DOCUMENT RESUME

ED 046 639 RE 003 209

AUTHOR	Downing, John
TITLE	Specific Cognitive Factors in the Reading Process.
PUB DATE	Dec 70
NOTE	13p.; Paper presented at the National Reading Conference, St. Petersburg, Fla., Dec. 3-5, 1970
AVAILABLE FROM	Twentieth Yearbook of the National Reading Conference, Inc., Marquette University, 1217 W. Wisconsin Ave., Milwaukee, Wis. 53233
EDRS PRICE	EDRS Price MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS	Cognitive Ability, Cognitive Development, *Cognitive Processes, Learning Processes, *Learning Theories, Models, *Reading Development, *Reading Processes, Reading Skills, *Theories

ABSTRACT

Based on the idea that mastery of reading is a complex problem to be solved by a child, the author discusses the learning-to-read process as a series of discoveries of solutions to subproblems, all of which are then ordered into a total system. As a child's attempted solutions approximate more closely the reality of each aspect of the reading process, as he gains in understanding of the nature of the task, he achieves more cognitive clarity. This cognitive clarity is correlated highly with reading success, while its opposite, cognitive confusion, can be regarded as a symptom of reading failure. Pertinent evidence from studies of reading disability and from studies which relate reading achievement to various intellectual abilities are cited in support of the author's theory. He concludes that understanding of differences between spoken and written forms, knowledge of letter-sound correspondences, and ability to categorize words contribute to cognitive clarity, while auditory and visual discrimination and letter-name knowledge do not. A summary list of findings from studies which explore factors related to the proposed cognitive clarity theory of reading concludes the presentation. References are included. (MS)

Specific Cognitive Factors in the Reading Process

John Downing

University of Victoria

Although some original research will be summarized briefly at the end, this paper is not intended to be a research report. It is, rather, primarily a theoretical proposal, for which evidence will be adduced from a range of sources both indirect and direct.

Needed - A cognitive theory of reading

This theoretical paper is directed to the problem of the learning-to-read process rather than the established skill of reading. It postulates that research into visual and auditory perception in reading has been less fruitful than might have been anticipated from the "commonsense" view of what reading "obviously" is, and that, therefore, it may be more profitable to turn to the less obvious or

"invisible" cognitive aspects of learning to read. Such underlying cognitive factors may be much more important than the surface ones of visual and auditory perception.

More precisely, it is postulated that the task of mastering the skill of reading poses a very complex problem to be solved by the child. Thus the learning-to-read process may consist in a series of discoveries of solutions to the sub-problems which constitute the total complex problem of finding out how to read. In other words, progress in learning to read is made by a series of cognitive restructurings which result from probes made by the learner in his search for solutions. Sometimes the new cognitive structure will be a correct solution, but at other times it will be in error. As the child's attempted solutions approximate more and more closely to the reality of each aspect of the reading process, so he will achieve more and more cognitive clarity. The best measure of a child's progress in solving the learning-to-read problem, therefore, should be his degree of understanding of the nature of the task. Thus cognitive clarity will be correlated most highly with reading success, while failure in reading will have as its chief symptom, cognitive confusion.

Indirect evidence for this cognitive clarity viewpoint may be considered under two headings; (a) evidence from studies of reading disability; (b) evidence from studies relating reading achievement to various intellectual abilities.

Studies of reading disability

Vernon's (29) monumental review of the causes of failure in learning to read led her to conclude that "there may exist different

types of reading disability, produced by different factors, and different complexes of factors, in different cases". So much so that "almost the only fact which appears clearly at first sight is the heterogeneity of cases of reading disability - heterogeneous both in the origin and in the nature of the disability. But there does seem to be one fairly universal characteristic of the disability, namely, the child's general state of doubt and confusion as to the relationship between the printed shapes of words, their sounds and their meanings. This confusion resembles that of a young child who is just beginning to read."

This final sentence by Vernon triggers off the present theoretical proposition. Vernon expands the idea further, as follows:

> "We may conclude that, rather than suffering from some general defect in visual or auditory perception, imagery or memory, the child with reading disability has broken down at some point, and has failed to learn one or more of the essential processes that we have described. He therefore remains fixed at a particular point and is unable to proceed further."

In these two quotations from her conclusions from her extensive review of research on reading failure, Vernon provides evidence on two points:

1. The important common symptom of confusion regarding the nature of the task.

2. This symptom is reminiscent of the attitude of young beginners.

Vernon actually uses the term "cognitive confusion" to describe this pervasive symptom of reading disability:

> "Thus the fundamental and basic characteristic of reading disability appears to be cognitive confusion."

She defines this state, as follows:

> "The child with real reading disability ... may indeed have learnt that printed words have some relation to spoken words; and, with a few simple words, he has memorized the spoken word that corresponds to a particular shape. But he does not seem to understand why: it might be quite an arbitrary association. He appears hopelessly uncertain and confused as to why certain successions of printed letters should correspond to certain phonetic sounds in words."

Vernon further found that "to make this association demands a particular type of reasoning process", and that, in reading disability "the fundamental trouble appears to be a failure in development of this process", so that the disabled reader "remains in a state of confusion over the whole process".

Relating Vernon's conclusion to the present theoretical proposition, if "cognitive confusion" in the "particular type of reasoning process" involved in learning to read is the outstanding feature of the disabled reader, then, conversely, cognitive clarity ought to be the most prominent characteristic of the normal reader. Following Vernon's terminology for describing the disabled reader, the normally developing reader should "understand why" the written and spoken forms of language are related as they are. He should progress towards a clear understanding of "why certain successions of printed letters

should correspond to certain phonetic sounds in words", and Vernon's "particular type of reasoning process" should be observable in developmental stages beginning with the normal cognitive confusion of the earliest stage through a series of problem-solving phases to a later stage of normal cognitive clarity.

Studies of intellectual abilities in reading

Further indirect evidence for this cognitive clarity theory may be adduced from the common finding of a rather high correlation between intelligence and reading achievement. Success in problem-solving is a measure of intelligence, and, obviously, therefore, intelligence determines to an important degree the child's success or failure in solving the problems of finding out how to read. Vernon, herself, states, "It is clear that these processes are in themselves excessively complicated, and require a considerable degree of intelligence and insight." In one investigation, Tinker (28) concluded that general intelligence is the most important factor in determining the student's progress in learning to read. Thackray (27) in England and Malmquist (16) in Sweden both recently have completed studies confirming the high correlation between intelligence and reading achievement. For example, Malmquist's conclusion is:

> "The relation was of such an order of magnitude that it definitely confirms the almost unanimous view expressed by previous investigators that intelligence is an important factor in the development of reading ability."

Nor does the finding that correlations between reading achievement

and auditory or visual discrimination are higher than between reading achievement and intelligence invalidate the evidence adduced in the preceding paragraph. For one thing, the studies which found this, e.g., Durrell, Murphy, and Junkins (10), Harrington and Durrell (13), Nicholson (18), Thackray (27), indicated only very small differences in the correlations. Secondly, visual and auditory discrimination are, to a very important extent, learned abilities, which may have a substantial cognitive element. For example, learning to read in English, Finnish and Japanese all require discrimination learning of both types. Children in Finland or in Japan, no less than children in England or America, must learn to discriminate the particular sounds of their languages even though they have quite different phonological systems. They must also learn to discriminate between the particular graphemes of their languages even though these are quite different visual stimuli to those which exist in the English writing system. The grapheme-phoneme relations in Finnish are less confusable than those in English. Likewise, the Japanese Kana syllabary provides a more consistent system at a simpler level. Thus this particular aspect of problem-solving in learning to read is likely to present less difficulty in either Finnish or Japanese than it does in English, so that one would predict that cognitive clarity in respect of the problem of the relations between written and spoken symbols would be facilitated in children learning to read in Japan and Finland as compared with children in the English-speaking countries. Recent articles by Sakamoto and Makita (24) on reading in Japan and Kyöstiö (15) on Finnish reading behavior state that reading

disability is not a recognized problem in either Japan or Finland, whereas it is a source of great public concern in, for example, the United States and Britain. Since it is extremely unlikely that Finnish or Japanese children are twenty times better equipped morphologically, neurologically, physiologically, psychologically or in genetic influences, one must look for differences in the experiences of children learning to read in these different nations, the most remarkable of which are those which arise from the very different writing systems of the languages of these countries. These different experiences are likely to result in differences in specific cognitive factors beneath the surface of auditory and visual discrimination sub-skills. These could explain not only the national differences in the incidence of reading disability but also the correlations discovered by Durrell et al and the other investigators quoted earlier.

They may also explain what might be called the "Sesame Street" effect of the correlational finding that letter-name knowledge in kindergarten is the best single predictor of first grade achievement in reading, Nicholson (18), Olson (20), Gavel (12), Barrett (1), de Hirsch et al (5), Bond and Dykstra (2), and Dykstra (11). This produced the correlation fallacy expressed by Chall (4) as follows: "knowing the names of the letters before learning to read helps a child in the beginning stages of learning to read, whether he learns from an approach emphasizing code or meaning". Three independent experimenters, Johnson (14), Samuels (25), Ohnmacht (19), all found that teaching letter-names has no effect on reading achievement. For example, Samuels' results led to his conclusion "that letter-name

knowledge does not help the student learn to read".

Clearly some other factor or factors is responsible for the correlation between early letter-name knowledge and first grade reading achievement. Both could be a reflection of the same underlying factor, e.g., cognitive clarity in respect of such linguistic categories as the grapheme. As Piaget (21) has pointed out, "Verbal forms evolve more slowly than actual understanding". Hence, letter-name knowledge in kindergarten is probably a symptom of an early phase in the growth of cognitive clarity. Conversely, the findings of Johnson, Samuels, and Ohnmacht that training in letter-name knowledge is ineffectual fits well with Vygotsky's (30) generalization:

> "Direct teaching of concepts is impossible and fruitless. A teacher who tries to do this usually accomplishes nothing but empty verbalism, a parrotlike repetition of words by the child, simulating a knowledge of the corresponding concepts but actually covering up a vacuum."

Research on children's thinking

Just as an over emphasis on perception has diverted attention from cognitive factors in reading, so also has there been a corresponding relative neglect of categorizing behavior in reading in comparison with the mass of studies on discrimination. As Bruner et al (3) have pointed out, "Virtually all cognitive ability involves and is dependent upon the process of categorizing." The importance of this aspect of cognitive behavior in reading has been hinted at by only a few studies. For example, Solomon's research as reported by Robinson (23)

found that the only predictive result of a Rorschach Test was the undue concern with unimportant details shown by some of her 8 year old subjects. These children were more likely to fail in reading. This seems a surprising result in view of the emphasis usually placed on discrimination in learning to read, but it would be less unexpected if this finding were related to the importance of categorizing.

More recently Serafica and Sigel (26) have reported a complete study of "Styles of Categorization and Reading Disability", which is a substantial contribution to research on cognitive factors in learning to read. Of particular interest, in connection with this theoretical discussion of cognitive clarity in reading is their conclusion that:

> "The boys with reading disability in this study do not seem lacking in an analytic ability. If the initial phase of learning to read requires differentiation of graphic symbols from one another, the non-readers were better equipped for that task than were the boys who showed no reading problems."

Again, this result is surprising only if discrimination is regarded as the fundamental sub-skill of reading.

More direct evidence that categorizing behavior is of greater importance in learning to read than has hitherto been recognized is provided by the research of Reid (22) and the present author's replication of her work -- Downing (6). Reid found that young beginners in a school in Scotland displayed much confusion in their use of such categorization terms as "word", "letter" and "sound".

which are important in talking and thinking about the task of learning to read. This finding was confirmed in Downing's replication using young children in the south of England.

Direct evidence of the importance of cognitive clarity in the learning-to-read process

Most of the direct evidence which can be cited consists in those findings of empirical research which have inspired this cognitive clarity theory of reading. Only recently have experiments begun to test hypotheses derived from the theory. As all these data have been published or are in the process of getting published already, and because space here is limited, they will be presented only in the form of a summary list of findings with their references to the original source of the data.

1. The young beginner's categories of spoken "word" and speech "sound" do not correspond with those of an adult. cf. Downing (6).
2. The young beginner's category of written "word" does not coincide with that of an adult. cf. Meltzer and Herse (17), Downing, Evanechko and Ollila (9).
3. Young beginners do not know the purpose of written language cf. Reid (22), Downing (6), Vygotsky (30).
4. Learners of reading demonstrate "a sequence in the development of the concept of word boundaries" (i.e. the category "word"). cf. Meltzer and Herse (17).
5. Five specific dimensions of growth in cognitive clarity in reading have been discerned in children as they progress in their first

year at school:

(a) "Understanding the communication purpose of the written form of language."

(b) Attaining "the concept of visual symbol."

(c) Attaining "concepts of abstract parts of spoken language."

(d) Learning the "technical vocabulary of language learning."

(e) "Understanding the decoding process."

cf. Downing (7 and 8).

Bibliography

1. Barrett, T., "Predicting Reading Achievement Through Readiness Tests". In Figurel, J. A. (Editor), Reading and Inquiry. Newark, Delaware: IRA, 1965.

2. Bond, G. L. and Dykstra, R., Final Report of the Coordinating Center for First-Grade Instruction. (USOE Project X-001). Minneapolis: University of Minnesota, 1967.

3. Bruner, Jerome S. et al, A Study of Thinking. New York: John Wiley and Sons, 1956.

4. Chall, Jeanne, Learning to Read: The Great Debate. New York: McGraw-Hill, 1967.

5. de Hirsch, K. et al, Predicting Reading Failure: A Preliminary Study. New York: Harper and Row, 1966.

6. Downing, John, "Children's Concepts of Language in Learning to Read". Educational Research, 12, February 1970, 106-112.

7. Downing, John, "How Children Develop Concepts of Language". Paper presented at IRA Convention, Anaheim, 1970.

8. Downing, John, "Children's Developing Concepts of Spoken and Written Language". Manuscript submitted for publication, 1970.

9. Downing, John, Evanechko, Peter and Ollila, Lloyd, "Cognitive Factors in Reading Readiness". Research report in preparation, 1970.

10. Durrell, D. D., Murphy, H. A., and Junkins, K. M., "Increasing the Rate of Learning in First Grade Reading". Education, 62, 1941, 37-39.

11. Dykstra, R., Final Report of the Continuation of the Coordinating Center for First-Grade Reading Instruction Programs. (USOE Project 6-1651). Minneapolis: University of Minnesota, 1967.

12. Gavel, S. R., "June Reading Achievement of First-Grade Children". Journal of Education, Boston University, 140, 1958, 37-43.

13. Harrington, Sister M. J. and Durrell, D. D., "Mental Maturity Versus Perception Abilities in Primary Reading". Journal of Educational Psychology, 46, 1955, 375-380.

14. Johnson, R. J., The Effect of Training in Letter Names on Success in Beginning Reading for Children of Differing Abilities. Paper presented at the AERA convention, 1970.

15. Kyöstiö, O. K., "Finland". In Downing, John et al, Comparative Reading. New York: Macmillan, in press.

16. Malmquist, Eve, "A Decade of Reading Research in Europe, 1959-1969: A Review". Journal of Educational Research, 63, March 1970, 309-329.

17. Meltzer, Nancy S. and Herse, R., "The Boundaries of Written Words as Seen by First Graders". Journal of Reading Behavior, 1, Summer 1969, 3-14.

18. Nicholson, A. "Background Abilities Related to Reading Success in First Grade". Journal of Education, Boston University, 140, 1958, 7-24.

19. Ohnmacht, D. D., The Effects of Letter-Knowledge on Achievement in Reading in the First Grade. Paper presented at the AERA convention, 1969.

20. Olson, A. V., "Growth in Word Perception Abilities as it Relates to Success in Beginning Reading". Journal of Education, Boston University, 140, 1958, 25-36.

21. Piaget, Jean, The Language and Thought of the Child. (Revised edition). London: Routledge and Kegan Paul, 1959.

22. Reid, Jessie F., "Learning to Think About Reading". Educational Research, 9, 1966, 56-62.

23. Robinson, Helen M., Supplementary Educational Monographs, No. 77, 1953.

24. Sakamoto, Takahiko and Makita, Kiyoshi, "Japan". In Downing, John et al, Comparative Reading. New York: Macmillan, in press.

25. Samuels, S. J., Letter-Name Versus Letter-Sound Knowledge as Factors Influencing Learning to Read. Paper presented at the AERA convention, 1970.

26. Serafica, Felicisima C., and Sigel, Irving E., "Styles of Categorization and Reading Disability". Journal of Reading Behavior, 2, Spring 1970, 105-115.

27. Thackray, Derek V., Readiness to Read with i.t.a. and T.O. London: Geoffrey Chapman, 1970.

28. Tinker, Miles, "Diagnostic and Remedial Reading". Elementary School Journal, 33, 1932, 307.

29. Vernon, Magdalen D., Backwardness in Reading. London and New York: Cambridge University Press, 1957.

30. Vygotsky, Lev S., Thought and Language. Cambridge, Mass: M.I.T. Press, 1962.