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DISPELLING THE MYSTERY ABOUT COMPREHENSION: KINTSCH'S MODEL AND IMPLICATIONS FOR INSTRUCTION

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Most teachers recognize that comprehension is essential to reading, yet to many it remains a mysterious process, certainly more difficult to understand than word identification. We teachers implement comprehension exercises suggested in teachers' manuals, activities written with such objectives as "The pupil will support inferences about characters" (Clymer & Indrisano, 1976, p. 28) or "The pupil will recall the details that support the main idea of a paragraph" (Clymer & Indrisano, 1976, p. 190) or "The pupil will infer story themes" (Clymer, Daniels, & Wardeberg, 1976, 259). Many resourceful teachers plan their own comprehension development activities based on common sensical understandings that comprehension is somehow a process of distilling the gist of a selection, that some parts of selections are more important to that process than others, and that paraphrasing and answering questions provide evidence about how well that process is operating. And some teachers are guided by intuitive insights about what makes a selection easy or difficult, that the state of students' prior knowledge and their meaning vocabularies are factors as important to readability as sentence length and word length, or even concept load and sentence complexity.

Still, all teachers would benefit from an understanding of recent models of the comprehension process. With the mystery about comprehension dispelled, teachers would teach more consistently, be less dependent on the authority of the teachers' manuals, and be more confident about the soundness of some past practices that are based on common sense and intuition.

Reading comprehension can be described as the result of a successful interaction of a reader with a text. Schema theory and linguistic theory are valuable for what they have to say about the parties to that interaction. Both bodies of theory have influenced cognitive psychologists' descriptions of the mental processes involved in comprehension (cf. Richgels, 1982). A brief description of each will provide some "prior knowledge" to make understanding of Kintsch's model of comprehension easier.

Schema Theory

The schema is a construct used by cognitive psychologists

in their theories of memory and learning. A schema can be thought of as a knowledge structure, or framework, which interrelates all of one's knowledge about a given topic. Prior knowledge, organized in schemata, in turn influences the form and content of new knowledge.

The "eating out schema" is a popular example. It contains all that is associated in one's memory with going to a restaurant; such people as the hostess, the maitre d', the waiters, and the waitresses, and such actions and events as giving one's name to the hostess, studying the menu, keeping one's elbows off the table, and leaving a tip, all organized about such scenes as entering, ordering, eating, and leaving.

Schallert (1982) describes schema theory as a list of propositions about the structure of schemata and the role they play in processing information. First, a schema is a specific configuration of variables, some obligatory and some not. Schemata can be embedded within each other, forming hierarchies; the configuration of one's total set of interconnected and cross-referenced schemata may change from moment to moment; and schemata become more elaborate and more specific with experience. Comprehension is a process of finding instances of the various elements within an activated mental framework. Meaning is in fact neither in the message itself, nor in the comprehender's schemata in their abstract state, but rather is a result of a process that combines the two. Finally, activatead schemata guide inferences. Inferring na urally happens as a part of what the schema-guided comprehension process is all about; it is not a separate process.

Linguistic Theory

Linguistic theory has gone through several revolutions during the past 25 years. The first and most important was Chomsky's (1957) break with structuralism, with its fixation on the structural relations among words in a sentence's spoken or written form — the kind of relations which are illustrated in sentence diagrams. Chomsky's insight — that sentences can be analyzed in terms of levels of structure, including the surface level form in which they are spoken and the deep structure level which characterizes their essential syntactic relations — created an awareness of the centrality of meaning.

Chomsky's standard theory would represent the deep structure of both sentences, "Johnny opened the book" and "The book was opened by Johnny", as a noun phrase (Johnny), a tense (past), and a verb phrase (open the book). Other linguists have argued for other representations of deep structure during the post-1957 period of linguistic theorizing and controversy. But it is impossible to imagine an effort to build a model of comprehension that does not take Chomsky's invention of the concept of deep structure for granted. Many models of comprehension use Fillmore's (1968) case grammar representation of deep structure. According to case grammar, a sentence consists of a verb and one or more noun phrases, and each noun phrase is associated with the verb in a particular case relationship (e.g. agentive, instrumental, dative, factitive, objective, locative, and benefactive). Thus, "Johnny opened the

book" would be represented as a mode (past) and a proposition, the latter consisting of a verb and two noun phrases (Johnny, in the agentive case, and the book, in the dative case).

When texts longer than one sentence are analyzed, the concept of cohesion becomes important. Halliday and Hason (1976) give detailed attention to such cohesion-creating relations as reference, substitution, and conjunction. An important result of looking for cohesion among sentences of a text is that meaning receives even greater emphasis. Halliday and Hason point out, "A text is best regarded as a semantic unit: a unit not of form but of meaning" (1976, p. 2).

Kintsch's Model of Comprehension

Walter Kintsch's (1979) model of comprehension makes use of elements of schema theory and linguistic theory and has practical implications for classroom teachers. The input to his model is a semantic representation of the text. That is, the text is first represented as a list of propositions, following the procedure described in Kintsch (1974). That procedure uses Fillmore's (1968) case grammar to indicate the relations within the predicate propositions. Propositions are conceptual units, e.g., The Swazi tribe (and) was at war with (and) a neighboring tribe. Arguments are, roughly words within propositions, e.g., "war" in was at war.

A kind of cohesion is then achieved by connecting propositions that have common arguments. The resulting "referential coherence", then, is based on repetition. The gist of a text emerges as repeated elements survive several cycles of such processing, that is, several consolidations of past meaning with new chunks of text. This is bottom-up process.

Gaps may occur, the result of new chunks of text having no elements in common with consolidations of past text in short term memory. When this happens, long term memory must be searched, and if no common elements are established, a "bridging reference" is required.

There are two givens in this process: besides the text, there is the influence of the reader's goal schema. It "determines what is relevant,—sets up expectations, and—calls for certain facts, inferring them if they are not directly represented in the input set" (Kintsch, 1979, p. 5). This is a top-down process.

Kintsch's earlier (1977) model for story comprehension depends upon a somewhat different chunking strategy and upon a different kind of schema. Readers first determine the "macrostructure" of a story, chunking it so that it conforms to a story schema (with the elements exposition, complications, and resolution). The next step is a process of inferring with the purpose of summarizing. Readers label the chunks produced in the first step.

In more recent work, Kintsch (1982) again emphasizes the top-down influence of schemata, this time text-type schemata. The reader must identify the type of text (e.g., whether it is a story or an expository text, or more specifically, a text that

presents an argument, a definition, or a functional analysis) and then can use strategies which are specialized for that text-type (and not tied to specific content).

Informed Classroom Practices

Two kinds of implications for classroom reading instruction follow from Kintsch's model of comprehension: those whose ends are reader behaviors and those whose ends are primarily teacher behaviors. Many of the implied behaviors are not new, but are provided with new purpose and justification, so that teachers familiar with theory will teach with more confidence and consistency.

For the reader

1. Meaning vocabulary and paraphrasing. For a long time experts have agreed that word meaning plays an important role in comprehension (cf. Davis, 1944). Furthermore, instructional techniques (e.g., Otto & Smith, 1980) and comprehension taxonomies (e.g., Carver, 1973) have assumed that comprehension is at least partly a bottom-up process, proceeding from word meanings, to meanings of sentences, to meanings of selections. These beliefs are consistent with Kintsch's (1974 & 1979) model's beginning with a semantic representation of the text, i.e., a list of arguments and propositions. The implication is that teachers can help readers to better comprehend by developing their repertoires of known concepts and their ability to paraphrase sentences. By doing so, teachers increase students' potential for inputting the correct semantic representation of the text; that is, for understanding the smallest elements of the text, its "arguments" or words, as the author intended and for being able to capture the same deep structure meaning for its "propositions" or clauses or sentences as the author's. Instruction should include such activities as semantic mapping and semantic feature analysis (Johnson & Pearson, 1978).

2. Main idea. Identifying the main idea from supporting detail is the most common skill objective of comprehension instruction. When it is not left to happen by a kind of magical osmosis between the text and the reader, it is usually approached in terms of identifying the topic of a selection, which in turn is usually picked out on the basis of which is the most frequently mentioned concept. Kintsch's (1979) "referential coherence" provides confirmation for such a process. Teachers should help students distill the gist of a selection in a manner that parallels Kintsch's chunking and consolidating cycles.

3. Inferring. Most teachers realize that making inferences is necessary at least for comprehension of the kind described in the higher levels of taxonomies (e.g., Barrett's [1972] taxonomy). At the same time, inferring is often mistakenly assumed to be something that happens only after reading, in response to "higher level" comprehension questions. Kintsch's model makes real Schallert's (1982) claim, in her exposition of schema theory, that inferring is a natural and pervasive part of comprehension. Kintsch (1979) shows where gaps in a text's coherence graph require that inferences be made. Young (1980) provides an example for

sound classroom practice in her report of a study that successfully used Kintsch's model as a tool for determining where inferences were required in a text, and thus where marginal notations would best facilitate readers' understanding. Otto, et.al. (1981) and Richgels & Hansen (1982) have described a procedure for writing such notations, which they call "gloss".

4. Prior knowledge. All teachers know that it is easier for their students to comprehend a passage when its subject is familiar to them. Good teachers provide background information before assigning reading on unfamiliar topics. This is evidence of their seeing comprehension at least in part as a top-down process. Strange (1980) and Jones (1982) have discussed instructional implications of schema theory, and Sadow (1982) has shown how basing comprehension questions on story grammar may help children develop story schemata. The additional implication from Kintsch's (1982) work is that teachers should develop children's schemata for other text-types than just stories, that they should encourage a specialized kind of prior knowledge, knowledge about the typical forms or structures of various kinds of texts. Teachers should then teach strategies (such as attending to the organizational features) for dealing with the unique characteristics of various texts.

For the teacher

1. Readability. Kintsch himself discusses the implications of his model for readability. Kintsch and Vipond (1979) improve upon traditional methods for determining readability, which are based upon such factors as sentence length and number of syllables in words. They criticize such methods for their lack of foundation in a theory of text structure and text processing, for their dependence on calculations of only fairly obvious surface features of texts, and for their measurement of style rather than content. In other words, the traditional formulas ignore many relevant findings from schema theory and linguistic theory. Kintsch and Vipond propose that readability might be better determined in terms of concepts drawn from Kintsch's model, such as how often a reader must search long term memory in order to make a connection between present and past input and number of bridging inferences that must be made. This implies doing a text analysis.

2. Text analysis. Teachers can better help their students to understand texts if they have first carefully analyzed the texts themselves. Otto et. al. (1951) suggest that both formal (e.g., Kintsch's system) and informal (e.g., mapping and outlining) analyses of texts can help teachers to determine which skills and strategies need be applied. With Kintsch's system, the analysis can go beyond determination of content. By determining what text-type the selection fits and how readable it is (based on Kintsch's and Vipond's [1979] interpretation of readability), teachers can prepare comprehension lessons that emphasize processes (both top-down and bottom-up) as well as products. Such lessons provide students with tools for comprehension which can be applied independently in later reading.

Summary

The mystery that surrounds comprehension development can be dispelled by an understanding of schema theory and linguistic theory, and especially by an understanding of Kintsch's model of comprehension, which draws from those bodies of theory. Some of the instructional practices discussed in this article are already in common use, but all the practices discussed here can be used with more confidence and more consistency in light of current theory regarding text processing.

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