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ABSTRACT

The core of schema theory is the concept that text is understood according to the reader's world knowledge and that this knowledge is altered whenever the reader encounters new information in print. Inferencing, that is the hypothesizing or predicting that the activation of schema sets in motion, is critical in this process. Recall is important insofar as it activates the schema necessary for inferencing. Using these principles, educators have devised a number of schema-based strategies for teaching reading, including the thematic organizer, story mapping, and story impressions. Recommendations for ways in which teachers can take advantage of schema theory in the classroom include motivation and giving children a purpose by spending more time on instructions before beginning the reading to alert them to schemata germane to the story. If children lack sufficient schemata, they can be helped to build new schemata by exposure to analogies and comparison that will make the transition from their current knowledge to new knowledge. Contains 17 references. (RS)

Schema-theoretical model of Reading: Revisited

by

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When an experienced reader sits down to enjoy a current bestseller or classic tale, he seldom considers that he is engaging in one of the most complex activities that the individual human undertakes. In this seemingly simple act, the reader is taking in the author's message, which he sees as graphic symbols of his language printed in the text, interprets them, and makes meaningful sense of them (Harris & Sipay, 1990).

While many people perform the act of reading without even being aware of doing so, many others throughout the world have never mastered this crucial skill. Thus, reading is the impetus behind much of the educational efforts, both instructional and research. Since reading is getting at meaning, a great deal of research is directed at comprehension. One of the current explanations in educational circles for what comprises reading comprehension is schema theory.

Schema theory, according to David E. Rumelhart, deals with knowledge, how it is represented and how this representation makes possible the use of the knowledge (1980).

Schema theory is rooted in psychological study. The term schema as it is currently used was introduced by

Frederic Bartlett in his book, Remembering, in 1932, in which he described schemata as general impressions of whole entities with details constructed around the impressions. This stressing of the whole rather than the individual parts also reflects the thinking of Gestalt psychologists studying mental organization in the 1930s. Later in the century, David P. Ausubel promoted the idea of the importance of prior knowledge in learning by stating that new propositions in texts are anchored to general concepts that are stored in the mind (Anderson & Pearson, 1984).

With the establishment of the computer age and the research into artificial intelligence, study regarding schema theory has expanded and moved forward. It is no coincidence that such terms as slots and default values associated with schema theory are also part of the jargon of computer science (Anderson & Pearson, 1984; Beers, 1987).

WHAT IS SCHEMA?

Schema has been defined as "an abstract knowledge structure . . . that represents the relationships among its component parts" (Anderson & Pearson, 1984) and "a data structure for representing the generic concepts

stored in memory" (Rumelhart, 1980). It is a prototype of some mental concept that may represent various kinds of objects, animals, people, abstract ideas, actions, or events and encompasses a network of knowledge related to a particular concept which may comprise additional schemata (Rumelhart, 1980). For example, Collins and Quillen portray this with a schema network beginning with a canary and its information that it is yellow and can sing. This schema is part of the bird schema that includes the knowledge that it has wings, can fly, and has feathers, which in turn is part of the animal schema including information that it has skin, can move about, eats, and breathes (Anderson & Pearson, 1984).

In other words, the schema itself can be a specific concept, as the canary example, or a very broad one, as the animal example, and can have other schemata embedded within it.

Each schema carries with it component information which makes it meaningful to the reader. These components are referred to as "nodes, variables, or slots." For example, the schema "ship christening" may have six slots such as breaking a bottle on the bow, in dry dock, blessing the ship, before launching, and by a celebrity.

The schema may be triggered by the slots or the slots may be inferenced through activation of the schema (Anderson & Pearson, 1984).

Two important ideas contained in schema theory are inferencing and instantiation. Inferencing consists of "filling in the missing connections between the surface structure fragments of the text by recourse to contest and knowledge about the world" (Collins, Brown, & Larkin, 1980).

When particular information pertaining to the schema is encountered in the text, as in, "The president christened the ship," the celerity slot is "instantiated" with this specific detail, making it valid for this instance (Anderson & Pearson, 1984).

Schema theory proposes that although one's schema is a structure, it is not static. One's extant schemata are continually being added to, adjusted, or fine tuned, and new schemata are created when one deposits new information in one's knowledge bank. These new concepts, sometimes referred to as restructuring, can be developed by imitating existing schemata or through experience. (Rumelhart, 1980).

The reader activates two types of schemata when he

is reading. One is content schema, which represents his knowledge of the actual and fancied world of things, events, people, and ideas. This is the top-down schema of meaning. The other is textual schema, a bottom-up type that involves the individual segments that indicate the form of the text -- novel, textbook, business letter, classified ad, news article, etc. (Anderson, Pichert, & Shirey, 1983).

Schema theory serves a number of functions in reading comprehension. Rumelhart contends that schemata facilitate perception, since readers construct a schema of an orderly collection of letters to form a recognizable word, that they perceive as a whole rather than a string of random letters. A greater number of word schemata available to a reader results in better comprehension (1980).

Schemata also function in deriving understanding from text. Without a schema to cue the reader as to what a passage is about, he may misinterpret a part of or the entire passage. Three schema-related causes for failure to comprehend text are 1. The reader may not possess the appropriate schema, thus interpreting the entire concept. 2. He may possess the appropriate schema, but the author

may have failed to provide sufficient clues to suggest it, thus rendering the text ununderstandable. 3. The reader may consistently interpret the text, but not in the way intended by the author. This third cause may be attributed to inadequate schema usage by either the reader or the author (Rumelhart, 1980).

One area in schema theory that has received a large amount of research is its effect on remembering, an important consideration in reading for learning purposes. Experiments have shown that using a particular schema as a perspective elicits a greater recall of specific details pertaining to that specific schema (Anderson, Pichert, & Shirey, 1983).

The findings of the same experiment also indicate that schema theory contributes to encoding knowledge or selective storage of material (Anderson, Pichert, & Shirey, 1983). A subsequent study, however, contradicts the hypothesis that schema activation aids in storing information, although the study supports the theory that schema usage influences recall (Kardash, Royer, & Greene, 1988).

Schema theory treats reading as an interactive process, utilizing both textual schemata and content

schemata from the reader's world knowledge. It is also an interaction between the author's meaning as expressed in his words in the text and the schemata activated by the reader as he encounters it. These are constantly being tested for "goodness of fit" by the reader (Durkin, 1984). If a student lack- adequate schemata, he may be unable to process interactively and rely on bottom-up processing focusing on each separate word to the detriment of this understanding the meaning of the text (Pearson & Spriro, 1982).

Since schema theory deals with mental processes which cannot be directly observed or measured, what is known about it is not always exact. Therefore, not all educators find it to be a totally adequate rationale for reading comprehension. Some feel that schema theory is "product oriented" and operates from a.. outside view, or "god's eye view," and suggest that critical thinking theory should be given greater prominence along with schema theory as a contributing factor toward comprehension (Norris & Phillips, 1987).

APPLYING SCHEMA THEORY TO READING INSTRUCTION

Schema theory is not a method of reading, nor is it

considered an approach to teaching reading. Rather it is a theory that attempts to explain what goes into the reading process and reading comprehension.

How, then, can schema theory apply to reading instruction?

The core of schema theory is the concept that text is understood according to the reader's world knowledge and that his knowledge is altered whenever the reader encounters new information in the print. Inferencing, that is the hypothesizing or predicting that the activation of schema sets in motion, is critical in this process. Recall is important in so far as it activates the schema necessary for inferencing (Strange, 1984).

Using these principles, educators have devised a number of schema-based strategies for teaching reading. One such strategy is the thematic organizer, an adjunct to the student's text that relates the theme of the story to the students' prior knowledge. It contains material from social studies, directions for recounting the passages, and literal and inferential questions. It has been found to increase both literal and inferential comprehension, as well as to recall more ideas from the text and to develop the implied information (Risko &

Alvarez, 1986).

A strategy using schema-building techniques to aid children who are poor readers is story mapping, a derivation of story grammars. It stresses the relationship between the children's prior knowledge and the text, by focusing on the interrelated portion of a story and pointing out common constituents, such as characters, settings, goals, problems, outcomes, and conclusion. The aim of story mapping is improved comprehension (Sorrell, 1990).

Story impressions is another strategy that has been effective in improving the reading levels of average and superior students, as well as those in need of previews used to activate schemata by supplying key words rather than information about story content (McGinley & Denner, 1987).

One strategy is particularly interesting because it details the use of the basal reader. The enrichment activities suggested in the reader are repositioned from their usual placement at the end of the lesson to the beginning so that schemata pertinent to the story are developed by children before reading it. Study indicates that children who used this strategy score higher on the

comprehension questions in the reader than children who followed the traditional format (Prince & Mancus, 1987).

Schema-based reading strategies have been found effective for a number of instructional purposes other than teaching in the traditional elementary grade classroom. Teachers of adult literacy have used writing activities and role-playing in a cooperative learning setting to build schema in older students (Perin, 1988). Another different strategy has been designed for reading comprehension assessment, such as the Metropolitan Achievement Tests (MAT). In this strategy students are exposed to a purpose question intended to activate schemata before each of the reading comprehension sections on the MAT. The aim is to provide students "both motivation and textual cues . . . to make maximum use of their existing reading strategies and abilities" (Rowe, & Rayford, 1987).

Recommendations for ways in which teachers can take advantage of schema theory in the classroom include motivation and giving children a purpose by spending more time on instructions before beginning the reading to alert them to schemata germane to the story. Vocabulary building can be emphasized by using synonyms and antonyms

instead of relying on the dictionary (Strange, 1984).

Another recommendation is to make use of questions and answers, such as "textually implicit" when the text contains both, but no grammatical cue for the answer, and "schema implicit" when the question is in the text, but the answer comes from beyond the text (Strange, 1984).

Others include recalling and noting details, focusing on guiding children in making inferences, comparing stories, modeling and simulating dialogues, and analyzing the "miscomprehension" of text to ascertain what part schema played in the meaning and how it was used (Strange, 1984).

If a child has difficulty maintaining schemata, separate sentences can be combined with cue words such as "because, since, after, or therefore" that link relationships between two concepts. Visual aid in the form of graphs, flow charts, outlines, and the like, as well as highlighting text, will also help the child with schema maintenance (Pearson & Spiro, 1982).

If children lack sufficient schemata, they can be helped to build new schemata by exposure to analogies and comparison that will make the transition from their current knowledge to new knowledge (Pearson & Spiro,

1982).

Perhaps the best method of building prior knowledge is to expose children to a variety of experiences and information. Planned trips to museums, farms, zoos, and businesses; hands-on activities such as cooking, constructing models, and making costumes; watching movies, videos, and filmstrips; and hearing stories read aloud are a few examples of enriching activities that will result in adding schemata to a child's mental repository (Pearson & Spiro, 1982).

In summary, schema theory explains reading through the activation of prior knowledge with the premise that the more you know, the better you can read. Although not an official approach to reading instruction, it confirms the importance of rich, varied experiences necessary for the language experience approach and fits well into the whole language philosophy.

Schema theory does not assert a practical method of teaching reading; however, as Strange quotes Pearson and Johnson, "Nothing is more practical than a good theory" (1984).

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