953)	four five six	problem-solving reading in science and general reading	author-constructed test of problem-solving in science plus published intelligence and read- ing tests	science reading somewhat unique
Maney and Sochor (1958)	five	general reading and literal and criti- cal reading in science and social studies	author-constructed and published reading tests plus published intelli- gence test	high and sub- stantial relationships
McMahon (1943)	five	comprehension of arithmetic, liter- ature, science, social studies	author-constructed tests	distinct though related abilities
Pressey and Pressey (1921)	seven	silent reading: general, poetry, science	author-constructed tests	little evidence of a general factor

TABLE II

Study	Grade Level of Subjects	Topic Investigated
Grim (1940)	seven eight nine	interpretation: general, social studies
McCallister (1930)	seven eight	reading difficult- ies in history, mathematics, and science
Swensen (1942)	eight	general and science reading
Shores (1943)	nine	comprehension of historical and science materials
Artley (1944)	eleven	general and social studies comprehen- sion

(CONTINUED)

Measuring Instruments

Conclusions

author-constructed
and published tests

general and social
studies compre-
hension not the
same behavior

observation

difficulties
peculiar to
subject areas

published and author-
constructed tests

more evidence of
similarity than
dissimilarity

battery of published
tests

refutation of
the concept of
a general read-
ing ability

battery of published
tests

a high degree
of specificity

TABLE II (CONTINUED)

Study	Grade Level of Subjects	Topic Investigated	Measuring Instruments	Conclusions
Cooper (1955)	eleven	general, English, social studies, and science reading	battery of published reading and intelli- gence tests	a minor degree of specificity
Robinson and Hall (1941)	college	comprehension of art, geology, fiction, history	author-constructed tests	comprehension different in each subject area but the same in two kinds of the same subject area

from the elementary grades to the college level, yet random sampling from a broad population is not apparent. Hence, the application of these findings to a universal population can be only tentative. It must be acknowledged, however, that practical considerations make the true random sampling of a universal population almost impossible. Therefore, it would seem that further insight into the nature of the comprehension of reading materials in different content areas might be derived from studies dealing with similar populations, determined by age and grade level, involving the measurement of variables which are as near the same as possible. Similar findings from a number of parallel investigations designed in this manner would provide a clearer understanding of the comprehension of materials in different content areas. Unfortunately, the studies reviewed above do not lend themselves to comparisons of this kind. Perhaps the most obvious reason for difficulty in comparing the findings of many of these studies lies in the different terms by which the objectives of the studies are described. While some investigators study "comprehension," others study "interpretation" or "reading ability" while all seemingly study essentially the same process. And the confusion evident here is further compounded by the

measuring instruments used. While a profusion of author-constructed tests have been employed, even when published tests are used, little consistency is evident in the tests chosen. Hence, the question of different variables being measured in different studies arises, making the comparison of findings and conclusions across studies difficult.

Added to this is the problem of the reliabilities of the tests used. In many reports of studies, this information is not given, making reported differences among scores of tests of comprehension in different content areas somewhat suspect, and making interpretations of correlations between variables impossible. This is especially true when no correction for attenuation is indicated. For this reason, one might question whether findings and conclusions in some studies result from poor research methodology or from the nature of reading comprehension. Therefore, comparisons of the findings of these studies, even when they involve apparently similar subjects, must be undertaken with caution.

Despite these shortcomings, however, one general conclusion does appear to emerge from these studies. This is that a degree of specificity in the comprehension of reading materials in different content areas exists, but there is a definite commonality as well. The extent to

which specificity is claimed varies with different investigations. Artley and Shores, for instance, contend that the comprehension of materials in different subject areas is quite distinct, while Swensen and Cooper admit that differences do exist but maintain that these differences are outweighed by similarities. The resolution of these apparent inconsistencies awaits further investigation.

INTROSPECTIVE-RETROSPECTIVE VERBALIZATION STUDIES

The most recent approach to understanding comprehension has been by way of introspective-retrospective verbalization studies. This approach is not a new one, however. As was outlined in an earlier section of this chapter, introspective-retrospective verbalization is a method which was used in many of the earliest studies of comprehension. One of the first studies of this type was carried out by Huey (21) seventy years ago.

Perhaps the renewed interest in introspective-retrospective verbalization results in part from a reaction to the earlier prevalence of factor analysis studies. Factor analysis studies present comprehension as a static condition. The mental abilities involved are isolated and held in suspension for the purposes of quantification and interpret-

ation. The process of comprehension, the manner in which these mental abilities are mobilized and interact during reading is not revealed. On the other hand, introspective-retrospective verbalization concentrates on this dynamic process of reading at the expense of precise quantification. Strang, in a recent discussion of four doctoral dissertations employing introspective-retrospective verbalization, clearly distinguishes between this type of investigation and those of a more rigorously scientific nature:

These four dissertations would not be considered "scientific" by the generally accepted standards of educational research. They do not arrive at generalizations or conclusions. They emphasize uniqueness rather than commonness, and take into account deviations as well as central tendencies. They use case studies as one way of emphasizing the fact that reading is an expression of individuality. Yet, as exploratory studies they contribute many observations of behavior--and nothing is more basic or permanent than an accurate observation. (49:46)

The manner in which this type of investigation has been applied to the study of reading comprehension is the topic of this section.

Review of Studies

A somewhat tentative application of introspective-retrospective verbalization was reported by Robinson (41). He investigated the reading skills used by twelve fourth grade pupils attending the University of Chicago laboratory

school. Subjects were asked to solve problems in social studies by reading any of a large number of different materials provided. They were asked to "think out loud" while reading. These verbalizations were taped and then examined and analyzed in order to categorize the reading skills used and the manner of using them. The resulting analysis was then judged by two independent authorities for consistency and accuracy. Robinson found that subjects made errors in comprehension due to their inability to remember the details of material read although these details were initially understood. The subjects also displayed weakness in their understanding of explicit and implicit main ideas. Many pupils failed to apply their background knowledge to the new reading situation, and many confused tasks involving searching for answers to literal questions with tasks requiring interpretative responses. The majority of subjects did not compare ideas found in various sources.

Robinson concluded that it was possible to study the reading process using introspective-retrospective techniques, but he also cautioned that his findings were applicable only to the group of pupils studied.

Squire (47) undertook a wide-ranging study aimed at analyzing the responses of fifty-two students in grades nine

and ten to four short stories in English literature. The stories were divided into segments for analysis by individual subjects in an interview situation. Individual responses to each segment were recorded after each segment was read and the responses were placed into the following categories: literary judgments, interpretational responses, narrational reactions, associational responses, self-involvement, descriptive judgments, and miscellaneous. Reading ability was measured by the Survey Section of the Diagnostic Reading Tests.

Squire found no significant relationship between types of response and reading ability. However, a comparison of the mean category scores of the five least able and the five most able readers revealed, for narrational responses only, a difference significant at the .02 level. Squire concluded that this finding supported his observation that readers who experienced difficulty in comprehension tended simply to restate the narrative when responding to it. He observed that "the slow readers seemed almost to repeat elements of the story in an attempt to clarify its meaning." Squire found that failure to grasp meaning derived from three causes including the misunderstanding of key words, the failure to grasp the implications

of details presented by the author, and making incorrect inferences (47:37).

The first of the more recent introspective-retrospective studies to investigate comprehension in depth was undertaken by Swain (52). Swain's objective was to observe behavior which she assumed reflected the thought processes involved while interpreting reading materials. Subjects were twenty-nine freshmen at the University of Georgia selected according to their scores on the A.C.E. Psychological Examination and the Cooperative English Test, Reading Section, Lower Level. Reading test scores determined the selection of three groups of students judged to be good, average, and poor readers. Within each of these three groups, three levels of intelligence were represented. Reading materials were taken from the battery of United States Armed Forces Institute Tests of General Educational Development, High School and College Level. Subjects were asked to read to answer questions requiring the understanding of several different relationships among the concepts expressed in the material. Subjects were also asked to verbalize their thoughts as they read, and their responses were recorded for analysis.

Swain found certain aspects of the interpretative

process to be typical of readers at all three ability levels. Readers all tended to focus initially upon the meanings conveyed rather than on the language form conveying these meanings. When comprehension is obtained easily, Swain found readers' responses to be characterized by smoothness, understanding and satisfaction which she described as "insight." When comprehension is not immediately obtained, the focus of readers' mental activity changed from seeking meaning alone to seeking language clues to meaning. This process was accompanied by an increase in tension. The release of this tension occurred when the reader indicated understanding of what he was reading. This release took place irrespective of whether the correct understanding was obtained or whether the reader provided an answer while demonstrating little understanding or confidence in its accuracy. In the latter case, it appeared that the reader was seeking to escape from the tension of the situation.

Besides these similarities among readers, Swain also found differences. Good readers tended to manipulate meanings mentally in order to understand a passage, average readers concentrated on language clues, while poor readers vacillated between these two approaches. When easy questions were put to good readers, they emphasized the structure of

meanings contained within passages as they sought solutions. With more difficult questions, good readers shifted their focus to analyzing the language and synthesizing the new meanings achieved into broader understanding. As difficulty increased, so did the tension demonstrated by good readers. This tension was accompanied by a loss of confidence and a lessening of control over seeking understanding as many alternative lines of thought were initiated and abandoned.

When poor readers answered easier questions, their initial thought processes involved both restructuring meanings and working with language clues. This latter activity often served to distract the poor reader from dealing with meanings. As the difficulty of questions increased, the poor readers placed more emphasis on language. However, though the energy expended increased, their ability to extract meaning remained uncontrolled as successive techniques were attempted and abandoned. In answering very difficult questions, poor readers tended to limit their response to reading orally and making defensive attempts to disguise their confusion. Answers to questions were more often characterized by exterior displays of confidence than by genuine assurance.

Average readers tended to focus on language which they synthesized and analyzed to obtain meaning. As problems increased in difficulty, average readers placed more emphasis on language form. They increased their effort and became more efficient in approaching problems. This efficiency resulted in increased confidence. Difficult problems resulted in little change in the focus of average readers' thought processes, but their effort and confidence decreased.

Piekarz (36) conducted a study involving the comparison of two pupils identified as a higher-level reader and a lower-level reader. Both subjects were taken from a group of twenty-two sixth grade pupils who were advanced in their general reading competency as measured by standardized tests, but who differed significantly in their ability to interpret what they read. Each pupil in the group was asked to read a selection on parent-child relations and to verbalize his thoughts and feelings while reading. Verbalizations were recorded on tape. The reading of the text was followed by a test composed of thirty questions based on nine postulated areas of interpretation designed to measure understanding of the selection. The higher-level reader selected was a boy whose score on the test was third

highest for the group. His score on the Wechsler-Bellevue Intelligence Scale for Adolescents and Adults was 129, and he was on good terms with his parents. The lower-level reader was a girl who scored among the lowest in the group, but whose score on the Wechsler-Bellevue Intelligence Scale for Adolescents and Adults was 127. She revealed an unfavorable attitude towards her parents.

The analysis of these two pupils' verbalizations revealed distinctive differences in their manner of interpreting what they read. The higher-level reader's responses were greater in number and variety than the lower-level reader leading Piekarz to infer that he participated to a greater extent in the reading process. The lower level reader's responses were characteristically literal in nature showing only slight recognition of implicit meaning and the need for critical evaluation. The responses of the higher-level reader were more fluent and evenly distributed among literal, implied, and evaluative interpretations. The higher-level reader maintained objectivity and emotional distance in terms of the content of the selection while the lower-level reader became personally involved and highly subjective in her approach. She seemed incapable of differentiating between her own opinions and the author's. Her

responses were characteristically emotional rather than intellectual.

Piekarz concluded that the low-level reader's poor interpretative ability was due to her negative feelings towards her parents which were stimulated by the nature of the reading passage. She was unable to approach the task in an objective and rational manner for the purpose of understanding the message which it conveyed.

In an attempt to explore the nature of reading comprehension among high school students, Jenkinson (24) used the "cloze" procedure to measure the comprehension of prose passages. Cloze tests were administered to 210 students in grades ten through twelve. From these subjects, twenty-two were selected for interviews, eleven making high scores and eleven making low scores. These twenty-two students were asked to complete two cloze passages while their verbalizations were recorded. The recordings were then analyzed to determine whether observable differences existed in the methods high-scoring and low-scoring students used to obtain meaning. A classification scheme was developed on the basis of these recordings including three major aspects of comprehension: (1) structure, revealing the use of linguistic knowledge to obtain meaning,

(2) Semantic, indicating the manner of obtaining meaning, and (3) Approach, suggesting the reader's method of attaching meaning.

With respect to Structure responses, Jenkinson found significant differences between high and low groups of readers in word recognition, awareness of language, sensitivity to sound, and sensitivity to style as these abilities were determined in her classification scheme.

In Semantic responses, good readers produced a greater number of responses than poor readers. They also made greater use of context in anticipating ideas and meaning, and retrospection in checking meaning. The good readers also produced a greater number of ideational responses involving the fusion of separate meanings of words or groups of words into ideas, the recognition of sequences and relationships among ideas, seeing implied meanings, and making inferences.

In Approach, high scorers displayed greater verbal fluency and more facility in verbal closure. The protocols of good readers also revealed the intellectual processes which they used to obtain meaning more fully. It was found that the better readers made more attempts to elucidate meaning and gave fewer negative responses.

Other findings indicated that both groups focussed their attention on meaning while reading rather than on the language forms conveying meaning. The verbalizations of good readers produced a larger number of discrete ideas than did those of poor readers. These ideas were characterized by greater precision, relevance, and more effective use of context--all indicating that good readers participated more actively in the interpretative process. Good readers used a greater variety of methods to assist them in comprehension and they displayed a greater knowledge of word meanings and language structure in completing the cloze test. Poor readers tended to reminisce about personal experiences extraneous to the reading selection. They also placed undue importance on individual details in a passage and showed an inability to synthesize. Readers in the high group were more often able to correct errors made, and they displayed greater flexibility in shifting their approaches and interpretations so as to accommodate the meaning of the entire passage.

In looking over the protocols as a whole, Jenkinson concluded that word fluency and language ability have a major role in influencing reading achievement. She also concluded that, since errors in interpretation seldom occurred in

isolation or were simple in nature, the process of interpretation was a highly complex one.

The interpretative responses of grade eleven students to a short story were the subject of an investigation by Strang and Rogers (50). Students were asked to read the story. Following this, they were interviewed and their unstructured responses solicited. They were then asked specific questions relating to the story. Finally, subjects were given selections from the story typed on cards and were asked to read them aloud and vocalize thoughts and feelings while doing so. The data obtained in this manner were then analyzed, responses were categorized and checked by an independent rater, and the differences between fourteen high-level readers and fourteen low-level readers were computed and tested for significance using the "t" test.

Significant differences were found between low and high-level readers in their ability to grasp both explicit and implicit meaning--in their ability to understand symbolism, similes and metaphors, the significance of the title, the mood of the story, and the author's point of view. High-level readers were more frequent in their comparisons of the story to others they had read and in their attempts to gain meaning from the story by such comparisons. They were

also more active in seeking meanings to words and ideas not understood, and their attitudes were altered to a greater extent by reading the story. These better readers reached beyond the surface meaning to interpret the story's significance on a more abstract and philosophical level. Finally, higher-level readers displayed a greater awareness of the reading process they employed.

Low-level readers showed lesser awareness of the elements of the story and were more likely to miss the main events. They were more sensory in their responses while remaining weak in their ability to understand symbolism, similes and metaphors, and words in context. The significance of the title often eluded them as did clues to setting, the author's background, and details of characterization. Low-level readers also displayed relative weakness in seeing purposes, recognizing main incidents, and detecting narrative transitions. These readers had difficulty in remembering facts and were less inclined to look for the meanings of misunderstood words and ideas. They tended to respond to the story on a literal level often simply recapitulating the fact pattern. Poor readers also tended to interject personal observations which were extraneous to understanding the story.

In a concluding remark relating to the value of the introspective-retrospective method of studying comprehension, the authors wrote:

Though quite inadequate for the purpose of testing factual comprehension, an unstructured approach is especially valuable in showing how the reader's mind works. From such free responses we learn what is really communicated to the adolescent reader of a given short story. We also obtain glimpses of the reading processes that are used and recognized by some of the more able readers. (50:823)

Smith (44) carried out a study to determine the success of twelfth-grade students in reading for details and for general impressions, and the processes these students reported using during the two kinds of reading. Fifteen good readers and fifteen poor readers were selected on the basis of their scores on the Cooperative English Test: Reading Comprehension. Within each of the two groups, three subgroups were determined representing different ranges of mental ability as measured by the Wechsler-Bellevue Intelligence Scale. The case study method was adopted involving structured interviews and retrospection in order to determine the processes used when subjects read for different purposes. Subjects first were directed on their purpose for reading. Then they read the selection and answered questions based on it. Following this, subjects were asked to describe their manner of answering the questions

and the procedures they used in reading for the two purposes.

With respect to reading procedures, Smith found that good readers made greater adjustment in reading for different purposes than did poor readers. In reading for details, good readers made reference to the content of the selections, anticipated meaning, remembered details and related them to the rest of the selection, organized, associated, and evaluated ideas, and held them in mind while reviewing content. In reading for general impressions, good readers made inferences based on the content of their own experience, opinionated freely and reacted to the content, generalized, and gave tentative descriptions of their own reading process.

In contrast, poor readers reported only slight variations in their reading process when reading for different purposes, in reading for details, they used related information in the selection, memorized, and reviewed more frequently than when reading for general impressions. Alternatively, when reading for inferences, they made numerous inferences and ignored details. In reading for both purposes, poor readers were unable to describe their methods of answering questions. They made incorrect references and

inferences more often when reading for general impressions. When reading for general impressions, their responses became irrelevant, incomplete or repetitious.

Good readers made more frequent adjustments in their approach to the two purposes for reading than did poor readers. In particular, they indicated a greater number of procedures when reading for details. Poor readers were less able to describe their reading procedures. They tended to make faulty inferences and references, were repetitive rather than expansive in their answers, vague in responding concerning the procedures they used, and made irrelevant responses.

In keeping their purpose for reading in mind, good readers succeeded to a greater extent than did poor readers. Good readers were better able to restate clearly their purpose for reading and the method to be employed than were poor readers.

A study focussing on the understanding of English literature was undertaken by Ward (61). He sought to describe the interpretative processes employed by his subjects as they read and responded to three short stories. Subjects were sixty-two twelfth grade students in two college preparatory English classes. Students were presented with two

stories and were encouraged to respond to them freely in writing with respect to how they felt, experienced, and perceived while reading. The students were also asked to construct questions based on a third story which would aid in its interpretation and analysis. Finally, subjects were asked to complete a questionnaire relating to a fourth story. From these three procedures, Ward hoped to acquire data about the students' perception of their own reading and interpretative behaviors.

Four characteristic reading and interpreting difficulties emerged from the students' responses to the stories. First, students failed to maintain adequate distance from the stories. That is, they were unable to detect the nuances of meaning placed on the story by the narrator and hence read the story as an objective account rather than a subtly subjective one. A second weakness was the subjects' inability to view the story as a whole. Certain elements and details took on significance in the minds of the readers which were disproportionate to their importance in the story. Invention constituted a third weakness in interpretation. Here students simply fabricated details not contained in the story. The final difficulty encountered by the subjects was an egocentric block to understanding the stories

when the content was antithetical to their own experience.

Additional findings derived from the questions constructed by students indicated that they adopted no characteristic pattern or process of interpretation. The questionnaire responses revealed that students generally understood and were able to report the reading processes they actually used. However, there was no evidence to suggest that a relationship existed between students' awareness of their interpretative process and the quality of their interpretation.

It is important to note that Ward, unlike the other studies reviewed thus far, does not seek to compare the reading behavior of good and poor readers. Rather, he takes the somewhat more limited perspective of viewing the reading behaviors of a supposedly typical group of adolescent readers with respect to a fairly particularized type of reading. However, his findings are illuminating and, as will be seen, are generally consistent with those of other investigators.

Another study which varied the introspective-retrospective method to approach the reading process from a somewhat different viewpoint was conducted by Stemmler (48). She undertook to compare the reading behaviors of highly

creative and highly intelligent school students all of whom were reading above grade level. The eighteen students in the highly creative group all scored in the top fifteen percent on the five-test creativity battery of Getzels and Jackson, but not in the top fifteen percent of intelligence as measured by an unnamed standardized intelligence test. The eighteen students in the highly intelligent group scored in the same percentage ranges as the creative students except that their high score was in intelligence. The case study approach was adopted using recorded oral introspection and retrospection as students read and answered questions on a prose excerpt and a poem. A classification scheme was developed and validated by experts, and the subjects' responses were analyzed in terms of this. Frequency counts for each group were made and comparisons to determine statistically significant differences between groups were conducted using the chi-square statistic.

Stemmler concluded that the two groups exhibited different reading styles. She found that the reading of highly creative students was very imaginative in nature being characterized by many sensations, images, and speculations, and a high level of sensitivity to the nuances of meaning. Highly creative readers were given to fantasizing

and role-playing but doing so in a manner which enhanced their enjoyment and interpretation of what they read. They were able to interpret at different levels and from a highly personal point of view.

The reading style of the highly intelligent student was characterized by an analytical approach although the nuances of meaning were often overlooked. Speculations were used to solve ambiguities presented directly in the material. The highly intelligent reader was systematic in comparing and contrasting what he read with outside objective criteria. It was this outer orientation which appeared to distinguish the highly intelligent reader from the inner-oriented highly creative one.

A second conclusion was that both groups employed speculation as a major component of their reading strategies. Though this always involved selecting from alternative meanings and reducing ambiguities, highly creative readers were more expansive in this activity than were highly intelligent readers.

Stemmler also concluded that her findings indicated not only different interpretive styles, but also suggested different "routes" for arriving at them. For the highly intelligent group, this route lay in what Stemmler called

the Intellectualive Dimension. This Dimension is characterized by the synthesis of meaning into a generalized theme or by the extension of meaning as an example of a more universal concept. The highly creative reader's route involved the Imaginative Dimension which is characterized by a tendency to symbolize sensational responses in concrete images.

A fourth conclusion reached by Stemmler was that, while the use of images, sensations, and role-playing was very important in the interpretive process of highly creative readers, these aids to interpretation were irrelevant for the highly intelligent readers.

As a final comment, Stemmler noted that her study revealed the Imaginative Dimension as a new aspect to the study of the reading process. Thus, though the comprehension scores of an intelligent and a creative reader may be similar, the process producing these scores may be quite different.

Summary and Evaluation

As was the case with factor analysis studies of comprehension, it is extremely difficult to extract defensible generalizations from the multitude of findings provided by introspective-retrospective studies. While the procedures employed in these investigations are generally

alike, the subjects used vary in number and maturity, the material read differs, and each investigation is to a slight degree different in its purpose. To be sure, all investigations seek to explore the reading process, but Swain undertook to determine the influence of material of different levels of difficulty on good, average and poor readers; Piekarz seemed primarily interested in the influence of the reader's emotional response on comprehension; Strang and Rogers broadened their investigation to include readers' reaction to literature in general as did Ward; Smith restricted her investigation to reading for two explicitly-stated purposes; while Stemmler was interested in the reading processes of two particular kinds of gifted readers. This leaves Jenkinson's study as the only "normal" one, a state of normalacy which is highly tenuous by virtue of its singularity.

The nature of introspection and retrospection itself can cast some doubt upon the accuracy of findings resulting from the adoption of this method. In the first instance, introspective and retrospective techniques are based on the assumption that the reader can and will provide an accurate account of his mental activity while reading. At the very best, this account must be limited to reporting the conscious

mental activity which the reader is prepared to freely impart. The need for a high level of rapport between interviewer and interviewee is immediately apparent if this approach is to be adopted. It is also necessary that the investigator establish a frame of reference within which the subject of his investigation will be adequately represented. Also, the investigator must take care that he does not distort the meaning of what is reported to him when interpreting it. Since the application of statistical controls in this method must be very limited, when used at all, the investigator is left with an essentially subjective interpretation of his data.

Despite these limitations, some generalizations are suggested in the findings provided by these studies. The mental processes used by a reader during comprehension appear to be represented by the following characteristics:

1. Ideational Fluency: a large number of responses leading to the determination of meaning on an abstract rather than a literal level.

2. Linguistic Fluency: a general sensitivity to language and to the use of language clues in the determination of meaning.

3. Manipulation: involving analysis, synthesis, anticipation, speculation, retrospection, etc., leading to

a wholistic rather than fragmented or distorted determination of meaning.

4. Variety and Flexibility: the use of a variety of strategies to determine meaning and flexibility in altering strategies to meet new needs.

5. Objectivity: extraneous, personal, subjective or emotional responses not allowed to interfere with the determination of meaning.

SUMMARY

A number of early investigations of reading comprehension were conducted during the first decades of this century. These studies are significant in that they shifted the focus of reading research away from a preoccupation with perception and word recognition to a basic concern with the nature of comprehension. Current knowledge about the nature of reading comprehension based on experimental evidence derives from three kinds of study: statistical analyses, studies of the specificity of comprehension, and introspective-retrospective verbalization case studies. Statistical analyses of comprehension have involved subjects of various age levels drawn from generally narrow populations. The topics investigated by these studies have appeared under various titles besides comprehension, but their nature

appears to be basically the same. A wide variety of measuring instruments has been used, although the analysis of the resulting data has usually involved factor analysis. The factors which have been isolated vary from one to many depending on which study is examined. A similar pattern of subjects, topic investigated, and measuring instruments characterizes studies of the specificity of comprehension. These studies show that comprehension ability tends to be somewhat specific to the content material read. Introspective-retrospective verbalization studies have revealed a number of mental operations accompanying comprehension. Yet the accuracy of this method of investigation may be questioned.

A compilation of findings from the three recent types of experimental investigation is provided below. Findings from the early investigations of comprehension have been omitted since these studies are of more value for their historical interest than for their contribution to current knowledge of comprehension. The present state of sometimes conflicting experimental knowledge relating to the nature of reading comprehension may be summarized as follows:

1. Comprehension as defined by statistical analyses:

- 1.1 Comprehension is a unitary mental ability

having no distinguishable subskills.

1.2 Comprehension is a composite of a number of subskills, the two most commonly found being interpreted as word knowledge and reasoning.

2. Comprehension as defined by studies of its specificity.

2.1 Comprehension is to a greater or lesser extent specific to the content material being read.

3. Comprehension as defined by introspective-retrospective verbalization case studies.

3.1 Comprehension is a cognitive activity involving the following processes.

3.11 Ideational Fluency: a large number of responses leading to the determination of meaning on an abstract rather than literal level.

3.12 Linguistic Fluency: a general sensitivity to language and to the use of language clues in the determination of meaning.

3.13 Manipulation: involving analysis, synthesis, anticipation, retrospection, etc.

leading to a holistic rather than fragmented or distorted determination of meaning.

3.14 Variety and Flexibility: the use of a variety of strategies to determine meaning and flexibility in altering strategies to meet new needs.

3.15 Objectivity: extraneous personal, subjective, or emotional responses not allowed to interfere with the determination of meaning.

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Chapter 4

VERBAL DEFINITIONS OF READING COMPREHENSION

The purpose of this chapter is to describe and assess verbal definitions of reading comprehension. These definitions are primarily based upon theoretical assumptions rather than experimental evidence. The chapter is divided into four sections. The first section concerns skills-based definitions of comprehension including hierarchial and non-hierarchial organizations. Also included in this section are definitions of critical and creative reading and descriptions of their associated skills. The section is concluded with an assessment of skills-based definitions of comprehension. The second section of the chapter is devoted to cognitive-based definitions of comprehension. Theoretical statements concerning the cognitive operations involved in comprehension are reviewed. An overall assessment of verbal definitions of reading comprehension comprises the third section of the chapter while the final section includes a summary.

SKILLS-BASED DEFINITIONS OF COMPREHENSION

By far the most common approach to defining comprehension verbally has been through the description of the skills involved. For the most part, these definitions either implicitly or explicitly embody a hierarchical organization of abilities. An example of this approach can be seen in Russell and Fea's definition:

Comprehension requires knowledge not only of the meaning of words but of their relationships in sentences, paragraphs, and longer passages. It involves understanding of the intent of the author and may go beyond literal recorded facts to hidden meanings or implications. (52:883)

In a similar manner, Betts contends that "depth of comprehension is a matter of degree":

Reading of the predominantly assimilative type emphasizes the identification and recall of facts. Reading of the predominantly critical type emphasizes the higher thought processes having to do with selection-rejection of ideas, the relationship between ideas and the organization of ideas. (4:11)

More recently, Carroll has suggested a qualitative distinction between those skills which he places under the rubric "comprehension" and those which he considers to be outcomes of "inference." He uses the term "comprehension" to refer to the literal understanding of what is read and to involve the following skills: "vocabulary knowledge, ability to

apprehend grammatical relations, and the ability to integrate the lexical and grammatical intonation in a text to perceive the meaning." On the other hand, by "inference," Carroll refers to an understanding of meanings which are not explicitly stated, and involving these skills: "a general ability to reason with information that is presented, and the ability to appreciate an author's purpose, attitude, tone, and mood" (7).

Hierarchical Definitions of Comprehension

More highly structured hierarchical organizations of comprehension skills are common in the literature. A rather extensive survey of them will be given here in order to assess the limits which authorities have set for comprehension when it is defined in these terms.

Many authorities arrange comprehension skills into three-part hierarchies. Typical of this approach is Piekarz's analysis. Under the heading "literal comprehension," she includes "the awareness or recognition of explicitly stated facts." "Interpretation" is used to refer to "those meanings which are implied in the writing and which must be inferred by the reader" while "the evaluative category" involves "the personal reaction of the reader to the material he reads" (45:136-7). Dale also outlines

comprehension skills in three levels. He describes the first level as the "simple, uncritical reproduction" of what is read, the second level as "drawing inferences from what is read" involving critical thinking and analysis, and a third level as embodying the "evaluation and application of what is read" (16:1). Cutter also proposes three levels of comprehension made up of "reading the lines" or what was said, "reading between the lines" or what was meant, and "reading beyond the lines" or what generalizations or evaluations can be made" (15:64-7). Huus also explains comprehension in terms of three levels. She characterizes "literal" comprehension as when "the reader grasps the work as a whole and knows 'what the book says,'" "interpretation" as "'what the author really means' regardless of what he says," and "assimilation" as the "recognition of a personal connection, of accepting into one's apperceptive mass or background the idea freshly gained from reading" (25). A further three-part analysis of comprehension skills is suggested by Joll:

First, there is the level of literal reading where the student gets full and accurate meaning from the lines. Second, there is that of critical reading which involves the ability to read carefully and to react intelligently to the presentation of the author. Third, there is that of reading interpretively which not only involves the previous two levels but requires a sensitiveness and involvement on the part of the reader.

(31:115)

More extensive skills analyses of comprehension have been proposed by other authorities in the field. Letton outlines a hierarchy of questioning categories which illustrate skills which she feels are included in five levels of comprehension:

A Level I question requires a factual response which is clearly stated in the selection read.

A Level II question requires an answer in which the reader must make some recognition of the author's material.

A Level III question requires an answer in which the reader must make inferences within a framework relevant to ideas which are not directly stated.

A Level IV question requires an answer in which the reader shows a knowledge of figurative, idiomatic, or picturesque language, and the connotations or denotations of words, if he is to interpret the selection accurately.

A Level V question requires an answer in which the reader must evaluate ideas in the selection, weighing them against those of another author or authors, or comparing them with those of the reader himself.

(41:79-80)

Andresen and Robinson postulate that "reading comprehension begins with an understanding of the author's meaning and ends with an intelligent reaction by the reader to the author's ideas." They include within this spectrum five levels which can be summarized as follows:

Literal Level: The reader recognizes and understands the author's stated ideas.

Interpretative Level: The reader understands the author's implied ideas.

Critical Level: The reader passes judgment on the author's ideas.

Assimilative Level: The reader adds to the author's thinking with thoughts from his own experiences and imagination.

Creative Level: The reader's imagination works on the ideas derived from reading and new ideas emerge.

Andresen and Robinson maintain that each of these levels is "additive": "A higher level cannot be achieved without the successful performance of the preceding lower levels" (1:102-103).

Smith suggests "a potential hierarchy" of comprehension skills. At the literal level, Smith includes the following: understanding relevant details and facts; securing the main idea or central thought; following directions; recognizing sequence of time, place, events, or steps; and identifying stated conclusions. Reading for implied meanings and drawing inferences involve: determining characterization and setting; sensing relationships among events and characters, cause and effect; anticipating outcomes; determining the author's purpose by identifying the tone, mood, and intent of the passage; making comparisons and contrasts; and drawing conclusions and making generalizations. Smith also emphasizes that the reader must follow the logic of an argument, filling in gaps left by the author but being certain that he is securing the author's ideas and not reflections of his own (53:51-3).

In a recent article, Smith develops a taxonomic "hierarchy of reading-for-meaning skills." The first of these Smith calls "literal comprehension" and involves "getting the primary direct literal meaning of a word, idea, or sentence in context." The second category, "interpretation," is concerned with "supplying meanings not directly stated in the text," while the third category, "critical reading," involves the reader in evaluating and passing personal judgment on "the quality, the value, the accuracy, and the truthfulness of what is read." Finally, Smith identifies "creative reading" in which the reader "goes out on his own beyond the author's text to seek out or express new ideas, to gain additional insights, to find the answer to a question or the solution to a life-like problem" (54:254-58).

Non-Hierarchical Definitions of Comprehension

Despite the frequent definitions of comprehension in terms of skills hierarchies, it is important to note that not all authorities accept the legitimacy of this approach. Sochor, after an extensive review of the literature, concludes that "proposed hierarchies...are primarily the product of logical thinking rather than research" (56:52-54). The manner in which this "logical thinking"

has come to influence educators is suggested by McCullough:

We harbour the misconception that one bit must precede another. This is the case because, after our initial discoveries, we let logic obscure the nature of language and learning and rule our decisions. (43:20)

Besides Sochor and McCullough, Howards (23), Heilman (22) and Bliesmer (5) also have questioned the use of unvalidated skills hierarchies to explain comprehension accurately.

Sochor provides her own explanation of why comprehension may not be legitimately viewed in hierarchical terms.

The thinking processes necessary to understand what one author says (literal reading) may be far more complex than the evaluation of what another author states (critical reading). If after difficult literal interpretation the reader must proceed to what is known as critical reading, the situation becomes even more complex.... The differentiation can be made on the basis of the reader's purpose for reading, ie., his need to understand what is stated (literal reading) as contrasted with his need to deal with the facts in some way (critical reading). (56:52)

It is possible that Sochor is confusing complexity with difficulty in her explanation. But in emphasizing the role of the reader's purpose, she is in general agreement with Davis, who, in providing a "functional definition" of comprehension, has made a similar point. He maintains that comprehension may be described as a "weighted composite" of the following five skills:

Skills in answering questions that are explicitly answered in a passage.

Skill in weaving together ideas in a passage, in grouping its central thought, and in answering questions that are not explicitly answered in it.

Skill in following the structure of a passage.

Skill in drawing inferences about the content of a passage and about the author's purpose, intent, and point of view.

Skill in recognizing the literary devices used by an author and in identifying the tone and mood of a passage. (17:541)

Rather than envisioning these skills operating within an hierarchical structure, Davis describes their functioning in terms of the "weights" attached to different skills depending upon the type of material read and the reader's purpose and maturity. Both Sochor and Davis contend, therefore, that it is the nature of the particular material read and the reader's specific purpose for reading that determine the skills used to comprehend, and the relative importance of these skills. In the view of these authorities, a rigid hierarchy of comprehension skills is untenable.

Critical Reading

Whether or not hierarchies are recognized, a frequently encountered element in skills analyses of comprehension is "critical reading" and the skills associated with it. Besides being discussed within the context of

comprehension as a whole, however, critical reading has been isolated for special attention by a number of authorities. The position which these authorities generally ascribe to critical reading has been described by Clymer as "the zenith of all comprehension skills" (9:41), and by Covell as one of the "highest planes" of comprehension (13:616).

Authorities seem to be in general agreement that critical reading involves evaluative thinking against the background of the reader's own experience. Robinson defines critical reading as "judgment of the veracity, validity, and worth of what is read, based on sound criteria or standards developed through previous experiences" (48:3). Robinson's formulation is reflected in Huus' definition: "Critical reading requires the evaluation of the material, comparing it with known standards and norms, and concluding or acting on the judgment" (24:115). Artley describes critical reading as "a process of judging with severity" involving "an active process of reflection with care on the ideas expressed, of making a rigidly exacting analysis and as a result, arriving at a valid conclusion" (2:122). Critical readers have been characterized by Piekarz as those who "project the literal meanings

against their own backgrounds of experience, 'reasoning with and evaluating the stated facts and implied ideas" (45:138). Karlin states that to be critical in reading means "to be discriminating or evaluative" involving "a kind of judgment based on what is known or implied" (33:74).

The nature of critical reading has been described more fully by setting out the specific skills involved. Robinson follows her definition of critical reading with an outline of six characteristics of the critical reader:

1. An inquiring attitude.
2. A background to supply knowledge about the topic.
3. The ability to suspend judgment until the writer's message is fully secured.
4. The ability to follow the organization or logic of the presentation, recognizing what is included and what is omitted.
5. Awareness of the author's qualifications and intent.
6. Recognition of the publisher's commitments. (48:6)

Huus relates three kinds of skills to critical reading. In the first instance, critical reading refers to seeing the author's purpose and evaluating his competence. Secondly, the reader focuses on the content of a selection; "its adequacy or completeness, its accuracy and recency, its inherent logic and consistency, and its suitability to the purpose at hand." Finally, according to Huus, the critical reader makes reference to the style in which the selection is written (24:115-16).

In an earlier attempt to delineate the skills subsumed under the term critical reading, Kay lists "the ability to make comparisons of the works of authors on the same subjects, to evaluate the authenticity of material, to discover inaccuracies and omissions in writer's works, [and] to find the writer's purpose" (34:383). De Boer's statement of critical reading skills in the same year compares with Kay's:

Critical reading involves the search for relevant materials, the evaluation of data, the identification and comparison of sources, and the synthesis of these findings. It involves the capacity for suspended judgment and the interpretation of the writer's motive. (18:251)

More recently, numerous lists of critical reading skills have been formulated. A representative three will be outlined here. In her insightful analysis of basal readers, Williams identified seven abilities associated with critical reading. These included comparing and contrasting, drawing conclusions, evaluating conclusions, evaluating relevancy and adequacy of material, making inferences, predicting the outcome of events, and arriving at generalizations (63:327). Cooper includes under critical reading the ability to recognize common assumptions, to recognize common fallacies in thinking, to distinguish between connotative and denotative meanings of words, to

evaluate the adequacy of general statements, and to evaluate the dependability of data and the competence of authorities (12). Massey states that the critical reader must perform the following tasks:

(1) perceive relationships between words, percepts, and concepts; (2) appraise the author's statements by ascertaining their relevancy to his problems, their authenticity, their objectivity, their agreement or disagreement with statements of other authors or speakers, and their truth or fancifulness; (3) draw inferences from the author's implications; and (4) reserve conclusions until all obtainable facts are perceived.

(42:104)

Creative Reading

A third rubric sometimes appearing as a subcategory under comprehension and often appearing alone is "creative reading." One approach to creative reading as a separate category is to treat it as synonymous with critical reading. Benson takes this approach in stating that "critical or creative reading means forming judgments and opinions, interpreting feelings, making comparisons and inferences and reflecting on what has been read" (3:150). Most authorities, however, see creative reading as a separate entity from critical reading. Russell, for example, employs the term "to signify behavior which goes beyond word identification or understanding of the literal meaning to the reader's interpretation of the printed materials. Such reading may

be productive of new ideas, critical of old ones, or appreciative of the art of literature" (51:36). Torrance characterizes the creative reader in a manner similar to Russell:

The creative reader sensitizes himself to problems, gaps in knowledge, missing elements, something incorrect. This calls for the formation of new relationships and combinations, synthesizing relatively unrelated elements into a coherent whole, redefining or transforming certain elements to discover new uses, and building onto what is known. (60:63)

McCullough defines creative reading as the type in which "the reader acts upon material intellectually and emotionally and thereby derives from the experience more than the author might have originally intended." She elaborates her definition by stating that creative reading involves such skills as seeing cause and effect relationships, making inferences, and passing judgments (44). Another explanation of creative reading supported by a description of associated skills is provided by Huus. She defines creative reading as being "concerned with the production of new ideas, the development of new insights, fresh approaches, and original constructs." The skills Huus finds involved in creative reading include the ability to see structural relationships within a selection, cause and effect relationships, juxtaposed events and actions, and comparisons of

time and space, place and sequency (24:116-17). However, despite McCullough's and Huss' inclusion of these skills under their definitions of creative reading, it has been seen that seemingly similar skills have been placed by other authorities under their definitions of comprehension and creative reading.

Assessment of Skills-Based Definitions

It becomes apparent that the skills approach to defining comprehension is confused. Not only do semantic difficulties arise when individual skills are described and differentiated from others, but when the "higher" comprehension skills are discussed, they are often placed under the more specialized headings of critical or creative reading rather than general comprehension. The semantic imprecision within different skills-based definitions of comprehension is revealed by an examination of the descriptions of different skills. For example, Joll includes at the second level of his analysis of comprehension "critical reading" which he regards as "the ability to read carefully and to react intelligently to the presentation of the author" (31:115). On the other hand, Andresen and Robinson define the "critical level" of their skills hierarchy as that where "the reader passes judgment on the author's ideas"

(1:103). It would seem that both definitions include something more than literal understanding, but it is unclear to what extent more precise similarity exists. This example serves to illustrate the lack of sharp definition which is often encountered in individual skills hierarchies, and, consequently, the near impossibility of making more than over-generalized comparisons among apparently similar skills presented in different hierarchies.

When critical and creative reading are defined and discussed as separate entities from comprehension, the definition of each term becomes hopelessly blurred. To follow upon the example cited above illustrating the semantic imprecision within hierarchies of comprehension, it is revealing to note that Cooper, for example, includes under the general heading of "critical reading" the ability "to evaluate the adequacy of general statements" (12:87). This ability appears to be closely allied to the two skills included by Joll (31:115) and Andresen and Robinson (1:103) in their respective definitions of comprehension. And yet, in giving a definition of creative reading, McCullough includes the skill of "passing judgments" (44), a skill seemingly very similar to those delineated by Joll, Andresen and Robinson, and Cooper. Hence, it would seem that, given

the vagueness contained within the different definitions of each skill, what appears to be approximately the same skill is included by different authorities under the headings of comprehension, critical reading and creative reading. Thus, not only is there semantic imprecision when comparing comprehension skills, determined by different authorities, but there is also confusion as to whether these skills should be included under the general categories of comprehension, critical reading, or creative reading.

A further complication in the skills approach to comprehension is the question of when comprehension stops. A perusal of the definitions of comprehension, critical, and creative reading outlined above soon reveals that some authorities include under these headings abilities which are not applied directly to the immediate reading task. For example, most definitions of creative reading seem to imply an emotional and creative response by the reader. These characteristics of creative reading are perhaps most clearly seen in McCullough's definition (44). Yet, whether these responses are involved in understanding the meaning of what is read, or whether they depend on such an understanding at all are questions which remain unanswered. It would seem possible for a reader to respond in an emotional

manner to something read but completely misunderstood. Similarly, some creative response might also result from a misunderstanding of the text. Furthermore, to combine the emotional response of the reader with a definition of how he understands what is read would appear to confuse what Bloom and his colleagues have designated as the cognitive and affective domains (6:7).

Another extension of skills beyond those which one might expect to find under comprehension occurs with respect to critical reading. Here, for example, Robinson includes "the awareness of the author's qualifications" (48:6). Also, under her discussion of critical reading, Kay places "the ability to make comparisons of the works of authors on the same subjects" (34:383). To be sure, previous knowledge of the author and the subject enhances the reader's understanding of what he reads in that this knowledge provides a conceptual framework within which reading can take place. However, an evaluation of the competence of an author by searching for information about him after reading is complete, and an assessment of the writing by later comparing it with other writing on the same topic both carry the reader beyond the act of reading and perhaps can more accurately be classified as study skills rather

than comprehension skills. For this reason, it can be maintained that comprehension is getting meaning from what is read and does not, in a strict sense, include ancillary activities taking place after reading has been completed which may enhance meaning once it has been achieved. Recently, Gephart has distinguished between thinking during reading and thinking about what has been read in the following manner:

If the intellectual activity involved in the analysis, interpretation, synthesis, and evaluation of a printed or written message is concurrent with the physiological reading activity, that mental activity is included as an aspect of reading. If the evaluation occurs through an oral discussion or mental consideration after the material to be read is placed aside, it is not considered reading. (20:116)

Hence, it would seem that the critical consideration in determining whether or not the reader's activities fall within a definition of comprehension is whether or not these activities take place concurrently with the reading act. If they do, then they may be deemed aspects of comprehension; if they do not, they must be considered extraneous to the reading process.

This discussion serves to illustrate the limitations of the skills approach in achieving an understanding of reading comprehension. While the teaching of specific comprehension skills may be a viable method of developing

children's understanding of what they read, to seek a clear understanding of the nature of comprehension via this method would seem to result in only limited success.

General dissatisfaction with present conceptions of comprehension reached through skills analysis is apparent in the opinion of reading experts. Typical of this sentiment is Staiger's view:

Comprehension skills can similarly be analyzed, tabulated and described, and then listed and dissected. Yet we still have difficulty in knowing what comprehension is because of the complex ways in which it operates. (57:143-49)

More recently, Kerfoot (51), Jenkinson (27), and Smith (54) have expressed similar views. And when the term "critical reading" is considered, authorities are even less satisfied with present definitions. Huus, for example, writes:

The need for critical reading in our contemporary culture has not been questioned. But there has been little agreement concerning the attributes of critical reading, and the term has been confused with vague descriptions of creative and interpretive reading.
(26:146)

Like opinions have been voiced by Sochor (56), Williams (63), and King (36:2). These authorities would all seem to agree with Kingston's recent statement that "at present the field of reading seems to be a pot pourri of poorly delineated behaviors and undefined terms" (38:133).

COGNITIVE-BASED DEFINITIONS OF COMPREHENSION

While many authorities have sought to explain comprehension in terms of the skills employed for understanding, a lesser number have suggested explanations of the mental activity which accompanies and produces this understanding. Too often it would seem that comprehension skills have been delineated with little regard for the mental activity which they suggest. An awareness of this shortcoming appears to underlie Raygor's comment:

It seems clear that one of the primary sources of confusion in reading is the tendency to substitute names of things for events. The whole notion of thought units and word meanings and main ideas, as things rather than events, is a good example of the explanatory fictions which provide us ways of talking about the behavior without really describing it. (47:36)

Among those who emphasize the mental activity involved in comprehension is Stauffer. He has recently discussed reading in terms of cognitive functioning and, in doing so, has contended that "reading is a complex form of mental activity akin to thinking" (58:5). Similar positions have been taken by Sochor (55), Strang (59), Pratt (46), Jenkinson (29) and Cramer (14). Thinking is most often linked with comprehension when the higher levels of comprehension, including critical reading, are examined. Typical

of this point of view is Russell who states that "critical reading does not exist in a vacuum by itself but can be thought of best as closely related to critical thinking" (51:579). Opinions parallel to Russell's have been expressed by Karlin (32), Robinson (48), and Sochor (56).

Cognitive-Based Definitions of Comprehension

Once comprehension is approached from the point of view of the mental activity involved, it comes to be viewed as a dynamic process--or "event", to use Raygor's (47:36) term--rather than a static construct of skills. Kingston's explanation provides clarification on this point:

Traditionally the psychologist speaks of "process" in contrast with "structure". A process involves a continuous series of successive but independent changes or events. Process, then, implies some sort of transformation taking place in time and obviously represents something that is dynamic rather than static. (39:6)

It is this dynamic cognitive aspect of reading comprehension that some authorities have sought to explain.

One approach to understanding the cognitive activity associated with comprehension is to discuss it in terms of the communication of meaning. Typical of this position is Weaver who maintains that meaning is communicated "as the coding of the message approaches relevant coded structures within the organism." He describes the processing of a

communication by a reader as follows:

Meaning, as I think of the term, is the result of the application of prior codings of the organism to the present decoding task. The prior codings of the organism do not seem entirely dependent on input sources external to the organism. That is, the internal system seems to be productive of new input to the system. External inputs into the system are interpreted by previous external inputs plus internal reorganizations which have occurred. (62:71-2)

A somewhat similar position is taken by Kress who, like Weaver, premises his explanation of comprehension on the communication of meaning between writer and reader:

To arrive at an understanding of what another person has put into print demands that one react to the symbols in which his ideas have been represented by relating them to meanings which already have developed out of one's previous perceptual-conceptual activities. To the degree that the past experiences of the author (the encoder) and the reader (the decoder) have resulted in commonality of meaning, communication between them is possible. Comprehension, therefore, is dependent on the relationship between the perceptual-conceptual reservoirs of both the author and the reader. (40:32)

Another approach to the process of comprehension is to consider it in terms of what Wark calls "internal verbal behavior" which he contends is "nothing more than internal talking." He describes comprehension essentially as a two-stage process of language processing:

A reader sees an external stimulus of some sort. He produces some subvocal, covert response. Then the same responses produce stimuli for further covert, internal responding. It is this "search level response",

controlled in part by what the reader sees and in part by memory, long-range association, contrast and so on that we call "comprehension". (61:192)

Carroll explains the process of comprehension in a similar manner by contending that it "occurs in response to some kind of internal representation, however abbreviated or fragmentary, of a spoken message." He goes on to elaborate by stating that "the reader does not respond solely to visual symbols; he also responds to some sort of reconstruction of a spoken message which he derives from the written message" (8:337-38).

Assessment of Cognitive-Based Definitions

Each of the definitions outlined here varies to some degree from the others, and all offer somewhat tentative explanations. It is not surprising that these differences and vagaries exist since each explanation is presented within the context of the thinking process. And, in this regard, the lack of a generally accepted and validated concept of thinking has been recognized by a number of authorities including Durrell and Chambers (19) and Russell (51). For this reason, Kingston condemns those who seek to understand comprehension by comparing it with thinking:

Rather than clarifying our understanding of the reading process, we have confused the issue by adding an equally complex and abstract term to further complicate the problem. (37:102)

More recently, both Robinson (49) and Clymer (10:11) have expressed similar views. Jenkinson (30:60) has gone one step further and asked the question: To what extent are thinking and comprehension synonymous, and, if they differ, how do they differ? It would seem that an understanding of the mental processes involved in comprehension is contingent on a clear understanding of cognition in general, and that this latter understanding is lacking.

Russell explains the lack of a satisfactory definition of thinking in terms of trends in experimental research:

American psychologists in general have been wary of studies of mental life. We have careful laboratory investigations of conditioning eye-blink and elegant procedures for recording the maze-running ability of rats, but we have often shied away from the study of the complex intellectual life of children and adults.
(51:370)

In a similar vein, Kingston decries "the ascendancy which behaviorism has held in American psychology during the present century, and the reluctance of the behavioral psychologist to deal with covert behavior" (39:425). Weaver, in his discussion of the psychology of reading, describes the difficulties encountered in exploring covert mental behaviors. He refers to the psychologist's use of the "black box" analogue to provide a basis for the understanding of

cognition during reading. Weaver points out that the psychologist, by using this device to explain mental operations, "is in contact with the covert only by inferences he is able to draw from the overt..." (62:69-72). Additional difficulties exist since, as Jenkinson has observed, measuring instruments appropriate to inferring cognitive activity from overt behavioral responses are lacking. Jenkinson further notes that even if such instruments were readily available, agreement is lacking regarding which thinking processes should be measured in order to study thinking while reading (28:549-51).

Despite these difficulties, the need for more definitive explanations of covert psychological processes in reading is not questioned. The inadequacy of the stimulus-response model has been clearly enunciated by Guilford:

The prevailing model of behavior has been that of stimulus-response associations.... Such a model has worked very well in instruction such as teaching the numerical operations. But even there, some added comprehension of the principles involved would be very desirable. Comprehension of principles is a matter of cognition and takes us at once beyond the stimulus-response model. (21:178)

It would seem that fruitful theoretical speculation regarding the cognitive operations involved in reading comprehension is dependent upon an integrated program of experimental research. This point will be dealt with in greater detail

in the next chapter.

ASSESSMENT OF VERBAL DEFINITIONS OF COMPREHENSION

This discussion of verbal definitions of reading comprehension has revealed a general lack of specificity. When comprehension has been approached by means of the skills employed by the reader, hierarchical organizations of these skills usually result. But these hierarchies are built on the basis of logical thinking rather than empirical data. Hence their organization and even the existence of the skills they organize may be questioned. Further confusion is generated by the semantic imprecision encountered when individual skills are described and when comparisons among different skills in different hierarchies are attempted. This confusion is compounded by the question of whether skills should be subsumed under the heading "comprehension," "critical reading," or "creative reading." A related complication appears when the issue of the conceptual boundaries for a discussion of comprehension is encountered. More particularly, should such matters as the reader's emotional response and his awareness of the author's qualifications be of legitimate concern in an explanation of comprehension?

Problems involved in describing the cognitive activity associated with comprehension fundamentally rest on the question of what constitutes thinking. Since a satisfactory description of thinking does not yet exist, the more particular question of what kinds of cognitive activity are mobilized during reading comprehension must remain unanswered. Basic to the whole matter of cognitive functioning is the problem of exploring covert activity. Not only do cognitive behaviors remain a relative mystery, but instruments by which they may be inferred from overt behavior are generally lacking.

SUMMARY

Verbal definitions of reading comprehension are basically of two types. The first type describes comprehension in terms of the various skills which are postulated as necessary to understand what is read. Descriptions of this kind are usually presented in an hierarchical organization, although some authorities question this arrangement. Included with skills-based definitions of comprehension are descriptions of critical and creative reading and their associated skills. The second type of verbal definition is founded upon descriptions of the cognitive operations

involved in reading comprehension. This type of description rests upon knowledge of cognition in general. Both skills-based and cognitive-based definitions of comprehension are characterized by a general lack of specificity.

Briefly, the definitions of comprehension discussed in this chapter may be summarized as follows:

1. Skills-based definitions of comprehension.

1.1 Comprehension involves a number of separate skills which are arranged hierarchically.

1.2 Comprehension involves a number of separate skills which are not arranged hierarchically.

1.3 Critical and creative reading constitute high-level comprehension and involve separate skills which are distinguishable from those associated with low-level comprehension.

2. Cognitive-based definitions of comprehension.

1.1 Comprehension is a cognitive process involving a variety of mental operations which may be described in a number of ways.

It would seem that the most consistent basis for distinguishing between the two basic types of verbal definition revealed in this summary is the difference between overt and covert behavior. The skills-based descriptions are

concerned with the overt behaviors performed by a reader in order to understand what is read. These behaviors are observable and measurable and may be used to draw inferences regarding the mental activity in progress. On the other hand, the cognitive-based definitions are concerned with describing the covert mental operations which result in comprehension. These operations are not observable and are extremely difficult to measure. Logic would seem to indicate that overt skills are the outcome of covert cognitive activity, but the exact relationship between these two facets of comprehension remains unclear.

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Chapter 5

MODELS OF READING COMPREHENSION

This chapter is concerned with describing and assessing the various models of reading comprehension which have been proposed. The first section of the chapter describes the need for models in reading as this need has been expressed by various authorities. The nature of models as discussed in scientific literature is the concern of the second section of the chapter. The third section presents a review of thirteen models of reading comprehension. The evaluation of these models is undertaken in the fourth section of the chapter while the fifth section focuses on an overall assessment of model building as it relates to reading comprehension. The final section presents a brief summary of the chapter.

THE NEED FOR MODELS

The common characteristic of findings resulting from experimental investigations of comprehension and theoretical statements concerning its nature is a lack of precision.

Though a great deal of empirical data exists and perhaps an even greater amount of theoretical speculation has been undertaken, the precise nature of comprehension remains unclear. The need for greater specificity in both data collection and verbal statements concerning reading comprehension has been partly recognized during the past decade in the appearance of a number of comprehension models.

The literature over the past few years reveals a growing awareness of the necessity for greater coordination between theoretical and experimental research if viable explanations of reading processes are to be forthcoming. For example, Strang states the need for more mature theoretical formulations:

To understand how students read, we need a framework, a paradigm, a pattern that encompasses the major or contributory factors. (55:49)

And Berg indicates the place of these formulations in empirical research:

The simple fact is that without a more pervasive theoretical structure we can never really develop an orderly system of data collecting or finally regularize the discipline into a science. (3:13)

Similar sentiments have been expressed by Jenkinson (27:551) and Levin (33:140). The danger of failing to work in terms of these formulations has been pointed to by Raygor:

The problem created by the radical empiricist who is unwilling even to commit himself to any notion of theory is that he has nothing to guide him in his collection of data, and he is very likely to do useless, repetitious data collecting. (42:172)

It is not surprising, therefore, that in reviewing reading research over the first years of the 1960's, Holmes and Singer (26) noted a tendency towards the greater ordering of empirical data:

Recognition of the need to search for "understandings" is evident in concerted effort (a) to construct new models representing the processes at work in the sub-systems or causal chains of events that come to focus in the reading act and (b) to probe deeper with studies that aim to explain reading phenomena in smaller and smaller units. (26:127)

Holmes and Singer also observed:

A field of study is generally headed for a spurt of creative productivity when theory construction and experimental research become closely interdependent and mutually directed. (26:150)

The growing interest in model construction during the 1960's is further exemplified by the International Reading Association's sponsoring of an institute prior to its 1965 convention devoted entirely to the use of models in reading research (13). At that time, Kingston noted that "models may help the researcher to understand more completely the underlying relationships between the various components of the [reading] phenomena [under study]" (30:4). Two years later, the utility of models was emphasized by Clymer in his

review of model building in reading:

Constructing a model forces the investigator to organize facts and to set them against a rational framework; at the same time, it provides a technique for testing these facts and for generating more hypotheses for testing. (12:12)

More recently, Jenkinson (27) and Singer (48) (49) have presented reviews of the numerous models of the reading process which have appeared over the past ten years. Similarly, a number of models have appeared which seek to explain the nature of comprehension within the total reading act. It is these models which are of direct concern here.

THE NATURE OF MODELS

Despite the large number of models which have appeared relating to reading, the definition of a model is itself a subject of conjecture among scientific theorists. It is obvious that the utility of models to explain processes in reading is dependent upon a clear understanding of their nature. As is so often the case when scientific procedures are adopted for the study of reading, an understanding of the nature of models comes from an examination of literature extending beyond the immediate field of reading education.

The Purpose of Models

The advocacy of models for scientific inquiry has

been based upon what Meadows calls the "commerce between empirical and conceptual systems" (37:3). Meadows' meaning is clarified by Maccia's description of the nature of scientific inquiry:

The complete act of scientific inquiry...has two main dimensions: the development of cognitive claims and the justification of cognitive claims. The conduct of inquiry therefore involves one in modes of constructing cognitive claims and modes of checking cognitive claims. (34:7)

Models are modes for constructing cognitive claims, or, as Belth has put it, "models are addressed to principles, not to raw experience" (4:209). Model building is based on the conviction that fruitful experimental investigation can only proceed in response to the need to verify cogent theoretical formulations. Thus, to again quote Maccia, "in scientific inquiry, theorizing must precede researching. Nature cannot be approached in an empty-headed fashion" (34:12).

It is the problem implicit in seeking an explanation of nature that gives credence to the use of models. Rosenblueth and Wiener have stated this problem and the value of models in solving it:

No substantial part of the universe is so simple that it can be grasped and controlled without abstraction. Abstraction consists of replacing the part of the universe under consideration by a model of similar but simpler structure. (44:316)

Hence it can be seen that the function of a model becomes the portrayal of a known or hypothesized part of the natural universe, but in a conceptually delimited way. As Meadows has put it, "through the acts of abstraction, which omit the distracting detail, the model 'stands for the reality'" (37:7). But it also stands for reality in a special manner-- it presents the structure and process of reality devoid of encumbering minutae; it provides what Deutsch calls a "pattern of distribution of relative discontinuities, and some 'laws' of operation" (14:230).

The construction of a model is only one stage in the complete act of scientific inquiry proposed by Maccia (34:8). Once the cognitive claims have been conceptually structured in and by the model, these claims must be verified. This is done by comparing the hypotheses embodied in the model with experimental data taken from the natural world which models seek to represent. It is only in this fashion that models can facilitate the prediction and understanding of natural phenomena. As Meadows states, "scientific prediction...is a process of comparing certain conclusions derived from the properties of our models with observations" (37:8).

The danger of becoming pre-occupied with model building for its own sake is indicated by Kaplan:

As attention focuses on the properties of a model, the data which it is to fit tend to become peripheral; by insensible degrees they are felt to be of only secondary importance, and at last are brushed aside as ugly facts capable of ruining a beautiful theory.

(29:290)

Here Kaplan implies that the construction of a model may follow the accumulation of data rather than form the initial theoretical basis for precise data collection. Lachman has made a similar suggestion in proposing that the function of a model is "to organize what is observed experimentally into some comprehensible order, and by proper symbolic manipulation to arrive at a representation of what has not been observed" (32:113). Although these statements disrupt the continuity of scientific inquiry propounded by Maccia (34), they remain consistent with the central purpose of models--to provide intellectually controlled delineations of real or hypothesized natural phenomena. It would seem clear that models, to provide the greatest utility in scientific inquiry, must both direct and be directed by data collection. Hypotheses developed through model building must be experimentally verified. But it is also vital that models be altered to accommodate empirically derived data not in accordance with initial hypotheses. As Meyer has observed, "scientific models are bound to be disturbed sooner or later by experience" (38:119).

Hence, the process of verifying models facilitates their continued refinement which, in turn, enables them to provide increasingly accurate representations of reality. Rosenbleuth and Wiener have described this process as "the progressive concretization of a theoretical model by the successive introduction of additional variables" (44:319). And Meyer has remarked that "fitting new facts into old models is less fruitful for the advancement of science than discovering why old models should be revised on account of new facts" (38:122). The necessity for the constant revision of models in the behavioral sciences particularly has been stressed by Kaplan (29:291) who points to the complexity of variables which influence phenomena in this field and the difficulty of measuring these variables accurately.

Despite general agreement concerning the function of models in scientific inquiry, the relationship between models and theories is an area of confusion. Brodbeck has noted the "unnecessary use" of "model" as a synonym for "theory," and has cited four instances when this occurs most frequently: (1) when a theory is untested or untestable, (2) when effort is made to avoid admitting the equivocal nature of a theory, (3) when a theory describes ideal

but unreal entities, and (4) when a theory is quantified (9:381-383).

The distinction between the terms "model" and "theory" would appear to lie with the function of each. While a theory seeks to explain reality, a model associated with a theory illustrates the structure of this explanation. This process George calls "the formalization of the theory" and it involves "showing the precise logical structure of the theory" (15:333). For this reason, George describes the use of models as "the use of relational structures":

It is certainly generally accepted that we can proceed from a set of statements of direct observation to generalizations by inductive inference, and from the generalizations back to the testable particulars by deduction. This is the theory; the model is in essence the skeletal, logical structure of this theory. There is thus clearly the closest relation between theory and model. (15:335-36)

Kaplan emphasizes the role of models in illustrating the structural properties implicit in theories by observing:

The theory states that the subject-matter has a certain structure, but the theory does not therefore necessarily exhibit that structure in itself. All theories make abstractions, to be sure, in the sense of treating as irrelevant some properties of their subject-matter. But not all of them abstract to the point of treating as relevant only the structural properties. (29:264-65).

The model, then, must be seen as illustrative of but differentiated from the theory. It is not a part of the theory

although it helps to illuminate the theory by providing an alternative structural representation of it. As Lachman states, a model is a "separate system" which "brings to bear an external organization of ideas, laws, or relationships upon the hypothetical propositions of a theory or phenomenon it encompasses" (32:114). Lachman continues:

Empirical elements and relationships which constitute the phenomena to be organized by a theory are known to us by the symbolic system or language that designates these data. By introducing a model constituting a separately organized system, we are provided an additional system or representation for the phenomena and a suitable way of speaking about them. (32:114)

It is through the use of models, therefore, that scientists produce separate "mental pictures", as Meyer calls them, which "tend to make the ideas embodied in their theories intuitively clear" (38:112-113). Thus, Nagel (39:107) maintains that a model provides an "interpretation" for a theory, or, as Braithwaite explains:

To think in terms of the model is therefore frequently the most convenient way of thinking about the structure of the theory, for it avoids the self-consciousness required in order to have before the mind at the same time both the set of propositions arranged in a deductive system which is the theory, and the set of sentences or formulae arranged in order which is the calculus representing the theory. (8:92)

It would seem that authorities are in general agreement that some theoretical formulations developed to explain natural phenomena are of such complexity that models are

helpful to illustrate more clearly the structural relationships suggested by these theories. Hence, models may be described as structural reproductions of theories. But they must of necessity initially post-date theories although models and the theories they represent will both be revised as hypotheses suggested by models are tested. Models cannot be self-generating since they depend for their existence on theoretical conceptualizations for which they in turn provide structural illustrations. As Black has put it, "the maker of a scientific model must have prior control of a well-knit scientific theory" since the "systematic complexity" embodied in the theory is "the source of the model" (5:219).

Kinds of Models

One reason for the confusion surrounding the relative functions of models and theories in scientific inquiry possibly lies in the multiplicity of uses to which models have been put. Meadows observes that these uses form "a gradient extending from the expedient, practical and pictorial to the abstractive and schematic" (37:8). Various points can be marked on this gradient, however, and different types of models may be observed at each of these points. For the purpose of this discussion, three categories of

model will be proposed. But it is important to note that no qualitative distinction is implied among these categories since, as will be discussed below, the utility of a model lies in the extent of its heuristic value, and not in the ingenuity or complexity of its construction.

The simplest kind of model is the scale model which Black describes as including "all likenesses of material objects, systems, or processes, whether real or imaginary, that preserve relative proportions" (5:220). It is this preservation of relative proportions which underlies the quality of isomorphism illustrated by these models. Brodbeck has set out two conditions required for isomorphism. First, a one-to-one correspondence between the components of the model and the components of the thing being modeled is necessary and, second, preservation of "certain relations" in the ordering of these elements. She goes on to distinguish between "complete" isomorphism, a model working on the same principle as the original, and "incomplete" isomorphism, a model functioning according to a different principle to the real thing (9:374-75).

A second type of model is the analogue. The difference between a scale and an analogue model is essentially that, while the scale model reproduces the physical proportions of the original though with a constant change in

dimension, the analogue model presents the structure of the original in some more abstract manner. Thus, Black defines the analogue model as "some material object, system or process designed to reproduce as faithfully as possible the structure or web of relationships in the original..." (5:22). Other terms have been used to describe analogue models. For example, Rosenbleuth and Wiener refer to a "material model" which they define as "the representation of a complex system by a system which is assumed to have some properties similar to those selected for study in the original complex system" (44:317). Kaplan distinguishes between "physical" analogues embodying "some actual physical system", and "semantical" analogues involving "a set of symbols" (29:266-267). The analogue model is described by Maccia as a "representational model" or a "model for." It may take the form of an object or some other characterization which may be "empirical," involving propositions, or which may be "formal," showing "the way in which the terms and propositions are interrelated" (34:190). Nagal categorizes analogue models as either "substantive" or "formal". In substantive analogues, "a system of elements possessing certain already familiar properties" and for which a known and relatively concrete

set of relations exists is implemented as a model to explain some second system. With "formal" models, however, the system of elements which serves as the model, while remaining familiar, is more abstract than in the substantive model. Nagel uses the mathematical model as an example here (39:110).

It follows that analogue models provide for a high level of flexibility in model building. They are more abstract than the scale models and therefore more versatile. And because models are independent structures from the theories they illustrate, more than one model can usually be constructed for a given theory. As George has noted, "any symbolic model can be regarded as a physical system and produced in hardware" (15:314).

Theoretical models constitute a third category. Black alludes to the more abstract nature of these models when he states that "the theoretical model need not be built; it is enough that it be described" (5:229). Similarly, Deutsch has said that theoretical models are constituted by "sets of symbols and operating rules carried largely in people's heads" (14:231-32). As Rosenbleuth and Wiener have speculated in their discussion of "formal" models, "the ideal formal model would be one which would cover the entire universe" (44:320).

Brodbeck has delineated theoretical models as follows:

Two theories whose laws have the same form are isomorphic or structurally similar to each other. If the laws of one theory have the same form as the laws of another theory, then one may be said to be a model for the other. (9:379)

Braithwaite has provided further explanation of theoretical models by his example in which "a model for a theory T is another theory M which corresponds to the theory T in respect of deductive structure." Braithwaite elaborates:

By correspondence in deductive structure between M and T is meant that there is a one-one correlation between the concepts of T and those of M which gives rise to a one-one correlation between the propositions of T and those of M which is such that if a proposition in T logically follows from a set of propositions in T, the correlate in M of the first proposition in T logically follows from the set of correlates in M of the propositions of the set in T. (7:225)

Brodbeck warns against undue significance being ascribed to structural isomorphism between theories, and sets out three conditions for viable theoretical models:

The identification of one set of phenomena with another rests on three things: first, their laws have the same form; second, the same value for the constants in these laws, and, finally, the interchangeability of the empirical concepts. By condition one, two areas are merely shown to be structurally isomorphic. Only by conditions two and three can they meaningfully be said to be the same phenomena. (9:349)

She adds that once one theory has been identified as a viable model for another, the reverse is also true. Maccia characterizes a theoretical model as a "non-representational"

model or a "model for" as opposed to her "model of" outlined above (34:9). Kaplan appears to include his designation of "formal" and "interpretive" models under the theoretical category. He describes the formal model as being highly abstract and "free from the irrelevancies necessarily involved in any concrete embodiment of the structure," while the "interpretive model is used to interpret the formal model, since "it allows us to use what we know of one subject-matter to arrive at hypotheses concerning another subject-matter structurally similar to the first" (29:267-68).

Criteria for Models

It is difficult to place different kinds of models designated by different authorities under prescribed categories. This is partly because each model represents an isolated point on a continuum ranging from concrete scale models to abstract theoretical models. A second complication arises from the use by different authorities of different terms to describe their models. Yet difficulties in assigning models to categories and epithets to models, if allowed to assume undue importance, can only detract from an appreciation of the worth of models.

It was suggested above that the criterion against

which a model must always be measured is its heuristic value. The ingenuity of its construction or the complexity of its design, if concentrated on for their own sakes, are the preoccupation of dilettantism. Models are tools for scientific inquiry and the degree to which they facilitate this inquiry is the measure of their worth. Yet models are more than just devices in scientific inquiry--they form a dynamic link between the theoretical conceptualizations which initiate inquiry and the experimental verification of these conceptualizations. They do this by providing separate systems which clarify hypothesized structural features and relationships within a theory, and which suggest ways by which the existence of these features and relationships may be verified.

In order that models may fulfil their heuristic function in scientific inquiry, it would seem that certain conditions must be met. These conditions can be outlined under the five headings which follow.

Articulation. The central criterion here is the precision of the model. It must provide an explicitly articulated separate symbolic system which illuminates the underlying structure of the theory being considered. Further, this symbolic system must maintain simplicity by containing

only those structural features which have utility for elucidating the theory. In this regard, Kaplan distinguishes between "exogenous" features which he defines as "properties of a system which are irrelevant to its structure", and "endogenous" features which are relevant (29:286). Conversely, it must be insured that no structurally vital properties are ignored in the model. In this way, a well-articulated model provides for communication among scholars thereby making theoretical formulations repeatable. This is what Deutsch calls "the property of retraceability" (14:230).

Differentiation. The model must be clearly distinguishable from the theory it illuminates even though, by its very nature, it structurally reproduces the theory. This is what Braithwaite means when he cautions that "thinking of scientific theories by means of models is always as-if thinking," and adds, "the price of the employment of models is eternal vigilance" (8:93).

Hence, the model must reflect conscious intellectual rigor in that it really does help to clarify the theory, and does not merely express the imponderables of a theory in another way. It must supply what Belth calls "the conceptual instruments for discovery, analysis, explanation or

definition," (4:217) and for this reason, as Meadows states, "the utility of any given model is a function of the level of symbolization" (37:7). It is in this way that the explanatory power of a model is established.

Prediction. A model, to be heuristically fruitful, must provide testable hypotheses. These hypotheses are based upon elements and relationships illustrated by the model and suggested by the theory. In this way, as Braithwaite has noted, a model may be said "to point towards its extension" (7:229). Studies initiated to test hypotheses provide for the quantification of the elements and relationships upon which the hypotheses are based. In this way, a calculus for the model is generated. Hence, Braithwaite observes that the calculus of a model is, like the model itself, an alternative representation of the theory (8:90). The quantification of the elements and relationships illustrated by the model thereby allows for the development of mathematical formulae which explain the interaction of these components. The formulae can in turn be used to predict operations and outcomes hypothesized from the model. Operations and outcomes can then be compared with observed natural phenomena, and in this way the degree of the model's predictive capability can be determined.

Creativity. Black speaks of models bringing about "a wedding of disparate subjects" in their attempts to illustrate new relationships (5:237). This is the essence of creativity in model building, provided that the new relationships reveal the structural elements of the theory under consideration. There is little point in creating models to illustrate already-known conceptual structures, or to display bizarre relationships, the knowledge of which does nothing to interpret the theory involved.

Flexibility. The essence of heuristic value lies in flexibility. This characteristic must be present in a model from its inception. The flexibility of a model is what Lachman refers to as "deployability" and "scope" (32:126)-- the capacity of a model to adapt and to accommodate changes in its structure as new elements and relationships are discovered by empirical investigation. The propensity of a model to "impose premature closure on our ideas," as Kaplan (29:279-80) warns, must be avoided. Hence what appear to be logical forms must give way before accumulating empirical evidence. In short, the model must remain heuristically expandible. This expansion can be encouraged by what George refers to as "controlled vagueness," (15:313) the negative capability which allows for the maintenance

of intellectual flexibility in the face of apparent theoretical certitude.

REVIEW OF COMPREHENSION MODELS

Many of the models specifically aimed at explaining reading comprehension have been identified by Clymer (12) in his review of models in reading. Since Clymer's review, other models have appeared. Each of these models will be described in this section of the chapter, and in the following section all models will be evaluated according to the criteria outlined above. A summary of this evaluation is provided in Table III at the end of the evaluation section. Following this, general conclusions regarding the status of model building as it pertains to reading comprehension will be drawn.

The Smith Model

Smith (50) founds his model upon Guilford's (22) model of the structure of intellect. The pictorial representation of Smith's model as presented by him is given in Figure 2. He takes the Semantic Contents dimension of Guilford's model, but modifies it to remove Relations from the Products dimension and Cognition, Memory, and Evaluation from the Operations dimension. Smith justifies these

(Implication) Implications
 (Transformation) Application

(System) Paragraph

(Class) Sentence Similarity
 and Difference

(Unit) Sentence

Implications	
Applications	
Conclusions resulting from: logical order temporal order spatial order	Main Idea: as topic sentence as implied
Contrast: of subject of intent	Comparison: of subject of intent
Literal meaning	Implied meaning

Convergent
 (deductive)
 thinking

Divergent
 (inductive)
 thinking

FIGURE 2

SMITH'S MODEL OF READING COMPREHENSION

omissions by maintaining that, in the case of Relations, there is no corresponding reading skill. Cognition is removed on the grounds that material is never merely cognized, but it is always acted upon in some way when it is comprehended. Memory, Smith argues, extends beyond comprehension and is therefore removed, while Evaluation also lies outside of the realm of comprehension since it relates to decisions made concerning the material after it has been understood (50:23-24).

With these changes made in Guilford's construct, Smith describes comprehension in terms of "directed thinking" operating at different levels as determined by the complexity of the material being read:

The unit is considered to be the sentence, classes to be the grouping of sentences as similar or contrasting in subject and intent, and the system to be the paragraph. A convergent thinking style will then be most suitable for comprehension of literal meanings, for determining differences, and for drawing a conclusion from an orderly sequence of sentence ideas. The orders tend to be logical, temporal (time order) or spatial.... A divergent style of thinking best fits implied meanings, the noting of similarities, and the ability to induce or infer a main idea which is implicit in the paragraph. (50:25-26)

Smith contends that the skills which he associates with the mental activities outlined in his model constitute a complete list. He concludes that "comprehension skills are scarce," and argues that more extensive lists "must be encompassed by

the few described herein" (50:26).

A number of assumptions underlie Smith's model. Among them is the significant attempt he makes to link the mental processes involved in comprehension to specific skills. It should be noted that Smith does not see skills as being arranged hierarchically since they are associated with the non-hierarchical cells of the Guilford model. Smith argues that it is the complexity of the reading material which determines the levels at which the reader functions and the skills which he brings into operation. It is also significant that Smith is very reluctant to include within his model any cognitive operation and associated skill which does not relate directly to the immediate reading task. For this reason he eliminates critical reading from a discussion of comprehension maintaining that critical reading involves evaluation which occurs after understanding has taken place.

The Spache Model

Spache, (51) like Smith, bases his model on the Semantic Content dimension of Guilford's structure of intellect model. He explains his adaptation of Guilford's model to describe comprehension as follows:

The unit is considered to be the word, the class is the sentence, relations are the interrelationships of sentences, and systems are the arrangements of sentences we call paragraphs. Finally, transformations are the manipulation of paragraphs and implications represent inferential reactions to paragraphs. (51:66)

But Spache emphasizes that he wishes to describe not only the cognitive operations involved in comprehension, but also how these operations are "exemplified in various reading behaviors" (51:66). He does this by means of a diagram in which the components of the Semantic Content dimension of Guilford's model are linked with specific reading skills. Spache's diagram is shown in Figure 3. The skills presented, Spache argues, are uniquely related to the cognitive operations under which they are placed in the diagram. Spache emphasizes that there is no hierarchy implied by the arrangement of cognitive operations and associated skills in his diagram. He maintains that such factors as the reader's experiential background and the degree of abstraction contained within the material being read determine the mental process used in comprehension.

Similarities between Smith's model and Spache's are immediately apparent. Like Smith, Spache seeks to relate specific skills to the cognitive operations identified by Guilford. The most striking difference lies in the expanded range of mental activity and skills which Spache provides.

	UNIT	CLASS	RELATIONS	SYSTEMS	TRANSFORMATIONS	IMPLICATIONS
Cognition (recognition of information)	Recognition that word has meaning	Recognition of sentence as complete thought	Recognition of paragraph meaning (literal idea of paragraph)	Recognition of types of relationships within structure of paragraph	Underline key words of paragraph	Recognize that there are implications in author's main idea
Memory (retention of information)	Recall specific word meanings	Recall of thoughts of sentence (reverberations)	Comprehend main idea as summation of sentences (reverberation)	Summarize facts of paragraph in own words with due attention to structure	Combine recall with own associations	Choose possible implications from given alternates
Divergent Production (logical, creative ideas)	Meaning from context by inference	Selecting implied meaning of sentence	Choosing implied main idea	Analyze author's reasons for structure	Construct rebus of paragraph; offer new titles for paragraph	Amplify author's implications and ideas in free association
Convergent Production (conclusions, inductive thinking)	Meaning from structure of context, (i.e. appositive sentence)	Combining ideas into literal meaning of sentence	Evolving main idea as extension of topic sentence	Categorize structure of paragraph; outline it	Choose among alternate titles or statements of main idea	Suggest future applications of author's ideas
Evaluation (critical thinking)	Acceptance or rejection of author's diction	Acceptance or rejection of meaning of sentence, as fact-opinion	Acceptance or rejection of main idea as fact or opinion; check author's sources; compare with own experiences and beliefs	Look for fallacies in logic, appeals to reader's emotions, overgeneralizations, omissions, distortions	Identify author's viewpoint and purpose; compare with other viewpoints; explore the ultimate outcomes of acceptance of author's viewpoint	Check author's background as basis for viewpoint; react to author's value judgments; examine author's basic assumptions and inferences from these

FIGURE 3

SPACHE'S MODEL OF READING BEHAVIORS IN SEMANTIC CONTENT (MEANINGS, IDEAS)

He includes all of the elements Guilford places within Products and Operations rather than only selected ones as is the case with Smith. And in doing so, Spache accommodates all the aspects of critical reading which occur under Evaluation which Smith deliberately omits. Hence, Spache's model represents a far more inclusive concept of comprehension than does Smith's.

The Cleland Model

Cleland (11) defines comprehension in the following manner:

Comprehension--a central mental activity involving the higher intellectual processes in which there is a reorganization of experiences relevant to the purpose of the reading, these experiences having been evoked by the linguistic symbols we call words. (11:21)

His model of comprehension is an attempt to further elucidate the cognitive operations suggested in this definition. Against the background of an extensive review of the related psychological literature, Cleland presents a six-part verbal model, each part of which defines an aspect of the total mental process involved in comprehension.

"Perception" is the first component of Cleland's model. By this he means not only the recognition of words, but, more important, the "meaningful response" of the reader to words, sentences, paragraphs, and entire stories

or articles. The second element of the model Cleland calls "Apperception" by which he means "the process of relating background experiences to the meanings couched in the language of author or speaker--it is perception characterized by clearness." Under the heading "Abstraction," Cleland refers to "the mental process by which the reader or listener neglects or selects percepts, images, or memories which are relevant to the purpose of reading or listening." He adds that related concepts and specific as opposed to generic meanings may also be selected in this manner. "Appraisal," the fourth component of the model, "refers to the process of estimating the value or the validity of the aforementioned materials of thinking, according to accepted norms, standards or processes." The fifth part of the model is "Ideation" and it involves five modes of thinking: inductive, deductive, critical, problem solving, and creative. The final component of Cleland's model is "Application" and it includes "the functional uses readers make of the new ideas acquired" (11:28-31).

It can be seen from this resume of the components of Cleland's model that it is the total cognitive process of comprehension which interest him along with the components of the process. Cleland is not concerned with describing

the observable outcomes of this process although the process is described in terms of a progression of cognitive activity ranging from the recognition of printed or written words to the application of understanding gleaned from reading. By including Application, Cleland accommodates within his model cognitive activities which go beyond the immediate derivation of meaning during the reading act.

The Stauffer Model

Although Stauffer does not present his outline of the "reading-thinking process" explicitly as a model, it does display the structural characteristics necessary to qualify as one and will therefore be treated as such here. Stauffer's model, originally stated in 1965 (54) and to a greater or lesser extent propounded in the enormous volume of his published work, is developed most completely in his recent book, Directing Reading Maturity as a Cognitive Process (53). The process he delineates is essentially an instructional procedure for teaching comprehension, but it is founded upon the notion of encouraging the development of the process used by mature readers to understand what they read, and is therefore illustrative of Stauffer's theoretical formulation of this process.

Stauffer strongly emphasizes the cognitive aspects

of the reading process and the importance of comprehension within it. He contends that "reading is a complex phenomenon of mental activity akin to thinking" and that "to read is to comprehend what is read" (53:5). Hence, reading becomes a purposeful process directed at obtaining information. Stauffer identifies three steps in this process the first of which is "Declaring purposes." Here the reader establishes "a perplexity that demands a solution" and the reader therefore reads to resolve this perplexity. It is this purpose which "regulates the rate and scope of the reading-thinking process." The second stage of this process Stauffer describes as "Reasoning while reading." At this state the reader "manipulates the ideas to discover logical relations, or he rearranges logical patterns in such a way that a conclusion can be reached." At the final stage, "Judging" occurs whereby the reader evaluates and draws conclusions. To do this, he must "select and weigh the facts and make decisions that are pertinent and discriminate." Stauffer suggests that to these three aspects of the reading-thinking process, a fourth might be added. This he calls "refining and extending ideas" and it includes "the more ardent tasks of discriminating between the particular qualities of a concept, and sorting and

assimilating the qualities so that a standard of reference can be obtained" (53:26-28).

Like Cleland, Stauffer presents a sequence of cognitive operations which he contends constitute comprehension. His model places heavy stress on the process of understanding what is read, even to the exclusion of a reference to perception. Stauffer does not extend his notion of comprehension to include activities which follow understanding as does Cleland, however, and to this extent his model is more restrictive. On the other hand, it is closely reminiscent of Cleland's construct in its omission of reference to specific skills which may be interpreted as the manifest outcomes of the processes described.

The McCullough Model

Unlike Cleland and Stauffer who consider only the thought processes of the reader, McCullough (35) claims that comprehension rests upon the communication of thought patterns between the author and the reader. She explains:

Comprehension is based partly upon familiarity with and recognition of the modes of thought employed by the author of the material read. Interpretation applies the reader's own modes of thought to what he believes the author means. (35:333)

In an earlier article (36), McCullough describes the cognitive operations employed by an author to express himself

verbally and which must in turn be used by a reader to understand what has been written:

The brain of a human being receives sensory impressions of objects and living organisms in patterns of events and situations, modified by his own thought-and-feeling predispositions and reactions. He becomes conscious of various relationships: whole-part, cause-effect, sequential, comparison-contrast, and coordinate-subordinate. From these he can develop certain products of the mind: theories, laws and principles, generalizations, summarizations, definitions, classifications, and procedures. These, in turn, he can support with examples, elaboration, and application.

(36:357)

As is illustrated in Figure 4, McCullough presents a diagrammatic version of this "schema of thought patterns" (35:333).

It is important to note that McCullough implies no hierarchy in her schema. As she puts it, "the path an author takes from one point to another on this chart is highly individual; hence the importance of being able to follow his path" (35:334). It is therefore apparent that comprehension involves the reader in free movement through various thought patterns as he seeks accord with the thought of the author. According to McCullough, the directions which these movements take can involve inductive, deductive, convergent, divergent, and evaluative thinking.

McCullough's model, like those of Cleland and Stauffer, is concerned solely with the cognitive processes involved in comprehension. She suggests no specific skills

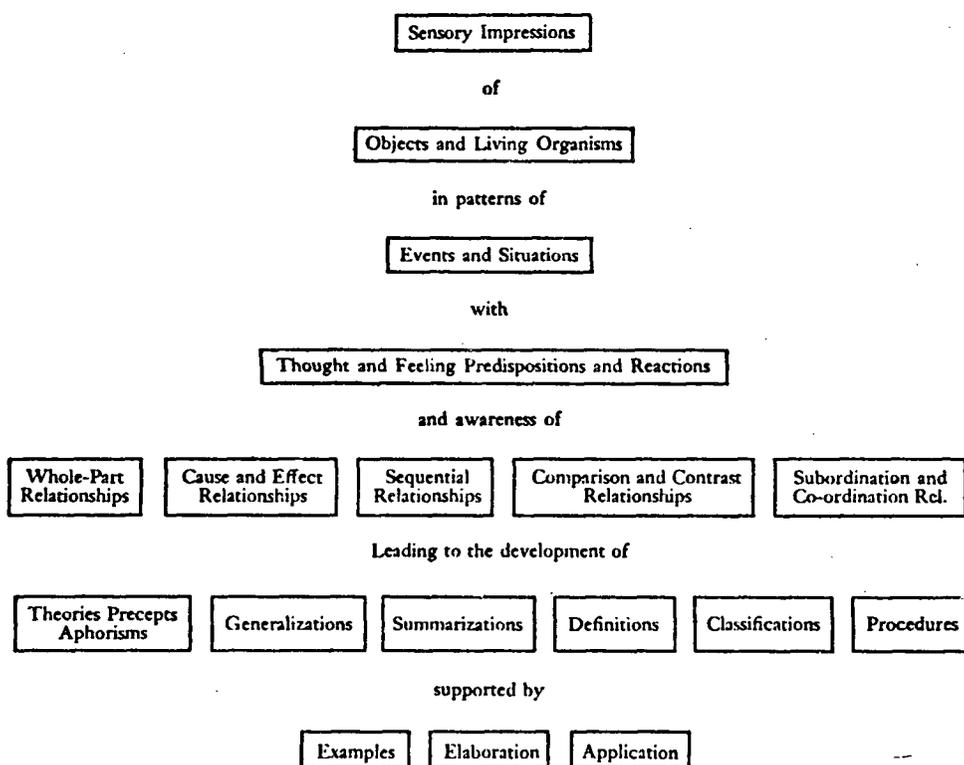


FIGURE 4

MCCULLOUGH'S SCHEMA OF
THOUGHT PATTERNS

although they might be inferred from her description of cognitive operations. Where McCullough differs from both Cleland and Stauffer is in describing comprehension in terms of the interaction of thought patterns between the author and the reader rather than solely in terms of the reader's cognitive response.

The Kingston Model

Like McCullough, Kingston (30) presents a model of comprehension based on the process of communication between the author and the reader. But here the similarity ends. While McCullough delineates the thought processes employed by the author and the reader as they communicate, Kingston defines what are essentially external conditions which influence the efficacy of this communication.

Kingston explains his model in the following terms:

It essentially states that if the past experience in learning of both the reader and the writer are such that both attach a common meaning to a language symbol, comprehension will result. (30:103)

Figure 5 illustrates Kingston's diagrammatic presentation of his model. The model is supported by four postulates which can be summarized as follows:

- I. Reading comprehension can best be understood as a product of communication that results from interaction between the reader and the writer.

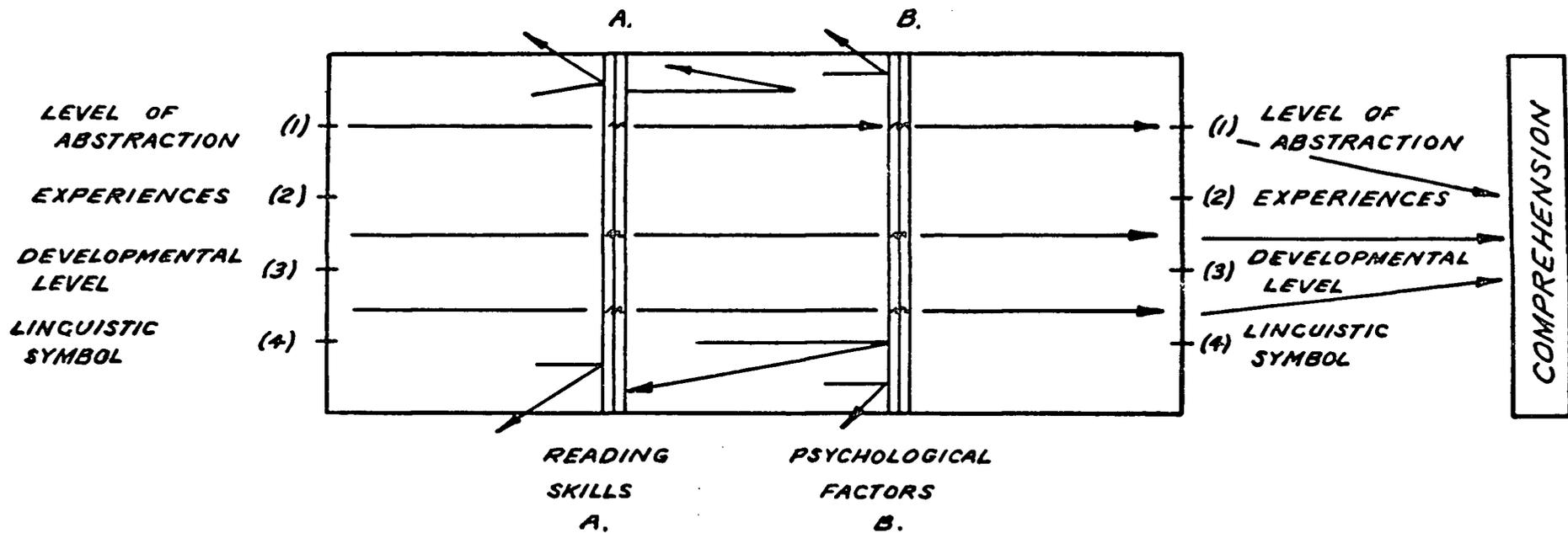


FIGURE 5

KINGSTON'S CONCEPTUAL MODEL
FOR READING COMPREHENSION

- II. Meanings attributed to word symbols are developed through common learning experiences and these learning experiences are reinforced throughout the life span of the individual. Effective communication between the author and the reader results provided that the language employed by the author is familiar to the reader in lexical structure and form, there is agreement on the meaning of verbal symbols employed by the author, and these symbols are of comparable levels of abstraction.
- III. The reading skills possessed and employed by the reader determine the efficacy of his comprehension of the author's communication.
- IV. The personality structure of the reader determines his sensitivity to receiving the message. Such factors as reader motivation or interest, excessive anxieties or unresolved needs, rigidity of personality structure, and active prejudices and biases regarding the communicator or the message may all function to limit or distort message intake. (30:105-7)

Kingston concentrates on what he believes to be the external influences on comprehension which he envisages as the end product of a communication process. The cognitive operations whereby an author and a reader communicate through a written or printed message are not dealt with. Hence, Kingston, while not delineating (or denying) the skills involved in comprehension, is not concerned with the process of comprehension either. Rather, he is interested in identifying some external factors which come to influence the efficacy of this process.

The Gray-Robinson Model

The Gray-Robinson model, first enunciated by Gray (21)

and modified by Robinson (43), encompasses what Gray refers to as "the understandings, attitudes, and skills common to most reading activities" (21:8). Gray places these under four headings to which Robinson adds a fifth. Though the different aspects of reading are considered separately, Gray emphasizes that "they are closely integrated to form a psychologically coherent unit" (21:8). Gray summarized the major aspects of reading as follows:

1. Word Perception: involves the arousal of both meaning and pronunciation associations.
2. Comprehension: involves a clear grasp on the meaning of what is read.
3. Reaction: the reader's reaction to and evaluation of the ideas secured.
4. Assimilation: the fusion of new ideas acquired with previous experience.
5. Rates of Reading: Flexible and adjusted to the reader's purpose and to the difficulty of the materials. (27:9)

Besides verbal descriptions of the five aspects of reading, both Gray and Robinson provide pictorial representations as well. In the case of Gray, however, the relationships between his verbal and pictorial representations are not always clear, and one suspects that the pictorial model is at a relatively early stage of development. Perhaps in recognition of this, but also in order to accommodate her fifth aspect ("Rates"), Robinson modifies the Gray diagrams. In addition, her pictorial representation is coloured in

order to indicate "the close relationship among the areas and the interaction of each with all the others" (43:29). Like Gray, Robinson warns against deriving a segmented concept of reading from the model: "Although each of the five major aspects may be identified and described separately, they are never conceived as steps but as coherent whole" (43:29).

Despite changes in the model as a whole, that part of it relating specifically to comprehension is adopted from Gray unaltered by Robinson. Gray identifies three aspects of comprehension under each of which he places specific "understandings, attitudes, and skills":

Grasping literal meaning the good reader--

- A-Adopts an inquiring attitude
- B-Focuses attention on and anticipates meanings
- C-Fuses meanings into a stream of related ideas
- D-Follows the author's arrangement of ideas
- E-Recognizes their relative importance and use
- F-Visualizes clearly the scenes and events described
- G-Adjusts speed of reading to difficulties faced
- H-Utilizes all his mental resources in achieving purpose

Securing an expanded grasp of the meaning, the good reader--

- A-Recognizes
 - Type of material read
 - Author's purpose, mood
 - Attitude toward subject and reader
- B-Recalls related experiences
- C-Recognizes implied meanings
- D-Makes inquiries appropriate to material read
- E-Interprets
 - In light of author's purpose, mood, attitude
 - Time and place setting
 - Use of words--rhetorical devices

- F-Follows arguments
- G-Recognizes unstated generalizations and conclusions
- H-Distinguishes between one's own ideas and those of author

Understanding ideas read, the good reader--

A-Recognizes

- Author's purpose or problem, questions faced
- Frame of reference
- Assumptions
- Generalizations
- Conclusions

B-Sees their implications

C-Recognizes their applications. (21:15-16)

It is significant that the Gray-Robinson model explicitly separates "reaction" and "assimilation" from "comprehension." Robinson is very clear on this point when she states: "It should be noted that reaction occurs only as comprehension is fully realized" (43:30). It would seem that under the headings "reaction" and "assimilation," Gray and Robinson include what is more commonly referred to as critical and creative reading. Hence, in the opinion of these two authorities, skills involved in reading of these latter two types should not be included under a definition of comprehension since comprehension has taken place before they begin. However, it appears that an element of inconsistency exists here. Since both Gray and Robinson insist that their model represents a coherent whole, each aspect of which functions "concurrently" (43:29) with the others, the sequence Robinson establishes between "comprehension" and

"reaction" and "assimilation" seems to be incompatible with the highly integrated nature of the model. This is especially true when one considers that Robinson adopted colours to illustrate the model in order to indicate "the close relationship among the areas and the interaction of each with all others" (43:29).

A consideration of the Gray-Robinson model soon reveals that it is essentially a skills model. Although Gray seeks to clarify some aspects of the psychology of reading, the coherence of his model derives from its delineation of specific skills. Robinson emphasizes this skills orientation when she maintains that "the intent of this model is to distinguish between what we are trying to achieve and the processes for achieving our goals" (43:32). Robinson bases her discussion on what she calls "an operational definition which includes identification of the skills and abilities." She is careful to note that "models of the reading process and of procedures for teaching reading have been omitted" (43:23).

The Barrett Model

A taxonomy purporting to describe both the cognitive and affective dimensions of comprehension is presented by Barrett (1) and has been recently revised (2). According to

Clymer, Barrett's taxonomy was originally conceived to provide teachers with "both a manageable and understandable means of teaching comprehension" (12:17). Clymer also notes that the taxonomy is based principally upon the model of educational objectives for the cognitive domain proposed by Bloom (6). Barrett's revised taxonomy includes four levels of skills arranged hierarchically in order of complexity.

The taxonomy may be summarized as follows:

- 1.0 Literal Comprehension: Literal comprehension requires the recognition or recall of ideas, information, and happenings that are explicitly stated in the materials used.
 - 1.1 Recognition or Recall of Details
 - 1.2 Recognition or Recall of Main Ideas
 - 1.3 Recognition or Recall of Sequence
 - 1.4 Recognition or Recall of Comparisons
 - 1.5 Recognition or Recall of Cause and Effect Relationships
 - 1.6 Recognition or Recall of Character Traits

- 2.0 Inferential Comprehension: Inferential comprehension is demonstrated by the student when he uses a synthesis of the literal content of a selection, his personal knowledge, his intuition and his imagination as a basis for conjectures or hypotheses.
 - 2.1 Inferring Supporting Details
 - 2.2 Inferring the Main Idea
 - 2.3 Inferring Sequence
 - 2.4 Inferring Comparisons
 - 2.5 Inferring Cause and Effect Relationships
 - 2.6 Inferring Character Traits
 - 2.7 Predicting Outcomes
 - 2.8 Inferring About Figurative Language

- 3.0 Evaluation: Evaluation is demonstrated by a student when he makes judgments about the content of a reading selection by comparing it with external criteria or with internal criteria.

- 3.1 Judgments of Reality or Fantasy
 - 3.2 Judgments of Fact or Opinion
 - 3.3 Judgments of Adequacy or Validity
 - 3.4 Judgments of Appropriateness
 - 3.5 Judgments of Worth, Desirability, or Acceptability
- 4.0 Appreciation: Appreciation involves all the previously cited cognitive dimensions of reading, for it deals with the psychological, and aesthetic impact of the selection on the reader.
- 4.1 Emotional Response to the Content
 - 4.2 Identification with Characters and Incidents
 - 4.3 Reactions to the Author's Use of Language
 - 4.4 Imagery (2)

Within each level and subcategory of the taxonomy Barrett provides examples of tasks which the student must perform in order to demonstrate proficiency at each level.

Some resemblance is apparent between Barrett's model and the models of Smith and Spache. While Smith and Spache deny any hierarchical organization within their models, they do seek to indicate the relationship between the cognitive operations involved in comprehension and the skills resulting from these operations. Similarly, Barrett places under each of the four major categories of his model which indicate cognitive operations "some of the tasks that might be used to produce comprehension...on the part of the students...(2:1). In this manner, Barrett seeks to establish the relationship between overt and covert aspects of comprehension. In doing so, he extends his concept of comprehension beyond that pro-

posed by Gray and Robinson to include evaluative skills by which, for example, the reader judges the adequacy or validity of reading material. However, Barrett's model is seriously limited by his vague description of the cognitive operations involved. Terms such as "recognition," "evaluation," and "appreciation" do little to illuminate what takes place in the mind of the reader as he gains meaning from what he reads.

A further observation on Barrett's taxonomy involves a comparison between it and the model upon which it was based, Bloom's (6) taxonomy. Barrett places at the highest level of his taxonomy the emotional response of the reader to what is read. This response, Barrett maintains, "involves all the previously cited cognitive dimensions of reading." Here it would seem that Barrett violates one of the fundamental tenets of Bloom: that the cognitive, affective, and psychomotor domains all operate concurrently yet in separate systems having complementary levels (6:7). In contrast, Barrett implies that the affective domain dominates the cognitive domain.

The Rystrom Model

Rystrom's model (46) is formulated in an attempt to explain the nature of comprehension and how it may be taught.

The model consists of six different "skill areas" which are defined as vocabulary, syntax, item recall, item sequence, interpretation, and evaluation. Rystrom provides a pictorial representation of his model which is given here in Figure 6.

Rystrom explains the comprehension process represented by his model in terms of a child reading a story. The process begins with a decoding operation whereby information is taken in and decoded in the brain. At the first stage, the vocabulary in the story is matched with the knowledge of words stored in the reader's mind. Then sentence patterns and syntactic items are matched. Next, significant individual items or events in the story are identified and their order remembered. Following this, the reader interprets the story in terms of his own experience through a process of inference. Finally, the story is evaluated on the basis of its internal consistency and its perceived consistency with reality. Rystrom emphasizes that his model does not necessarily imply a linear progression in the comprehension process. It is possible for a reader to shift back and forth among various parts of the model as he seeks understanding of what is being read (46:60-64).

Unlike the other comprehension models discussed thus

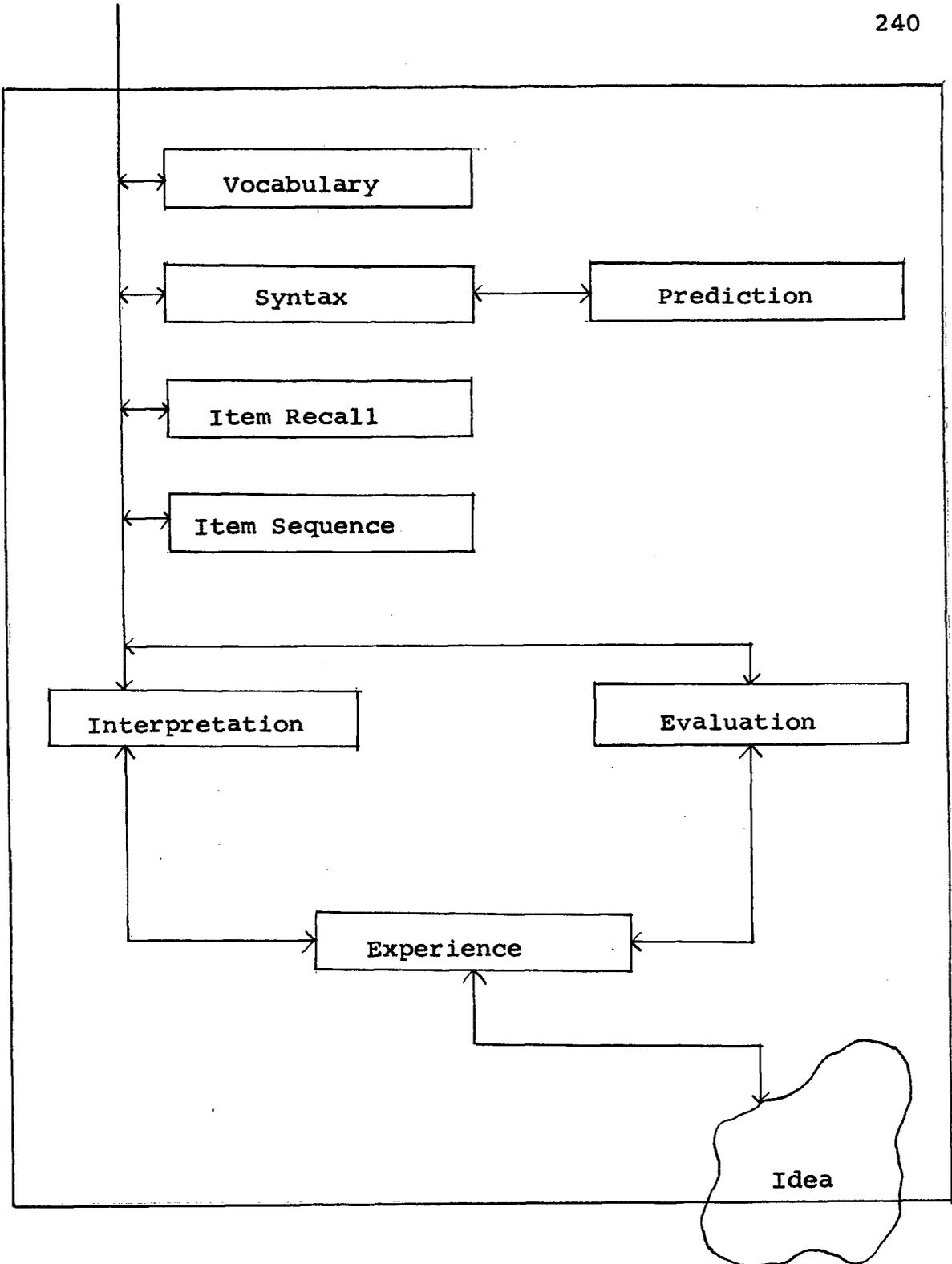


FIGURE 6

RYSTROM'S READING COMPREHENSION MODEL

far, Rystrom has sought to validate his model by constructing a test "indicating the extent to which this model accurately reflects the comprehension process (46:146). The test was administered to 169 grade four pupils in six classes from northeastern Georgia schools. Reliability and content validity were established, and a step-wise regression analysis, factor analysis, and item analysis were carried out. From these statistical procedures, Rystrom concludes that "the six comprehension factors presented [in the model] appear to determine comprehension." He further concludes that "the most important single comprehension skill appears to be the ability to remember specific facts from what has been read" (46:156).

The legitimacy of Rystrom's conclusion that his test validates his model appears to be open to question, however. Though the six parts of the model may appear to be represented in the analysis of data derived from the test, the operation of these parts and the relationships among them which the model postulates are not confirmed by the analysis of data. Even if Rystrom's test has in fact content validity for his model, this in no way indicates that the model itself accurately illustrates the process he seeks to explain and measure.

The Goodman Model

Goodman proposes a psycholinguistic model (20) founded upon his theory that "reading comprehension results from a series of tentative decisions made on the basis of partial use of available language clues" (19:191). In actual fact, Goodman uses the term "reading" to mean "comprehension" since reading is conceived as "the receptive phase of written communication" (18:15). Like Kingston and McCullough, Goodman views comprehension as resulting from communication between author and reader, but communication which can be explained in terms of language processing:

The reader, a user of language, interacts with the graphic input as he seeks to reconstruct a message encoded by the writer. He concentrates his total prior experience and learning on the task, drawing on his experiences and the concepts he has attained as well as the language competence he has achieved. (16:15)

The nature of this interaction is "tentative," however, since, according to Goodman, "reading is a selective process":

It involves partial use of available minimal language cues selected from perceptual input on the basis of the reader's expectation. As this partial information is processed, tentative decisions are made to be confirmed, rejected, or refined as reading progresses. (20:260)

It is for this reason that Goodman calls reading "a psycholinguistic guessing game," the nature of which can be explored through an analysis of the "miscues" or errors made

during oral reading. On the basis of evidence gleaned from his research (17), Goodman has developed a taxonomy of cues and miscues for the purpose of analyzing a reader's psycholinguistic functioning during oral reading (16).

Goodman is both adamant and specific in his rejection of the view that reading "involves exact, detailed, sequential perception and identification of letters, words, spelling patterns and large language units." He disparages such theories as embodying an "'end of the nose' view" of reading which cannot explain the speed and complexity of the reading process. On the contrary, Goodman argues that the reader employs three kinds of information simultaneously-- grapho-phonetic, syntactic, and semantic. Through the use of these three systems, the reader "predicts and anticipates ..., sampling from the print just enough to confirm his guess of what's coming, to cue more semantic and syntactic information." Goodman maintains that this prediction is possible because of redundancy and sequential restraints in language (20:265-266).

Goodman further objects to dividing "code-breaking" from "reading for meaning" contending that the language read is not composed solely of a set of symbols, but, rather, that "it is a system of communication capable of carrying an

infinite variety of messages" (16:16). While drawing a close relationship between language and thought, Goodman is nevertheless restrictive in the degree of cognitive activity which he allows as part of reading. He clearly distinguishes between the psycholinguistic process of reading and the thinking and linguistic processes themselves. He states that, while the reader may "experience cycles of reflective thinking" while reading, "these cycles cannot be considered part of the reading process itself any more than following directions after having read them can be considered a part of the reading process" (16:15).

Through his model of the reading process, Goodman seeks to illustrate how a reader acquires meaning from a written or printed communication. Goodman's representation of his model is given in Figure 7. Here he traces the process by which he conceives a reader to move from the visual perception of the reading material to an understanding of the encoded message in the material. Besides presenting his model as a flow diagram, Goodman also describes it verbally:

1. The reader scans along a line of print from left to right and down the page, line by line.
2. He fixes at a point to permit eye focus. Some print will be central and in focus, some will be peripheral; perhaps his perceptual field is a flattened circle.
3. Now begins the selection process. He picks up graphic cues guided by constraints set up through prior choices, his language knowledge, his cognitive styles, and strategies he has learned.

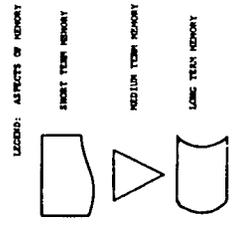
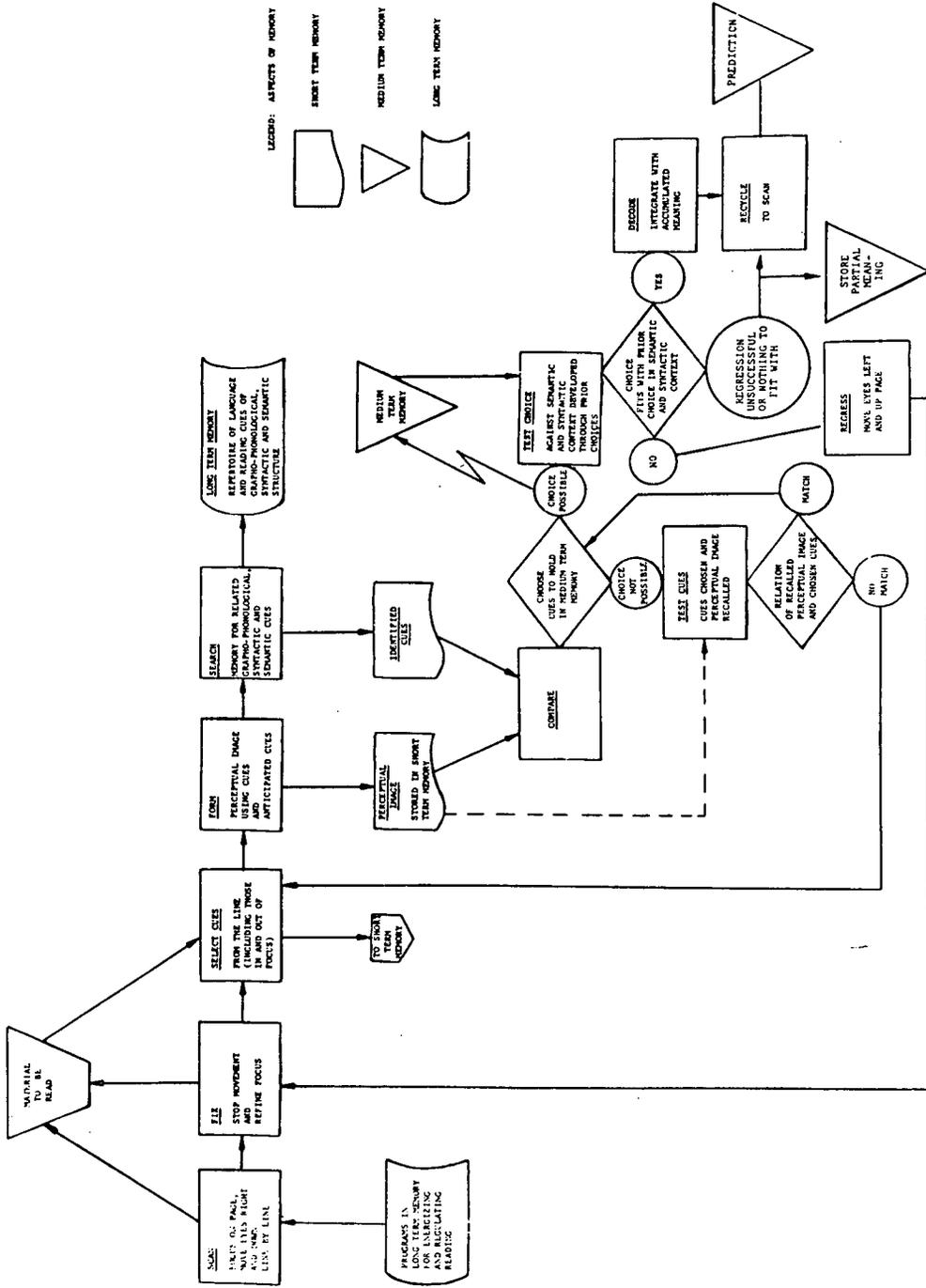


FIGURE 7
A FLOW CHART OF GOODMAN'S MODEL OF READING

4. He forms a perceptual image using these cues and his anticipated cues. This image then is partly what he sees and partly what he expected to see.
5. Now he searches his memory for related syntactic, semantic, and phonological cues. This may lead to selection of more graphic cues and to reforming the perceptual image.
6. At this point, he makes a guess or tentative choice consistent with graphic cues. Semantic analysis leads to partial decoding as far as possible. This meaning is stored in short-term memory as he proceeds.
7. If no guess is possible, he checks the recalled perceptual input and tries again. If a guess is still not possible, he takes another look at the text to gather more graphic cues.
8. If he can make a decodable choice, he tests it for semantic and grammatical acceptability in the context developed by prior choices and decoding.
9. If the tentative choice is not acceptable semantically or syntactically, then he regresses, scanning from right to left along the line and up the page to locate a point of semantic or syntactic inconsistency. When such a point is found, he starts over at that point. If no inconsistency can be identified, he reads on seeking some cue which will make it possible to reconcile the anomalous situation.
10. If the choice is acceptable, decoding is extended, meaning is assimilated with prior meaning, and prior meaning is accommodated, if necessary. Expectations are formed about input and meaning that lies ahead.
11. Then the cycle continues. (20:269-70)

The obvious distinguishing characteristic of Goodman's model is its psycholinguistic basis. Goodman seeks to explain the process of comprehension by accounting for the covert psychological processes involved in understanding written or printed language. He traces this process as it involves the scanning of print and the cognitive operations involved in decoding the meaning of this print. In doing so,

Goodman takes into account the nature of language and the relationship between language structure and the particular thinking processes involved in understanding language. Hence, Goodman presents a highly unified model illustrating the structure of his theory of reading. Despite the complexity of his model, however, Goodman maintains that it is still inadequate to explain the complexities of the reading process (20:271).

The Venezky and Calfee Model

Venezky and Calfee have developed a model describing their theory of adult reading competence (37). Like Goodman, they attempt to deduce "a procedure for generating output from input, input being printed materials in English, and output being "a vagary called understanding" (37:273). These authors' theory of reading rests on their conceptualization of a highly integrated structure including three basic processes: "forward scanning" and "integration" leading to "comprehension". Two factors determine scanning--the general knowledge of the reader stored in his Integrated Knowledge Store (IKS), and his immediate knowledge obtained from the reading material and stored in his Temporary Knowledge Store (TKS). Intermediate knowledge can take two forms, knowledge which is derived from the reading material

and which therefore creates "logical sets (expectancies) for particular words, phrases, or ideas," and knowledge which is closest to the eye's processing of a given time, "that is, intra-sentence, intra-phrase, or intra-word data that aid in the search for the LMUs" or "Largest Manageable Units" (56:273-277).

During reading, simultaneous dual-processing occurs involving the "syntactic-semantic integration of what has just been scanned and forward scanning to locate the next LMU." The direction of this processing is undertaken by the "Control Unit" which "mediates between the various stores and the ongoing processes." The process of integration involves "connecting isolated units to what has already been picked up and generating new predictions about what will occur next." LMUs are defined as the "largest units that can be chunked rapidly." They can be phrases, words, letter strings, or single words. Venezky and Calfee hypothesize that as each LMU is initially identified, forward scanning continues while the LMU is positively identified and integrated. If the initial identification is incorrect, there may be repetition of forward scanning. Word identification results from a search of the Associative Word Store (AWS) containing well-known words, or, if unsuccessful, a search of the Low Frequency Store (LFS). Failure

to immediately match a word produces subvocalization and rescanning (56:273-277).

It is clear that in this proposed theory of reading, the scanning process occupies a central position. It is through scanning that the reader engages in what Venezky and Calfee call "attention tagging," the process of marking certain letters, letter-units, words, or phrases in order to indicate the degree of attention necessary to integrate them. Hence, integration involves the identification of tagged items, the relating of newly acquired material to what is already stored, and the predicting of what should be scanned next. Thus, the success a reader has in integrating what he reads determines the rapidity with which scanning can progress. The balance between integration and scanning is also determined by the nature of the material read and the reader's purpose. In every case, however, the extent of scanning depends upon the identification of the Largest Manageable Unit (56:273-277).

The components contained within Venezky and Calfee's model of reading are presented diagrammatically in Figure 8. They also provide a verbal description of their model in note form. These notations are summarized as follows:

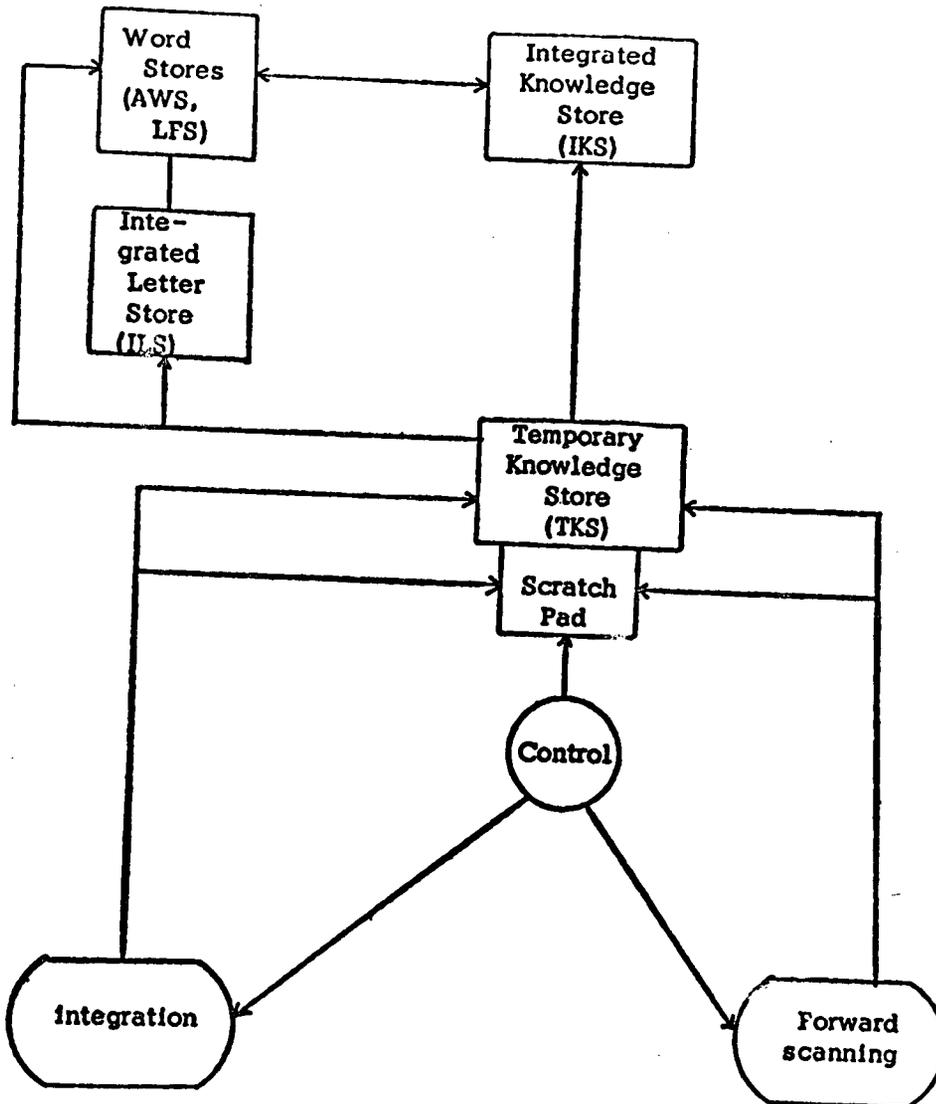


FIGURE 8

VENEZKY AND CALFEE'S SCHEMATIC
OF READING MODEL

- IKS (Integrated Knowledge Store): contains the most stable knowledge that the reader has: how reading works, sentence types, knowledge of the real and imaginary worlds, etc.
- ILS (Integrated Letter Store): contains, for the mature reader, stable information--information on letters and letter expectancies.
- TKS (Temporary Knowledge Store): contains integrated information about what is currently being read, obtained from the Scratch Pad Store (also part of the TKS).
- SPS (Scratch Pad Score): contains data needed to analyze either the current LMU being integrated or the next LMUs.
- AWS (Associative Word Store): contains the most frequently encountered words and word parts with strong linkages to their semantic and syntactic functions, and to their pronunciations.
- LFS (Low Frequency Store): contains words that do not fit the AWS. (56:277-78)

Venezky and Calfee emphasize that their model has been developed with heuristic intent. They explicitly set out the hypotheses suggested by their model and state that each of these hypotheses should be tested. They also freely allow that verification of their model will result in revisions as new evidence comes to light. While recognizing the difficulties involved in investigating "processes... internal to the subject," they suggest research to answer such questions as whether the three stages of the reading process which they postulate actually exist and, if they do, how they operate. They also suggest research designed to determine whether or not the components of their model listed above exist. Put simply, Venezky and Calfee are not satisfied

to create a model and to leave it; they realize that model building provides a starting point for further experimental investigation.

Similarities between Goodman's model and the model of Venezky and Calfee are immediately apparent. Both models view comprehension as the output of a communication system and printed language as the input. And both models seek to explain the intervening processes between this input and output. More particularly, both models envision comprehension as based on a dynamic sampling process whereby the reader tentatively tests his choices of meaning against information which he brings to the selection stores in his memory. This process is presented in each model as involving both forward scanning and regressive movements as the reader tests his speculations concerning the meaning of the message being decoded. The key to both models therefore lies in their notion of decoding. Neither model extends beyond the simple acquisition of the message to include critical or evaluative response. The two models differ, however, especially in Goodman's seemingly more elaborate accounting for linguistic and perceptual functions. However, Venezky and Calfee indicate, in the questions they raise relating to the verification of their model, certain doubts

which they entertain with respect to its construction. These questions contain within them the seeds for further research, while Goodman's somewhat vague statement that his model is inadequate to explain fully the complexities of the reading process is lacking in this regard.

The Ruddell Model

Ruddell (45) presents a systems of communication model founded upon a concept of language processing. His model encompasses all aspects of psycholinguistic competence including speech, listening, reading, and writing. However, Ruddell does provide an explicit definition of reading as it is theoretically conceived and represented in his model:

[Reading is] a complex psycholinguistic behavior which consists of decoding written language units, processing the resulting language counterparts through structural and semantic dimensions, and interpreting the deep structure data relative to an individual's established objectives. (45:239)

Ruddell's debt to generative transformational grammar is immediately apparent from this definition. Ruddell's model is further based upon an attempted consolidation of research related to decoding and comprehension. This consolidation is embodied in a performance model expressing the relationships which he hypothesizes to exist among the various psycholinguistic factors operating in the communication process.

Ruddell's model, shown here in Figure 9, is presented as a flow diagram illustrating either the decoding of auditory and visual input or the encoding of oral or written output, depending upon the direction of flow. The decoding process during reading begins with visual input. From this point on, the message is processed through three interacting levels based on Ruddell's understanding of Chomsky's model of generative transformational grammar (45). At the first level, the surface structure of the communication is processed through the graphemic, morphographemic, phonemic, and morphophonemic systems. The second level involves structural and semantic processing as language is interpreted. This level also comprises the various transformations and rewrite rules along with short term memory and the individual's mental dictionary of semantic readings. The third level involves interpretation of the deep structure meaning of language. Here are activated semantic interpretation, structural and semantic markers, and long term memory. Structural and semantic markers are generated by the semantic interpretation system which integrates the structural and semantic components of a sentence. They operate in feedback lines and are stored in long term memory.

Besides these three systems, Ruddell's model also

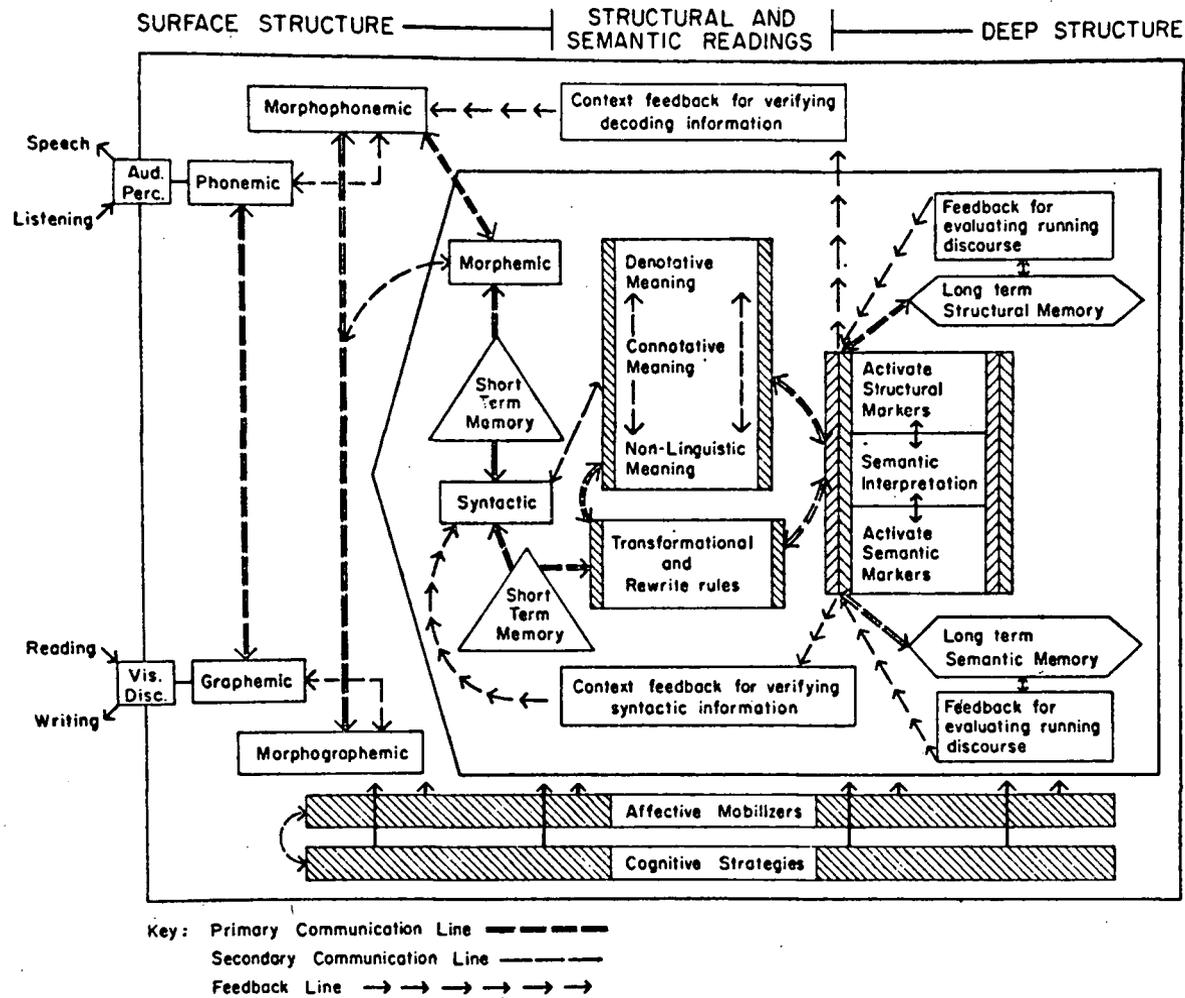


FIGURE 9

RUDELL'S SYSTEMS OF COMMUNICATION MODEL

includes affective mobilizers and cognitive strategies which are in constant interaction with each phase of the model. Affective mobilizers are made up of the individual's interests, attitudes, and values and become activated as goals and objectives in the communication process. Cognitive strategies are determined by an individual's objectives and represent his approach to the task of language processing.

Ruddell further illustrates the functioning of his model by tracing the reading act through it. The process of decoding is initiated by input in the form of visual stimuli. These stimuli activate the reader's knowledge of the language code along with one or more subsystems in accordance with his objective and cognitive strategy. An attempt is made to decode the message employing phoneme-grapheme relationships. If this fails, sound-spelling clues at the morphographemic and morphophonemic levels can become involved. Other systems, such as context feedback from the deep structure level may be activated during the decoding process. Ruddell notes that, in the case of mature readers, decoding at the surface level may be minimized as these readers proceed directly to a morphemic level. At the next level of language processing, the short term memory is activated as the sentence being read is "chunked" by the

syntactic system, and the sentence is processed by the transformational and rewrite rules. Once the sentence has been rewritten in its most basic form, the semantic aspect of the model is activated. Morphological meanings are selected from the denotative, connotative, and non-linguistic components of the reader's mental dictionary. Structural and semantic meanings in the sentence are then integrated through the semantic interpretation or projection rules and the meaning of the sentence is determined. Concurrently, the appropriate semantic and structural markers are attached and stored in long-term memory. Hence, as the reader encounters new sentences in the discourse, they are processed in the same manner. Information which has been stored in the long-term semantic and structural memories is activated to the semantic-interpretation level as an aid to the evaluation of discourse in terms of the reader's objectives (45:252-55).

Ruddell's model presents a highly integrated psycholinguistic description of the reading process. Reading comprehension is viewed as the end product of language processing, the stimulus for which is visual input. Unlike Goodman, and to a lesser extent Venezky and Calfee, Ruddell does not include in his model a description of the visual scanning

process which these other theorists suggest is involved in comprehension. The model begins with the reception of visual stimuli on the brain and the operations described by the model are those which follow this reception. No attempt is made to describe the scanning process. Ruddell might be excused from this omission, however, since he proposes a model for both decoding and encoding messages received and transmitted through all the media involving psycholinguistic processing and not just reading. At the same time, it may be argued that such an excuse points to the inevitably cumbersome nature of a model which seeks to be this inclusive. Another feature of Ruddell's model is that, like the models of Goodman and Venezky and Calfee, reading is envisioned as a decoding process. No consideration is given to the critical and evaluative aspects of reading which these theorists would probably argue lie beyond the scope of a model of the reading process.

The Holmes and Singer Model

Holmes and Singer develop a statistically-determined model by which they attempt to explain the entire act of reading. Their model was originally enunciated by Holmes (24) and since that time has served as the basis for a growing body of research and as the focal point of continued

discussion. An outline of the model as it relates to reading comprehension will be given here along with a sampling of authoritative reaction to it.

Holmes recently provided an extensive description of the assumptions underlying his model and the statistical technique upon which it is founded (23). This technique, called "substrata factor analysis," represents an extension of the Wherry-Doolittle multiple correlation selection method to include successive levels of analysis. Holmes describes the technique as follows: "...a substrata analysis sequentially prorates some part of the 'explained' variance in the criterion, initially allocated to Level I, to the undergirding substrata factors at Levels II, III, etc." In this manner, a hierarchy of substrata factors is produced at successive levels from a pool of tests representing various abilities which previous research has shown to be related to reading. Thus the substrata analysis "yields the direct and joint contribution which each of the selected variables, now called substrata factors, makes to its immediate criterion" (23:14-16).

Holmes explains the logic of substrata analysis on the basis of two assumptions. In the first instance, he states that a substrata factor is composed of "an organized

system of subsystems." In turn, each subsystem is made up of increasingly smaller systems until "the very micro-systems constitute tiny engram-assemblies of the cortical cells themselves." Hence:

The cognitive-conative complex of the brain is thought of as constituting a cosmos of ability subsystems which, under the guidance of an individual's long-term value system, immediate purposes, and requirements of the task at hand, become dynamically mobilized into a working system. (24:21)

In this way Holmes postulates "a mutual and reciprocal relationship between the psycho-educational and neuro-physiological components of the mind-brain contraplex." The second assumption upon which the substrata factor theory is based is that, for a correlation to have "psycho-educational meaning," it must:

...reflect the mean mutual interaction of two sets of scores which, in turn, represents the dynamic interplay of two working systems, a system with one of its subsystems, or between two subsystems. (24:21)

Hence, for Holmes, a test score represents "an integral function of the conjoined constituents producing that score" (24:21-2).

It is the structural relationships existing within working systems that the Holmes and Singer model seeks to illustrate. As indicated above, the substrata factor theory postulates that a test score is the product of a complex

cognitive process involving the mobilization of a number of subsystems in the brain. These subsystems are integrated into a unique working system in response to the specific task presented by the test. And the nature of this working system can be described statistically using the Wherry-Doolittle-Holmes method. In this way, the Holmes and Singer model is statistically based. But it can also be illustrated graphically or be represented concretely. These possibilities are recognized and acted upon by Holmes:

...if one were to focus his attention on any one of these areas of rich psycho-educational associations of highly related concepts as a criterion, say reading, then a hypothetical solid angle might be constructed in a three-dimensional space within which the supporting substrata-factor subsystems would statistically behave as if they were ordered in a well-defined hierarchy or working system. (24:25)

It is this "as if" thinking which constitutes the essence of model building and which produced the Holmes and Singer model shown in Figure 10.

With the structure of the substrata-factor theory illustrated by the model, it simply follows to place the appropriate values derived from substrata factor analyses at the corresponding points in the model. Holmes is careful to emphasize that these analyses yield "first approximations" only in quantifying the relationships hypothesized by the theory. He makes his point by stating that "in lieu of a

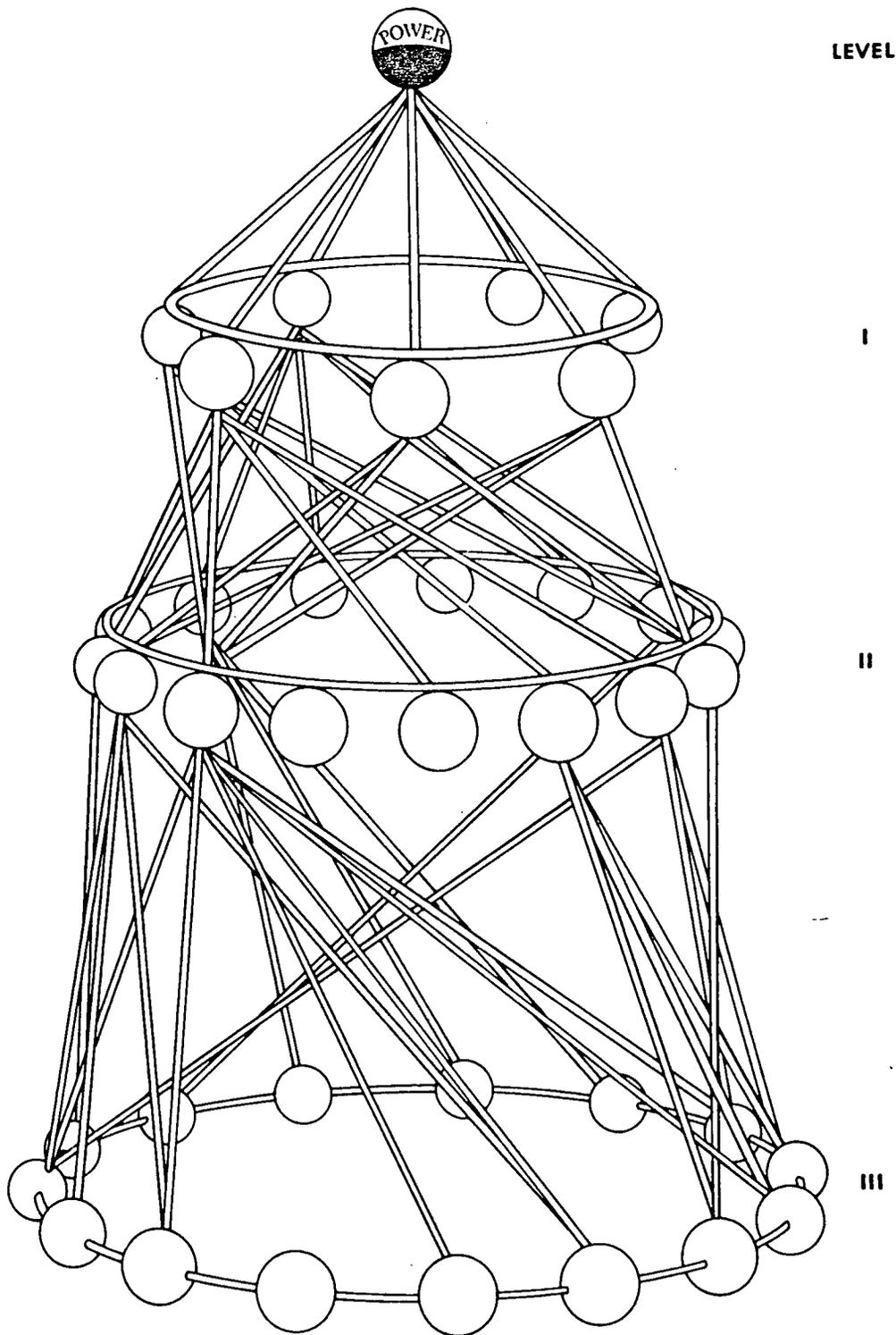


FIGURE 10

HOLMES AND SINGER'S MODEL OF A WORKING SYSTEM

statistical test of significance beyond the first level of analysis, students of the substrata-factor theory have placed their confidence in replicability" (24:16). He goes on to note that these needed replications have not been forthcoming thus far.

The concept of reading underlying the model has been defined by Singer as "an audio-visual verbal processing skill of symbolic reasoning" (49:157). The act of reading is viewed as being composed of two parts, "speed of reading" and "power of reading." Speed and power are, in turn, hypothesized to be made up of working systems built of hierarchies of contributing substrata factors. Within this construct, comprehension is defined by Holmes as occurring when "coded audio-visual and kinesthetic impressions derived from the description of concrete objects are reassembled in the mind" (25:10-11). And comprehension is subsumed within the working system designated as "power of reading," the operation of which Holmes describes as follows:

...as a result of the heightened cerebral activity engendered by increased concentration, conceptual abstractions are wrought by the process of comparing and contrasting the incoming information with relevant information already stored from past experiences....

(25:12)

Hence, according to Holmes, comprehension takes place when information input occurs and the incoming information is

deposited in the mind. But at the same time, this information is processed by the mind and this processing, as described in his working system model, is power of reading. Thus, what Holmes calls power of reading appears to include what is more generally referred to as comprehension, that is the input and integration of information presented in written or printed form. Singer elucidates this point:

In essence, the substrata-factor theory of reading is an explanation of the development and dynamic functioning of an intellect that is increasingly able to transform symbolic stimuli into meaningful mental processes, and they purposefully interrelate these processes by various mediational systems in order to efficiently and effectively comprehend and react to the thoughts of another person as expressed in his writing. (47:43)

In an attempt to illustrate their model, Holmes and Singer and their students have conducted a number of experimental investigations of substrata factors mobilized during reading. The first of these studies, carried out by Holmes (24), involved college students. It was designed to determine the relationship between speed and power of reading and over forty measures of abilities arranged under the topics of intelligence, linguistic abilities, oculomotor abilities, and personality traits. Since this discussion is concerned with comprehension, only those findings relating to power of reading will be presented here. Holmes found that 68 percent of

the variance in power of reading was accounted for by thirty-seven substrata factors. First order factors were determined to be: vocabulary in context, 39 percent; intelligence, 27 percent; perception of verbal relations, 8 percent; fewer fixations per one hundred words, 4 percent; and unaccounted for variance, 22 percent. Six other abilities were found to underlie these four first order abilities at the second and third levels.

A similar study conducted by Holmes and Singer at the high school level has been reported by Holmes (25). In this study, substrata factors underlying power of reading were determined by the administration of fifty-six separate tests to four hundred students. Under power of reading, Holmes and Singer were able to account for 75 percent of the variance distributed among seven first level abilities: vocabulary in context, 16 percent; mechanical interest, 1 percent; study planning and deliberation, 1 percent; visual verbal meaning, 6 percent; verbal analogies, 16 percent; auditing ability, 16 percent; tone intensity, 3 percent; and vocabulary in isolation, 16 percent. The remaining substrata factors were explained as being mobilized at the second and third levels.

At the elementary level, Singer (47) has conducted a series of studies involving pupils in grades three through

six. Singer's analysis reveals what he claims to be a developmental change in the substrata factors contributing to power of reading over these grades. It should be noted, however, that different subjects were used at each grade level, and that a longitudinal study of the same pupils over the four grades might well have revealed different findings. Singer also compares his findings at the grade six level with those earlier ones of Holmes (24) and of Holmes and Singer (25) outlined above. Here he admits that his comparisons can only be suggestive since the tests used in the various studies differed as did the subjects. He does insist, however, that his own investigation coupled with those of Holmes strongly suggest "a kinesthetic-auditory-visual gradient shift accompanying development of a general reading ability" (49:164).

Among reading authorities, the substrata factor theory and the model used to represent it have come under serious scrutiny and not a little criticism. Robinson (43:27), Raygor (41:149), and Clymer (12:13) have all noted that the findings of a single substrata-factor analysis are determined by the criterion measures and test battery used. Hence, different tests ostensibly measuring the same abilities would quite likely produce different results. This

problem is complicated by Sparks and Mitzel's observation that to assume perfect test validity is naive. They note that "tests may be intercorrelated because part of the variance in each is due to factors irrelevant to the particular labels one assigns" (52:142). The question of correlation adds another qualification to Holmes and Singer's theory. Clymer (12:13) and Raygor (41:149) both point out that, though measures vary with respect to each other, causation cannot be assumed from this correlation.

Holmes' statistical procedures have been challenged by Sparks and Mitzel. They maintain that it is incorrect to attempt to determine the proportions of variance in a criterion accountable for by separate predictor variables (52:139-140). They also question the legitimacy of assuming that the variables remaining in the pool after the determination of the initial regression equation constitute the best predictors of variance in first level variables. They support their question by observing that the remaining variables were not placed in the pool with the intention of predicting the criteria for which they were used. Sparks and Mitzel conclude by charging that "no theoretical basis is offered for measures on criteria tests 'affecting' the criterion test through their influence on measures on other

tests" (52:142). Another authority to question the statistical validity of second and third level variables is Wark who speculates whether these variables are not a "mere reshuffling of error variance, unrelated to the major criterion" (57:163). Raygor wonders whether the identification of second and third level variables, assuming they exist, gives any more information than the initial level of prediction. He further warns that, "to go beyond the point where additional tests add anything significant to prediction runs a very grave risk of getting into an over-elaboration of the relationships among testing errors in the criterion and in the predictors" (41:148-9).

Perhaps the most telling criticism of the model comes from those who dispute the validity of accounting for cognitive operations on the basis of statistical relationships derived from test scores. Although, as Sparks and Mitzel (52:143-4) have noted, Holmes quotes from sources dealing with the brain and its operation, he takes what can only be described as an immense leap of faith by equating this "neurological evidence" with the statistical evidence which he claims can be derived using the substrata-factor analysis. In response to this, Raygor observes that "to talk about the relationships among test scores is not the

same thing as talking about the structure of the human brain" (41:149). And Wark asks, "How can statements about an individual's momentarily shifting cognitive activity logically be supported by data from a single test?" (57:163)

The doubts which questions such as these raise about the substrata-factor theory are hardly allayed by those commentators who question whether Holmes has presented a theory at all. This criticism is grounded upon the contention that Holmes has not formulated testable hypotheses based on his theory and hence the theory and Holmes' model are incomplete. For this reason, Sparks and Mitzel dismiss Holmes' theory as "exploratory ideas" which "must be considered just that and nothing more" (52:138). Both Clymer (12:13) and Raygor (41:149-150) support this criticism, and Goodman states flatly that the substrata-factor theory "is not a theory at all, but rather an artifact of manipulation of statistics generated by a set of reading tests" (16:15).

Singer has met these latter criticisms by contending that "testable hypotheses are not inherent within the theory or model alone," but, rather, they emerge from the meeting and commingling of the theory or model with "the imaginative, logical, critical, and knowledgeable mind of the researcher" (49:151). It would seem that Singer implies that the minds

of his critics are deficient in these requisite qualities. At another point, however, Singer states that the investigations of reading based on the substrata-factor theory have produced "empirical models" and represent "research to test hypotheses of the substrata-factor theory of reading." Furthermore, Singer maintains that these investigations have produced "evidence on psychological factors associated with development of speed and power of reading" (49:174). Exactly how these investigations have accomplished this beyond demonstrating the procedural aspects and statistical workings of substrata analysis remains unexplained.

These comments all indicate the something less than universal acceptance with which the substrata-factor theory has been greeted. It would seem that Holmes' leap from a statistical model of reading performance to a theory of cognitive operation both reverses the usual progression of scientific inquiry and presents the greatest obstacle to accepting his theory. This is particularly so since he fails to provide explicit hypotheses which would allow for the verification of his theory and the model through which it is expressed. The method whereby the statistical model was developed is itself a subject of controversy, and until this is resolved, one can only view the model and the findings of

investigations ostensibly based upon it with scepticism.

EVALUATION OF COMPREHENSION MODELS

After analyzing these various models of reading comprehension, one can sympathize with Robinson who, following a review of reading models, found "sharp differences which appeared to defy efforts at reconciliation" (43:23). Robinson explained this confusion on the basis of the model's failure to distinguish among the process of reading, the skills and abilities demonstrated while reading, and the procedures used to teach reading. A similar conclusion is reached by Jenkinson in her review of model building in reading:

The intellectual, dynamic activity of the reading process has been confused by linking this with the techniques and skills which need to be acquired in the 'learning to read' process. In addition, the learning and teaching activity are rarely examined independently.
(28:58)

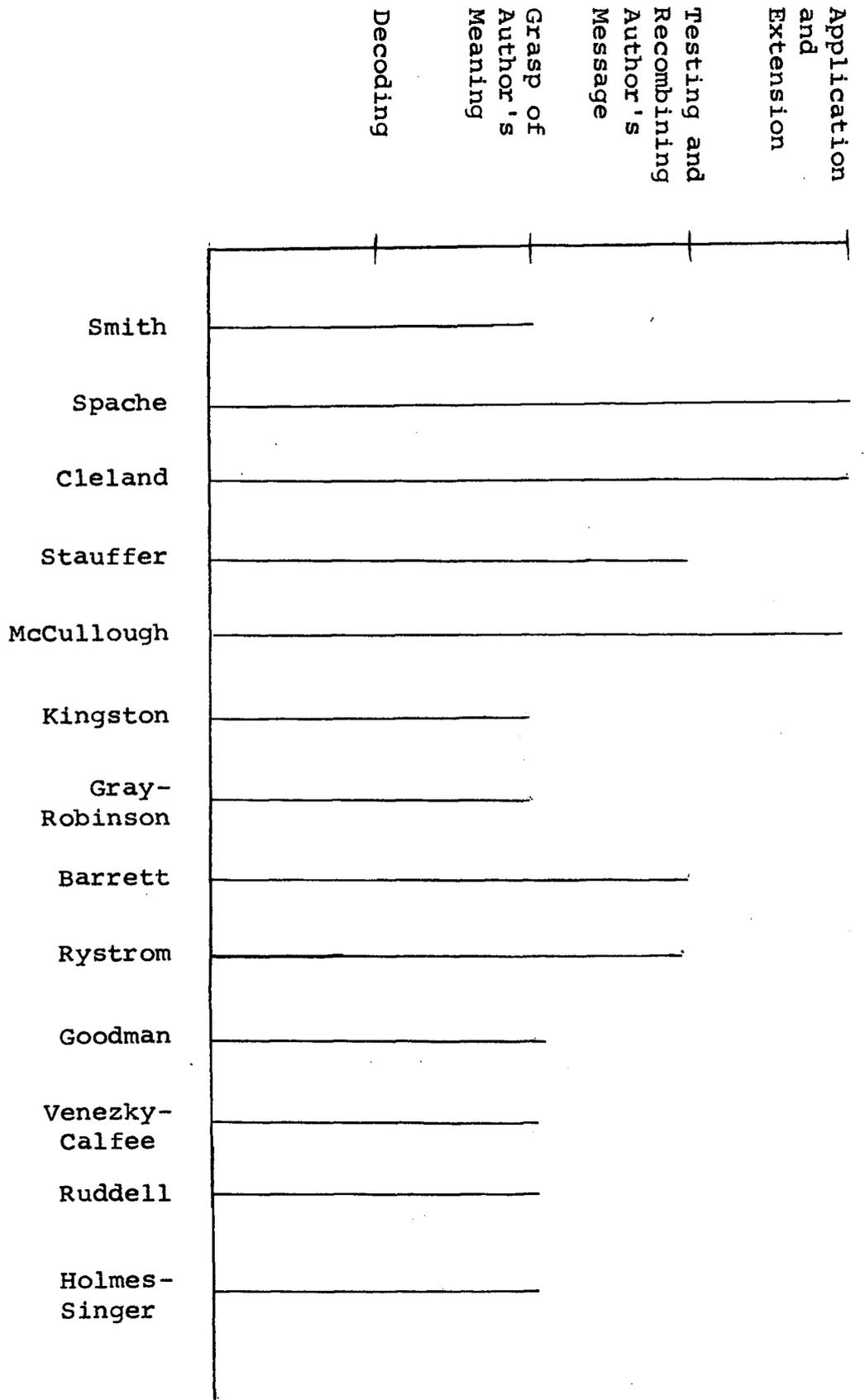
Simply stated, these authorities are saying that, although a large number of models have been subsumed under the heading "reading", what these models in fact represent varies greatly.

A similar conclusion is reached by an examination of models of reading comprehension. The Gray-Robinson model is essentially concerned with the skills necessary for

effective comprehension. Barrett aims at setting out the instructional objectives necessary to teach comprehension, while Kingston is concerned with illustrating some of the external influences which can affect comprehension. Models have been presented by Rystrom, McCullough, Cleland, Stauffer, and Holmes and Singer, all of which attempt to illustrate the cognitive operations involved in comprehension. Spache and Smith combine overt skills and covert cognitive operations in their models. The more recent models of Goodman, Venezkey and Calfee, and Ruddell combine linguistic and psychological theory to produce psycholinguistic models.

Besides approaching comprehension from different points of view, different model builders include varying ranges of activity in their models. Clymer (12:29) has provided an outline of different "reading outcomes" and the extent of agreement concerning them among authorities. His four categories are adopted here in order to provide a similar estimate of the extent to which comprehension model builders agree concerning the activities included in their models. Figure 11 reveals that a wide range of activity is represented by these models as a group, but only limited agreement exists among individual models concerning the activities they should include.

Reading Outcomes



Authors of Models

FIGURE 11

READING OUTCOMES INCLUDED IN COMPREHENSION MODELS

The result of these differences among models is confusion, especially when their comparative evaluation is contemplated. Ideally, all models of comprehension would explicitly delineate one aspect of comprehension, whether it be the skills performed, the instructional procedures for teaching comprehension, or the cognitive operations involved. This ideal situation would allow for the evaluation of comprehension models from two points of view. First, comparisons could be made among models of the same aspect of comprehension with respect to their relative success in portraying the aspect of comprehension concerned. And second, the models themselves could be evaluated in the abstract--that is as models irrespective of what they were modeling. (It is of course recognized that, in this ideal situation, the evaluation of a model would proceed from a close interaction of these two points of view.) As has been demonstrated in the review of models, such an ideal situation does not exist, however. For this reason, the models of comprehension reviewed here will be evaluated individually--that is, as models in the abstract--rather than on a comparative basis. Hence, the criteria used for this evaluation will be those applicable to the evaluation of models in general. These criteria have been developed above on the basis of the review of

scientific discourse concerning model construction. They are: Articulation, Differentiation, Prediction, Creativity, and Flexibility.

Articulation

Among the models of comprehension discussed above, some have a higher level of articulation than others. One of the deciding factors appears to be the form in which the models are presented. Verbal presentations alone are generally not as effective as verbal plus pictorial presentations. Cleland and Stauffer, for example, present their models verbally, and these models are lacking in the structural and symbolic precision necessary for effective articulation. Vagueness in articulation also inhibits the models of McCullough and Rystrom, however, despite their use of visual presentations. In the case of McCullough, this vagueness results from the imprecise manner in which she illustrates relationships among the elements in her model. Rystrom, on the other hand, uses unelaborated general terms to describe the elements in his model with the result that the exact nature of these elements remains unclear.

Greater clarity in articulation is shown by the models of Smith and Spache. Both of these models are based upon Guilford's portrayal of the structure of intellect and hence

derive much of their precision from this source. The adaptation of Guilford's model also provides for a more orderly outline of the skills described by Smith and Spache. The Gray-Robinson and Barrett models are clearly articulated, primarily because they deal with more easily described overt behavior. Similarly, Kingston's model is clearly articulated since he is concerned with more readily identified external factors which influence comprehension. The Holmes-Singer model is well articulated as far as it goes. However, it is lacking in its failure to demonstrate the relationship between substrata factor analysis and psychological and neurological functioning. The most well-articulated models are the psycholinguistic ones of Goodman, Venezky and Calfee, and Ruddell. Here, pictorial representation in the form of flow diagrams are combined with verbal descriptions to produce clear delineations of the elements and relationships present in the theories under consideration. These models demand pictorial representations to make explicit the highly complex multi-dimensional processes they depict. The only qualification in this appraisal must be aimed at the occasional vagueness in Ruddell's model. This seems due to his attempt to deal with the whole of psycholinguistic activity rather than that activity related specifically to reading.

Differentiation

As might be expected, well-articulated models also tend to be clearly differentiated. It has been seen that the models of Cleland, Stauffer, McCullough and Rystrom are not well articulated. Correspondingly, they are not well differentiated. In examining these models, it is felt that one is simply witnessing the restatement or elaboration of a theory rather than having the structure of a theory clarified. That is to say, there is no essential difference between the theory and the model. Stating progressive steps in the process of comprehension scarcely provides sufficient structural illumination to warrant the appellation of model to these four presentations. And this is true despite the use of pictorial representations by McCullough and Rystrom.

The use of pictorial representations can aid in differentiating a model, however. Smith and Spache both succeed in illustrating the structure underlying their theories of comprehension by using tabular descriptions to augment their verbal ones. Similar presentations are given by Gray and Robinson and by Barrett, and these models are distinguishable from the theories they represent. Kingston's graphically presented model is also differentiated from his theory and helps to illuminate the structural properties of the theory.

Holmes and Singer employ both graphical two-dimensional and concrete three-dimensional models to explicate their theory. Finally, the psycholinguistic models with their high level of articulation are also clearly differentiated from the theories upon which they are based. Again, it is the precise nature of their pictorial representations coupled with verbal descriptions which provides for their vivid articulation and distinct differentiation.

Prediction

For the full predictive capability of a model to be realized, the elements and relationships represented by the model must be quantified and the calculus of operation for the model developed. It can be said categorically that such a level of prediction has not been achieved by any of the extant models of comprehension. Holmes and Singer probably would claim that their model, being "statistically based," is quantified. But this claim points to the fundamental problem facing researchers who would validate comprehension models. The factors contributing to reading ability in the Holmes-Singer model may be quantified to the extent that they can be isolated by test scores, but the relationships among these elements and the processes they perform are not quantified and therefore cannot be predicted. It is the

covert aspect of comprehension that for the moment defies the development of testable hypotheses. The very elements identified in the most clearly articulated and vividly differentiated models are in most cases only speculations. These models are analogues which represent but do not duplicate nature. What goes into these models (the text being read) and what comes out (an understanding of the text) replicates reality, but the intervening process is represented in a more abstract manner. The features of these models are not necessarily isomorphic with nature and therefore impossible to quantify for validation against natural phenomena.

Those models which represent the overt aspects of comprehension lend themselves more readily to quantification and prediction. The skills represented by the models of Smith and Spache may be identified and measured although their relationship to the cognitive operations from which they hypothetically result is less easily determined since these cognitive operations are covert. The skills models of Gray and Robinson and Barrett lend themselves to quantification as does the model of Kingston. The fact remains, however, that these models have not been quantified and the hypotheses stemming from them stand untested. Until these models are

verified, the veracity of their portrayals of nature remains in question.

Creativity

A wide range of creativity exists among models of comprehension. Cleland and Stauffer, for example, range far and wide over psychological theory before developing models which represent little more than a reshuffling of this theoretical speculation in a relatively inarticulate, poorly differentiated, and untestable manner. Similarly, Kingston gathers together a body of well-known information and rearranges it to formulate a model which provides little new information. The skills models of Gray and Robinson and Barrett also are lacking in creativity. With respect to the Gray-Robinson model, it seems fair to state that, in being limited to skills, the model is deficient in not coming to terms with the cognitive operations accompanying the performance of these skills. Barrett does little more than present another hierarchically arranged group of comprehension skills, the taxonomic nature of which remains unsubstantiated.

The bringing together of disparate elements to explain comprehension has been well managed by a number of model builders, however. Counted among this number are Smith and Spache. The singular contribution of their models is that

they have related specific skills to specific cognitive behaviors. McCullough and Rystrom both represent precursors (in conception if not in chronology) of the psycholinguistic models. Their models conceptualize the linguistic and ideational fluency which underlies the models of Goodman Venezky and Calfee, and Ruddell. These latter model builders have made a major contribution by integrating current linguistic knowledge with relevant concepts of perception and cognition. Here, truly masterful combinations of disparate elements have been accomplished in cogent models. Finally, it must be admitted that the Holmes-Singer model is highly creative in its representation of an equally creative theory.

Flexibility

Flexibility can be a mixed blessing in model building since it accommodates both folly and fecundity with indiscriminating ease. The only inflexible comprehension models are those of Smith and Spache. Their dependence upon the Guilford model seems to dictate a somewhat rigid adherence to Guilford's concept of the structure of intellect, and to the corresponding placing of skills according to this structure.

The flexibility of the Cleland, Stauffer, McCullough, and Rystrom models derives from their poor articulation and

differentiation. These models are so loose in their initial formulations that they may be altered quite easily without any disruption of what little structure they illustrate. The Kingston, Gray-Robinson, and Barrett models all display flexibility in that newly discovered skills and external influences can be integrated into them without significant structural disruption. The most constructive and heuristically promising examples of flexibility exist in the psycholinguistic models. These models provide structures to which elements may be added and in which new relationships may be delineated. In this way, as new evidence is discovered, these models can be further refined. The Holmes-Singer model, while very rigid in its depiction of working systems determined through substrata-factor analysis, provides for different substrata components at the various levels of these working systems. Hence, though the structure of the model is rigid, flexibility exists in the components which may fit into this structure.

Overview

This evaluation of the models is summarized in Table III. Here each model is evaluated against each of the five criteria to determine the extent to which the model meets each of the criteria to a "low", "moderate", or "high" degree.

TABLE III
EVALUATION OF COMPREHENSION MODELS

	Articulation	Differentiation	Prediction	Creativity	Flexibility
Smith	0	+	0	0	+
Spache	0	+	0	0	-
Cleland	0	-	-	-	+
Stauffer	0	-	-	0	0
McCullough	0	0	-	+	+
Kingston	0	+	+	-	0
Gray-Robinson	0	0	0	0	0
Barrett	+	0	0	-	0
Rystrom	0	-	-	0	+
Goodman	+	+	-	+	+
Vanezky-Calfee	+	+	-	+	+
Ruddell	0	+	-	+	+
Holmes-Singer	0	+	-	+	0

+ : criterion satisfied
0 : doubtful whether criterion satisfied
- : criterion not satisfied

It is freely admitted that this somewhat arbitrary procedure can only approximate the status of each model. But it is felt that such a procedure is useful in providing a concise summary of the verbal evaluation of the models which has been undertaken.

ASSESSMENT OF MODEL BUILDING

This review and evaluation of comprehension models illustrates a wide range of model development. It would appear that, while model building continues with increasing vigor and more refined models are presented, none has provided the desired definitive explanation of comprehension. Yet, while models have not solved the problem of defining comprehension, they have served to mirror more clearly its intricacies.

A fundamental question relates to the basic approach taken to defining comprehension. While model builders have approached their task in many different ways and have enjoyed varying degrees of success, the basic issue of which approach to take in defining comprehension remains unresolved. Is comprehension most effectively explained by models depicting the overt behaviors which demonstrate understanding? Or is comprehension to be understood most clearly by models based

on instructional procedures designed to encourage its development? A third approach has been to provide models which postulate the cognitive operations involved in comprehension. Where this latter approach has been taken, divergence appears with respect to the cognitive operations that should be considered. In some models, strictly psychological components are included. In others, linguistic considerations have been added to produce psycholinguistic models. In terms of their components and construction, these psycholinguistic models may be the most promising since they include and integrate elements which intuitively seem involved in comprehension.

It must be remembered that, when any two models approach a definition of comprehension from the same point of view, differences between them indicate differences between the model builders' insight into their problem rather than differences in the nature of comprehension. Reflection on this point will soon reveal the wide range of opinion within any one approach to defining comprehension. Although the same route is taken by different model builders (for example, the cognitive operations involved in comprehension), the destinations reached usually differ. An ancillary question here relates to the problem of boundaries. Some models include

within their definitions of comprehension a full spectrum of behaviors ranging from visual scanning to critical reaction. Most models concentrate near one or the other end of this spectrum. The basic question of when comprehension begins and when it ends has not been answered. Until it is answered, the components contained within various models of comprehension are bound to differ.

Given these limitations, one may question the utility of model construction at all. The value of models lies in that they represent a stage in scientific inquiry between theoretical speculation and scientific experimentation. Lack of specificity has plagued verbal descriptions of comprehension. The more rigorous intellectual discipline imposed by well-constructed models provides greater precision in theoretical statements about comprehension. Model builders, by the very nature of their task, are forced to be explicit in stating their conceptualizations. This explicitness in turn provides for self-criticism as well as the critical responses of others. Through this process of conceptual refinement, hypotheses can be provided to explain the significance of existing empirical data, and to provide the basis for further experimental investigation. In this way, comprehension models can be modified and finally validated as they come into closer

conformity with nature. When this conformity has been achieved, comprehension will be understood.

Considered in these terms, the apparent reluctance of model builders to undertake the validation of their models is unfortunate. It would seem that these theorists have been content to construct models and then to leave them, apparently fearful that any attempt at validation can only bring disillusionment. But disillusionment is grist to the mill of scientific progress. Given the difficulties in measuring the covert processes involved in comprehension, it is still incumbent upon researchers to seek ways to test at least the more easily accessible hypotheses suggested by their models and to modify them according to the findings of these investigations. It is also incumbent upon model builders to demonstrate that their models account for known research data. Little utility can be derived from models which either ignore or violate empirically-derived findings concerning comprehension. Only in these ways can the value of models in facilitating the scientific investigation of reading comprehension be fully realized.

SUMMARY

The need for models in reading has been recognized with increasing frequency over the past decade. Yet one of

the fundamental problems in adopting models to the explanation of reading comprehension is confusion regarding their exact nature. A model may be described as a separate symbolic system which illustrates the structure of a theory. Three basic kinds of models exist--scale, analogue, and theoretical models. Criteria for the evaluation of models may be defined as articulation, differentiation, prediction, creativity, and flexibility. A number of different models of reading comprehension has been proposed over the past decade. When these models are described and evaluated, they are found to reflect many of the problems illustrated by other attempts to explain the nature of reading comprehension.

The definitions of reading comprehension presented by the models reviewed in this chapter may be summarized as follows:

1. Comprehension involves a number of separate overt skills which reflect a coherent psychological whole.
2. Comprehension is describable in terms of a hierarchical organization of educational outcomes.
3. Comprehension is influenced by a number of external factors which affect its attainment.

4. Comprehension is a cognitive process including a series of mental operations which may be described in a number of different ways.

5. Comprehension is a highly complex cognitive process involving the psychological processing of language.

This summary reveals distinct similarities between definitions of comprehension embodied in models and the verbal definitions of comprehension discussed in the previous chapter. Models of comprehension generally divide themselves between those portraying overt behaviors attesting to comprehension, and those postulating the covert cognitive activity producing comprehension.

It would seem that the major contribution of models to the definition of comprehension is the additional precision which they provide. One suspects that this precision has accommodated the development of the psycholinguistic models particularly. Despite increased precision, however, models of comprehension are only a beginning stage in the scientific process that they are meant to nurture. These models all provide hypotheses. At present, the nature of the hypotheses renders many of them untestable. However, this apparent cul-de-sac should not discourage researchers from endeavouring to develop testable hypotheses whereby the validity

of their models may be determined. It is only then that the veracity of the concepts of comprehension which models embody may be determined.

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Chapter 6

OVERVIEW OF DEFINITIONS OF COMPREHENSION

The purpose of this chapter is to bring together the various definitions of comprehension outlined in the previous three chapters. This is done in order to provide a basis for the analysis of the concepts of comprehension contained within the professional textbooks, instructional materials, and published tests discussed in the next three chapters.

It has been shown that knowledge regarding the nature of reading comprehension derives from three principal sources: experimental investigations, verbal descriptions, and models. The definitions of comprehension which these sources provide have been analyzed and summarized in the relevant chapters. It has been seen that, in many instances, these definitions lack the precision and fail to establish the inclusiveness and exclusiveness which should characterize fully-developed definitions of comprehension. For these reasons, some definitions may be more accurately identified as descriptions despite the fact that their authors usually offer them as definitions. However, while recognizing their

limitations, these partial and somewhat tentative definitions have been included under the various categories of definitions of comprehension developed in this study, thereby permitting comparisons among a large number of individual definitions and affording the analysis and evaluation of these definitions.

A further consideration of the definitions of comprehension outlined below relates to differences among the sources from which these definitions come. Experimental investigations are concerned with studying comprehension directly. For example, factor analysis and introspective-retrospective verbalization are two devices by which investigators have explored directly the nature of comprehension. Therefore, experimental definitions of comprehension are founded on directly derived knowledge. However, verbal definitions of comprehension are expressions of knowledge derived from usually unspecified sources and formulated in the mind of the author. For this reason, verbal definitions are less direct sources of knowledge than experimental definitions. The knowledge of comprehension deriving from models issues from the hypotheses concerning the nature of comprehension which these models embody. Hence, this knowledge, like that contained in verbal definitions is

indirect rather than direct. For this knowledge to become direct, it must be verified by experimentally testing the hypotheses suggested by the models.

A final observation on the overview presented below is concerned with the fact that the definitions of comprehension included are in some cases inconsistent and conflicting. These inconsistencies and conflicts, when they occur, represent unresolved controversies concerning the nature of reading comprehension in which there is evidence for both sides.

With these observations, an overview of the present state of knowledge concerning reading comprehension may be represented as follows:

1.00 Comprehension as defined by experimental investigations.

1.10 Comprehension as defined by statistical analyses.

1.11 Comprehension is a unitary mental ability having no distinguishable subskills.

1.12 Comprehension is a composite of a number of subskills, the two most commonly found being interpreted as word knowledge and reasoning.

1.20 Comprehension as defined by studies of its specificity.

1.21 Comprehension is to a greater or lesser extent specific to the content material being read.

1.30 Comprehension as defined by introspective-retrospective verbalization studies.

1.31 Comprehension is a cognitive activity involving the following mental processes.

--Ideational Fluency: a large number of responses leading to the determination of meaning on an abstract rather than literal level.

--Linguistic Fluency: a general sensitivity to language and to the use of language clues in the determination of meaning.

--Manipulation: involving analysis, synthesis, anticipation, retrospection, etc. leading to a wholistic rather than fragmented or distorted determination of meaning.

--Variety and Flexibility: the use of a variety of strategies to determine meaning and flexibility in altering strategies to meet new needs.

--Objectivity: extraneous personal, subjective, or emotional responses not allowed to interfere with the determination of meaning.

2.00 Comprehension as defined by verbal definitions.

2.10 Skills-based definitions of comprehension.

2.11 Comprehension involves a number of separate skills which are arranged hierarchically.

2.12 Comprehension involves a number of separate skills which are not arranged hierarchically.

2.13 Critical and creative reading constitute high-level comprehension and involve separate skills which are distinguishable from those associated with low-level comprehension.

2.20 Cognitive-based definitions of comprehension.

2.21 Comprehension is a cognitive process

involving a variety of mental operations which may be described in a number of ways.

3.00 Comprehension as defined by models.

3.10 Comprehension involves a number of separate overt skills which reflect a coherent psychological whole.

3.20 Comprehension is describable in terms of a hierarchical organization of educational outcomes.

3.30 Comprehension is influenced by a number of external factors which affect its attainment.

3.40 Comprehension is a cognitive process including a series of mental operations which may be described in a number of ways.

3.50 Comprehension is a highly complex cognitive process involving the psychological processing of language.

A fundamental dichotomy emerges from this overview. It lies between definitions of comprehension based on the reader's overt behavior, and definitions founded on the covert cognitive operations by which the reader obtains meaning.

Factor analyses of comprehension are fundamentally concerned with detecting underlying abilities which explain trends in overt measured performance. Verbal definitions of comprehension emphasizing skills are aimed at delineating theorized overt behavior, while some models attempt to establish the structural relations among these skills. Yet little agreement exists among these different attempts to determine comprehension skills. Experimental evidence strongly suggests only a few distinct abilities, while theoretical statements and models have proposed a large number. On the other hand, introspective-retrospective verbalization studies seek to reveal the covert cognitive activity accompanying comprehension. The nature of this activity is the subject of speculation in many verbal descriptions and models of comprehension. In the psycholinguistic models, the depiction of theorized covert mental behavior has become especially refined. Yet, though the actual cognitive operations involved in comprehension have been described in a wide variety of ways, very little consistency is found among different definitions.

Little comfort can be derived from the relative ease with which one can identify the hiatus between overt and covert approaches to comprehension. Nor can encouragement be

found in the inconsistencies existing among examples of each of these approaches. Yet this hiatus and these inconsistencies are artificial--they exist only in the minds of researchers and theorists. The definitive definition of comprehension, when achieved, will have as its most significant contribution the closing of this hiatus and the removal of these inconsistencies.

Chapter 7

CONCEPTS OF COMPREHENSION REPRESENTED IN PROFESSIONAL SECONDARY READING TEXTBOOKS

The purpose of this chapter is to examine concepts of reading comprehension presented in current professional textbooks dealing with reading instruction in the secondary grades. First, these concepts of comprehension will be determined from an examination of the relevant textbooks; then they will be assessed in terms of current experimental and theoretical knowledge of reading comprehension summarized in the previous chapter.

The importance of concepts of reading comprehension presented in professional textbooks is apparent when it is realized that these concepts form the basis upon which the textbook authors suggest instructional objectives for the teaching of comprehension. Moreover, these instructional objectives constitute the first stage of instructional programs aimed at developing students' comprehension ability. Once objectives have been established, instructional procedures designed to realize these objectives are developed

and implemented. This stage includes the adoption and use of instructional materials. Finally, tests are employed to determine student success in attaining instructional objectives and to establish priorities for subsequent teaching designed to remedy revealed weaknesses. The concepts of comprehension underlying instructional materials and published reading tests pertaining to comprehension are examined in the two chapters which follow this one. The concern of this chapter is to determine and assess concepts of comprehension presented in professional textbooks intended for secondary teachers.

The method adopted in this chapter is to determine from a recent compilation of resources available to secondary reading teachers (9) all current professional textbooks dealing in depth with reading comprehension. Each of these textbooks is then examined and the concept of comprehension presented is described and analyzed. Following this, the concepts of comprehension represented in these various textbooks are reviewed and their relationship to current experimental and theoretical knowledge of reading comprehension is assessed. The chapter concludes with a brief summary.

REVIEW OF PROFESSIONAL TEXTBOOKS

Making Better Readers

The preface of this textbook describes its purpose as "to help prospective teachers and teachers-in-service to understand reading development and ways of furthering it" (7:v). Comprehension is dealt with in a chapter entitled "Essential Reading Abilities" which includes descriptions of basic reading and study abilities and suggests methods for teaching them.

Comprehension is described as "essentially reading for meaning" (7:122). This concept of comprehension is based on the following skills: determining main ideas and supporting details, organizing and outlining, critical reading, and drawing conclusions. Numerous methods are suggested whereby these different comprehension skills can be developed by the teacher. For example, the ability to detect main ideas and supporting details is explained within the context of teaching paragraph comprehension. Outlining and organizing are described as involving the comprehension and retention of the writer's thought patterns. The authors encourage critical reading since it facilitates "thoughtful interpretation and deliberation." They include

critical reading along with "creative reading" and maintain that it is inseparable from critical thinking and problem solving (7:147-48). Seven "steps in critical reading" are outlined by the authors as follows:

1. Recognizing the author's intent.
2. Exploring the scope of the selection.
3. Reflecting on reader attitudes which may influence interpretation.
4. Comprehending accurately what the author said.
5. Appraising the soundness of the author's ideas and assumptions.
6. Relating and synthesizing the ideas presented in relation to the wider field of which they are a part.
7. Applying the ideas gained. (7:151-52)

It can be seen that, though Strang and Bracken include critical reading as a subskill under comprehension, they place a great deal of emphasis upon its development in the secondary grades. Further, it would seem that critical reading and the conclusions resulting from it represent the highest point in an implied hierarchy of abilities subsumed under the title "comprehension."

Reading Instruction in the Secondary School

The authors describe their purpose for writing this textbook as "to provide the secondary school staff with a professional book on the teaching of reading" (1:iv). The chapter discussing comprehension is entitled "Basic Reading Skills" and includes comprehension along with word

recognition, vocabulary, locating information and speed.

Comprehension is considered in terms of four sub-headings--Main Ideas, Details, Critical Reading, and Precis. The authors emphasize that literal understanding is the minimal requirement for comprehension in the secondary grades. They stress that the facts derived from literal understanding must be organized according to the main ideas and supporting details which they convey if these facts are to take on more than superficial meaning. The importance of reading for inference is strongly affirmed. Included under inference are the abilities to recognize cause and effect relationships, persuasion, exaggeration, and oversimplification. The authors explain that skill in making inferences is a "thinking process" which "ties directly into past experiences of the reader as he fuses his own ideas with the thoughts of the author" (1:108-109). Critical reading is included under the heading comprehension and is described as the ability "to assess the worth, authenticity, and integrity of each piece of writing" (1:109). A final ability defined as part of comprehension is the kind of analytical reading necessary for precis writing. This is described as demanding "intimate insight into the author's viewpoint, as retention of the sequence and

relationship of ideas to the intent of the author" (1:110).

Thus, while emphasizing that comprehension directly involves thinking, Bamman, Hogan and Green concentrate on describing the skills which must be demonstrated by students if they are to develop in their comprehension ability. These skills range from the minimum requirement of factual comprehension through a sequence of abilities culminating with the critical evaluation and precise analysis of what is read.

Teaching Reading in High School

Karlin's discussion of comprehension is included in his chapter headed "Meanings and Reading." As the title of his text suggests, Karlin is primarily concerned with producing "a 'practical' textbook" for secondary teachers. His treatment of comprehension is heavily loaded with methodological suggestions "designed for prospective and practicing secondary school teachers" (3:vii).

Despite its practical emphasis, however, Karlin's discussion of comprehension is founded upon an explicit concept of its nature. The term "comprehension" is used in a special sense in this textbook to denote "literal understanding" which is defined as "the ability to understand what is given directly" (3:115). The term "interpretation"

is used to indicate "reading that goes beyond literal understanding" (3:115). Skills identified at this level include seeing cause-and-effect relationships, making generalizations, and drawing conclusions. The exercise of these skills involves going beyond what is explicitly stated to "probe for hidden meanings," "to determine the author's purpose from what he says," and to "clarify what is left unsaid" (3:129). Karlin describes the most sophisticated type of understanding included in his concept of comprehension as "critical reading." He justifies this inclusion by stating:

In this book, critical reading is treated as a function of meanings rather than as a separate entity, because the way in which the reader reacts to printed ideas is one reflection of his thorough understanding of them. (3:113)

Critical reading is described as encompassing such abilities as the evaluation of the accuracy of an author's facts or the logic of his argument. Karlin maintains that a close relationship exists between critical reading and critical thinking. He claims the reader deals with printed language "in much the same way that a listener deals with spoken language," and that "once the added element of the visual symbols has been mastered, the orderly processes of thinking are activated" (3:131).

It can be seen that Karlin's concept of comprehension is presented essentially in terms of the abilities required of students to understand what they read. Further, this concept is structured hierarchically: literal comprehension provides the basis for interpretation which is necessary for critical reading. According to Karlin, it is by functioning according to this hierarchy of abilities that complete understanding of what is read is achieved.

Helping High School Students to Read Better

The stated purpose of this textbook is to present student and practicing teachers with "the tools that will assist them in helping students to read better" (5:v). Comprehension and critical reading are dealt with in separate chapters devoted entirely to discussions of skills involved under each heading.

Comprehension is considered in terms of two postulated levels--literal and inferential. Massey and Moore describe their concept of comprehension in this manner.

Perhaps the foundation of reading comprehension rests upon the ability to interpret literal (on the line) and inferential (between the lines) meanings. The intelligent reader develops the skills required to arrive at the precise, exact, or literal meaning of what the author states. At the same time, he must be equally adept at knowing what the author implies but does not state. (5:24)

Literal comprehension is conceived of as involving the operation of a number of skills which the authors describe as follows:

1. Noting key words in a sentence.
2. Noting facts explicitly stated.
3. Noting central ideas, subordinate ideas, relevant and irrelevant ideas, supporting and non-supporting ideas.
4. Perceiving the relative importance of ideas.
5. Noting topic sentences.
6. Recognizing the author's purposes if specifically stated.
7. Perceiving direct relationships.
8. Following directions.
9. Organizing of ideas or events in sequence (order, series arrangement, importance, succession, chronology, steps in a process, character development, plot development of an argument). (5:24-25)

On the other hand, inferential comprehension is described as extending beyond the literal level to provide "more sophisticated conclusions" (5:25). Skills required for inferential comprehension are delineated as follows:

1. Recognizing the author's intent and mood.
2. Noting facts not explicitly stated.
3. Perceiving similarities in ideas and events.
4. Perceiving differences in ideas and events.
5. Selecting specific ideas from which to draw inferences.
6. Selecting related ideas from which to draw inferences.
7. Making comparisons of similar ideas.
8. Noting contrasting ideas.
9. Recognizing cause-effect, or symptom-cause relationships.
10. Anticipating and predicting outcomes.
11. Seeing interrelationships among ideas.
12. Drawing conclusions.
13. Perceiving relationships in sequence, time, space, relevancy, cause and effect. (5:26)

Critical reading is explained in a separate chapter from the one dealing with literal and inferential comprehension. Yet the authors clearly establish the relationship between these two kinds of comprehension and critical reading when they contend that "critical reading calls for comprehension skills of a higher level of thinking than is usually necessary for deriving literal or inferential meanings" (5:40). Hence, the emphasis here is on highly sophisticated thinking applied to the understanding of what is being read. Massey and Moore outline critical reading skills in the following fashion:

1. Identifying an inherent problem, or question, or issue.
2. Distinguishing fact from fiction.
3. Distinguishing the realistic from the fantastic.
4. Identifying the author's purpose, mood, and intent.
5. Determining relevancy of ideas to a problem, a question, or an issue at hand.
6. Recognizing patterns of thinking as inductive and/or deductive development, scientific reasoning, logic, and the like.
7. Recognizing abuses of logic.
8. Judging source and accuracy of material.
9. Noting completeness of analysis.
10. Judging competency of the author as a source of information.
11. Predicting outcomes.
12. Making generalizations.
13. Recognizing controversial materials or issues.
14. Differentiating between objective and subjective statements.
15. Distinguishing between the informative, referential, and emotive use of words.
16. Understanding the denotation and connotation of words.
17. Recognizing differences in levels of abstractions.

18. Recognizing hazards to clear thinking: emotion-laden words, irrelevant ideas, bias, unsound conclusions, invalid assumptions, and the like.
19. Identifying specific propaganda techniques: name calling, card stacking, using catch phrases, band wagon tactics, testimonials, and the like. (5:41-42)

This summary reveals Massey and Moore's concept of comprehension to be a three-part skills hierarchy. Following the attainment of literal comprehension comes inferential comprehension which in turn provides the basis for critical reading. At each of these levels, the reader must be able to demonstrate the skills required for success at that level before comprehending at the next level.

Better Reading in the Secondary School

Marksheffel describes his textbook as designed to bring together "some pertinent information especially valuable to...teachers and students at the secondary level" (4:v). A unique feature of Marksheffel's book among those devoted to secondary reading instruction is its lack of any discussion under the heading "comprehension." When one examines the index, "comprehension" refers the reader to "critical reading." Critical reading is discussed in the final chapter of Marksheffel's textbook along with vocabulary building and concept development.

Marksheffel defines critical reading as "purposeful

reading in which the higher-level thinking processes are used in making sound judgments on the basis of all available evidence" (4:250). He explains the relationship between critical reading and critical thinking by asserting that, though the two terms are "not synonymous," the two processes are "almost identical" (4:251). Critical reading is equated with such other terms as "creative reading," "inferential reading," "reading between the lines," and "interpretive reading." Marksheffel maintains that, "no matter what the process is called, it involves comprehension of reading materials" (4:250), and is founded upon "the ability to understand the literal meaning" (4:232) of what is read. Some critical reading skills which Marksheffel outlines include distinguishing between fact and fantasy, making inferences, anticipating events and outcomes in a narrative, validating conclusions, and comparing and contrasting what is read in one source with other sources.

Marksheffel presents a somewhat truncated concept of comprehension in that he concentrates almost exclusively upon critical reading and the skills associated with it. Critical reading is presented as the highest level of understanding, yet the nature of lower levels of understanding is almost ignored. Whether he believes that skills associated

with literal comprehension are so obvious as to preclude their consideration, or that secondary students all possess these skills are questions which remain unanswered.

A Guidebook for the Teaching of Reading

This textbook, which the authors state is intended for virtually anyone interested in reading, devotes a separate chapter to comprehension.

While emphasizing the importance of comprehension as "the end product" of efficient reading, Schick and Schmidt maintain that comprehension "cannot be confined to a single definition" (6:59). They contend that the complexity of comprehension and the different meanings the term conveys to different people renders definitive agreement concerning its nature impossible. They assert that what is meant by comprehension depends upon what information is being sought. Their own concept of comprehension is stated in terms of language and structure. They maintain that comprehension may be described as involving the following abilities:

A. Understanding of words.

1. Understanding the denotation, designation, connotation, and suggestions made by words.
2. Recognition of ambiguity, equivocation, and vagueness of words.
3. Understanding figurative use of words.
4. Ability to define a word.

- B. Understanding of sentences.
 - 1. Ability to follow the thought of increasingly lengthy sentences.
 - 2. Ability to perceive the varying emphasis given by various syntactic forms.
 - 3. Ability to perceive the logical connections among the various elements in increasingly elaborate sentences.
- C. Understanding of paragraphs.
 - 1. Ability to determine the main point and supporting details.
 - 2. Ability to recognize and understand transitions, and to supply them when they are not explicitly given.
- D. Understanding chapters or sections.
 - 1. Ability to see a chapter as a unit, both independently and as a part of a larger unit.
 - 2. Ability to see transitions, structure, and summaries within chapters.
- E. Understanding the symbolic nature of language to see that words are not identical with what they stand for.
- F. Understanding the nature of differences.
- G. Understanding abstractions. (6:60-61)

Besides comprehension as outlined above, Schick and Schmidt describe what they term "creative-critical comprehension." They contend that it is the nature of the reader's task which determines the manner of his comprehension: "the reader approaches a simple term or neutral assertion in quite a different manner from the way in which he approaches a complicated and subtle literary work or a clever piece of propaganda." It is the reading of this latter type which necessitates creative-critical comprehension. Yet the authors write that "no single definition...covers all facets of creative-critical reading, nor can this kind of reading

be separated completely from other reading" (6:63). However, they do contend that creative-critical comprehension requires a high level of critical thinking involving evaluation, judgment, and perception. Abilities necessary for creative-critical reading may be summarized as follows:

- A. Comprehension of the author's attitude towards his material and his readers.
- B. Ability to criticize reasoning including generalizations, hypotheses, and deductive arguments.
- C. Ability to determine inferences.
- D. Ability to associate written material with the writer's experience.
- E. Understanding organization including comparison, classification, cause-effect, analogy, concession, syllogism, and enumeration. (6:67-68)

The concept of comprehension presented by Schick and Schmidt is founded on their contention that comprehension is task-oriented. They repeatedly state that the understanding gained from reading depends upon the kind of understanding sought and the nature of the material read. Their discussion of "comprehension" reveals that by this term they mean literal comprehension, but they include literal comprehension of a highly sophisticated type involving the understanding of fine distinctions and abstractions. "Creative-critical comprehension" includes inferential understanding and other types of comprehension extending beyond literal understanding. Hence, though it might be argued that the relationship between the two types of comprehension postulated

by Schick and Schmidt is a hierarchical one, it would seem more accurate to state that they see their two types of comprehension as equal in difficulty when applied to the appropriate tasks. As with other textbook authors, the manner by which Schick and Schmidt delineate their concept of comprehension is to outline the skills and abilities required of readers when engaged in each kind of comprehension.

The Improvement of Reading

Unlike the other textbooks reviewed here, this one seeks to cover the whole field of reading from the preschool years to maturity. According to its authors, it is intended for both prospective and practicing teachers as well as graduate students in reading. The emphasis is "not only to state principles and describe practices but also to illustrate their application" (8:v). Comprehension is discussed in a chapter entitled "Developing Maturity in Reading" under the heading "Higher-Level Reading Skills."

The concept of comprehension presented in this textbook is based on a number of levels although the authors admit difficulty in establishing dividing lines between levels since "one builds upon and merges into the other" (8:272). The hypothesized levels of comprehension may be summarized as follows:

1. Receptivity--the reader must understand in general but not necessarily accept or reject what the author says.
2. Literal Comprehension--involves an intensive effort at reconstructing the author's exact meaning.
3. Critical Inquiry--the author's statements raise questions in the mind of the reader which he tries to answer by drawing on his background of knowledge and experience. He passes judgments on these statements.
4. Creative Reading--the reader derives new insights, values, or attitudes or new solutions to a problem.
5. Application--the reader may apply his ideas, insights, and solutions in life situations. (8:272)

Strang, McCullough and Traxler emphasize the importance of critical reading in their comprehension hierarchy. They assert that "critical reading is critical thinking applied to reading" and that it stems from a reader's attitude of inquiry. This attitude results in the reader treating the author's statements "as hypotheses to be tested rather than as conclusions to be remembered" (8:273). Creative reading, the next level of comprehension, is described as involving the discovery of "new principles and new relationships." Here, the reader's attitude becomes exploratory, imaginative, and inventive as he mentally develops and elaborates on what he reads.

Although the authors tend to explain comprehension by descriptions of its component levels rather than by explicit statements of the skills involved at each of these levels, they do provide extensive suggestions to teachers regarding ways in which comprehension can be taught. Here

skills are emphasized which are designed to promote growth in various levels of comprehension, principally critical reading. However, the most notable feature of Strang, McCullough and Traxler's concept of comprehension is its rigid hierarchical nature. One feels that the imprecision which the authors admit to exist in their hierarchy is thought by them to derive from its cumulative nature rather than from any innate flaw in its hierarchical conception.

Teaching Reading in Content Areas

As the title suggests, this textbook is intended to assist elementary and secondary content area teachers in teaching reading within their content areas. Herber's discussion of comprehension is located in two chapters entitled "Levels of Comprehension" and "Patterns, Skills, and Transformation."

Herber's discussion is based on his concept of the levels of comprehension. He denotes these levels as "literal," "interpretive," and "applied," and states that "each level requires the product of the previous level or levels in order to function." The literal level is described as involving "what the author has said" without necessarily understanding

"what the author meant." Hence, the literal level requires little more than decoding words and recognizing some relationship among them within the context. The interpretive level is applied "in order to derive meaning" from what the author has said. The reader searches for intrinsic relationships within the text from which he derives meaning. The applied level takes the product of the previous two levels and "applies it in some pragmatic or theoretical exercise." Here the reader juxtaposes the intrinsic relationships determined at the interpretive level with concepts derived from his own previous knowledge and experience. From this process, the reader generates new insights and ideas of increased scope which extend beyond the content of the reading selection (2:62-63).

Herber contends that the nature of these three levels of comprehension represents the initial concern of the teacher. It is only after students have demonstrated their ability to function in terms of these levels that teachers should undertake the explicit teaching of what Herber calls "organizational patterns." These include cause-and-effect, comparison-contrast, time order and enumerative order and they may operate at each level of comprehension.

Once the nature of levels of comprehension and organizational patterns has been established, Herber advocates the introduction of comprehension skills. He conceives skills to be "descriptive of the relationships occurring within the organizational patterns" (2:119) which, in turn, describe the relationships contained within levels of comprehension. Herber suggests the explicit labelling of skills only after students have unknowingly used them to detect organizational patterns. He provides a list of ninety-nine skills and maintains that these may be "transformed" or adapted to reading material in particular content areas (2:122). Hence, Herber repudiates the notion that different content areas demand the exclusive use of separate skills.

It can be seen that Herber's concept of comprehension is a skills-based hierarchy. But, rather than beginning with individual skills and relating these to particular kinds of comprehension, Herber begins with his postulated levels of comprehension and deduces the associated skills. He claims that this approach and the teaching method it suggests is useful to teachers and students alike since it allows for a gradual elaboration of the concept of comprehension being taught to include more numerous

and specific components. In this way, teachers and students are not overwhelmed with the task of teaching and learning a profusion of isolated skills.

ASSESSMENT OF PROFESSIONAL TEXTBOOKS

The concepts of comprehension presented in the professional textbooks reviewed here and summarized in Table IV are alike in that each is expressed by a verbal definition. A significant characteristic of these definitions is that each one reduces comprehension to a number of different levels or types which are all subsumed under the general term. Moreover, these different levels of comprehension are organized hierarchically. In some cases, authors clearly imply hierarchical organizations (eg. Strang and Bracken [7], Bamman, Hogan, and Greene [1]), while in other cases authors explicitly state this kind of organization (eg. Karlin [3], Massey and More [5], Strang, McCullough, and Traxler [8], and Herber [2]). Within these hierarchies, one level of comprehension serves as the basis for the next level and is included in all succeeding levels until the most complex type of comprehension represented in the hierarchy is reached. The only exception to hierarchical organization is the concept of comprehension propounded by Schick and Schmidt (6).

TABLE IV

CONCEPTS OF COMPREHENSION REPRESENTED IN
SECONDARY READING PROFESSIONAL TEXTBOOKS

Title	Author(s)	Publication Date	Concepts in Comprehension
Making Better Readers	Ruth Strang and Dorothy Kendall Bracken	1957	-Determining main ideas and supporting details -Organizing and outlining -Critical reading and drawing conclusions
Reading Instruction in the Secondary School	Henry A. Bamman Ursula Hogan Charles E. Greene	1961	-Seeing main ideas and details -Reading for inference -Critical and analytical reading
Teaching reading in High School	Robert Karlin	1964	-Comprehension -Interpretation -Critical Reading
Helping High School Students to Read Better	W. J. Massey Virginia D. Moore	1965	-Literal comprehension -Inferential comprehension -Critical reading

TABLE IV (CONTINUED)

Title	Author(s)	Public- ation Date	Concepts in Comprehension
Better Reading in the Secondary School	Ned D. Marksheffel	1966	-Literal understanding -Critical reading
A Guidebook for the Teaching of Reading	George B. Schick Bernard Schmidt	1966	Comprehension: Creative-critical comprehension
The Improvement of Reading	Ruth Strang C. M. McCullough A. E. Traxler	1967	-Receptivity -Literal Comprehension -Critical Inquiry -Creative Reading -Application
Teaching Reading in the Content Areas	Harold L. Herber	1970	-Literal Comprehension -Interpretive Comprehension -Applied Comprehension

One further significant characteristic of the concepts of comprehension found in professional textbooks is that, within each level of the hierarchies presented, specific skills relevant to each level are given. The number of skills provided varies from a relative few as in the case of Karlin (3) to the ninety-nine supplied by Herber (2). Thus, the concepts of comprehension represented in these textbooks may be generally accounted for as verbally defined skills-based hierarchies. Unfortunately, these authors seemingly ignore the considerable amount of available experimental evidence concerning the nature of comprehension as well as concepts of comprehension represented by models. Appropriate references to these two sources of knowledge would almost certainly have added credibility and precision to the concepts of comprehension presented in these professional textbooks. It is on the basis of these concepts that textbook authors suggest instructional objectives for the teaching of comprehension.

Verbal skills-based definitions of comprehension are not without limitations, however. The two most frequent difficulties encountered with this type of definition have been described above in Chapter 4. These difficulties were found to derive from the semantic imprecision with

which specific skills are described, and the uncertainty of conceptual boundaries applicable to defining comprehension. Both of these problems are revealed in the textbooks examined here.

In the descriptions of skills provided by these textbooks, semantic imprecision is apparent. As has been noted, the number of specific skills provided by various textbooks varies widely. Bamman, Hogan, and Greene who describe relatively few skills, include under critical reading "the ability to assess the worth, authenticity, and integrity" of a reading selection (1:109). On the other hand, in his extensive list of skills, Herber includes "critical analysis," "problem solving," "concept application," and "allusion" (2:124-26). The common characteristic of all these skills is their lack of specificity. Though their general intent is fairly clear, the specific nature of the abilities which they describe is not. For this reason, their usefulness in planning instructional programs and procedures is severely limited.

The problem of the conceptual limits which should circumscribe definitions of comprehension also emerges from an examination of these textbooks. It is important to note that almost all of these textbooks emphasize the importance

of critical reading as a component of comprehension. Some textbooks also include creative reading with their descriptions of comprehension. Yet, despite the accommodation of these two particular kinds of reading within the broader concept of comprehension, difficulties in establishing the boundaries within which comprehension should be considered still appear. Both Karlin (3:115-23) and Schick and Schmidt (6:60), for instance, include skills associated with word knowledge within their definitions of comprehension. Most other textbooks describe these skills separately from comprehension. The point at which comprehension stops and other capacities begin presents another problem. Strang, McCullough and Traxler, for example, include within their definition of comprehension the application of "ideas, insights, and solutions" to "life situations" (8:272). This would appear to involve activities taking place after comprehension has occurred and hence extends the nature of comprehension considerably beyond the conceptual boundaries within which most textbook authors consider it. Thus, though hierarchically organized skills-based verbal definitions of comprehension predominate in textbooks intended for secondary reading teachers, the manner of these definitions is not wholly satisfactory.

SUMMARY

Eight recent professional textbooks intended for potential or practicing secondary reading teachers are currently available. Each of these textbooks presents a concept of reading comprehension on the basis of which educational objectives for the teaching of comprehension are suggested. When these concepts of comprehension are assessed in terms of current experimental and theoretical knowledge of comprehension, it is found that, in general, comprehension is defined verbally in terms of skills-based hierarchies. Difficulties generally associated with verbal definitions of comprehension are apparent in these textbooks. These difficulties are manifest in the form of semantic imprecision relating to the specific skills described, and uncertainty regarding the conceptual boundaries within which comprehension should be considered.

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Chapter 8

CONCEPTS OF COMPREHENSION REPRESENTED IN SECONDARY READING INSTRUCTIONAL MATERIALS

"Instructional materials are big business!" With this comment, rendered in his usual inimitable fashion, Karlin (22:425) has commented on the proliferation of published instructional materials available to the secondary reading teacher. More recently, Devine (13:88) has assessed "the amount and variety" of current materials in secondary reading.

The importance of instructional materials lies in the fact that they constitute the medium through which instructional objectives are pursued in the reading program. More particularly, it is through the implementation of instructional materials that the classroom teacher seeks to realize the instructional objectives determined at the outset of the reading program. The instructional objectives set for teachers in professional textbooks relating to the teaching of comprehension and the concepts of comprehension upon which these objectives are based have been outlined and

assessed in the preceding chapter. The purpose of this chapter is to determine the concepts of comprehension embodied in instructional materials intended for teaching reading in the secondary grades. These concepts will in turn be examined in the light of present knowledge of the nature of reading comprehension.

The materials examined in this chapter are those intended for the secondary grades included in the collection of the Reading Resources Centre at the University of British Columbia. This collection has been compiled over a number of years by faculty members in the Department of Reading Education for the purpose of providing future and practicing teachers with an extensive cross-section of available instructional materials in reading. Though this collection does not contain every item of instructional material in print, it is representative of materials available and in current use including those designed for the secondary grades.

Once all instructional materials intended for the secondary grades were isolated, they were examined and categorized by type. The categories were adopted and modified from those suggested by Devine (13). Attention was also given to the categories of instructional materials used in

the ERIC/CRIER Guide to Materials for Reading Instruction

(19). From an examination of these two sources, the following five categories were determined and used: Basal Materials, Skills-Building Materials, Materials for Special Groups, Workbooks, and Boxed Materials. It soon became apparent that strict categorization of materials was impossible, many materials having characteristics of two or more categories. The example of workbooks serves to illustrate this point. Besides appearing independently, workbooks were found to be included with instructional materials in virtually every other category. Where difficulties such as this arose, what appeared to be the fundamental characteristic of the material served as the basis for its categorization. Hence, in the case of workbooks, when they appeared independent of other kinds of materials, they were placed in the Workbook category. But when they were used to supplement materials in other categories, they were included with the materials in these categories.

When the materials were categorized, the concepts of comprehension which they represented were determined. This was done by an examination of manuals, guides and any other information supplied to teachers by the publishers. Moreover, the materials themselves were examined in order to find any exercise headings, question sections, etc. which

provided evidence of the nature of comprehension that the materials are designed to teach. From a combination of evidence gleaned from these two principal sources (and any other sources available), the concepts of comprehension embodied in these materials were determined. These concepts are reported to the full extent that they are directly stated in the materials. No attempt is made to infer descriptions of the nature of comprehension represented in the materials beyond the descriptions explicitly provided since this would constitute placing an interpretation on the materials which is not warranted by the information supplied.

The organization of the chapter follows the five categories of materials adopted. The discussion of each category is divided into a description of the general nature of materials contained within the category, a table outlining each item within the category including the concept of comprehension which it represents, and a general summary of the concepts of comprehension underlying the materials within the category. Following this discussion of individual categories, an assessment of the concepts of comprehension underlying instructional materials in all categories is made in terms of current experimental and

theoretical knowledge of comprehension. The chapter is concluded with a summary.

REVIEW OF INSTRUCTIONAL MATERIALS

Basal Materials

Basal materials available for reading instruction in the secondary grades are of two general types. The first represents the upper limits of series extending through the elementary grades into the secondary grades. Examples of this type reviewed below include Basic Reading, published by Lippincott (25), Challenges (33) and Open Highways (34), both published by Scott Foresman, and Deeds of Men, published by Lyons and Carnahan (4). The second type of basal materials applicable to the secondary grades includes series expressly developed for these grades. The Adventures in Literature Series, published by Harcourt, Brace and World (30), the Canadian Reading Development Series, published by Copp Clark (3), and the Ginn Junior-High-School Series (35) are all included in this latter category.

Whichever type basal series come under, their chief characteristic remains the same--they are intended to form the core of the developmental reading program. In order to do this, they come supplied with a variety of materials beyond the readers themselves. Usually workbooks and

teachers' guides and sometimes supplementary readers and audio-visual aids accompany basal readers. For this reason, they provide the foundation upon which developmental reading programs are often based.

Table V indicates the concepts of comprehension embodied in a number of basal reading series designed for the secondary grades. It is apparent that the majority of secondary basal reading series found their teaching of comprehension upon verbal descriptions of the specific skills students should learn in order to understand what they read. Extensive lists of skills are provided which are in most cases keyed to specific sections of the series. It is important to note that only one of these basal series presents skills hierarchically (35). In most series, different skills are developed intermittently throughout the series within the context of progressively difficult reading selections. Many of the skills included under comprehension are sometimes associated with the more specialized designations of critical and creative reading.

Two exceptions to the generalization made above are evident. The first occurs in the Ginn Junior-High-School Series (35). Here a distinctly hierarchical structure of skills is presented and pursued. Two levels of "reading

TABLE V
 CONCEPTS OF COMPREHENSION REPRESENTED
 IN SECONDARY BASAL MATERIALS

Title	Intended Reading Grade Level	Reading Grade Level	Concept of Comprehension
Adventures in Literature Series: -Adventures for Today	9	4-7	-Understanding the main idea
-Adventures in Living	10	5-8	-Distinguishing import- ant details -Seeing related details
-Adventures for Americans	11	6-9	-Noting organization -Following directions -Anticipating outcomes
-Adventures in Modern Literature	12	7-10	-Making inferences and judgments -Drawing conclusions -Following time order -Distinguishing fact from opinion -Visualizing -Understanding authors' purpose, tone, and plan
Basic Reading Book 8	8	8	None at this level-- at lower levels: reading for details, finding main ideas, establishing correct sequence, reading maps and charts, in- terpreting figures of speech
Canadian Reading Development Series: -Shining Skies	8	8	-Reading for main ideas -Making comparisons -Making inferences -Drawing conclusions -Predicting outcomes

TABLE V (CONTINUED)

Title	Intended Reading Grade Grade Level Level		Concept of Comprehension
-That Untravelled World			<ul style="list-style-type: none"> -Finding proof -Seeing cause and effect -Evaluating logical statements -Making judgments -Reading for details -Reading to answer questions -Following directions -Forming sensory impressions and visualizing -Recognizing supporting details -Detecting sequence -Making outlines
Challenges, Book 8	8	8	<ul style="list-style-type: none"> -Determining main ideas and details -Detecting sequence -Making judgments -Drawing conclusions -Understanding figurative language -Making critical evaluations -Seeing comparison and contrast -Understanding the author's purpose and qualifications -Distinguishing fact from opinion -Making inferences -Correlating ideas -Seeing time relationships

TABLE V (CONTINUED)

Title	Intended Reading Grade Level	Reading Grade Level	Concept of Comprehension
			<ul style="list-style-type: none"> -Detecting mood -Seeing cause and effect relationships -Determining sequence
Deeds of Men	8	8	<ul style="list-style-type: none"> -Understanding details -Receiving sensory impressions -Anticipating outcomes -Finding related facts -Making comparisons -Determining cause and effect -Verifying statements -Organizing information -Categorizing -Seeing relationships -Finding relevant details -Establishing a sequence -Making inferences -Forming judgments -Sensing emotions
Ginn Junior-High-School Series:			Two levels of "Reading Power":
-Exploration Through Reading	8	8	<ul style="list-style-type: none"> 1. Basic Skills <ul style="list-style-type: none"> -Using word clues -Recognizing main idea -Noting significant details -Following sequence
-Achievement Through Reading	9	9	<ul style="list-style-type: none"> 2. Critical and Creative Reading <ul style="list-style-type: none"> -Seeing relationships -Drawing conclusions

TABLE V (CONTINUED)

Title	Intended Reading Grade Level	Grade Level	Concept of Comprehension
Open Highways, Book 8	8	4-6	<ul style="list-style-type: none"> -Making inferences -Judging the re- liability and val- idity of inform- ation -Anticipating out- comes -Seeing comparisons and contrasts -Determining time and place relationships -Understanding main idea and details -Distinguishing fact from opinion -Making inferences -Detecting character traits -Determining point of view -Making judgments -Drawing conclusions -Understanding motives and reactions -Relating ideas -Detecting setting and mood -Seeing cause-effect relationships -Understanding analogies -Understanding figur- ative language -Detecting authors' purpose and theme -Making inferences

power" are postulated, including skills subsumed under the heading "Basic Skills" and those placed under "Critical and Creative Reading." The authors explicitly state that the acquisition of skills at the second level is dependent upon learning those at the first level. A second exception occurs in Basic Reading, Book 8 published by Lippincott (25). Here no clear indication is given of the nature of comprehension which the reader is intended to develop. In fact, there is a strong suggestion by the authors that comprehension skills have been acquired by the time the student reaches the eighth grade and that the function of the reader is to encourage students' awareness of moral and ethical issues contained in what they read. This suggestion is strengthened by the fact that the authors outline a number of comprehension skills as the instructional objectives in their lower-grade reader series.

A final comment can be made regarding the reading levels of these basal materials. As might be expected, the intended grade level and the reading grade level are identical in most of these series. However, in two cases, the Adventures in Literature Series (30) and Open Highways (34), provision is made for students reading at somewhat below grade level. Presumably these two series may be used

to encourage growth in comprehension ability with students reading below their grade level.

Skills-Building Materials

While secondary basal materials are designed to provide the core of the reading program, skills-building materials are most often intended for supplementary use. They are planned to strengthen student deficiencies in specific reading skills which may have been revealed through working with basal and other types of reading materials.

Unlike basal materials, skills-building materials are generally not developed for specific grade levels. Rather, they are meant for use with secondary students at whatever grade level required. It is a distinct short-coming of many of these materials, however, that they do not provide the reading grade level of their content. This information would allow for their use with students for whom vocabulary would not provide an initial barrier to comprehension thereby interfering with their acquisition of comprehension skills applicable to longer units of prose.

One distinguishing characteristic of these skills-building materials is their varied format. The majority of them consist of short prose selections followed by exercises

especially designed to develop specific comprehension skills. However, two of the examples reviewed here (16, 24) demonstrate the variety of publishers' approaches to skills-building materials in that they are based on the programmed format. Whatever the construction of these materials, however, their purpose is to build specific reading abilities, including those concerned with comprehension. Table VI summarizes some examples of this type of material and indicates the concepts of comprehension upon which they are based.

It is apparent from Table VI that the concepts of comprehension represented in the majority of these skills-building materials are described verbally. These descriptions are for the most part extensive in their inclusion of a larger number of individual comprehension skills. Although a number of "higher level" comprehension skills are included (eg. making inferences, drawing conclusions, making judgments), there is no indication that these skills are intended to be viewed within hierarchical structures.

As might be expected, however, exceptions to these general conclusions exist. While most skills-building materials rest on verbal skills-based non-hierarchical definitions of comprehension, two examples present comprehension

TABLE VI

CONCEPTS OF COMPREHENSION REPRESENTED IN SECONDARY
SKILLS-BUILDING MATERIALS

Title	Intended Grade Level	Reading Grade Level	Concept of Comprehension
Advanced Skills in Reading Book 1, 2, 3			<ul style="list-style-type: none"> -Seeing main ideas and details -Following directions -Detecting organizational patterns -Understanding relationships: opposites, time order, place relations, cause and effect -Making inferences -Predicting outcomes -Making comparisons -Following sequence -Making judgments -Drawing conclusions
Better Reading, Book 1, 2, 3			Comprehension
High School Reading, Book 1 and 2			<p>Three Levels of Reading:</p> <ol style="list-style-type: none"> 1. Word Recognition--including phonics, structural analysis, context clues, and the use of the dictionary 2. Comprehension--of the meaningful grouping of words in phrases, of the meaningful grouping of phrases in sentences, of the meaningful grouping of

TABLE VI (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concept of Comprehension
How to Improve Your Reading	7-8	5-6	<p>sentences in paragraphs, and of the meaningful grouping of paragraphs in the development of a topic</p> <p>3. Interpretation--of unexpressed ideas, of author's purpose, of character, of misinformation, and of figurative language</p>
Lessons for Self-Instruction in Basic Skills	7-8	5-6	<ul style="list-style-type: none"> <li>-Understanding main ideas and details <li>-Following directions <li>-Making comparisons <li>-Forming generalizations <li>-Evaluating opinions <li>-Seeing organizational patterns <li>-Determining cause and effect <li>-Observing sequence
Lessons for Self-Instruction in Basic Skills	7-8	5-6	<ul style="list-style-type: none"> <li>-Reference skills--the dictionary <li>-Following directions <li>-Interpretations I and II: <ul style="list-style-type: none"> <li>-understanding word meanings <li>-recognizing a paraphrase <li>-recognizing main ideas <li>-understanding inferences

TABLE VI (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concept of Comprehension
Let's Read			<ul style="list-style-type: none"> -determining the author's purpose -drawing conclusions
New Practice Readers, Book G		8	<ul style="list-style-type: none"> -Grasping the main idea -Understanding and recalling ideas -Recalling sequences -Relating ideas to each other -Drawing conclusions -Understanding implied details -Understanding the central theme -Recognizing antecedents -Recognizing the correctness of a statement -Awareness of false statements -Recognizing the meaning of words in context
Programmed Reading			<ul style="list-style-type: none"> -Finding the main thought -Finding key sentences in paragraphs -Noting supporting details -Spotting important details

TABLE VI (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concept of Comprehension
Reader's Digest Advanced Reading Skill Builder, Book 1-4			<ul style="list-style-type: none"> -Putting details in order -Following directions -Predicting what will happen -Understanding main ideas and details -Understanding definitions -Evaluating -Understanding figurative language -Noting sequence -Grasping organization -Reading between the lines -Noting the author's plan -Recognizing cause and result -Seeing relationships -Summarizing -Drawing conclusions -Distinguishing between fact and fiction -Reading beyond the lines
Reading for Achievement			<ul style="list-style-type: none"> 1. Literal Comprehension <ul style="list-style-type: none"> -using context clues -following paragraph patterns -looking for word signals as clues to meaning

TABLE VI (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concept of Comprehension
Reading for Comprehension, Book 1 and 2			2. Interpretation -making inferences -drawing conclusions -perceiving relationships -predicting outcomes -determining the author's purpose 3. Critical Reaction -judging and verifying the writer's statements
			Seeing main ideas and details

skills within hierarchical contexts, High School Reading (7) and Reading for Achievement (21). Of these two, High School Reading is based upon a somewhat uniquely-expressed concept of comprehension. The authors state the second level of their hierarchy in terms of the reader's perception of linguistic and structural relationships rather than specific skills indicating the perception of these relationships. Two other examples of skills-building materials, Better Reading (38) and Reading for Comprehension (32), differ from the majority in that they supply almost no indication of the concepts of comprehension upon which they are based.

Materials for Special Groups

The instructional materials included in this category are designed to promote growth in reading ability among students who do not respond to the usual basal and skills-building materials. These students are most often found in non-academic classes. They are in many instances potential dropouts, their interest in school having been stifled by such factors as cultural deprivation, reluctance to read stemming from growing difficulty with reading, and general academic discouragement. These students have gradually become alienated from the school situation and from the usual

reading material which it offers.

The purpose of the instructional materials included in this category is to rekindle the interest of these special groups of students by providing them with interesting material that they can read successfully. Hence, these materials strive for relevance to adolescent experiences and interests. They are usually very attractively illustrated and are designed in such a way as to discourage students from associating them with the more traditional secondary textbooks and reading anthologies. As is apparent in Table VII, while some of these materials include selections at reading levels below student grade levels, others include passages at student grade levels. In the latter cases, authors and publishers generally explain their position by claiming that high-interest reading is the key to stimulating reluctant readers and that reading material written at low reading levels altered to reduce its reading difficulty detracts from its interest and thus its usefulness in these programs.

In considering the implementation of these materials, it is important to note that the exact grades for which they are intended are often not designated. This fact would seem to indicate that publishers expect the materials to be used

TABLE VII

CONCEPTS OF COMPREHENSION REPRESENTED IN SECONDARY
MATERIALS FOR SPECIAL GROUPS

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Breakthrough: -Winner's Circle -Beyond the Block -This Cool World -The Big Ones	junior and senior high school	3-4 4 5 6	Comprehension
The Galaxy Program: -Focus -Vanguard -Perspectives -Accent: U.S.A.	8 9 10 11	8 9 10 11	-Obtaining general information -Following sequence -Interpreting symbolism -Understanding imagery -Finding the main idea and supporting details -Drawing conclusions -Making inferences -Seeing relationships -Understanding figurative language
Holt's Impact	junior high school	junior high school	None given
Merrill Mainstream Books: -Courage Under Fire -Against the Odds	high school	4-7.5	Comprehension and Interpretation

TABLE VII (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
<ul style="list-style-type: none"> -They Were First -In New Directions -People Like You 			
Passport to Reading Series: <ul style="list-style-type: none"> -Anchors Aweigh -Over the Horizon -Outward Bound -Into Orbit -Full Flight 	6-10	2-6 4-7 5-8 6-9 7-10	Reading for Details: <ul style="list-style-type: none"> -Finding answers to questions involving specific details -Locating and correlating facts and information Reading for Main Ideas: <ul style="list-style-type: none"> -Locating the central idea of a passage Reading to Understand Organization: sequence Reading to Understand Inferences: <ul style="list-style-type: none"> -Predicting outcomes -Drawing inferences -Distinguishing fact from opinion -Empathizing with characters and authors -Making generalizations
Reading for Pleasure: <ul style="list-style-type: none"> -On Target -In Orbit -Top Flight 	high school	5	None given

TABLE VII (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Reading Incentive Series:	junior high school	3.0 4.0 5.0 6.0 7.0	None given
-Mystery in the Sky -Swamp March -Full Speed Ahead -Venus Bound -To Climb a Mountain			
Scope/Reading, Book 1, 2, 3	high school	high school	Comprehension
Teen-Age Tales	high school	5-6	-Grasping literal meaning and remembering important facts -Distinguishing between the relative importance of ideas and recogniz- ing main incidents and events -Recognizing the author's purpose and the reader's purpose -Organizing ideas -Drawing conclusions and inferences

at whatever grade level is felt appropriate in a particular teaching situation. A further observation is that, while some of these materials are intended to provide complete core reading programs (5, 6, 11, 29, 43), others are meant as supplementary materials (20, 37, 41). Therefore, these materials exhibit a fairly high level of flexibility in the manner in which they may be used. The concepts of comprehension upon which they are based along with their reading and grade levels are outlined in Table VII.

A sharp distinction is apparent in Table VII between those materials which provide statements of the concepts of comprehension upon which they are based and those which do not. When comprehension is explained, it is conceived in terms of verbal descriptions of the skills required, and these skills are arranged non-hierarchically. However, the majority of these examples present either extremely vague or virtually no definitions of the nature of comprehension upon which they are based.

Two quite divergent philosophies relating to the teaching of comprehension to reluctant readers appear to underly the materials examined here. Those authors and publishers who include extensive lists of comprehension skills do so in the apparent belief that it is only upon a

firm foundation of acquired skills that reading achievement can be realized. This position is made explicit by Strang in her teacher's manual for Teen-Age Tales (42) and it is admirably represented by Covell in the Passport to Reading Series (11). On the other hand, Summers, maintains in his introduction to the Reading Incentive Series (43) that the objective in material such as his is not to build skills, but rather to provide motivation and to stimulate student interest in reading. The implication here is that the overt teaching of comprehension skills somehow detracts from the development of reading interest and ability among reluctant adolescent readers. The fallacy in this position appears to be that growth in reading ability can proceed without the acquisition of basic reading skills such as those which many authorities ascribe to comprehension. It would seem that the development of motivation and the stimulation of interest alone are not enough; students must be provided with the comprehension skills necessary in order to sustain their motivation and interest by reading successfully. Further, teachers must be given sufficient information to know in what way materials are intended to develop comprehension ability. For these reasons, the lack of explicitly stated concepts of comprehension underlying many of the

materials intended for special groups of secondary school students must be seen as a decided shortcoming.

Workbooks

A common type of instructional material used with secondary students is the workbook. As was noted above, many different types of instructional materials are accompanied by supplementary workbooks. However, a number of workbooks are available for independent use with secondary students. These workbooks provide reading selections followed by exercises and questions to which students provide various kinds of written responses. Some workbooks have adopted the programmed format.

One underlying characteristic of workbooks is their flexibility. Not only may they be introduced at different grade levels where teachers feel that they are appropriate to students' needs, but they may also be used with entire classes, with different groups within classes, or with individual students. Generally, workbooks are used to supplement other materials in the reading program, but they may be used as core material as well. The focus of different workbooks ranges widely. Some, such as the Be a Better Reader series (40) are primarily intended for inclusion in developmental programs and hence strongly emphasize academic

reading skills in the content areas. Others are more remedial in intent and are aimed at students with vocational interests. Examples of this latter type are the Follett Vocational Reading Series (23) and the Turner-Livingston Reading Series (45). The readability levels of these different workbooks, where provided, reflects their differing emphases.

Table VIII provides a review of some examples of workbooks intended for use in the secondary grades. While this review indicates that some workbooks are founded on rather sparsely described concepts of comprehension--and one fails to explain comprehension at all--the majority are based on more extensive verbal definitions of comprehension. In these latter cases, comprehension is defined in terms of the specific skills involved. Moreover, among these examples of workbooks, the skills described are usually given non-hierarchically. Three exceptions to this generalization are apparent, however: Reading Skillbook 1 and 2 (8), Effective Reading (10), and Reading Study Book One, Two, and Three (12). In each of these, comprehension skills are presented hierarchically. Taking Effective Reading (10) as an example, the student is provided here with a structured progression through a number of skills which the authors

TABLE VIII
 CONCEPTS OF COMPREHENSION REPRESENTED
 IN SECONDARY WORKBOOKS

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Be A Better Reader:			
-Book 1	7	5-6	-Making judgments
-Book 2	8	6-7	-Finding main ideas and supporting details
-Book 3	9	7-8	-Making comparisons
-Book 4	10	10	-Sensing cause and effect
-Book 5	11	11	-Making inferences
-Book 6	12	12	-Drawing conclusions
			-Making comparisons and contrasts
			-Following sequence
			-Recognizing point of view
Design for Good Reading, Book A, B, C			-Grasping the main idea
			-Sensing implications
			-Detecting themes
			-Sensing tone
			-Seeing the writer's purpose
			-Detecting the author's attitude
			-Making judgments
Effective Reading, Book 1-4	7-10		Literal Meanings
			-Seeing main ideas and details
			-Following organization including sequence
			Interpreting Ideas including Critical Read- ing
			-Reading between the lines

TABLE VIII (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
			<ul style="list-style-type: none"> -Grasping implied meanings -Forming judgments -Evaluating -Forming conclusions
Follett Vocational Reading	high school	4-6	<ul style="list-style-type: none"> -Determining main ideas and supporting details -Making inference -Following sequence -Word knowledge
Reading for Meaning, Book 7, 8, 9	7,8,9	7,8,9	<ul style="list-style-type: none"> -Understanding word meanings -Getting the main ideas and details -Understanding paragraph organization: sequence -Drawing conclusions
Reading Skillbook 1 and 2			<ol style="list-style-type: none"> 1. Comprehension: putting meanings together to form larger meanings 2. Interpretation: understanding more than is actually said
Reading Study Book One, Two, and Three	7 8 9	5-7 6-8 7-9	<p>Literal Meanings</p> <ul style="list-style-type: none"> -Seeing main ideas and details -Following organization including sequence

TABLE VIII (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Steps to Better Reading	7,8,9		Interpreting Ideas including Critical Reading -Reading between the lines -Grasping implied meanings -Forming judgments -Evaluating -Forming conclusions -Identifying key words -Finding generalizations -Understanding references -Recognizing transitions -Finding relationships -Distinguishing between literal and figurative language -Determining main ideas -Perceiving patterns of development: stating reasons, listing details, providing examples, cause-and-effect, com- parisons, contrast, examples
Success in Language/A	high school		-Seeing main ideas and details
The Turner- Livingstone Reading Series	high school		None given

maintain are contained within three successive levels of understanding. In this and other hierarchical and non-hierarchical constructs, however, verbal skills-based definitions of comprehension prevail.

Boxed Materials

A number of boxed reading laboratories and kits are available to the secondary reading teacher. These materials are usually composed of a number of reading selections printed on individual cards or in short booklets followed by exercises designed to encourage growth in students' reading ability. Two characteristics distinguish these boxed materials. In the first place, they are generally designed to promote the adolescent reader's interest in reading and to develop his taste for more mature reading materials. Hence, a broad range of interests is usually accommodated within the reading matter provided. A second characteristic of these materials is their multi-level format. Recognizing that most secondary classes are composed of students who range widely in their reading abilities, these materials most often contain reading selections of an equally wide range of difficulty. In this way, adolescents are encouraged to read material of interest to them at reading levels which they do not find frustrating. On the basis of

this activity, growth in reading ability, including comprehension, is encouraged.

The ways in which boxed materials may be implemented for instructional purposes vary greatly. Since these materials are usually self-instructional in that students score their own work and keep their own records, the teacher is free to circulate among individuals, helping them with their specific problems. The multi-level format of most boxed materials allows for a high degree of flexibility with respect to students interests and reading levels. Hence, these materials may be used for either developmental or remedial instruction. They may serve as the core or as supplementary materials in a developmental program conducted on a class-wide basis, or they may be used to provide corrective or remedial instruction for small groups or individual students.

Examples of boxed instructional materials reviewed in Table IX reveal essentially two conceptual bases for the teaching of comprehension. As might be expected by the nature of these materials, the predominating concept of comprehension represented is a skills-based one. Here, authors delineate the specific skills which their materials are designed to teach. These skills are expressed verbally and the descriptions of them are, for the most part, extensive and

TABLE IX
 CONCEPTS OF COMPREHENSION REPRESENTED
 IN SECONDARY BOXED MATERIALS

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Dimensions in Reading: Man-power and Natural Resources	high school and adult	4.0-11.9	<ul style="list-style-type: none"> -Interpretation -Reasoning -Critical thinking
Pilot Library IIIb	8,9	5-12	<ul style="list-style-type: none"> -Recognizing literary devices and figures of speech -Recognizing techniques of characterization -Seeing comparison and contrast -Understanding explicit and implicit details -Detecting motivation -Seeing point of view -Detecting the author's tone or attitude
Reading Development, Kit C	high school and adult	7-10	<ul style="list-style-type: none"> -Determining facts -Making correct inferences -Utilizing critical thinking--evaluating arguments and conclusions -Applying concepts of facts within the context -Extending facts, concepts and skills to other contexts

TABLE IX (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Senior Reading for Under- standing	high school	8-12	-Reasoning -Inference -Interpretation -Meaning
SRA Reading Laboratory IIIa	junior high school	3.0-12.0	-Understanding what the author says -Reading between the lines -Understanding the author's feelings and opinions -Understanding the author's purpose -Following time order -Noting important facts -Drawing conclusions -Seeing main idea -Evaluating evidence -Evaluating judgments -Seeing relationships
SRA Reading Laboratory IVa	senior high school	8-14	-Noting important details -Determining the writer's opinion -Seeing the main idea -Seeing implications -Perceiving cause and effect -Perceiving the writer's tone -Telling fact from fantasy -Evaluating evidence -Judging the writer's purpose -Understanding motives -Reading between the lines

TABLE IX (CONTINUED)

Title	Intended Grade Level	Reading Grade Level	Concepts of Comprehension
Tactics in Reading, I and II	9, 10	9, 10	<ul style="list-style-type: none"> -Drawing conclusions -Perceiving the writer's plan -Seeing relationships -Understanding main ideas and details -Following sequence -Separating fact from opinion -Understanding generalizations -Making Judgments-- Critical -Reading: facts and opinions, recognizing an authority, importance of dates, connotations of words, begging the question, recognizing assumptions, irrelevant evidence, jumping to conclusions, generalizations -Understanding Central Ideas and Supporting Details -Making Inferences -Seeing Relationships: time order, comparison-contrast, cause-effect, simple listing -Imagery: visualizing, noting sensory impressions

explicit. Included are many skills sometimes associated with critical and creative reading (detecting the author's point of view, evaluating arguments and conclusions, distinguishing fact from opinion, etc.). It is important to note, however, that these skills-based definitions of comprehension are non-hierarchical in nature, there being suggested no sequential progression in their acquisition of difficulty.

The second concept upon which the teaching of comprehension using boxed materials is based is described in terms of cognition. Two of the examples reviewed adopt this approach--Dimensions in Reading: Manpower and Natural Resources (14), and Senior Reading for Understanding (44). Where cognitive-based verbal definitions of comprehension are attempted, however, the results are unclear. Terms such as "interpretation," "reasoning," and "critical thinking" do little to clarify the nature of comprehension being taught. A valuable insight could be provided if the specific relationship between the cognitive abilities described and the actual student activities generated by the materials were clarified. Unfortunately, such clarification is lacking.

ASSESSMENT OF INSTRUCTIONAL MATERIALS

The instructional materials contained within the five categories reviewed above reveal one prevailing concept of

comprehension. This concept is expressed verbally in skills-based non-hierarchical definitions. These definitions predominate in every category except one, Materials for Special Groups. In this category, the majority of materials reviewed provide either very vague or no descriptions of the nature of comprehension which they represent. The second most prevalent concept of comprehension is stated in terms of verbal skills-based hierarchical definitions. Hence, the only difference between the first and second most common definitions of comprehension is that one represents comprehension skills non-hierarchically while the other represents them within hierarchical structures. Only in the case of Boxed Materials are cognitive-based definitions of comprehension provided and here they are given in a very vague fashion. As was the case with professional textbook authors, insight into the nature of comprehension provided by experimental investigations and models is apparently ignored by materials builders. By these omissions, it would seem that materials builders have deprived themselves of two sources which may well have afforded additional credibility and precision to the concepts of comprehension which they seek to embody in their instructional materials.

The prevalence of skills-based verbal definitions of

comprehension underlying instructional materials brings with it certain problems, however. In the first instance, though these definitions are explicit and often extensive, the manner of their expression is often imprecise. This imprecision has been noted in the previous chapter with respect to verbal definitions of comprehension presented in textbooks. This problem is no less evident here as it relates to instructional materials. For example, the Adventures in Literature Series (30) includes as one of the comprehension skills it seeks to teach the ability to note the organization of a reading passage. In the same way, Advanced Skills in Reading (15) teaches seeing relationships. While each of these statements appears to be describing essentially the same skill, the precise nature of this skill remains uncertain due to the vagueness of the descriptions provided. What kinds of organization or relationships are being taught? Are they linguistic, structural, implicit, explicit, or are they something else entirely? None of these questions is answered. Naturally, partial answers may be determined by a careful examination of the specific exercises and questions asked of students in the materials. But such an examination should not be necessary in order to gain a reasonably accurate understanding of the skills which materials are intended to develop. The nature of these skills

should be explicitly and precisely stated.

A further difficulty with skills-based verbal definitions relates to the conceptual boundaries within which definitions of comprehension must be contained. The materials examined here are consistent in that, when they make reference to critical and creative reading, these kinds of reading and their associated skills are usually included under the broader heading of comprehension. But the question of which skills to include within definitions of comprehension is not so easily resolved. Karlin, for instance, in Reading for Achievement (21) includes determining word meanings from context clues under his definition of literal comprehension. However, both Strang in Teen-Age Tales (42) and Covell and McGechaen in Effective Reading (10) expressly exclude vocabulary skills from their definitions of comprehension. At the other end of the scale, Biehl and Barrett, in The Canadian Reading Development Series (3), include outlining in their discussions of comprehension skills. Yet most materials include outlining under the heading of study skills. The implication appears to be that outlining and other study skills involve the application of comprehension once it has been attained rather than constitute a part of it. Whatever the reasoning, these examples serve

to illustrate that the conceptual limits within which comprehension is represented in instructional materials are by no means clear. Therefore, added to the confusion caused by vaguely stated descriptions of component skills of comprehension are the kinds of conceptual inconsistencies outlined here.

SUMMARY

Recent years have witnessed the appearance of a growing number of instructional materials intended for the teaching of reading in the secondary grades. The importance of these materials lies in the fact that they constitute the medium through which established instructional objectives for secondary reading programs are pursued. The secondary reading materials contained in the Reading Resources Centre of the University of British Columbia were adopted as a representative collection of those currently available to teachers. These materials were sorted into five categories: Basal Materials, Skills-Building Materials, Materials for Special Groups, Workbooks, and Boxed Materials. The materials were then analyzed in order to determine the concepts of comprehension upon which they are based. This analysis reveals that the prevailing concept of comprehension underly-

ing these materials is expressed in terms of verbal skills-based, non-hierarchical definitions. The second most prevalent definition is also a verbal one but is based on skills conceived hierarchically. Associated with these skills-based verbal definitions of comprehension are two sources of confusion. First, though the definitions provided tend to be explicit and extensive, they also tend to be vaguely expressed. Secondly, the conceptual limits for comprehension are unclear thus causing confusion regarding which skills are to be included within concepts of comprehension.

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Chapter 9

CONCEPTS OF COMPREHENSION REPRESENTED IN PUBLISHED SECONDARY READING TESTS

The previous two chapters have reviewed the concepts of reading comprehension represented in professional textbooks and instructional materials intended for the secondary grades. The purpose of this chapter is to examine the concepts of comprehension which test authors claim provide the basis for the measurement of comprehension in published reading tests designed for the secondary grades. The first stage in this examination is to determine the nature of comprehension as represented in published tests. This is followed by an assessment of these concepts in the light of current theoretical and experimental knowledge of the nature of comprehension.

It has been seen that professional textbooks and instructional materials may influence the determination of instructional objectives for teaching comprehension and the medium through which this teaching is carried out. To this it can be added that published reading tests are often

used to assess the extent to which teaching has achieved instructional objectives. Moreover, test results may serve as the basis for new instructional programs designed to rectify revealed student weaknesses and to capitalize on demonstrated student strengths.

An important basis for the selection of tests is a clear understanding of what test authors and publishers claim that their instruments measure. Certainly, what tests actually do measure is the only viable basis for accurate interpretation of test scores. However, the first step in intelligent test selection usually involves determining whether or not tests claim to measure comprehension ability as it has been initially conceived as an instructional objective, and as it has come to be taught. The primary concern of this chapter is to determine the concepts of comprehension which test authors claim they have attempted to embody in their tests, and the extent to which these attempts reflect current theoretical and experimental knowledge of the nature of reading comprehension. Whether or not these tests have succeeded in measuring comprehension as it is conceived by test authors is essentially a measurement problem and as such extends beyond the scope of this discussion.

Currently-available tests designed to measure comprehension in the secondary grades were determined from Farr's (22) recent compilation of published tests in reading. Since the object of this chapter is the examination of current measures of comprehension, only those tests published or revised after 1955 were selected. In a few instances, tests listed by Farr were unavailable from publishers and are therefore omitted. In these cases, it is unlikely that test users could readily obtain these instruments, and hence they probably do not fall into the category of currently available tests. In a few additional cases, tests listed by Farr as being revised since 1955 were found to be unrevised reissues of tests developed and published before 1955. Tests of this type were determined by consulting Buros (7) and by examining the tests themselves. These tests have not been included in the discussion here. Other minor emendations to Farr's compilation have been made when the need for them has been discovered.

Each of the tests selected was examined along with its accompanying manual in order to determine the concept of comprehension upon which it is based. The resulting review of tests is presented here in chronological order of test publication or most recent revision. This organization is

adopted in order to illustrate any developmental patterns over the past fifteen years in the manner in which test publishers and authors have conceived comprehension.

Within the overall review, each test summary begins with a brief overview of the test as a whole including the general objective of the test, the levels and number of forms relating to the secondary grades, and the individual subtests and presentation of scores. A description of the part of the test specifically measuring comprehension is then given including the content and length of reading passages, the number and type of questions, and the manner by which comprehension scores are determined. Finally, and most important for the purposes of this study, the concept of comprehension upon which the measurement of comprehension is based is described to the extent that it is explicitly provided. Following this review of individual tests, a general assessment of secondary comprehension tests is made in terms of current experimental and theoretical knowledge of the nature of reading comprehension. The chapter is concluded with a brief summary.

REVIEW OF TESTS

Diagnostic Reading Tests: Survey Section

The Upper Level of this test is available in eight

forms intended for grades seven through thirteen. The test includes three subtests--General Reading, Vocabulary, and Comprehension--which provide four scores: Rate of Reading, Story Comprehension, Vocabulary, Comprehension, and Total Comprehension.

The Comprehension subtest is designed to measure "study-type reading skills" (59:1). It is made up of four timed reading passages "similar to that found in textbooks in social studies and science" (59:1-2). Each passage is followed by five four-alternative multiple choice questions. It is important to note, however, that the Comprehension score calculated from the test includes both the student's score on the Comprehension subtest and his score on the comprehension questions based on the Rate-of-Reading subtest. This latter measure of comprehension is described in the test manual as "story comprehension." Test users are warned that, by itself, "it is not a thoroughly reliable and valid measure" of comprehension (59:2). For reasons which are not explained, however, this score is combined with the Comprehension subtest score to produce a Comprehension score which is described as "a dependable measure of story type and work-type comprehension" (59:3). However, this test also provides a third comprehension score designated Total Comprehension which includes all subtest scores

on the test (including Vocabulary) except Rate-of-Reading. This third comprehension score is described as "an evaluation of efficiency of the over-all reading skills of an individual" (59:3).

Despite the profusion of comprehension scores provided by this test, the exact meaning of these scores remains unclear. The difference between "story-type" and "work-type" comprehension is not stated nor is an explanation provided of what constitutes a student's "over-all reading skills." One searches the manual in vain for a description of the abilities measured by the Comprehension subtest. The answer to this question is partly provided by the test form itself where students are told that the Comprehension subtest will determine their abilities to find main ideas, important facts, the order of events, and to draw conclusions. Hence, though the consumer of this test is almost certain to be confused by the number of scores to which the term "comprehension" has been attached, the skills purportedly measured by the Comprehension subtest are partially clarified in the test form, but not in the manual where one would expect to find this information. Further, experimental studies of the specificity of comprehension indicate that a test such as this one, based on social studies

and science materials alone, will measure comprehension at least partially specific to these two content areas. Hence, the test will provide only an approximate measure of the comprehension of reading materials in other content areas. The test authors fail to inform the test user of this apparent restriction on the general applicability of scores obtained from their test, however.

Cooperative English Test: Reading Comprehension

This survey test of reading comprehension provides three equivalent forms applicable to students in grades nine through twelve, and three equivalent forms intended for students in the first two years of college. Three sub-scores are provided including Vocabulary, Level of Comprehension and Speed of Comprehension. Vocabulary and Speed of Comprehension are averaged to produce a Total Reading Comprehension score. Vocabulary is included in the Total Reading Comprehension score since, according to the test manual (12:6), it "has been shown to be the best single index of verbal skill." This subtest requires the student to match the meaning of a word with the meaning of another word or phrase contained in a list of four alternatives provided. The reading passages used to determine the Level of Comprehension and Speed of Comprehension scores are

somewhat vaguely described as representing "the many kinds of materials which students are called upon to read in school" (12:6). Reading passages range in length from single paragraphs to short excerpts, and comprehension is measured by sixty four-alternative multiple choice questions. Speed of Comprehension is determined from student scores on all sixty questions. Level of Comprehension is determined on the basis of students' scores on the first thirty questions which the manual contends represent a measure of power rather than speed since "experimental tests have shown that most students have time to try all of these 30 items" (13:6). However, the authors fail to account for the possibility that students' scores on the first thirty items are affected by their awareness of the test time limit. Given unlimited time, students' scores on these thirty items may well be higher. For this reason, the legitimacy of the claim that performance on the first thirty items provides a true measure of power may be questioned.

A number of questions pertaining to the meaning of the Total Comprehension score obtainable from this test remains unanswered. The nature of comprehension represented by this score is partly clarified by the statement in the

test manual that questions based on the reading passages "range from those requiring the student only to recall a 'fact' of the passage to increasingly complex items requiring him to interpret what he has read" (12:6). The exact nature of this continuum is not clarified, however, thereby leaving in obscurity the nature of comprehension measured by this test. Another question concerning the concept of comprehension underlying this test arises from the inclusion of the Vocabulary subscore in the Total Comprehension score. Even though vocabulary knowledge is indicative of verbal ability, the combination of vocabulary in isolation with speed of comprehension needs more justification as a measure of reading comprehension than the manual provides, particularly in view of the exclusion of the Level of Comprehension subscore from the Total Comprehension score. This exclusion would seem to give undue emphasis to speed in measuring comprehension while tending to depreciate the importance of power. It is likely that answers to the questions raised here are available; that they are not provided in the manual can only confuse the potential user of this test.

Diagnostic Reading Test, Pupil Progress Series

The manual accompanying this test describes its

purpose as the identification of readers deficient in reading skills and the diagnosis of their deficiencies (4:3). The Advanced Level of the test is available in two forms applicable to grades seven and eight. The total test score is composed of scores from three subtests entitled Knowledge and Use of Sources, Rate of Reading for Meaning, and Reading Comprehension.

The Comprehension subtest is divided into six parts: Word Meaning, Reading for Recall of Information, Reading for Meaning, Reading to Locate Information, Reading for Directions or Procedures, and Reading for Descriptions. Scores on these parts are determined from answers to three- and four-alternative multiple choice questions based on the timed reading of passages ranging in length from short phrases to full paragraphs. The Total Comprehension score is described as one which "evaluates understanding of materials read" (4:21). Although individual scores from parts of the Comprehension subtest are readily obtainable from the marking procedure, the test manual warns against using these for reliable analysis except on a class-wide basis.

The concept of comprehension underlying the comprehension subtest is strongly suggested by the titles of its parts.

This concept is made clear by the test authors in their statement that they seek to measure:

...comprehension of material read when the tasks assigned are: reading for recall of information, for meaning, to locate information, to follow directions, and to gain "visual images" of objects from verbal descriptions of them. (4:21)

One wishes that "reading for meaning" were further elucidated. Yet, despite this criticism, it is clear that the test authors have attempted to provide a statement of what their comprehension subtest measures. For this reason, the potential test consumer can consider this instrument with some awareness of what its authors have sought to measure under the heading "comprehension."

The Nelson-Denny Reading Test

According to its authors, this test serves "predictive, screening and broadly diagnostic purposes" (48:3). It is available in two forms intended for use with students in grades nine through sixteen. A Total Reading score is obtained by adding the Vocabulary subtest score to the doubled score from the Comprehension subtest.

The Comprehension subtest is based on eight prose selections one of which is over six hundred words long, the balance being each approximately two hundred words long. The test is limited to twenty minutes and is measured by thirty-

six five-alternative multiple choice questions. No description of the content of the reading passages is given although they appear to be heavily academic in nature involving history, economics, literature, sociology and anthropology.

Although the test manual states that the comprehension score is "the best single index of reading ability" (48:3), virtually no attempt is made to describe the conceptual basis of this score. Hence the test user is left in a benighted state when he searches in vain for a statement of the nature of comprehension as it is measured by this test.

Metropolitan Achievement Tests: Reading

The Advanced Reading Test, taken from the Metropolitan Achievement Test Advanced Battery, provides three forms intended for students in grades seven through nine. The test is designed "to afford dependable data concerning the level of pupil achievement in word knowledge and reading" (14:10). Separate scores are provided for each subtest. The Reading subtest contains seven passages ranging in length from approximately 150 to four hundred words. These passages are followed by four-alternative multiple choice questions designed to measure comprehension.

The manual accompanying the Advanced Reading Test

informs the test user that pertinent research literature and various reading program objectives have been reviewed to establish the content and reading abilities measured by the test. Despite this assurance, the Advanced Reading Test manual fails to give an explicit description of the actual reading abilities which the test proposes to measure. The test user must go to the Manual for Interpreting Metropolitan Achievement Tests for this information. These abilities are described as follows:

1. Ability to select the main thought of a passage, or to judge its general significance.
 2. Ability to understand the literal meaning of the selection or to locate information explicitly set forth.
 3. Ability to see the relationships among the ideas set forth in the selection and to draw correct inferences from the selection.
 4. Ability to determine the meaning of a word from content or to judge from the context which of several possible meanings is the appropriate one.
- (15:35)

Hence, though there is no indication of the relative weight assigned to these different abilities in the measurement of reading comprehension, an attempt is made to acquaint the test user with the concept of comprehension upon which this test is based.

Davis Reading Test

The Davis Reading Test is designed to assess the

over-all reading ability of students in grades eight through thirteen. Series I measures reading ability in grades eight to eleven while Series II is intended for students in grades eleven to thirteen. Both series are available in four equivalent forms. Two scores are provided by the test-- Speed of Comprehension and Level of Comprehension. Speed of Comprehension is determined from all of the eighty five-alternative multiple choice questions which constitute the test. Forty minutes are allowed for the completion of the questions. The Level of Comprehension score is based on the first forty questions all of which, according to the authors (11:22), are attempted in the time allowed by all but severely retarded readers. The authors differentiate between the two comprehension scores by stating that, while the Level of Comprehension score indicates "the depth of understanding displayed by a student in reading the kinds of material he is ordinarily required to read in high school and college," the Speed of Comprehension score indicates "the rapidity and accuracy" with which this material is understood (11:5).

It should be noted, however, that the Level of Comprehension score may not be as free from the influence of time as these authors appear to suggest. It would seem

legitimate to speculate that student scores on the first forty questions would be higher if students were told they had unlimited time in which to complete the questions rather than the forty minutes allowed by the test. Hence, it appears possible to question the validity of scoring the first forty items and considering the results a measure of "Level of Comprehension" simply because all but retarded readers finish these forty items.

Davis and Davis delineate the concept of comprehension upon which their test is based by referring to the findings of F. B. Davis' first factor analysis study of comprehension (9). Based on the findings of this earlier investigation, the authors set out five categories of "operational skills" which serve as the conceptual foundation of their test:

1. Finding the answers to questions answered explicitly or in paraphrase in a passage.
2. Weaving together the ideas in a passage and grasping its central thought.
3. Making inferences about the content of a passage and about the purpose or point of view of its author.
4. Recognizing the tone and mood of a passage and the literary devices used by its author.
5. Following the structure of a passage. (11:28)

Hence, the conceptual basis of the Davis Reading Test is a clearly-articulated one founded upon experimental evidence. And even though there is controversy surrounding this

evidence, a good deal of support for it can be found in other investigations reviewed in an earlier part of this study.

Reading Versatility Test

The authors of this test describe its purpose as the evaluation of students' ability "to read in a number of task-oriented ways," and the determination of "the effectiveness and efficiency, or flexibility" of this reading (43:3). The Intermediate and Advanced levels of the test are intended for grades eight through twelve and twelve through sixteen respectively. Four forms are available at each level.

The test is composed of four reading passages each approximately nine hundred words in length which the authors maintain represent the "type range and content" actually used at the grade levels for which the test is intended (43:10). Examinees are directed to read the first passage as if time were very limited, and to read the second passage in a careful and thoughtful manner; they are told to skim the third passage and to scan the fourth. Reading time for each passage is recorded and comprehension is determined by ten four-alternative multiple choice questions following each of the first and second passages, three questions following the third passage, and one following the fourth. The scanty measurement of skimming and scanning comprehension

is probably reflected in the sharp drop in reliability coefficients reported in the manual between comprehension scores on the first and second parts of the test and the combined scores of the third and fourth parts (43:10).

Despite this limitation with respect to the measurement of skimming and scanning comprehension, the test manual is explicit in stating the concept of comprehension measured by the first two passages. Here the reader is expected to understand important facts and details, main ideas, and implications. The skimming passage measures only the ability to detect "the more important ideas," while the scanning passage measures the ability to read in search of the answer to a question provided in advance (43:3). Hence, it would appear that the first two passages of the test measure general comprehension, while the last two measure comprehension of a particular type.

California Reading Test

The California Reading Test, part of the California Achievement Tests battery, provides a Junior High Level in four forms, intended for grades seven through nine, and an Advanced Level in three forms, designed for grades nine through fourteen. The test manual describes the test as fulfilling "the three-fold purpose of facilitating evaluation,

educational measurement, and diagnosis" (55:5). It should be noted that another test battery by the same publisher entitled the California Survey Series includes a reading test adapted from the California Reading Test. The major difference is that the Survey Series reading test has been shortened by excluding the diagnostic features contained in the California Reading Test. Since the concept of comprehension underlying both tests remains essentially the same (57:3), an analysis of comprehension as measured by the Survey Series may be included with a discussion of comprehension as measured by the California Reading Test.

The California Reading Test includes two timed subtests designated as Reading Vocabulary and Reading Comprehension. Scores from these two subtests are combined to give a Total Reading score. The Reading Comprehension score is a composite of scores from three sections of the subtest described as Following Directions, Reference Skills and Interpretation of Material. Eighty-six four-alternative multiple choice questions based on passages varying in length from single sentences to two and three paragraphs are used to measure comprehension. The content of these passages is rather imprecisely described in the manual as including "the most universal subject-matter objectives

of the curriculum" (55:9). These objectives are reported to be determined from the examination of school curricula and verified by the opinions of experts.

The manual describes the Reading Comprehension subtest as revealing "the student's comprehension of what he reads and to enable the teacher or counsellor to make a diagnosis of specific difficulties which cause problems in reading" (55:5). The manner by which this objective is claimed to be accomplished is described by reference to the three sections of the comprehension subtest. In the Following Directions section, the ability to follow general and specific directions and to comprehend definitions is tested by the fifteen items. The Reference Skills section includes twenty-six items testing dictionary and library skills. Included here are the ability to select proper references, knowledge of report outline forms, and graph and map reading skills. Finally, the section entitled Interpretation of Material contains forty-five items designed to reveal a student's ability to comprehend explicitly stated facts, to select the most appropriate topic or main idea, to make inferences and deductions, and to reconstruct an author's sequence of ideas. A "Diagnostic Analysis of Learning Difficulties" is printed on the examination booklet

which keys each item of the test to the skills which it is designed to measure. The test user is cautioned against placing undue confidence in this analysis, however, and the manual explicitly states that, "because of the limited number of items (15-45), the section scores of each test should be used only as guides to indicate the presence of student difficulties" (55:8).

In general, it seems that the California Reading Tests designed for the secondary grades illustrate a conscientious attempt on the part of the authors to express their concept of comprehension in a clear and precise manner. The test user is given an explicit understanding of what is intended to be measured and he is provided with a useful guide for interpreting the results of this measurement.

The Gray-Votaw-Rogers General Achievement Test

This survey test includes ten subtests measuring achievement in different curriculum areas including reading comprehension. The Advanced Level includes four forms applicable to students in grades seven through nine.

The comprehension subtest is timed and composed of forty three-alternative multiple choice questions based on eight reading passages of prose and poetry ranging in

length from about eighty to four hundred words. The manual states that the material upon which the test is based has been selected with reference to courses of study, outlines submitted by teachers, textbooks, and curriculum bulletins (29:8). A single score is provided by the comprehension subtest.

In describing the concepts upon which the comprehension subtest is based, the authors maintain that they have endeavoured to measure "various aspects of comprehension." They contend that their test "goes farther than some reading tests calling merely for recognition or recall of ideas" in that it contains "some items framed to measure the ability to draw inferences, to form conclusions, and to grasp the overall meaning of a paragraph or section" (29:11). However, the authors fail to provide any indication of the degree of emphasis the test places on each of these aspects of comprehension. Thus, the test user could feel more confidence in this instrument if the extent to which different aspects of comprehension are purportedly measured were made explicit.

The Iowa Tests of Educational Development

The manual accompanying this battery describes the tests as designed "to provide a comprehensive and dependable

description of the general educational development of the high school pupil" (41:6). Nine timed tests intended for grades nine through twelve are included, three of which directly measure the comprehension of reading materials in social studies, natural science, and literature. Scores from these three tests are combined to give an average reading score which is described as "a summary measure" of reading ability (39:3). Between eight and ten reading passages and eighty four-alternative multiple choice questions are included in each test.

In order to help the test user to determine what the test is designed to measure, the manual provides a comprehensive summary of these objectives with each test item keyed to the objective it is intended to measure. The authors warn, however, that "these analyses represent only the considered judgments of the authors" since "the same exercise may function in a number of ways, depending on the instruction that has preceded testing" (40:19). For this reason, the authors emphasize that "the test user--with his knowledge of his students and curriculum--is often the best judge of content validity" (40:19). The skills upon which the three tests of comprehension included in this battery are based may be summarized as follows:

- Test 5: Ability to Interpret Reading Materials in the Social Studies.
- A. Ability to comprehend what is stated in a selection.
 - B. Ability to interpret what is implied in a selection.
 - C. Ability to analyze and evaluate a selection critically.
- Test 6: Ability to Interpret Reading Materials in the Natural Sciences.
- A. Ability to comprehend the content of a selection.
 - B. Ability to draw immediate conclusions from experimental conclusions.
 - C. Ability to extend conclusions to related phenomena.
 - D. Ability to analyze and interpret an experiment as a whole.
- Test 7: Ability to Interpret Literary Materials.
- A. Ability to comprehend and interpret the content of a selection.
 - B. Ability to analyse and appreciate the elements of literary works. (41:20-30)

Clearly, the test manual provides an excellent description of the nature of comprehension measured by this test in relation to particular content materials. Further, the test user is given some sound advice regarding the appropriate use of the test results in his particular situation. By limiting their measurement of comprehension to reading material from specific content areas, the authors maintain consistency with experimental findings pertaining to the specificity of comprehension. The authors' failure to inform the test consumer of this evidence in support of their test would seem to be an oversight, however, since to have

done so would have probably contributed to the test consumer's confidence in using the test results accurately.

Sequential Tests of Educational Progress--Reading

Three levels of this test are available in two forms at each level. The three levels measure reading in grades seven through nine, ten through twelve, and thirteen through fourteen, respectively. The general emphasis of the entire STEP battery is placed on "broad understandings and abilities to use learned skills in solving new problems" (21:5). The STEP Reading Tests are composed of a variety of passages which the authors maintain represent "the major types of material which students are called upon to read" (19:7). The passages include directions and announcements, articles of information or explanation, letters, stories, poetry, articles of opinion or interpretation and plays. Comprehension of these materials is measured by four-alternative multiple choice questions. Test items were determined by a committee of reading experts along with specialists in test construction. Although the test is timed, the authors contend it is primarily a power test since all but the slowest readers complete it in the time allowed. However, one may question this claim since it seems possible that test scores would be higher if the test were

administered without the pressure of a time limit being imposed on examinees.

An explicit description of the concept of comprehension underlying the STEP Reading Tests is given. According to the test authors, the test measures the following: the ability to understand direct statements, to interpret and summarize passages, to see authors' motives, to observe the organization of ideas, and to criticize passages with respect to ideas and purposes of presentation (19:7).

Emporia Reading Tests

The Emporia Junior High School Reading Test is available in two forms designed for use in grades seven and eight. The test is made up of two untitled subtests which appear to measure word knowledge and the comprehension of prose passages approximately two hundred words in length. The test is timed and sixty-five four-alternative multiple choice questions determine the single test score provided.

The test authors inform the test user that "a high degree of validity has been assured" by selecting and checking each item against "reputable criteria such as courses of study, textbooks, word lists, criticisms of teachers and supervisors, and analyses of pupils' test papers" (50:2). However, despite these assurances, the exact nature of what

is being measured remains a mystery. Virtually no rationale for this test as a measure of reading comprehension is offered. Thus, what this measures besides an undefined concept of reading is not clear, especially since the two parts of the test are not even given descriptive titles. These deficiencies become even more pronounced when one reads in the test manual the recommendation that the test results be used for assigning marks, promotion, and "most important of all..., diagnostic use...and the remedial measures which may be applied after the specific shortcomings have been discovered" (50:4). It is obvious that such uses are impossible when the lack of specificity displayed by this instrument is considered.

SRA Achievement Series: Reading

The Reading Test of the SRA Achievement Series is composed of two subtests, Comprehension and Vocabulary. The multilevel battery is applicable to grades one through nine and is available in four forms. The authors claim that the Comprehension subtest is designed "to sample typical reading situations." They also claim that the tests were constructed on the basis of "carefully surveying children's reading interests at various grade levels and studying the types of materials they are commonly asked to read" (53:5). The reading passages represent different

content areas including social studies, science, and literature. Comprehension is measured by multiple choice questions under timed conditions.

The test manual provides a classification of items in the Reading Comprehension subtest according to the following general outline: Reading for Specific Information, Correlating Information, Recognizing Implications and Drawing Logical Inferences, and Recognizing Main Ideas. Hence, the authors of this test provide a general framework by which a test user can determine the nature of comprehension which they claim to measure. However, the test authors fail to provide separate comprehension scores for reading passages taken from the different content areas included in this test. The provision of these scores would seem to be warranted on the basis of experimental evidence regarding the specificity of comprehension in different content areas. As it stands, the comprehension score obtained from this test is a global one probably giving only an approximate measure of students' comprehension ability with respect to reading material in specific content areas.

Stanford Achievement Test: Reading Tests

The Advanced Paragraph Meaning Test in this series is designed for grades seven through nine. It is available

in only one form. The entire test measures reading comprehension by means of a series of paragraphs in which one or a number of words have been omitted. The student is to select the appropriate word from a choice of four alternatives to fill each omission. The content material of the paragraph ranges from general to science, geography, history, literature, and fine arts. This test, like the SRA Reading Test, provides only a single comprehension score, however. Hence, the examinee's comprehension of reading material from the specific content areas included in the test is not indicated.

The manual for the Advanced Paragraph Meaning Test informs the test consumer that the paragraphs and questions were determined by examining pertinent courses of study and textbooks in order to determine "the skills, knowledges, understandings, etc., to be measured" (35:10). For a clearer understanding of what this test measures, however, the test user must consult the manual for the complete battery. Here it is learned that the test is intended to provide "a functional measure" of students' comprehension ability involving comprehension varying from "extremely simple recognition to the making of inferences from what is stated in several related sentences" (33:4). The authors

further state that they have sought to "emphasize the notion of 'reading as reasoning'," and that, accordingly, they have constructed test items "that place a premium on genuine comprehension of the material read" (33:4).

Despite these assurances, one searches in vain for further elucidation of what is meant by "genuine comprehension" or "reading as reasoning." Beyond their statement that these abilities involve making inferences, the test authors fail to provide further explanation of exactly what they seek to measure. This is unfortunate since their stated aspirations are admirable ones, and the provision of a clear pronouncement of what "genuine comprehension" and "reading as reasoning" involve would provide the potential test consumer with some basis for determining the usefulness of this instrument for his specific purposes.

Watson-Glaser Critical Thinking Appraisal

Two forms of this test are available for use in grades nine through sixteen and beyond. Although the title indicates that this test may not be exclusively a measure of reading comprehension, the authors maintain that a student obtaining a high score on their test is also likely to score high on a reading test. However, they state:

While it is true that a person must be able to read in order to perform effectively on the Critical Thinking Appraisal, the test items require mental activity more complicated than mere recognition of the vocabulary and comprehension of the sentences.

(61:11)

It would seem that the meaning of "comprehension" as it is used in this quotation is restricted to literal comprehension. This puts the authors in the position of measuring aspects of comprehension that some model builders, notably Goodman, reject as being beyond the scope of comprehension proper. If an examinee fails an item on this test, it may be for one of several reasons including failure to understand the vocabulary, failure of literal comprehension, or failure of critical thinking beyond literal comprehension. It would seem that in order to interpret an individual's scores as measures of critical thinking, one first would have to obtain information about this individual's vocabulary and literal comprehension abilities from a separate source.

This is a true power test since it imposes no time limit on examinees. The reading passages range in length from single sentences to short passages and the test includes one hundred five-alternative multiple choice questions. The material used to construct the reading passages is described as involving "problems, statements, arguments, and interpret-

ations of data similar to those which a citizen in a democracy might encounter in his daily life as he works, reads newspapers or magazine articles, hears speeches, participates in discussions of various issues, etc" (61:2).

The precise nature of this test and the manner in which it measures comprehension is illustrated by the description of the test provided in the manual. Here five subtests are outlined in terms of the abilities which they are designed to measure:

Inference. Samples ability to discriminate among degrees of truth or falsity of inferences drawn from given data.

Recognition of Assumptions. Samples ability to recognize unstated assumptions or presuppositions which are taken for granted in given statements or assertions.

Deduction. Samples ability to reason deductively from given statements or premises; to recognize the relation of implication between propositions; to determine whether what may seem to be an implication or a necessary inference from given premises is indeed such.

Interpretation. Samples ability to weigh evidence and to distinguish between (a) generalizations from given data that are not warranted beyond a reasonable doubt, and (b) generalizations which, although not absolutely certain or necessary, do seem to be warranted beyond a reasonable doubt.

Evaluation of Arguments. Samples ability to distinguish between arguments which are strong and relevant and those which are weak or irrelevant to a particular question at issue. (61:2)

Thus, the test user is provided with a comprehensive description of the authors' concept of critical thinking. The parallels between what is called "critical thinking" here and

what is measured under the designation "comprehension" by other instruments are apparent.

The test provides a total score only, although individual subtest scores can be extracted easily. However, the use of subtest scores is discouraged in the test manual since they are based on too few items for adequate reliability.

Gates-MacGinitie Reading Tests

Survey E of this test is intended for grades seven through nine while Survey F is applicable to the tenth through the twelfth grade. Both tests include three subtests--Speed and Accuracy, Vocabulary, and Comprehension--which collectively give a total reading score. Each subtest is timed and is rather imprecisely described as based on content "typical of current reading material" (26:1,27:1). The comprehension subtest is made up of twenty-one short paragraphs in which a total of fifty-two blank spaces have been left where words would normally occur. For each blank space, a choice of five words is provided. The word most appropriate to the total meaning of the passage is to be selected by the examinee.

One feels intuitively that comprehension measured in the manner described above is likely to be limited to

the literal level. The truth or falsity of this speculation is not clarified by a statement from the test authors concerning the nature of comprehension which they seek to measure. The only statement regarding the comprehension subtest is the vague one that it "measures the student's ability to read complete prose passages with understanding" (26:1, 27:1). The nature of this understanding remains unclarified.

Stanford Reading Test: High School Reading Test

This test is available in three forms for use with students in grades nine through twelve. The entire test measures comprehension by means of sixty-five four-alternative multiple choice questions of two types. The first type is similar to that used in the Gates MacGinitie Reading Tests. Here short paragraphs are given with words deleted; from the choices provided, the student selects the appropriate word to fill in the blanks. The second type is the more common multiple choice where the examinee is expected to choose the correct answer from among the four provided. The reading passages range in length from approximately six to forty lines. Although a time limit is set for the test, the authors maintain that it is "primarily a power test" since "a vast number of high school students

can attempt all items within the time limit" (23:7).

Exactly what proportion constitutes "a vast number" remains unclarified by the authors, however, as does the influence of an announced time limit on students' test performance.

The subject matter content of the test is described in the manual as being based on "a representative sample of the skills, knowledges, and understandings that are goals of instruction in a modern, comprehensive high school" (23:9). It includes passages dealing with science, history, social science, behavioral science, the arts, and the humanities. The authors state that this material was determined from an examination of courses of study and textbooks in common use along with consultation with experts. They emphasize, however, that since instructional objectives vary, the potential test user should make a careful comparison between the instructional objectives he has determined and pursued in his own teaching and those measured by this test (23:15-16). Each test item is keyed to the content area to which it applies although the authors admit that some items apply to more than one area and that assignment of items is essentially subjective.

Beyond illustrating the content of the test, the authors attempt in a limited fashion to describe the

abilities required of the reader to comprehend this material. These are described as "the ability to comprehend what is explicit in the material, to judge what is implied, and to draw inferences (23:8). The degree of emphasis given to each of these comprehension skills in the test remains unstated, however. Hence, one may conclude that, while the authors are conscientious in describing the content upon which the test is based, they are somewhat deficient in providing only a very brief description of the skills demanded of examinees in testing their comprehension of this material.

Scholastic Tests--Educational Development Series

Two levels of this test apply to the secondary grades, the Advanced level for grades six through nine and the Senior level for grades nine through twelve. The test manuals for each level are identical in delineating four objectives for the total test battery: the assessment of students' motivation and interests, the comparison of these with their school achievement, the determination of students' performance on a test requiring no reading, and the comparison of student achievement in six curriculum areas. One of these six curricular areas is reading. The Reading Test is composed of seven reading passages ranging in length

from approximately one hundred to 250 words followed by seventy-five four-alternative multiple choice questions. The Reading Test is timed and one score is produced.

The only hint of what this Reading Test is intended to measure is given to the students in the examination booklet where they are told that the test determines their ability "to understand different kinds of reading materials" (1:23). The kinds of reading materials involved are never clarified nor is their relevance to the school curriculum indicated. Neither is there any statement made concerning the nature of the understanding which the questions seek to measure. Obviously this test is deficient in providing no clear indication of either the nature of the content upon which it is based or the comprehension of this content demanded.

Tests of Pupil Progress: Reading

The battery from which this reading test is taken is described as providing "an efficient and comprehensive appraisal of student progress toward the most widely accepted academic goals of secondary-school education" (51:1). The battery is available in two forms designed for students in grades nine through twelve. Like the Canadian Test of Basic Skills, different grades are given different but over-

lapping sections from each test.

As with all the tests in the battery, the authors state that the items in the Reading Test were developed on the basis of their review of pertinent textbooks, courses of study, recommendations by curriculum organizations, and the opinions of subject matter and curriculum experts. The reading passages vary in length from about 150 to three hundred words based upon a wide range of subject material including history, science, human relations, and economics. The test is timed and examinees are asked to indicate the correct response to five-alternative multiple choice questions varying in number from sixty-four in grade nine to seventy in grade twelve.

The entire Reading Test gives one undifferentiated score "designed to measure student competency in reading" (51:14). It would seem that this reading score is intended primarily as a measure of comprehension since the manual states that "most of the items require the student to discover meanings rather than simply locate information" (52:14). The authors maintain that the test items can be classified into four broad categories which they describe as follows:

1. Identification of explicitly stated facts, details, and relationships.

2. Comprehension of information which has been identified.
3. Application of information in drawing conclusions.
4. Evaluation of the theme or purpose of the writer.

(51:14)

Although this description is given, the emphasis of each of these abilities in the test is not indicated. And, as with other tests, experimental evidence regarding the specificity of comprehension is ignored in that no provision is made to determine separate comprehension scores on reading material taken from the different content areas included in the test. Such information would have been helpful to test users who seek to assess, as the manual encourages, the extent to which this test conforms to the educational objectives in particular schools and districts.

Stanford Diagnostic Reading Test

Level II of this test is available in two forms applicable to students between the middle of the fourth and the middle of the eighth grades. The test is described as diagnostic, its purpose being the identification of needed areas of emphasis at the outset of an instructional program. Six timed subtests are included in Level II: Reading Comprehension, Vocabulary, Syllabication, Sound Discrimination, Blending, and Rate of Reading. Level II of the Stanford Diagnostic Reading Test is identical to Level II

of the Ohio Diagnostic Reading Test (30) and hence a discussion of one instrument is equally applicable to the other.

According to the authors, the Stanford Diagnostic Reading Test is based upon skills "necessary to the reading process" as determined by over two hundred (unidentified) research studies examined (32:27). Hence, the authors maintain that the test items "are representative of the domain of reading" (32:29). The comprehension subtest is composed of short prose passages ranging in length from approximately twenty to 130 words. The passages are based on a variety of content materials including social studies, science and health. Comprehension is measured by sixty four-alternative multiple choice questions which require the reader to select the appropriate word with which to fill in a blank left in the paragraph. However, no provision is made for individual comprehension scores on reading material taken from individual content areas.

The concept of comprehension embodied in the test involves two "subskills," literal and inferential comprehension. Literal comprehension is described as requiring the understanding of "stated content" (32:6) while inferential comprehension is equated with "critical reading" which

involves "reading between the lines, drawing conclusions, determining the motives of the author, finding implicit meanings, etc." (32:17). Separate scores are provided for literal and inferential comprehension which combine to give a Reading Comprehension score. However, the manual fails to provide reliability coefficients for the two sub-scores thereby forcing the test consumer to be cautious in their use. This deficiency characterizes this test's treatment of comprehension. While claiming to be diagnostic, only sparse information is provided concerning what is measured. Hence, in the final analysis, this test provides a single comprehension score, the meaning of which is considerably less explicit than is the meaning of the comprehension score described in some survey tests.

Burnett Reading Series: Survey Test

The Advanced level of this test is designed for grades seven through nine while the Senior level is intended for grades ten through twelve. Only one form at each level is available. The manual states that the general purpose of this test is the "analysis of pupil strengths and weaknesses in reading" by testing "the kinds of behaviors required of a successful reader" (6:1). The test provides three timed subtest scores based on Word Meaning, Comprehen-

sion, and Rate and Accuracy and a total score computed by summing the Word Meaning and Comprehension subtest scores. No rationale is given for the content material included in the test.

The Comprehension subtest is described as assessing "the student's facility in obtaining meaning in a contextual reading situation" (6:2). The subtest is made up of four paragraphs interspersed with three-alternative multiple choice questions which demand the selection of an appropriate word to fill a space left in the paragraph. This type of question is essentially the same as that used in the Gates-MacGinitie Reading Tests, the Stanford Achievement Test and the Stanford Diagnostic Reading Test, yet the author heralds it as "the modified 'cloze' technique." He describes this technique as measuring the examinee's ability to apply "a variety of learnings--knowledge of sentence structure, noun-verb relationships, adjective-noun relationships, singular and plural forms, gender of pronouns, verb tense, inferential reasoning, etc.--to demonstrate his comprehension." The concept of comprehension from which the author judges the manifestation of these skills and abilities to demonstrate comprehension is not established, however. The author continues by adding that the Comprehension

subtest determines "the reader's ability to see the main idea, correctly organize supporting details, and, occasionally, make a choice based on inference..." (6:2). This latter statement provides a clearer understanding of the nature of comprehension which this test seeks to measure. But even here only a very generalized description is provided, especially when one ponders the meaning of "occasionally" in reference to inferential comprehension. It would seem that no weighted scheme, based on a well-delineated concept of comprehension, has been formulated and implemented.

Canadian Tests of Basic Skills

This test is available in only one form for grades three through eight. According to its authors, the test is meant to provide information regarding pupil progress in a number of curriculum areas including reading comprehension. The material upon which the test is based is somewhat vaguely described as representing "a variety of currently recommended curriculum practices" (37:3). Although the same tests are used for all grades, separate sections within each test are designated for use at different grade levels. Thus, the section of the Reading Comprehension test designed for grade eight pupils is partially separate from

that intended for pupils in the elementary grades. In this way, the authors maintain that "each pupil takes only items appropriate, in content and difficulty, to his own grade level" (37:3). However, the unqualified justification of this claim might be questioned by noting that, though separate starting and stopping points are provided, there is an overlap of test items resulting in grade six and seven pupils answering questions included in the grade eight test.

The Reading Comprehension test for grade eight is composed of reading passages ranging in length from about two hundred to one thousand words. The test is timed and includes seventy-nine four-alternative multiple choice questions. The concept of comprehension underlying the test is set out in the manual under the title "Skills Classification." Here four basic skills are outlined: details, purpose, organization, and evaluation. Each item in the test is keyed to one of these skills, although the authors maintain that, because of the close correlation of scores on items of the four types, "it is not considered worthwhile to derive a separate score for each type" (37:30). No correlation data is provided to substantiate this claim, nor do the authors acknowledge the charge to which

their statement exposes them--that, since the individual skill scores are highly correlated, they apparently measure almost the same ability and hence the distinctions made among different skills are artificial ones. Rather, the authors state somewhat guardedly that "for the purposes of instruction, it is useful to consider each of these skills separately" (37:30). One might comment further that when supposedly conceptually different tasks are highly correlated, one wonders if scores on any of them really represent much more than a general mental ability such as that identified by Thurstone in his re-analysis of Davis' data. It would seem that these test authors have inadvertently given support to the notion of comprehension as a unitary mental ability while presenting a test which ostensibly measures separate abilities.

Despite these limitations, however, the test authors provide a comprehensive outline describing the skills which are ostensibly measured by the test. This outline may be summarized as follows:

- Details--to recognize and understand stated or implied factual details and relationships.
- Purpose--to develop skills in discerning the purpose or main idea of a paragraph or selection.
- Organization--to develop ability to organize ideas.
- Evaluation--to develop skill in evaluating what is read.

Hence, the Canadian Test of Basic Skills provides the

potential user with a suitable description of the concept of comprehension upon which it is based.

Durrell Listening-Reading Series

This test is designed to measure reading disability by comparing students' performance on a reading test with their performance on a listening test. The author provides a rationale for this approach by contending that "knowledge of discrepancies between a pupil's understanding of spoken language and of printed words is basic to analysis of reading disabilities and diagnosis of remedial needs" (18:3). The manner in which this knowledge is basic to remediation remains unelaborated, however. The Advanced level of the test, available in only one form, is intended for students in grades seven through nine. It is composed of reading and listening vocabulary and paragraph comprehension tests that are "balanced in difficulty, and of parallel but different content" (18:3).

The reading paragraph comprehension test (which is of direct concern here) consists of two parts. The first part is made up of five statements which the student is to indicate as true, false or as information not given in the passage. A sixth item (four-alternative multiple choice) follows each statement. In the second part, students are to

answer questions following three passages, posed in the same manner as the majority of questions in the first part. The content of the passages includes fiction, social studies, and science material "of the type found in the curriculum for the grade under consideration" (18:15).

The concept of comprehension upon which the reading paragraph comprehension subtest is based is said to include abilities ranging from "simple factual recall to inference, classification, and other types of interpretation" (18:15). Clearly, this is an inadequate description of the kinds of comprehension which this test seeks to measure, especially when one ponders what these "other types of comprehension" may be. The manual adds, somewhat defensively, one feels, that "there is no attempt to analyze different types of mental processes in relation to reading and listening" (18:15). Exactly what constitutes the nature of comprehension measured by this ostensibly diagnostic test remains something of a mystery. A further limitation is Durrell's lack of attention to the experimental evidence indicating comprehension scores based on reading materials from different content areas, such as those included in his test, to be at least partially specific to materials from these areas, and therefore to be only approximately indicative of

comprehension ability in other content areas.

McMenemy Measure of Reading Ability

The Advanced level of this test is available in one form designed to measure reading achievement in grades seven and eight. The test is divided between two subtests labelled "Vocabulary" and "Comprehension" which are combined to give a total score.

The Comprehension subtest is timed and includes forty-five five-alternative multiple choice questions based on reading passages ranging in length from single sentences to short paragraphs. The content of the passages is described as involving "basic general reading" as well as material from science, social studies, and other content areas (45:10). However, like Durrell and others, McMenemy ignores the experimental evidence indicating the specificity of comprehension with respect to reading materials in different content areas.

The nature of comprehension measured by the test is described as including vocabulary, finding the main idea and general comprehension, study skills and the ability to interpret factual data, and inference (44:9). The author maintains that the test has "diagnostic properties" in that each test item is keyed to one of the aspects of comprehension

which the test claims to measure. In this way it is suggested that teachers may gain insight into pupils' particular strengths and weaknesses. However, reliability data to support such diagnostic use is not provided.

Maintaining Reading Efficiency Tests

Five forms of this test are available intended for grades nine through sixteen. Scores are provided for Rate of Reading, Comprehension Accuracy (number right divided by number tried), and Reading Efficiency (Rate times Comprehension). All parts of the test are timed and its purpose is described as the measurement of pupil's ability "to read effectively" (47:1). Each form involves the reading of a five thousand word passage based on the history of Brazil, Japan, India, New Zealand, or Switzerland. Fifty questions follow the reading passage constituting a mixture of fill-in-the-blank, multiple choice, and true and false types. The questions are inscrutably described as "the type generally asked in examinations on such material" (47:1). This description, coupled with the term "comprehension accuracy," is all that is provided to describe what this test measures. Hence, the test user remains uninformed about the concept of comprehension which this test undertakes to measure. Moreover, the test author fails to

inform the test user that, since his test is apparently based on social studies material, experimental evidence concerning the specificity of comprehension would indicate that the measure the test provides is at least partially limited to the comprehension of this type of material.

ASSESSMENT OF TESTS

Table X provides a summary of the concepts of comprehension underlying the tests reviewed above. Inspection of this table reveals little consistency in the extent to which test authors and publishers provide statements of the concepts of comprehension which they measure. In some cases, virtually no description of what is being measured under the heading "comprehension" is given. In other cases, a brief statement is provided which, because of its vagueness, is little better than no statement at all. On the other hand, some tests do provide explicit descriptions of the concepts of comprehension upon which they are based.

When explicit descriptions are given, they all take the form of verbal definitions. Only the Davis Reading Test directly cites research evidence and this is done in support of a verbal definition. An additional characteristic of these definitions is their inclusion of a number of skills

TABLE X

CONCEPTS OF COMPREHENSION REPRESENTED IN PUBLISHED
SECONDARY READING TESTS

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
Diagnostic Reading Test: Survey Section (1956)	Upper Level	7-13	-Finding main ideas and important facts -Determining the order of events -Drawing conclusions
Cooperative English Tests: Reading Comprehension (1960)	Form 1 Form 2	9-12 13-14	-From facts to interpretation
Diagnostic Reading Test, Pupil Progress Series (1960)	Advanced	7, 8	-Reading for recall of information -Reading for meaning -Reading to locate information -Reading to follow directions -Reading to visualize objects from verbal descriptions
Nelson-Denny Reading Test (1960)	1 level	9-16	-None given
Metropolitan Achievement Tests: Reading (1961)	Advanced	7-9	-Ability to select the main thought -Ability to understand literal meaning -Ability to see relationships and to

TABLE X (CONTINUED)

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
			draw inferences -Ability to determine the meaning of a word from context
Davis Reading Test (1962)	Series I Series II	11-13 8-11	-Understanding explicitly and implicitly stated information -Weaving together ideas and grasping the central thought -Making inferences -Recognizing tone, mood, and the use of literary devices -Following the structure of a passage
Reading Versatility Test (1962)	Intermediate Advanced	8-12 12-16	-Understanding facts, details, main ideas, and implications
California Reading Test (1963)	Junior High Level Advanced Level	7-9 9-14	-Following general and specific direc- tions and comprehending definitions -Reference skills including diction- ary and library skills -Interpretation of Material: directly stated facts, topic or main idea, inferences and deductions, organi- zation and sequence of ideas

TABLE X (CONTINUED)

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
The Gray-Votaw- Rogers General Achievement Test (1963)	Level II	4-9	-Recognition and recall of ideas -Drawing inferences -Forming conclusions -Grasping overall meaning
Iowa Tests of Educational Development (1963)	Interpreta- tion--Social Studies	9-12	-Comprehension of what is stated -Interpretation of what is implied -Critical analysis and evaluation
	Interpreta- tion--Natural Sciences	9-12	-Comprehension of content -Drawing conclusions -Extending conclusions -Analysing and interpreting
	Interpreta- tion--Liter- ature	9-12	-Comprehension and interpretation of content -Analysis and appreciation of elements of literary works
Sequential Tests of Educational Progress --Reading (1963)	Level 1 Level 2 Level 3	13-14 10-12 7-9	-Understanding of direct statements -Interpretation and summarizing -Seeing author's motives

TABLE X (CONTINUED)

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
			<ul style="list-style-type: none"> -Observing the organization of ideas -Critical evaluation
Emporia Reading Tests (1964)	Junior High School Reading Test	7,8	-None given
SRA Achievement Series: Reading (1964)	Multilevel battery	1-9	<ul style="list-style-type: none"> -Reading for specific information -Correlating information -Recognizing implications and drawing logical inferences -Recognizing main ideas
Stanford Achieve- ment Tests: Reading (1964)	Advanced	7-9	<ul style="list-style-type: none"> -Simple recognition to the making of inferences
Watson-Glaser Critical Thinking Appraisal (1964)	1 level	9-16	<ul style="list-style-type: none"> -Inference -Recognition of assumptions -Deduction -Interpretation -Evaluation of arguments

TABLE X (CONTINUED)

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
Gates-MacGinitie Reading Tests (1965; 1969)	Survey E Survey F	7-9 10-12	-Ability to read with understanding
Stanford Achieve- ment Test: High School Reading Test	1 level	9-12	-Comprehension of explicit information -Judgment of what is implied -Drawing inferences
Scholastic Tests-- Educational Development Series (1965)	Advanced Senior	6-9 9-12	-To understand different kinds of reading materials
Tests of Academic Progress: Reading (1965)	Multilevel battery	9-12	-Identification of explicitly stated facts, details, and relationships -Comprehension of information which has been identified -Application of information on drawing conclusions and forming inferences -Evaluation of the theme or purpose of a writer
Stanford Diagnostic Reading Test (1966)	Level II	4.5-8.5	-Literal comprehension--understanding stated content

TABLE X (CONTINUED)

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
			-Inferential comprehension--reading between the lines, drawing conclusions, determining the author's motives, finding implicit meanings, etc.
Burnett Reading Series: Survey Test (1967; 1968)	Advanced Senior	7-10 10-12	-Seeing main ideas -Organizing supporting details -Making inferences
Canadian Test of Basic Skills (1967)	Multilevel battery	3-8	-Details: to recognize and understand stated or implied factual details and relationships -Purpose: to develop skills in discern- ing the purpose or main idea of a paragraph or selection -Organization: to develop ability to organize ideas -Evaluation: to develop skill in evaluating what is read
McMenemy Measure of Reading Ability (1968)	Advanced	7,8	-Word knowledge -Finding main ideas and general comprehension -Making inferences

TABLE X (CONTINUED)

Title and Date of Latest Revision	Test Level(s)	Grade Level(s)	Concept of Comprehension
Durrell Listening- Reading Series (1969)	Advanced	7-9	-Factual recall -Inference -Classification
Maintaining Reading Efficiency Tests (1970)	Test No. 1 Test No. 2 Test No. 3 Test No. 4 Test No. 5 Test No. 6	9-16 9-16 9-16 9-16 9-16 9-16	-Comprehension accuracy

which are described in a non-hierarchical manner. While the implication of hierarchical organization may be suspected in a few cases, in no instance is it claimed that a test measures comprehension skills functioning in an hierarchical organization. Neither is it contended that the definition of comprehension in terms of a number of separate skills implies that comprehension is a composite as opposed to a unitary ability. Test authors, as do textbook authors and materials builders, avoid discussion of this latter point entirely. Where general agreement among test authors exists, therefore, is in their verbal definitions of comprehension based on the non-hierarchical organization of skills.

While agreement exists concerning the manner in which most test authors state their concepts of comprehension, clarity in describing specific skills constituting comprehension is not so apparent. The skills which tests claim to measure are wide ranging and include many abilities sometimes associated in educational literature with critical and creative reading. But the problem of clearly describing the skills which are measured does not derive directly from the extensive number of those included. As is true of skills described in textbooks and instructional materials,

the skills included in definitions of comprehension by test authors suffer from what has been referred to in previous chapters as semantic imprecision. While different tests seem to describe the same or similar skills as measurement objectives, one is often unsure of the exact nature of these skills due to the imprecision of the language used to describe them. For example, "reading for meaning" is indicated as a measurement objective of the Diagnostic Reading Test, while "comprehension and interpretation of content" is cited as an objective of the Iowa Test of Educational Development. It is possible that these two objectives are quite similar, but the imprecision with which they are described allows for a high degree of dissimilarity as well.

Another problem encountered with skills-based definitions of comprehension found in professional textbooks and instructional materials is apparent in tests as well. This is inconsistency in the conceptual boundaries within which comprehension is to be understood. For example, the comprehension subtest of the California Reading Test includes a section entitled "Reference Materials." Here, the measurement objective is stated as being the determination of the student's dictionary and library skills. Such

an objective appears to extend beyond those normally included in tests of comprehension. Hence, although general agreement exists among test authors with respect to the concepts of comprehension upon which they base their measurement of comprehension, the specific skills contained within different tests are not always clearly defined nor are they the same from test to test.

It would appear that the position of the test user regarding tests of reading comprehension in the secondary grades is not as secure as it might be. The intelligent test consumer will seek an instrument that explicitly states its intention to measure the educational objectives which he has established and pursued in his teaching. However, not all tests provide explicit statements of their measurement objectives in terms of the concepts of comprehension upon which they are based. Those that do provide such statements do so by means of verbal definitions which, with one exception (the Davis Reading Test), are given without reference to supporting experimental evidence. Many of these definitions are not clearly articulated due to semantic imprecision. A further problem arises where objectives established for measurement by tests do not conform to those most commonly thought of as being involved in

comprehension. Hence, though some tests conscientiously attempt to inform the potential user of the concept of comprehension upon which they are based, the statement of this information in many instances lacks the precision which would provide the basis for initial test selection. Moreover, despite the appearance of a number of new and revised tests over the past fifteen years, the observations made here seem as pertinent to more recent tests as they do to earlier ones.

This review of published reading tests also reveals that the great majority of test constructors have apparently ignored models of comprehension and experimental evidence relating to the nature of comprehension when formulating the concepts of comprehension upon which they claim their tests are based. It would seem that a recognition by these test authors of the intellectual precision afforded by models of comprehension may well have helped to alleviate some of the imprecision which their various verbal definitions of comprehension reveal. Moreover, attention to the experimental evidence concerning the nature of comprehension might have profitably influenced the selection of the individual abilities purportedly measured by different comprehension tests. Even when statistical analyses of comprehension

have identified multiple factors, these are often fewer in number and different from those abilities which test authors claim their instruments measure. For these reasons, one may ask whether many of the ostensibly independent abilities which some comprehension tests claim to measure are not in fact identical. And, as has been noted at various points with respect to individual tests, the failure of the majority of test authors to account for studies of the specificity of comprehension with respect to reading material in different content areas has resulted in most tests providing a global comprehension score that is likely to be only approximate for any given content area. Conversely, tests which are based on reading material drawn exclusively from particular content areas often fail to inform the test user that the comprehension scores obtained should be viewed as at least partially specific to the comprehension of reading material in these particular content areas.

Beyond these comments on the concepts of comprehension underlying secondary reading tests, some additional observations can be made relating to the tests themselves. In the first instance, while many tests of comprehension are designed exclusively for use with secondary students, others are extensions of tests applicable to the elementary

grades as well. These latter tests may provide levels specifically intended for students in grade eight and beyond, or they may simply include the lower secondary grades with their measurement of comprehension in the elementary grades. Among these different tests, some are entirely devoted to the measurement of comprehension while others include the measurement of comprehension along with subtests of other reading abilities such as vocabulary and rate.

In a few tests, individual items are keyed to particular aspects of comprehension included in the test authors' definitions of comprehension. When this is done, test users are usually cautioned against putting too much faith in these part scores since their reliability is insufficient for individual diagnostic purposes. These analyses of test items are useful to the test consumer in that they allow him to determine the degree to which different aspects of comprehension are claimed to be represented in individual tests.

A further general observation arises from a consideration of the differences between survey and diagnostic tests of comprehension. The conclusion which emerges from this review is that, though these differences in terminology exist, the difference between tests bearing these labels appears to be negligible. This is not to say that in theory there is

or should be no difference between tests seeking to survey pupil achievement and those aimed at testing and diagnosing particular deficiencies in pupils' reading comprehension. What is contended here is that comprehension tests which are ostensibly diagnostic in nature in most cases do not display more dependable sensitivity to particular pupil weaknesses than do survey tests.

A final general observation relates to the manner by which these tests measure comprehension. Only the Watson-Glaser Critical Thinking Appraisal provides a comprehension score totally uninfluenced by the pressure of time on the examinee. However, this test has counterbalancing problems of interpretation which have been noted above. Some tests, notably the Cooperative English Test and the Davis Reading Test, give both speed and power of comprehension scores. But these scores are both actually determined under timed conditions which are apparent to the examinee. Other tests, such as the Stanford Achievement Tests: High School Reading Test, are also timed although their authors claim that most examinees complete all the questions and hence the emphasis of the test is on power rather than speed. It would seem that there is a need for an untimed test of secondary students' reading comprehension

developed within the context of a carefully articulated concept of comprehension. Such a test would provide a measure of comprehension under the untimed conditions which more closely approximate the situation in which most students actually read. Further, this test might well provide separate comprehension scores for reading materials taken from different content areas, thereby accounting for the experimental evidence pointing to the specificity of comprehension.

SUMMARY

Tests of reading comprehension are often used to evaluate the effectiveness of instructional programs and to determine further instructional practices designed to remedy revealed student weaknesses. Numerous comprehension tests that are applicable to the secondary grades are available. Some of these tests provide virtually no indication of the nature of comprehension which they seek to measure while others provide descriptions varying in specificity. These latter tests are all based upon non-hierarchical skills-based definitions of comprehension. Difficulties associated with these definitions are semantic imprecision in describing the skills requisite to effective comprehension

and inconsistency regarding the kinds of skills that should be included. Hence, though general agreement exists when the conceptual bases of comprehension tests are given, the test consumer is likely to be confused when he attempts to make an accurate appraisal of the nature of comprehension measured by published comprehension tests.

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Chapter 10

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

FOR FURTHER RESEARCH

SUMMARY

The purpose of this study was to fulfill two objectives. The first was to determine current concepts of reading comprehension deriving from experimental investigations and theoretical statements. The second objective was to establish the extent to which these current concepts of reading comprehension are represented consistently in currently available secondary professional reading textbooks, instructional materials, and published tests.

Two major assumptions formed the basis of this investigation. The first was that the ultimate objective of the reading act is understanding what is read. This understanding is usually referred to as comprehension. However, though the importance of comprehension is widely recognized by reading authorities, comprehension is one of the least understood aspects of the reading process. For this reason there was a need for a study such as the present

one which would draw together and analyze the findings of the growing number of experimental and theoretical investigations of comprehension. Such a study could provide an inclusive description of present knowledge relating to comprehension and the prevailing concepts by which it is explained. This study could also indicate the direction further investigations of comprehension might take while providing a comprehensive framework within which these investigations could be carried out.

The second major assumption underlying this study was that the ultimate purpose of educational research is the improvement of educational practice. Reading instruction in the secondary grades has developed rapidly over the past decade bringing with it a growing number of professional textbooks intended for secondary teachers, secondary reading instructional materials, and published reading tests applicable to the secondary grades. The question of concern in the second phase of the present study was the extent to which current concepts of reading comprehension represented in experimental research and theoretical statements are reflected in these professional textbooks, instructional materials, and published tests, and the degree of consistency in these representations.

Specifically, the major questions which this study sought to answer were the following:

1. What are the current concepts of reading comprehension which derive from experimental investigations and verbal statements?

2. Which current concepts of reading comprehension are represented in professional textbooks intended for secondary teachers?

3. Which current concepts of reading comprehension are represented in instructional materials intended for teaching reading in the secondary grades?

4. Which current concepts of reading comprehension are represented in published reading tests designed for the secondary grades?

5. Does agreement exist among the concepts of comprehension represented in secondary reading professional textbooks, instructional materials, and published reading tests?

Each of these questions has been considered in previous chapters except the fifth question which is discussed below.

The initial stage of this study involved an intensive search of both the experimental and theoretical literature pertaining to reading comprehension. The relevant experimental

literature was identified through the ERIC/CRIER system. Pertinent non-research literature was determined by a thorough search of numerous published bibliographies containing references to articles relating to comprehension.

Professional textbooks, instructional materials, and published tests intended for secondary reading were also identified. All current professional textbooks dealing in depth with comprehension and written for prospective and practicing secondary reading teachers were selected from a recent compilation of resources available to these teachers. The instructional materials analyzed were those designed for the secondary grades contained in the collection of instructional reading materials located in the University of British Columbia Reading Resources Centre. Published reading tests containing measures of comprehension applicable to the secondary grades were determined from an examination of a recent comprehensive listing of published reading tests.

Comprehension is itself part of a more extensive process encompassing the entire reading act. Conceptions of reading prevalent during the early years of this century were characterized by an emphasis on the physiology of reading and word recognition. During the second decade of the

century, however, emphasis came to be placed on silent reading and the understanding of what was read. This concept of reading grew until it has come to include an interacting combination of the development of the reader's critical ability and the broadening of his experiential background through reading. At present, interest is focused upon the nature of the reading process as well as the educational objectives which should be pursued through reading instruction. However, despite current interest in the reading process, no definitive explanation of reading exists and the nature of comprehension within this process remains similarly unclear.

Early experimental investigations of comprehension were instrumental in shifting the focus of reading research away from a preoccupation with perception and word recognition to a concern with the obtaining of meaning during the reading act. More recent experimental investigations of comprehension have been of three main types: statistical analyses, studies of the specificity of comprehension, and introspective-retrospective verbalization case studies. Statistical analyses of comprehension have involved subjects drawn from the elementary grades through college, depending on which study is examined. The topics investigated have

been described by various terms besides comprehension, but their nature appears to be essentially the same. Though a broad range of tests has been adopted in these studies, the analytic procedure used is most often factor analysis. Other methods have also been employed, including item analysis and simple correlation analysis. Some studies have isolated only one factor while others have isolated a number, two of which are usually interpreted as word knowledge and reasoning. Studies of the specificity of comprehension involve subjects, topics of investigation, and measuring instruments similar to those in what has been termed statistical analyses. Generally, while a definite degree of specificity with respect to the comprehension of reading materials in different content areas is apparent from these studies, they show some commonality as well. Introspective-retrospective verbalization case studies suggest a number of mental operations accompanying comprehension although the accuracy of this method of investigation may be questioned.

In general, the present state of experimental knowledge relating to the nature of reading comprehension may be summarized as follows:¹

¹These items of "knowledge" in some cases conflict, there being evidence to support each.

1. Comprehension as defined by statistical analyses.
 - 1.1 Comprehension is a unitary mental ability having no distinguishable subskills.
 - 1.2 Comprehension is a composite of a number of subskills the two most commonly found being interpreted as word knowledge and reasoning.
2. Comprehension as defined by studies of its specificity.
 - 2.1 Comprehension is to a greater or lesser extent specific to the content material being read.
3. Comprehension as defined by introspective-retrospective verbalization studies.
 - 3.1 Comprehension is a cognitive activity involving the following mental processes.
 - 3.11 Ideational Fluency: a large number of responses leading to the determination of meaning on an abstract rather than literal level.
 - 3.12 Linguistic Fluency: a general sensitivity to language and to the use of language clues in the determination of meaning.
 - 3.13 Manipulation: involving analysis, synthesis, anticipation, retrospection,

etc. leading to a holistic rather than fragmented or distorted determination of meaning.

3.14 Variety and Flexibility: the use of a variety of strategies to determine meaning and flexibility in altering strategies to meet new needs.

3.15 Objectivity: extraneous personal, subjective, or emotional responses not allowed to interfere with the determination of meaning.

Verbal definitions of reading comprehension are of two general types, skills-based definitions and cognitive-based definitions. Skills-based definitions present concepts of comprehension in terms of the specific skills which it is deemed to be necessary for a reader to possess in order to understand what he reads. In most cases, these skills are presented within hierarchical organizations. However, some authorities question the legitimacy of these hierarchical organizations maintaining that it is the nature of the material read coupled with the reader's purpose which determines the skills used to comprehend. The skills involved in critical and creative reading are also used to describe these two

kinds of "higher" comprehension ability when they are discussed separately from literal comprehension. Skills-based definitions of comprehension are characterized by lack of clarity, however. When individual skills are described imprecision often results. This imprecision makes the comparison of skills among different definitions extremely difficult. When, in addition to comprehension, critical and creative reading are explained in terms of the skills supposedly involved, definitions become hopelessly blurred. A further question regarding skills-based definitions arises from the problem of the conceptual boundaries within which these definitions should be formulated. There seems little agreement among authorities concerning whether or not certain skills can be legitimately subsumed under the heading "comprehension."

While skills-based definitions describe comprehension through the skills necessary to understand what is read, cognitive-based definitions provide explanations of comprehension in terms of the mental operations believed to produce this understanding. Cognitive-based definitions of comprehension vary in the manner by which they explain the cognitive operations producing comprehension. This variety in part results from the fundamental problem encountered in

cognitive-based definitions--the lack of a generally accepted explanation of cognition. Until an answer is provided to this basic question, the more particular question of the kinds of cognitive activity involved in reading comprehension must remain extremely tentative.

Briefly, verbal definitions of comprehension may be summarized as follows:²

1. Skills-based definitions of comprehension.
 - 1.1 Comprehension involves a number of separate skills which are arranged hierarchically.
 - 1.2 Comprehension involves a number of separate skills which are not arranged hierarchically.
 - 1.3 Critical and creative reading constitute high-level comprehension and involve separate skills which are distinguishable from those associated with low-level comprehension.
2. Cognitive-based definitions of comprehension.
 - 2.1 Comprehension is a cognitive process involving a variety of mental operations which may be described in a number of ways.

²As was the case with experimental knowledge, in some cases, these items of "knowledge" conflict, there being opinion to support each.

Recently, a number of models of comprehension have been proposed. The appearance of these models results at least in part from the recognition by reading authorities of the need for greater precision and coordination in data collection and theoretical speculation relevant to understanding comprehension. Despite this recognition of the value of models, scientists are not in unanimous agreement concerning the exact nature of models. However, scientific opinion would seem to support the statement that models may be generally described as separate symbolic systems which illustrate the structure of a theory. Three basic types of models are apparent--scale, analogue, and theoretical models. Criteria for evaluating models may be summarized under the headings of articulation, differentiation, prediction, creativity, and flexibility.

When comprehension models are considered together, confusion is apparent in that the understanding of comprehension has been approached from a number of different points of view including the skills deemed necessary for comprehension, the instructional objectives considered necessary to teach comprehension, the external influences which may affect comprehension, the cognitive operations which are conceived to produce comprehension, and the

psycholinguistic activity that seems to be involved in comprehension. An additional source of confusion derives from the lack of generally accepted conceptual boundaries within which comprehension should be described. Hence, though models have not produced the definitive explanation of reading comprehension, they have illustrated with greater precision the intricacies and problems involved in determining such an explanation.

Definitions of reading comprehension provided by models may be summarized as follows, though the several models differ considerably in detail:

1. Comprehension involves a number of separate overt skills which reflect a coherent psychological whole.
2. Comprehension is describable in terms of a hierarchical organization of educational outcomes.
3. Comprehension is influenced by a number of external factors which affect its attainment.
4. Comprehension is a cognitive process including a series of mental operations which may be described in a number of different ways.
5. Comprehension is a highly complex cognitive process involving the psychological processing of language.

The manner whereby different concepts of comprehension have been represented in professional secondary reading textbooks, instructional materials and published reading tests is fairly consistent. The concepts of comprehension represented in professional textbooks intended for future or practicing secondary reading teachers provide the basis upon which textbook authors suggest instructional objectives for the teaching of comprehension. Each of the textbooks reviewed provides a verbal definition of comprehension which, with only one exception, is expressed in terms of a hierarchical organization of the skills involved. Thus, the concepts of comprehension represented in these textbooks may be generally accounted for as verbally defined skills-based hierarchies.

Concepts of comprehension represented in instructional materials intended for teaching reading in the secondary grades do not differ markedly from those represented in professional textbooks. The importance of these materials lies in the fact that they constitute the medium through which instructional objectives are pursued in the reading program. The instructional materials examined here were placed into five categories (Basal Materials, Skills-Building Materials, Materials for Special Groups, Workbooks, and Boxed Materials)

and the concepts of comprehension which the materials represent were determined within each of these categories. One concept of comprehension was found to prevail in instructional materials. This concept is represented verbally in skills-based non-hierarchical definitions. These definitions were found to predominate in four of the five categories of materials. In the fifth category, Materials for Special Groups, either extremely vague or no definitions of comprehension were found. The second most prevalent concept of comprehension revealed in these materials is stated by verbal skills-based hierarchical definitions. Therefore, the only difference between the first and second most common definitions of comprehension is that one represents skills non-hierarchically while the other represents skills within hierarchical structures. It may be observed, however, that since almost all professional textbooks represent comprehension skills hierarchically, teachers following textbooks as sources of instructional objectives are likely to find it difficult to accommodate the non-hierarchical presentations of skills prevailing in materials within their teaching procedures.

When concepts of comprehension underlying the measurement of comprehension in published reading tests intended

for the secondary grades are given, it is found that these concepts are very similar to those found in instructional materials. The importance of published reading tests is that they are often used to assess the degree to which teaching has achieved previously established instructional objectives. Moreover, test results are frequently used as the basis for new instructional programs designed to remedy revealed student weaknesses. Therefore, it is essential that test consumers be informed of the concept of comprehension on the basis of which tests purport to measure comprehension. Some tests are grossly deficient in this regard in that they provide virtually no statement of the concept of comprehension upon which they are based. Other tests provide such vague descriptions of the nature of comprehension which they undertake to measure that they are only slightly more informative than tests providing no descriptions at all. Where explicit definitions are provided, they are expressed verbally and are based on the skills involved in comprehension. These skills are without exception conceived as operating in a non-hierarchical manner. The question of whether the tests reviewed actually do reflect the concept of comprehension (if any) on which they are based was not pursued.

Difficulties associated with verbal definitions of comprehension in general are apparent in the verbal definitions represented in secondary professional reading textbooks, instructional materials, and published tests, however. The semantic imprecision which characterizes verbal definitions of comprehension leads to confusion when individual skills are examined both within and across individual definitions. A second difficulty encountered in these verbal definitions is the problem of the conceptual boundaries within which comprehension should be defined. There appears to be little agreement concerning the limits within which comprehension should be considered and the individual skills to be included within these limits.

CONCLUSIONS

A basic dichotomy emerges from the gathering together and analysis of current concepts of reading comprehension. This dichotomy exists between concepts of comprehension described in terms of overt behavior and those described in terms of covert behavior. Overt behavior associated with comprehension is usually described by verbal delineations of the particular skills which a reader must exercise in order to understand what he reads. These skills are

sometimes described within hierarchical structures, while other times they are not organized in this manner. Factor analyses and other analytic methods have been adopted in experimental investigations designed to determine the underlying abilities which explain the measured overt performance of comprehension skills.

Concepts of comprehension described in terms of the cognitive activity supposedly involved seek to describe the mental operations producing comprehension. These descriptions are given verbally, and in many instances are incorporated in models. Psycholinguistic models are concerned with combining linguistic and psychological knowledge to explain comprehension. Introspective-retrospective case studies, the most recently adopted type of experimental investigation of comprehension, seek to reveal the covert cognitive activity producing comprehension.

Much of the difficulty in understanding the nature of comprehension appears to derive from a failure among experimenters and theorists to attempt to explain the overt behavior associated with comprehension in terms of underlying processes. It would seem fruitful to consider comprehension as a psychological process in terms of postulated covert behaviors. The overt behavior associated with

comprehension may then be considered as outer manifestations of these postulated covert behaviors. Hence, it may be argued that it is the psychology of comprehension which determines the outer display of understanding exhibited by readers when they perform comprehension skills. Given this, it follows that until the covert psychological process which produces comprehension is explained, verbal descriptions of comprehension skills are almost certainly going to be imprecise since their psychological basis is not understood. Moreover, the conceptual boundaries within which comprehension is explained verbally are bound to remain unclear while the psychological process which determines these boundaries remains unexplained.

Professional textbooks, instructional materials and published tests currently available to secondary reading teachers are all based upon concepts of comprehension described verbally in terms of specific skills. These skills are arranged hierarchically in the descriptions provided by the majority of professional textbooks. In the case of most instructional materials and tests, however, these skills are not organized hierarchically. Despite this latter inconsistency, general continuity is apparent in the verbal skills-based definitions by which concepts of comprehension

represented in secondary reading professional textbooks, instructional materials, and published tests are expressed. These definitions generally do not make explicit reference to the considerable body of available experimental evidence concerning the nature of comprehension, or the growing number of models of comprehension.

Although general conceptual continuity exists among textbooks, materials, and tests concerned with comprehension in the secondary grades, the verbal skills-based definitions by which these concepts are expressed lack precision and consistency. This condition is apparent in the semantic imprecision which characterizes verbal descriptions of individual skills, and the inconsistency of the boundaries within which comprehension is defined. In some cases, verbal definitions of comprehension include skills which appear to extend beyond the limits of understanding what is read. It would seem that the basic reason for this lack of precision and consistency in professional textbooks, instructional materials, and tests derives from the lack of a clear understanding of the psychological processes which constitute comprehension. In no instance do textbook authors, materials builders, or test constructors provide a well-formulated psychological rationale for the verbal definitions

of comprehension which they propose. These definitions are almost always given solely in terms of the specific overt behaviors which readers are to display as evidence of their understanding of what they read. In the few instances when cognitive-based definitions are provided, they are given in an extremely vague fashion, and the relationship between these definitions and the overt behaviors expected of students is not delineated.

The lack of precision and consistency in descriptions of the concepts of comprehension underlying secondary reading professional textbooks, instructional materials, and tests makes the development of an effective reading program in the secondary grades extremely difficult. If the definitions of comprehension underlying the instructional objectives set for teachers in professional textbooks, the materials available for teachers to carry out these objectives, and the tests used to measure the achievement of these objectives are not accurately understood, then clearly articulated instructional programs are not possible. Unfortunately, it would seem that this condition exists at present.

RECOMMENDATIONS FOR FURTHER RESEARCH

Recommendations for further research into the nature of reading comprehension and the concepts upon which it should be taught and measured could be almost unlimited. Rather than trying to outline the numerous specific studies which might be undertaken, what will be presented here are some general suggestions relating to the directions which the scientific study of comprehension might take.

The most recent type of experimental investigation of comprehension has involved introspective-retrospective verbalization techniques. Yet this method of studying comprehension was adopted as early as the beginning of this century. It would seem from this fact that current research methods for the study of comprehension have reached the point of stasis. Not since the first applications of factor analysis procedures to the study of comprehension in the late 1930's and early 1940's has there been a distinctly new approach to the scientific investigation of comprehension.

The promise for further insights into the nature of reading comprehension would seem to lie with the models of comprehension which have appeared over the past decade. The intellectual precision which many of these models illustrate

provides the basis for numerous hypotheses for experimental investigation. It is only through testing models scientifically that their accuracy in representing the nature of comprehension can be determined. The psycholinguistic models appear to provide a particularly fruitful source of investigation in that they accommodate current linguistic theory within models of the psychological processes conceived to underlie comprehension. From this integration of theoretical speculation with scientific experimentation, further insights into the psychology of reading comprehension might well be obtained. Moreover, such psychological insights are essential for the development of precise concepts of comprehension upon which can be established instructional objectives for teaching comprehension, materials to facilitate this teaching, and tests to determine students' comprehension ability. It is this coordination of scientific theory, experimental research, and educational practice that is essential for the effective teaching of reading comprehension in the secondary grades.

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