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ABSTRACT

Theories of reading development may be grouped into roughly two opposing categories, depending on where the source of reading control is assumed to be located. "Outside-in" theories, those characterized by the notion that reading is a hierarchical series of decisions dependent on structured discrimination of print material, clearly predominate. Although these theories provide the basis for the most frequently used reading instruction programs, they fail to account for intention, selectivity, prediction, and comprehension in reading. "Inside-out" approaches, on the other hand, argue that children learn to read by making sense of written language from inferred meaning and prior knowledge, in much the same manner that they acquire language skills. Although these theories do not offer prescriptions for methodology or provide direct translations into practice, their assumptions often appeal to the intuitions of experienced teachers. Since the skill of reading is imbedded in the complex functions of the brain, educators need to focus their attention on the internal, as well as external, processes of learning. (KS)

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APPLICATIONS OF RESEARCH:
LANGUAGE COMPREHENSION AND READING

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I always hesitate before becoming involved with any of the perennial attempts to "translate" theory and research about the nature of reading into practical applications for teachers, as though theory were a language that practitioners could never be expected to comprehend. The dichotomy of "theory" and "practice" strikes me as highly artificial, with its implication that theory - which I see as the way we all try to make sense of anything - cannot be practical unless concretized into instructional programs or specific courses of action, and that educational practice could ever exist independently of theory, as a kind of detached bloodless unmotivated behavior. When I am occasionally asked to ensure that a talk to an academic audience will be theoretical while a discussion of the same topic for teachers should be practical, I am inclined to argue that the emphases should be reversed.

There are three broad reasons for my apprehension about the constant demand for "applications". The first is that the direct conversion of theoretical insights into practical terms - whether on the level of helpful hints to individual teachers or as fullblown instructional programs - tends to lead to egregious overgeneralization. What might be a good idea with a few children in a limited context becomes inflated into a foolproof system for teaching entire populations the whole time. Teachers already conditioned to rely on experts rather than on their own accumulated wisdom and experience to solve day to day classroom problems become even more disappointed and disillusioned with the theorist or researcher when the desired improvement so rarely comes.

My second concern is that the rush to be applied frequently confuses what a person is able to do as a consequence of being a reader with what is necessary in order to learn to read in the first

place. A recent example was the effort to transmogrify large numbers of children into transformational grammarians when linguists discovered that transformational rules were a convenient way of characterizing part of their own language competence. Almost contemporaneously, many children were drilled in the identification of meaningless "distinctive features" as a preliminary to exposure to the alphabet after theorists hypothesized that feature detection models might be a useful conceptual tool for examining letter and word recognition processes. Because some children had difficulty comprehending the "significant differences" that were supposed to constitute distinctive features, training exercises in the detection of differences even became a part of some "readiness" programs. A more recent theoretical interest in the roles of redundancy and prediction in reading has begun to spawn attempts to teach children to become responsive to redundancy and to predict But such abilities - like the ability to detect differences that are truly significant - seem integral parts of the natural capacity of all children to make sense of the world, and especially of spoken language, long before they get to school. The continually resurgent emphasis on phonics provides an historic example of confusion between the consequences and causes of reading. Because phonics looks so obvious to anyone who can read, it is taken for granted that phonics must work for anyone who cannot, despite the painfully obvious difficulties of many "problem readers" of all ages trying to sound out words and the statistical analyses showing that the enormous complexity and unreliability of spelling-sound correspondence rules can only be overcome by having a good idea of what a word is in the first place.

The emphasis on "decoding" is also related to the third reason I mistrust the translation of theory into practice. My argument is that there is a critical bias in reading theory and research that has been extended into a bias in classroom practice, a

bias that limits and distorts the way many people think about reading and reading instruction. There are two quite distinct ways of viewing reading, and of viewing language comprehension in general, but only one of these perspectives tends to be considered when there is a demand or wish for theory to be translated into practice.

Conflicting theoretical approaches to reading

Although there are many "theories" of reading, they can be roughly grouped into two opposing categories, depending on where the source and control of any particular act of reading is located. Many theories see reading as a process that begins with the print on the page and ends with some representation or interpretation inside the brain - I shall call such theories outside-in. The other class of theories perceives reading as a highly discriminatory process that begins in the brain and ends with selective attention to only part of the printed text - I shall call such theories inside-out. Outside-in theories are clearly dominant in both the research literature and instructional development, and since I shall be unable to conceal my predelictions and present a "neutral" paper, I shall state at the outset that my own position is with the minority.

Outside-in theories are characterized by the notion that everything on a page of text is "processed" and that reading is primarily a hierarchical series of decisions - first letters are discriminated, then they are synthesized into words (usually but not always through "decoding" into a phonological or "underlying" level of spoken language) as a consequence of which comprehension takes place. It would be invidious to identify one or two or these theories and I have neither the space nor the inclination to list them all. Examples proliferate in such recent compilations as Kavanagh and Mattlingly (6) and the final report of the USOE Targeted Research and

Development Program in Reading (3). They also account for a large proportion of the studies reported in Reading Research Quarterly and predominate in most psychological and linguistic speculation about reading. Outside-in theories are frequently detectable from a distance by virtue of their elaborate flowcharts, with arrows leading from the "stimulus" of print through iconic storages, scanners, comparators and decoders into destination boxes labelled "semantic store" or quite simply "meaning".

There is in fact no evidence that any reader pays attention to every letter - or in many circumstances to every word - in any natural reading situation. Neither eye-movement studies nor analyses of oral reading indicate just how much or how little of the actual print readers "process" when they are reading meaningful text, although it is obvious that readers often identify words without attending to all of the letters on the page, and that they can also make sense of text without identifying all of the particular words in front of their eyes. Almost all of the experimental work that has provided the conceptual basis for outside-in theories of reading has been done with tachistoscopic equipment and meaningless materials in unmotivated laboratory situations.

My main criticism of outside-in theories is not so much that they are wrong as they are not representative. They provide reliable and replicable data about how individuals respond when confronted with atypical "identification" tasks in laboratory settings, but in fact bear little resemblance to what takes place when individuals normally read street signs, telephone directories, labels, menus, newspaper reports, poetry, or anything else that is interesting or informative to them. More specifically, outside-in theories fail to account for intention (we usually read for a purpose), selectivity (we attend only to what we want and need to know), prediction (we are

rarely bewildered or surprised by anything that we read), and comprehension (we are rarely aware of the enormous potential ambiguity, both syntactic and semantic, of the most common words and constructions of our language). It is invariably easier to read texts that are meaningful than nonsensical strings of words, just as letters in words are easier to identify than letters occurring randomly - in fact we are normally only aware of words when meaning fails and we attend to letters only when words are unfamiliar, the reverse of the outside-in view. Of course, the fact that readers are usually aware only of meaning does not logically entail that they are giving no attention to letters and words in the process. But on the other hand the absence of direct or introspective evidence is hardly support for the outside-in point of view.

This pervasive element of downward (or outward) control in meaningful reading is not something that outside-in theories can cope with simply by appeal to specialized "filters" or by the introduction of additional arrows pointing upstream in their flowcharts and labelled "feedback" or "prediction". Nor can such theories assert that the reader looks for and processes "higher order invariances" or "largest meaningful units" without acknowledging that what determines the size of a unit is not the nature of the print on the page but the intention of the reader in the first place, an inside-out perspective.

The inside-out view in fact begins with intention - it regards reading as a truly active, centrally motivated and centrally directed process in which the reader hypothesizes, or predicts, among a certain range of meaningful likely alternatives and searches and analyzes among the featural information available in the print only to the extent necessary to resolve his remaining uncertainty. The inside-out view endeavors to account for how words can be identified without the mediation of letter identification (the reader can search for features

to decide among alternative word possibilities independently of a feature search to identify letters). It tries to explain why letters in words are easier to identify than letters in random sequences and why words in meaningful sequences are easier to identify than random words. In each case a set of expectancies is established reducing the number of alternatives considered by the reader and based upon his prior knowledge. He looks for the featural information that he needs and ignores information that is irrelevant or redundant to his purposes. The inside-out perspective does not require recourse to spoken language for the comprehension of print. Meaning is directly accessible through print (as exemplified in the visible difference in meaning between their and there) and in fact must be determined before text can be read meaningfully aloud. Without prior comprehension, many words cannot even be allocated a grammatical function, e.g., house - noun or verb? - let alone an appropriate pronunciation or intonation.

Inside-out theories are by no means adequate, of course. Indeed, when one considers the enormity of the attempt to understand how knowledge of the world is organized and integrated in the human brain, which is the beginning of the inside-out analysis of reading, then one comprehends why it has been asserted more than once that to understand reading would be the acme of a psychologist's achievement (5, 10). The acme of a psychologist's achievement is surely not a series of reaction time studies measuring how long it takes individuals to name letters and words. Gough (4) acknowledges the root of the problem when he characterizes the end-point of his outside-in theory of reading as "The Place Where Sentences Go When They are Understood", reached by a procedure that he leaves in the hands of a wizard-in-the-head named Merlin. Such a magical approach cannot explain why readers

remain unaware of letters or even words before sentences are understood nor why they are also unaware of potential ambiguities and even of the meaningful mistakes which from time to time all readers make. Normal reading seems to begin, proceed and end in meaning, and the source of meaningfulness must be the prior knowledge in the reader's head. Nothing is comprehended if it does not reflect or elaborate upon what the reader already knows. (These and other inside-out arguments are elaborated in 11, 12, 15).

It can rightly be objected that inside-out theories are vague. But not enough is known about the way individual human knowledge is organized to provide a basis for more than cautious speculation (for examples and summaries, see 1, 7). On the other hand, outside-in theories tend to give a spurious impression of rigor and completeness only by ignoring critical issues of comprehension altogether. Outside-in theories do not get very far in. Can "reading" really be studies if it stops short of comprehension?

Apart from the conceptual conundrums confronted by inside-out theories, they are also handicapped by the difficulty of designing "critical" experiments. Because of their scope and the inherent problem of exercising laboratory control in situations where the major variable is something as unpredictable as an individual's prior knowledge and intentions, very few experimental paradigms for comprehension lend themselves to simple replication or quantitative analysis. Even the most compelling studies of language comprehension (such as 2) can be regarded only as illustrative. Most of the data relevant to inside-out theories of reading and language comprehension are based on anecdote, observation or introspection - but so then are many of the studies upon which today's powerful theories of spoken language acquisition are based.

Conversely, I think the dominance of outside-in theories in the research literature is entirely attributable to their conceptual simplicity and experimental tractability. It is far easier to design replicable experiments, conduct statistical analyses and achieve reliable results when the concern is limited to reaction times to meaningless letters and words. It is only when subjects succeed in imposing sense on such tasks - by relating the stimuli to something they know already - that the well-ordered predictability of results breaks down. Meaning makes such tasks easier for subjects but harder for experimenters, thus the need in most outside-in studies of reading for the subject to be the most unrepresentative of all readers, an individual with no relevent prior knowledge or expectations about the task at hand.

Such essential nonsensicality in outside-in reading research mirrors the 100-year study of nonsense in experimental psychology's investigation of "verbal learning". Since the invention of the nonsense syllable, this investigation has been a constant battle between subjects striving to make sense of their tasks and experimenters trying to devise more effective nonsense, since it is only with nonsense that psychology's vererable "laws of learning" apply (13).

Conflicting approaches to reading instruction

There are also outside-in and inside-out approaches to reading instruction. Outside-in programs are founded on the belief that a child learns to read by learning first the alphabet and then the "sounds of letters" which may be combined to form words that hopefully he can recognize as part of his spoken language. And that - from the outside-in point of view - just about accounts for reading. Typically if a child fails to learn to read by such treatment, he is given more of it.

One reason that outside-in instructional programs are so numerous and widespread in classrooms (and at reading conventions) today is that they are a direct reflection of outside-in theories of reading. Outside-in theories " ranslate" naturally into outside-in programs.

But outside-in instructional programs are also prolific in their own right for the same reason that outside-in theories flourish - they are conceptually simple and lend themselves easily to measurement, manipulation and control. With outside-in instruction there is little concern with comprehension on the part of the child, either in terms of content or in terms of why he should be involved in the exercise in the first place. Comprehension of content is supposed to come about automatically if and when the child masters decoding skills, and is in any case the child's responsibility. Comprehension of the purpose of the drills and skills is disregarded; it is irrelevent. Task achievement is everything. And not only are outside-in instructional methods frequently successful - within their own limited range of objectives - but they have the great advantage of being able to demonstrate their success. Objectives can be set within the reach of any desired proportion of a particular population, and scores can be recorded to prove that criterion levels have indeed been achieved. By offering a convenient scale of scores, outside-in procedures will even "diagnose" which children are likely to be good students (i.e., will score high on similar tasks) and which children have learning disabilities.

The outside-in perspective is a boon to instructional program developers who need to break down complex tasks into series of discrete and simple steps, so that teaching can be standardized and made amenable to technology. To achieve this simplification a few contemporary reading programs claim to teach only "subskills" of reading, relieving

the teacher of anxiety about whatever the total skill might be of which the subskills are a part. Because of their facile formulations and quantitative nature, outside-in procedures are generally adopted whenever someone wants to hold someone else "accountable" for progress or regression in literacy. Outside-in instruction is usually also the referent when there is concern for "getting back to basics".

Inside-out approaches to instruction, on the other hand, try to argue that children learn to read by making sense of written language; they learn to read by reading and the teacher's role is to help children read. (For a summary of these arguments see 13). Such a perspective asserts that it is sense that enables children to learn to read, making use of inferred meaning and prior knowledge, just as the development of spoken language fluency is rooted in the sense children are able to bring to the learning situation (8, 9). According to the inside-out point of view, expecting children to "decode" letters into words is to expect them to learn words the hard way; it is familiarity with words that makes letter recognition (and phonics) easy. Similarly the requirement that children should identify strings of words accurately in order to obtain meaning, or without recourse to meaning at all, is also to impose the most difficult task. Anything that does not make sense to the child is regarded as a hindrance to his learning. Learning nonsense is not only harder, it is pointless.

The inside-out perspective appeals to the intuitions of many experienced teachers. Their own feelings - often tentatively expressed because they fear they lack "scientific" validity - are that children learn by being immersed in meaningful written language, in situations that generate pleasure and assurance rather than bewilderment and apprehension. From such a perspective, the more structured outside-in approach may be seen as a systematic deprivation of important information. But it must also be stated that other teachers

are threatened by inside-out points of view, by their lack of structure, the responsibility they seem to throw on the teacher, and the fact that they are not amenable to simple packaging and measurement. They are not labor-saving.

Inside-out theories do not offer prescriptions for methodology. They are not directly translatable into practice (14). Instead their aim is to inform teachers, to assist them in making their own diagnoses and decisions. Teachers who rely on outside-in instruction may only be able to move from one program to another; they need advice, tests, or luck to make appropriate on-the-spot decisions. But the ultimate dilemma for such teachers is that they must still choose. They must select among programs, tests, and experts. And to make such choices they need information, an understanding of the nature of children and of reading. The inside-out perspective does not hold that reading teachers should ignore the tools of their trade, the methods and materials that are available, but it asserts that teachers should know how and when methods and materials are appropriate, and when their use may make no sense at all. Inside-out theory can be practical - but not [illegible] being strait-jacketed into programs.

The inside-out perspective reminds teachers and researchers alike that the skill of reading remains largely a mystery because so much of it is embedded in the complex structures and functions of the brain. But the perspective also emphasizes a point that is widely overlooked - that many children succeed in learning to read, despite the variety of instructional methods employed. And despite the countless millions of dollars spent on program development and testing by Government agencies and commerical enterprises, there is not the slightest evidence that children who learn to read today do so with any more facility than those who learned with a hornbook and the family Bible. Yet it is still widely believed that space-age technology will give

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